4

PROJECT RISK MANAGEMENT

Unit Structure:

4.0 OBJECTIVES

After reading this chapter you will be able to:

1. Understand what risk is and the importance of good project risk management

2. Discuss the elements involved in risk management planning and contents of a risk management plan.
3. List common sources of risks on information technology projects
4. describe the risk identification process, tools and techniques to help identify project risks and the main output of risk identification-risk register
5. Discuss the qualitative risk analysis process and explain how to calculate risk factors, create probability impact matrixes, apply the top ten risk item tracking techniques, and use expert judgment to rank risks
6. Explain quantitative risk analysis process and how to apply decision trees, simulation, and sensitivity analysis to quantify risks
7. Provide examples of using different risk response planning strategies to address both negative and positive risks
8. Discuss the components of risk monitoring and control
9. Describe how software can assist in project risk management

4.1 INTRODUCTION

Managing risk is an integral part of good management and is something many managers do already in one form or another.

Project risk is an uncertain event or condition that, if it occurs, has a positive or a negative effect on at least one project objective. A risk may have one or more causes and, if it occurs, one or more impacts. Risk management is the systematic process of planning for, identifying, analyzing, responding to, and monitoring project risks. It involves processes, tools, and techniques that will help the project manager maximize the probability and results of positive events and minimize the probability and consequences of adverse events as indicated and appropriate within the context of risk to the overall project objectives of cost, time, scope and quality. Project risk management is most effective when first performed early in the life of the project and is a continuing responsibility throughout the project's life cycle.

4.2 THE IMPORTANCE OF PROJECT RISK MANAGEMENT

The project risk management process helps project sponsors and project teams make informed decisions regarding

alternative approaches to achieving their objectives and the relative risk involved in each, in order to increase the likelihood of success in meeting or exceeding the most important objectives (e.g. time) sometimes at the expense of other objectives (e.g. cost).

Risk Management provides a structured way of identifying and analyzing potential risks, and devising and implementing responses appropriate to their impact. These responses generally draw on strategies of risk prevention, risk transfer, impact mitigation or risk acceptance. Within a single project or proposal each of these strategies may have application for different individual risks.
Risk management encourages the project team to take appropriate measures to:

1. Minimize adverse impacts to project scope, cost, and schedule (and quality, as a result).
2. Maximize opportunities to improve the project's objectives with lower cost, shorter schedules, enhanced scope and higher quality.
3. Minimize management by crisis.

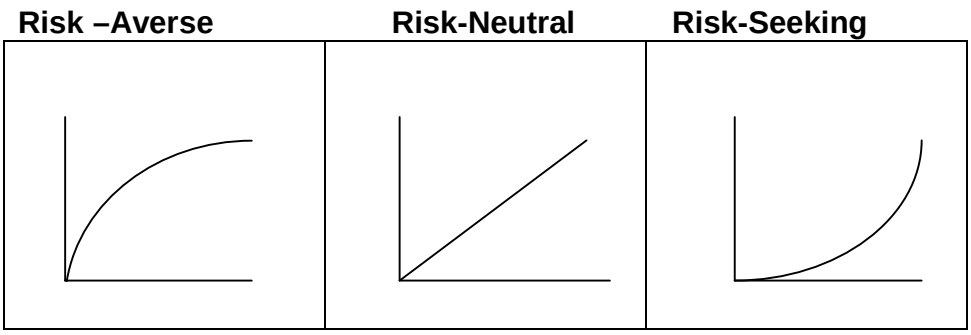
Project risk management is the art and science of identifying, analyzing and responding to risk throughout the life of a project and in the best interest of meeting the project objectives. A frequently overlooked aspect of project management, risk management can often result in significant improvements in the ultimate success of projects .Risk management can have a positive impact on selecting projects, determining scope of projects and developing realistic schedules and cost estimates. It helps project stakeholders understand the nature of the project, involves team members in defining the strengths and weakness , and helps to integrate the other project management knowledge areas.

Before you can improve project risk management, you must understand what risk is .A basic dictionary definition says that risk is "the possibility of loss or injury". This definition highlights the negativity often associated with risk and suggests that uncertainty is involved. Project risk management involves understanding potential problems that might occur on the project and how they might impede project success. The *PMBOK Guide 2004* refers to this type of risk as a negative risk. However, there are also positive risks, which can result in good things happening on a project. A general definition of a project risk , therefore , is an uncertainty that can have a negative or positive effect on meeting project objectives.

Some organizations or people have a neutral tolerance for risk, some have an aversion to risk, and others are risk seeking. These three preferences for risk are part of the utility theory of risk.

Risk utility or risk tolerance is the amount of satisfaction or pleasure received from a potential payoff. The following figure shows the basic difference between risk averse, risk neutral, and risk seeking preferences. The y-axis represents utility, or the amount of pleasure received from taking a risk. The x-axis shows the amount of potential payoff, opportunity, or dollar value of the opportunity at stake.

Utility rises at a decreasing rate for a risk averse person. That is when more payoff or money is at stake ,a person or organization that is risk averse gains less satisfaction from risk, or has lower tolerance for the risk. Those who are risk seeking have a higher tolerance for the risk, and their satisfaction increases when more payoff is at stake. A risk seeking person prefers outcomes that are more uncertain and is often willing to pay penalty to take risk. A risk neutral person achieves balance between risk and payoff..



Risk utility function and risk preference

The goal of project risk management can be viewed as minimizing potential negative risks while maximizing potential positive risks. The term known risks is some times used to describe risks that the project team has identified and analyzed .

4.2.1 Processes and outputs:

This matrix shows the six main processes and all of the deliverables associated with project risk management

Process	Output(deliverables)
Risk management planning	Risk management plan(RMP)

Risk identification	Risk Register (Register)
Qualitative risk analysis	Risk Register (updates) Prioritized list of risks classified as high, moderate, or low
Quantitative risk analysis	Quantitative Risk Analysis Reports Numerical analysis of the project's likelihood of achieving its overall objectives (Risk Register updates)
Risk response planning	1- Risk Register (updates) 2- Project Management Plan (updates) 3- Project Risk Management Plan (updates) 4- Risk-related contractual agreements The outcome may result in one or more of the following: residual risks, secondary risks, change control, contingency reserve (amounts of time or budget needed).
Risk monitoring and control	Risk Register (updates) The outcome may result in workaround plans, corrective actions, programming change request (PCR), and updates to risk identification checklists for future projects

4.3 RISK MANAGEMENT PLANNING

Risk management planning is the process of deciding how to approach and plan for risk management activities for a project, and the main output of this process is a risk management plan A risk management plan documents the procedure for managing risk throughout the project.

The project team should hold several planning meeting early in the project's life cycle to help develop the risk management plan. The project team should review the project documents as well as corporate risk management policies, risk categories, lessons learned reports from past projects and templates for creating risk management plan.

Careful and explicit planning enhances the possibility of success of the other risk management processes. Risk Management Planning is the process of deciding how to approach

and conduct the risk management activities for a project. Planning of risk management processes is important to ensure that the level, type, and visibility of risk management are commensurate with both the risk and importance of the project to the organization, to provide sufficient resources and time for risk management activities, and to establish an agreed-upon basis for evaluating risks. The Risk Management Planning process should be completed early during project planning, since it is crucial to successfully performing the other processes described in this handbook.

The result of Risk Management Planning is a Risk Management Plan. The risk management plan identifies and establishes the activities of risk management for the project in the project plan (RMP)

A risk management plan summarizes how risk management will be performed on a particular project. Like other specific knowledge area plans it becomes a subset of project management plan The following table lists the general topics that a risk management plan should address It is important to clarify roles and responsibilities, prepare budget and schedule estimates for risk-related work, and .identify risk categories for consideration. It is also important to describe how risk management will be done, including assessment of risk probabilities and impacts as well as creation of risk related documentation.

Methodology: How will risk management will be performed on this project?. What tools and data sources are available and applicable?
Roles and responsibilities: who are the individuals responsible for implementing specific tasks and providing deliverables related to risk management
Budget and schedule: What are the estimated costs and schedules for performing risk related activities?
Risk Categories: What are the main categories of risk that should be addressed on this project?. Is there a risk breakdown structure for the project
Risk Probability and Impact: How will the probabilities and impacts of risk items be assessed?. What scoring and interpretation methods will be used for the qualitative and quantitative analysis of risks?
Risk Documentation: What reporting formats and processes will used for risk management activities?

In addition to risk management plan many projects also include contingency plans, fallback plans, and contingency reserves. Contingency plans are predefined actions that the project team will take if an identified risk event occurs. For example ,if the project team knows that a new release of a software package may not be available in time for them to use it for their project, they might have a contingency plan to use the older version of the software.

Fallback plans are developed for risks that have a high impact on meeting project objectives and are put in to effect if attempts to reduce risks are not effective. For example , a new college graduate might have a main plan and several contingency plans on where to live after graduation, but if none of the plans work out a fallback plan might be to live at home for a while. Sometimes contingency plans and fallback plans are used interchangeably.

Contingency reserves or contingency allowances are provisions held by the project sponsor or organization to reduce the risk of cost or schedule overruns to an acceptable level. For example if a project appears to be off course because the the staff is inexperienced with some new technology and the team had not identified it as a risk ,the project sponsor may provide additional funds from contingency reserves to hire an outside consultant to train and advise the project staff in using the new technology.

4.4 COMMON SOURCES OF RISK IN INFORMATION TECHNOLOGY PROJECTS

Several studies show that IT projects share some common sources of risk. The Standish Group developed an IT success potential scoring sheet based on potential risks. Other broad categories of risk help identify potential risks.

Information Technology Success Potential Scoring Sheet

Success Criterion	Relative Importance
User Involvement	19
Executive Management support	16
Clear Statement of Requirements	15
Proper Planning	11
Realistic Expectations	10
Smaller Project Milestones	9
Competent Staff	8

Ownership	6
Clear Visions and Objectives	3
Hard-Working, Focused Staff	3
Total	100

The Standish Group provides specific questions for each success criterion to help decide the number of points to assign to a project. For example the five questions related to user involvement include the following
Do I have the right user(s)?
Did I involve the users early and often?
Do I have a quality relationship with user(s)?
Do I make involvement easy
Did I find out what the user(s) need(s)?

The number of questions corresponding to each success criterion determines the number of points each positive response is assigned. For example in the case of user involvement there are five questions . For each positive reply , you would get(19/5) 3.8 points . !9 represents the weight of the criterion and five represents the number of questions. Therefore ,you would assign a value to the user involvement criterion by adding 3.8 points to the score for each question you can answer positively.

4.4.1 Categories of Risk:

A broad categories of risks are described on the questionnaires developed by many organizations. Some of them are given below.

 Market risk: If the information technology project is to produce a new product or service will it be useful to the organization or marketable to others?. Will user accept the product or service?. Will someone else make a better product or service faster, making the project a waste of time and money.

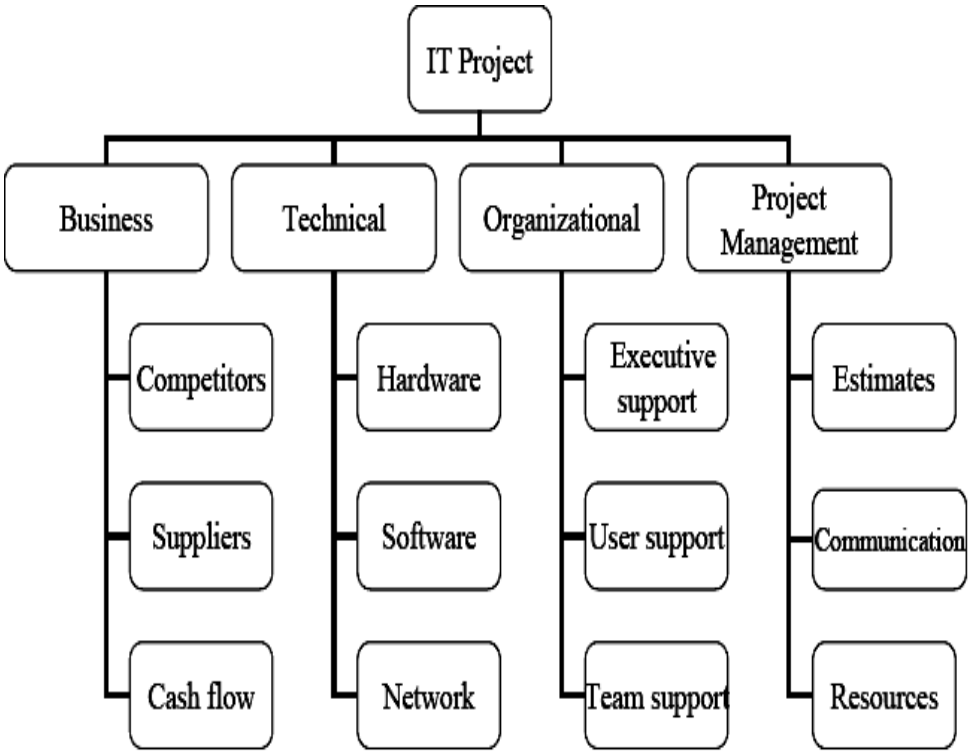
 Financial risk: Can the organization afford to undertake the project?. How confident are the stakeholders in the financial projections?. Will the project meet NPV,ROI, and payback estimates?. If not van the organization afford to proceed the project?. Is this project the best way to use the organization's financial resources?

 Technology risk: Is the project technically feasible?. Will it use mature, leading edge or bleeding edge technologies? When will decisions be made on which technology to use? Will H/w, S/w and network function properly?. You can also breakdown the technology risk into h/w, s/w, and network technology if required.

 People risk: Does the organization have or can they find people with appropriate skills to complete the project successfully?. Do they have enough experience?. Does senior management support the project?. Is the organization familiar sponsor/customer for the project?. How good is the relationship with the sponsor/customer?
 Structure/process risk: What is the degree of change the new project will introduce into user areas and business procedures? How many distinct user groups does the project need to satisfy? With how many other systems does the project need to interact? Does the organization have processes in place to complete the project successfully?

4.4.2 Risk Breakdown Structure:

 A **risk breakdown structure** is a hierarchy of potential risk categories for a project. Similar to a work breakdown structure but used to identify and categorize risks. A sample shown below.



A risk break down structure is a useful tool that can help project managers consider potential risks in different categories. The highest level categories are business, technical, and organizational and project management. Competitors suppliers, and cash flow are categories that fall under business risks. Under technical risk are the categories h/w, s/w, and network.

A risk break down structure provides a simple, one page chart to help ensure a project team is considering important risk categories related to all information technology projects.

The following table shows the potential negative risk conditions that can exist within each knowledge area.

Potential Risk Conditions Associated With Each Knowledge Area

Knowledge Area	Risk Conditions
Integration	Inadequate planning; poor resource allocation; poor integration management; lack of post-project review
Scope	Poor definition of scope or work packages; incomplete definition of quality requirements; inadequate scope control
Time	Errors in estimating time or resource availability; poor allocation and management of float; early release of competitive products
Cost	Estimating errors; inadequate productivity, cost, change, or contingency control; poor maintenance, security, purchasing, etc.
Quality	Poor attitude toward quality; substandard design/materials/workmanship; inadequate quality assurance program
Human Resources	Poor conflict management; poor project organization and definition of responsibilities; absence of leadership
Communications	Carelessness in planning or communicating; lack of consultation with key stakeholders
Risk	Ignoring risk; unclear assignment of risk; poor insurance management
Procurement	Unenforceable conditions or contract clauses; adversarial relations

4.5 RISK IDENTIFICATION

Risk identification involves identifying potential project risks. Risk Identification produces a deliverable — the project Risk Register – where risks are identified that may affect the project's ability to achieve its objectives. Risk Identification documents which risks might affect the project and documents their characteristics. The Risk Register is subsequently amended with the results from qualitative risk analysis and risk response planning, and is reviewed and updated throughout the project.

Participants in risk identification activities can include the following, where appropriate: project manager, project team members, risk management team (if assigned), subject matter experts both from the project and from outside the project team, customers, end users, other project managers, stakeholders, and risk management experts. While these personnel are often key

participants for risk identification, all project personnel should be encouraged to identify risks.

4.5.1 Suggestions For Identifying Risks:

The assigned team members identify the potential risks (threats and opportunities), using

- The risk breakdown structure, suitably tailored to the project.
- The sample risk list
- Their own knowledge of the project or similar projects.
- Consultation with others who have significant knowledge of the project or its environment.
- Consultation with others who have significant knowledge of similar projects.

There are several other tools and techniques also for identifying risks Five common information gathering techniques for risk identification include brainstorming ,Delphi technique ,interviewing ,root cause analysis, and SWOT analysis.

1. Brain Storming:

It is a technique by which a team attempt to generate ideas or find solutions for a specific by amassing ideas spontaneously and with out judgment . This approach can help the group create a comprehensive list of risks to address later in the qualitative and quantitative risk analysis process. An experienced facilitator should run the brainstorming session and introduce new categories of potential risks to keep the ideas flowing . After the ideas are collected ,the facilitator can group and categorize the ideas to make them more manageable

2. Delphi Technique:

The Delphi Technique is used to derive a consensus among a panel of experts who make predictions about future developments. It Provides independent and anonymous input regarding future events. Uses repeated rounds of questioning and written responses and avoids the biasing effects possible in oral methods, such as brainstorming.

3. Interviewing:

Interviewing is a fact-finding technique for collecting information in face-to-face, phone, e-mail, or instant messaging discussions. Interviewing people with similar project experience is an important tool for identifying potential risks.

4. SWOT Analysis:

- SWOT analysis (strengths, weaknesses, opportunities,and threats) can also be used during risk identification.

- Helps identify the broad negative risks that apply to a project.

Applying SWOT to specific potential projects can help identify the broad risks and opportunities that apply in that scenario Some other techniques for risk identification are

5. Use of checklists :

The list of risks that have been encountered in previous projects provide meaningful template for understanding risks in current projects.

It is important to analyze project assumptions to make sure that they are valid. Incomplete, inaccurate or inconsistent assumptions might lead to identifying more risks.

6. Diagramming Technique:

This method include using cause and effect diagrams or fishbone diagrams ,flow charts and influence diagrams .Fishbone diagrams help you trace problems back to their root cause. Process flow charts are diagrams that show how different parts of the system interrelate.

4.5.2 The Risk Register:

The main output of the risk identification process is a list of identified risks and other information needed to begin creating a risk register.

A risk register is:

- A document that contains the results of various risk management processes and that is often displayed in a table or spreadsheet format.
- A tool for documenting potential risk events and related information.

Risk Register Contents

- An identification number for each risk event.
- A rank for each risk event.
- The name of each risk event.
- A description of each risk event.
- The category under which each risk event falls.
- The root cause of each risk.

- Triggers for each risk; triggers are indicators or symptoms of actual risk events.
- Potential responses to each risk.
- The risk owner or person who will own or take responsibility for each risk.
- The probability and impact of each risk occurring.
- The status of each risk.

Sample Risk Register

No.	Rank	Risk	Description	Category	Root Cause	Triggers	Potential Responses	Risk Owner	Probability	Impact	Status
R44	1										
R21	2										
R7	3										

4.6 QUALITATIVE RISK ANALYSIS

- Assess the likelihood and impact of identified risks to determine their magnitude and priority.
- Risk quantification tools and techniques include:
- Probability/impact matrixes
- The Top Ten Risk Item Tracking
- Expert judgment

4.6.1 Using Probability/Impact Matrix To Calculate Risk Factors:

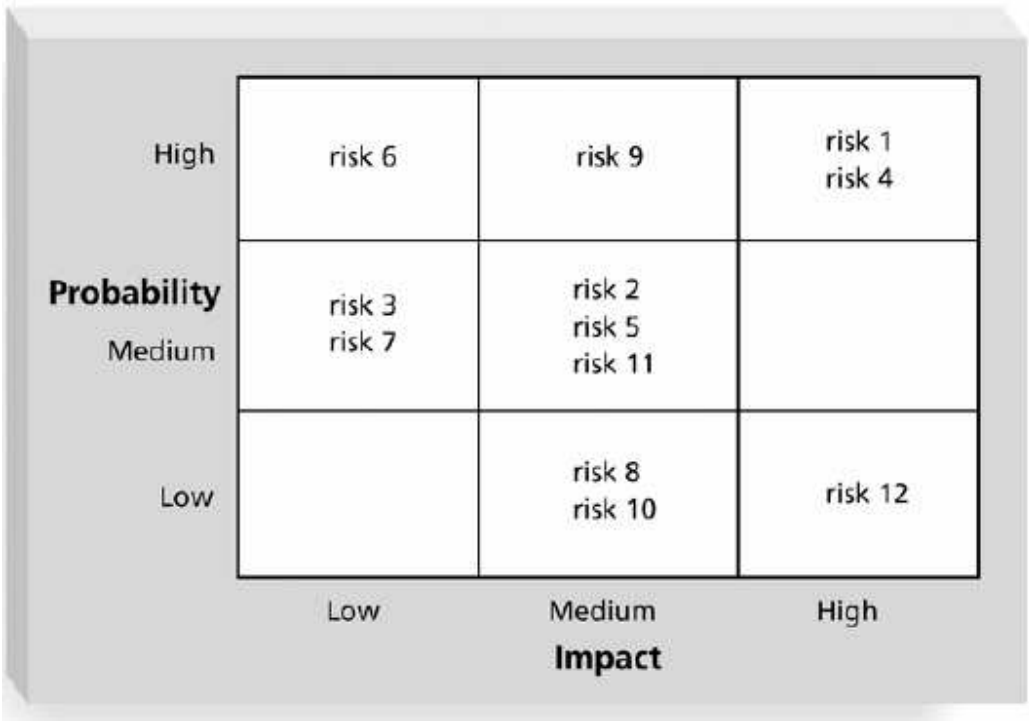
- A probability/impact matrix or chart lists the relative probability of a risk occurring on one side of a matrix or axis on a chart and the relative impact of the risk occurring on the other.

- List the risks and then label each one as high, medium, or low in terms of its probability of occurrence and its impact if it did occur.

It may be useful to create separate Probability/Impact Matrix or chart for negative risks and positive risks to make sure both types of risks are adequately addressed. Qualitative analysis is normally done quickly so that the project team has to decide what type of approach makes the most sense for their project. To quantify risk probability and consequence, the Defense Systems Management College developed a technique for calculating risk factors – the numbers that represent the overall risk of specific events ,based on their probability of occurring and consequences to the project if they do occur. The technique makes use of Probability/Impact Matrix that shows the probability of risks occurring and the impact or consequences of the risks.

Probability of a risk occurring can be estimated based on several factors as determined by the unique nature of each project . For example factors evaluated for potential H/W or S/W technology risks could include the technology not being mature, the technology being too complex, and an inadequate support base for developing the technology. The impact of a risk occurring could include factors such as availability of fallback solutions or the consequences of not meeting performance , cost and schedule estimates

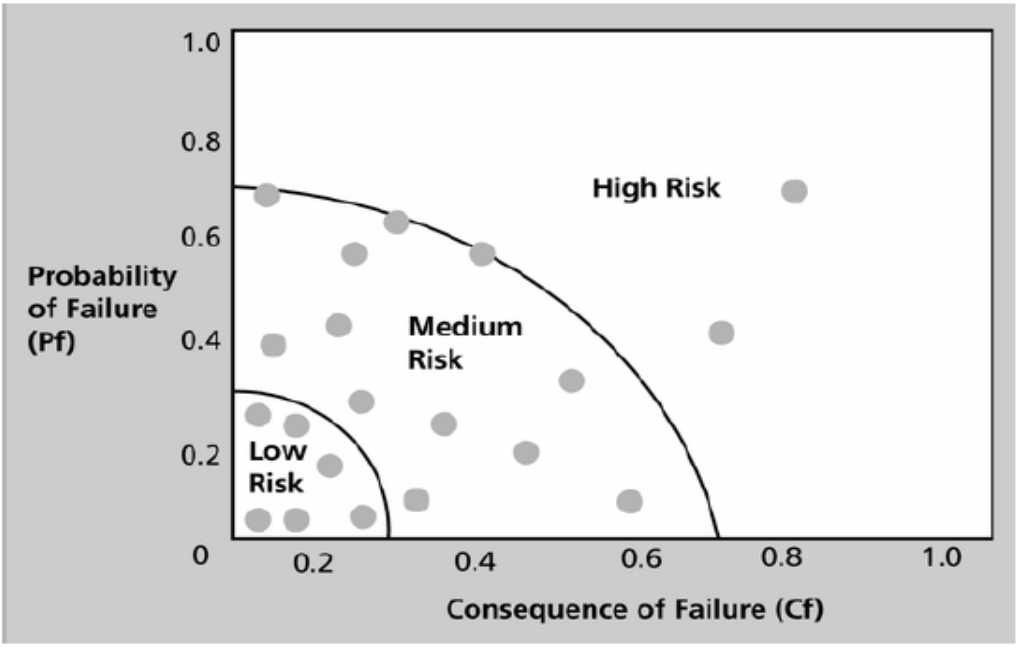
Sample Probability/Impact Matrix



The following figure gives an example of how the risk factors were used to graph the probability of failure and consequence of failure for proposed technologies. The figure classifies potential

technologies (dots on the charts) as high, medium, or low risk based on the probability of failure and consequence of failure. The researchers for this study highly recommended that the US Air Force invest in the low to medium risk technologies and suggested that it not pursue the high risk technologies. It can be seen that the rigor behind using Probability/Impact Matrix and risk factors provides a much stronger argument than simply stating the risk probabilities or consequences are high, medium, or low

Chart Showing High-, Medium-, and Low-Risk Technologies



4.6.2 Top Ten Risk Item Tracking:

Top Ten Risk Item Tracking is a qualitative risk analysis tool that helps to identify risks and maintain an awareness of risks throughout the life of a project. Establish a periodic review of the top ten project risk items.

The review begins with a summary of the status of top ten sources of risk on the project. The summary includes each item's current ranking previous ranking, number of times it appears on the list over a period of time, and a summary of progress made in resolving the risk item since the previous review.

List the current ranking, previous ranking, number of times the risk appears on the list over a period of time, and a summary of progress made in resolving the risk item.

The following figure provides an example of Top Ten Risk Item Tracking chart that could be used at a management review meeting for a project. This includes only the top five negative risk events. Each risk event is ranked based on the current month, previous month, and how many months it has been in the top ten. The last column briefly describes the progress for resolving each particular risk item

Example of Top Ten Risk Item Tracking

	Monthly Ranking			
Risk Item	**This Month**	**Last Month**	**Number of Months**	**Risk Resolution Progress**
Inadequate planning	1	2	4	Working on revising the entire project plan
Poor definition of scope	2	3	3	Holding meetings with project customer and sponsor to clarify scope
Absence of leadership	3	1	2	Just assigned a new project manager to lead the project after old one quit
Poor cost estimates	4	4	3	Revising cost estimates
Poor time estimates	5	5	3	Revising schedule estimates

4.6.3 Expert Judgment:

Many organizations rely on the intuitive feelings and past experience of experts to help identify potential project risks. Experts can categorize risks as high, medium, or low with or without more sophisticated techniques.

The main output of qualitative risk analysis is updating the risk register .The ranking column of the risk register should be filled in along with numeric value or high, medium, low for the probability and impact of the risk event. Additional information is often added for risk events, such as identification of risks that need more attention in the near term or those that can be placed on a watch list. A watch list is a list of risks that are low priority , but are still

identified as potential risks. Qualitative analysis can also identify risks that should be evaluated on a quantitative basis.

4.7 QUANTITATIVE RISK ANALYSIS

Often follows qualitative risk analysis, but both can be done together.

Large, complex projects involving leading edge technologies often require extensive quantitative risk analysis.
Main techniques include:

- Decision tree analysis
- Simulation
- Sensitivity analysis

Quantitative risk analysis is a way of numerically estimating the probability that a project will meet its cost and time objectives. Quantitative analysis is based on a simultaneous evaluation of the impact of all identified and quantified risks. The result is a probability distribution of the project's cost and completion date based on the identified risks in the project.

Quantitative risk analysis involves statistical techniques, primarily Monte Carlo simulation that is most widely and easily used with specialized software.

Quantitative risk analysis starts with the model of the project, either its project schedule or its cost estimate depending on the objective. The degree of uncertainty in each schedule activity and each line-item cost element is represented by a probability distribution. The probability distribution is usually specified by determining the optimistic, the most likely and the pessimistic values for the activity or cost element – this is typically called the "3-point estimate." The three points are estimated during an interview with subject matter experts who usually focus on the schedule or cost elements one at a time. The risks that lead to the three points are recorded for the quantitative risk analysis report and for risk response planning. For each activity or cost element a probability distribution type is chosen that best represents the risks discussed in the interview. Typical distributions usually include the triangular, beta, normal and uniform.

4.7.1 Decision Trees and Expected monetary Value:

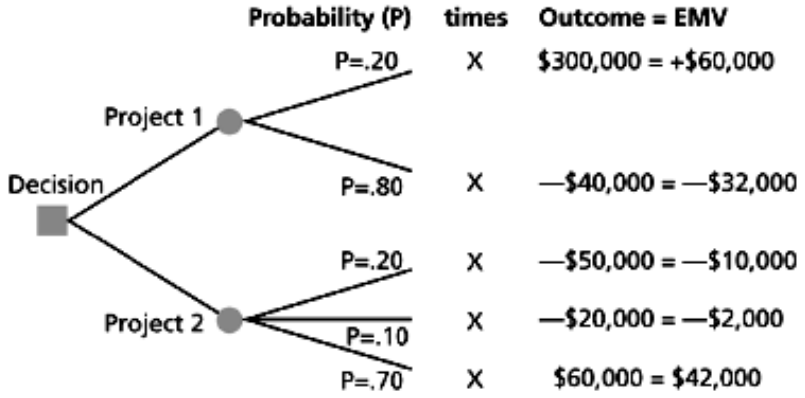
A decision tree is a diagramming analysis technique used to help select the best course of action in situations in which future outcomes are uncertain.

- Estimated monetary value (EMV) is the product of a risk event probability and the risk event's monetary value.

 You can draw a decision tree to help find the EMV.

To create a decision tree and to calculate expected monetary value specifically, you must estimate the probabilities, of certain events occurring. For example in the following figure there is a 20 percent probability(P=.20) that Cliff's firm will win the contract project1, which is estimated to be $300,000 in profits- the outcome of the top branch in the figure. There is an 80 percent probability that it will not win the contract for the project, and the outcome is estimated to be -$40,000 meaning that the firm has to invest $40,000 into project1with no reimbursement if it is not awarded the contract.

To calculate EMV for each project, multiply the probability by the outcome value for each potential outcome for each project .
The EMV for project 1 is 0.2($300,000)+0.8(-40,000)=$60,000-$32000=28,000



Project 1's EMV = $60,000 —32,000 = $28,000
Project 2's EMV = —$10,000 —2,000 + 42,000 = $30,000

4.7.2 Simulation:

A specialized Monte Carlo simulation software program runs (iterates) the project schedule or cost estimate many times, drawing duration or cost values for each iteration at random from the probability distribution derived from the 3-point estimates and probability distribution types selected for each element. The Monte Carlo software develops from the results of the simulation a probability distribution of possible completion dates and project costs. From this distribution it is possible to answer such questions as:

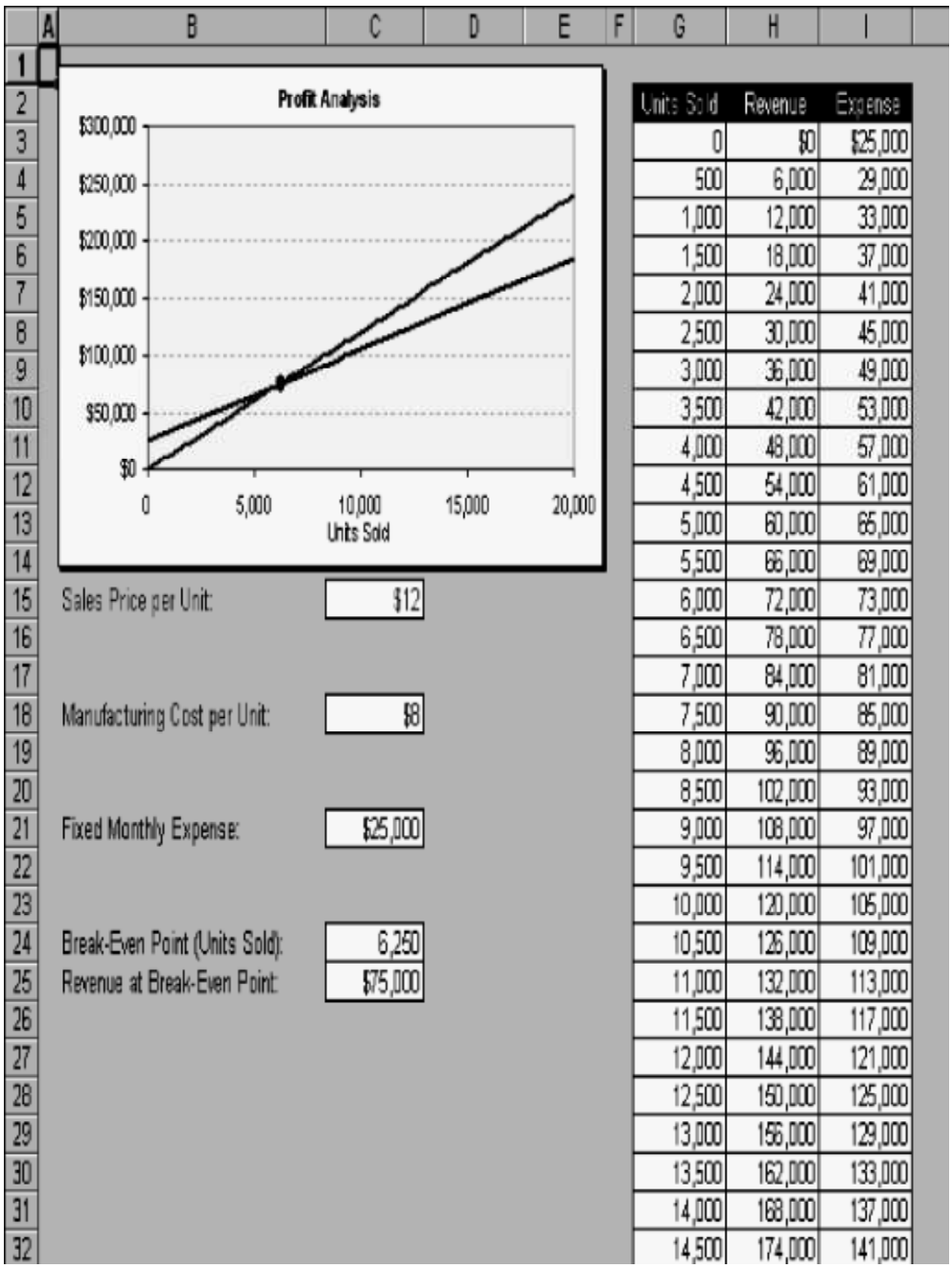
- How likely is the current plan to come in on schedule or on budget?
- How much contingency reserve of time or money is needed to provide the agency with a sufficient degree of certainty?

• Using sensitivity analysis, which activities or line-item cost elements contribute the most to the possibility of overrunning schedule or cost targets?

4.7.3 Sensitivity Analysis:

- Sensitivity analysis is a technique used to show the effects of changing one or more variables on an outcome.
- For example, many people use it to determine what the monthly payments for a loan will be given different interest rates or periods of the loan, or for determining break-even points based on different assumptions.
- Spreadsheet software, such as Excel, is a common tool for performing sensitivity analysis.

The following figure shows an example Excel file created to quickly show the break-even point for a product based on various inputs-the sales price per unit, manufacturing cost per unit, and fixed monthly expenses. The current inputs result I a break-even point of 6,250 units sold. Users of this spreadsheet can change inputs and see the effects on the break-even point in chart format. Project teams often create similar models to determine the sensitivity of various project variables.



The main outputs of quantitative risk analysis are updates to the risk register, such as revised risk rankings or detailed information behind those rankings. The quantitative analysis also provides high level information in terms of the probabilities of achieving certain projects objectives. This information might cause the project manager to suggest changes in contingency reserves .

4.8 RISK RESPONSE PLANNING

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Risk Response Planning is the process of developing options, and determining actions to enhance opportunities and reduce threats to the project's objectives. It focuses on the high-risk items evaluated in the qualitative and/or quantitative risk analysis. In Risk Response Planning parties are identified and assigned to take responsibility for each risk response. This process ensures that each risk requiring a response has an owner monitoring the responses, although a different party may be responsible for implementing the risk handling action itself.

The project manager and the PDT identify which strategy is best for each risk, and then design specific action(s) to implement that strategy.

Strategies for Negative Risks or Threats include:

 Avoid: Risk avoidance involves changing the project plan to eliminate the risk or to protect the project objectives (time, cost, scope, quality) from its impact. The team might achieve this by changing scope, adding time, or adding resources (thus relaxing the so-called "triple constraint").

These changes may require a Programming Change Request (PCR). Some negative risks (threats) that arise early in the project can be avoided by clarifying requirements, obtaining information, improving communication, or acquiring expertise.

 Transfer: Risk transference requires shifting the negative impact of a threat, along with ownership of the response, to a third party. An example would be the team transfers the financial impact of risk by contracting out some aspect of the work.

Transference reduces the risk only if the contractor is more capable of taking steps to reduce the risk and does so. Risk transference nearly always involves payment of a risk premium to the party taking on the risk.

Transference tools can be quite diverse and include, but are not limited to the use of: insurance, performance bonds, warranties, guarantees, incentive/disincentive clauses, A+B Contracts, etc.

 Mitigate. Risk mitigation implies a reduction in the probability and/or impact of an adverse risk event to an acceptable threshold. Taking early action to reduce the probability and/or impact of a risk is often more effective than trying to repair the damage after the risk has occurred.

Risk mitigation may take resources or time and hence may represent a tradeoff of one objective for another. However, it may

still be preferable to going forward with an unmitigated risk. Monitoring the deliverables closely, increasing the number of parallel activities in the schedule, early involvement of regulatory agencies in the project, early and continuous outreach to communities/advocacy groups, implementing value engineering, performing corridor studies, adopting less complex processes, conducting more tests, or choosing a more stable supplier are examples of mitigation actions.

General Risk Mitigation Strategies for Technical, Cost, and Schedule Risks

TECHNICAL RISKS	COST RISKS	SCHEDULE RISKS
Emphasize team support and avoid stand-alone project structure	Increase the frequency of project monitoring	Increase the frequency of project monitoring
Increase project manager authority	Use WBS and CPM	Use WBS and CPM
Improve problem handling and communication	Improve communication, project goals understanding, and team support	Select the most experienced project manager
Increase the frequency of project monitoring	Increase project manager authority	
Use WBS and CPM		

Strategies for Positive Risks or Opportunities include:

 Exploit. The organization wishes to ensure that the opportunity is realized. This strategy seeks to eliminate the uncertainty associated with a particular upside risk by making the opportunity definitely happen. Examples include securing talented resources that may become available for the project.

 Share. Allocating ownership to a third party who is best able to capture the opportunity for the benefit of the project. Examples include: forming risk-sharing partnerships, teams, working with elected officials, special-purpose companies, joint ventures, etc.

 Enhance. This strategy modifies the size of an opportunity by increasing probability and/or positive impacts, and by identifying and maximizing key drivers of these positive-impact risks. Seeking to facilitate or strengthen the cause of the opportunity, and proactively targeting and reinforcing its trigger conditions, might increase probability. Impact drivers can also be targeted, seeking to increase the project's susceptibility to the opportunity.

 Acceptance. A strategy that is adopted because it is either not possible to eliminate that risk from a project or the cost in time or money of the response is not warranted by the importance of the risk. When the project manager and the project team decide to accept a certain risk(s), they do not need to change the project plan to deal with that certain risk, or identify any response strategy other than agreeing to address the risk if and when it occurs. A workaround plan may be developed for that eventuality.

There are two types of acceptance strategy:

1. Active acceptance. The most common active acceptance strategy is to establish a contingency reserve, including amounts of time, money, or resources to handle the threat or opportunity.

2- Passive acceptance. Requires no action leaving the project team to deal with the threats or opportunities as they occur.

i. **Workaround**:

Workaround is distinguished from contingency plan in that a workaround is a recovery plan that is implemented if the event occurs, whereas a contingency plan is to be implemented if a trigger event indicates that the risk is very likely to occur.

As with risk identification process, the team should also consider residual risks, secondary risks, and risk interaction in the risk response planning process. See page 10 for details.

4.9 RISK MONITORING AND CONTROL

Risk monitoring and control keeps track of the identified risks, residual risks, and new risks. It also monitors the execution of planned strategies on the identified risks and evaluates their effectiveness.

Risk monitoring and control continues for the life of the project. The list of project risks changes as the project matures, new risks develop, or anticipated risks disappear.

Typically during project execution there should be regularly held risk meetings during which all or a part of the Risk Register is reviewed for the effectiveness of their handling and new risks are discussed and assigned owners. Periodic project risk reviews repeat the process of identification, analysis, and response planning. The project manager ensures that project risk is an agenda item at all PDT meetings. Risk ratings and prioritization commonly change during the project lifecycle.

If an unanticipated risk emerges, or a risk's impact is greater than expected, the planned response may not be adequate. The project manager and the PDT must perform additional response planning to control the risk.

Risk control involves:

- Choosing alternative response strategies
- Implementing a contingency plan
- Taking corrective actions
- Re-planning the project, as applicable

The individual or a group assigned to each risk (risk owner) reports periodically to the project manager and the risk team leader on the status of the risk and the effectiveness of the response plan. The risk owner also reports on any unanticipated effects, and any mid-course correction that the PDT must consider in order to mitigate the risk.

4.10. USING SOFTWARE TO ASSIST IN PROJECT RISK MANAGEMENT

Most organizations use software to create , update , and distribute informations in their risk registers.The risk register is often a word or excel file but it can also be part of a more sophisticated database. Spreadsheets can aid in tracking and quantifying risk , preparing charts and graphs , and performing sensitivity analysis. Software can be used to create decision trees and estimated monitary values.

More sophisticated risk management software such as Monte Carlo Simulation s/w can help you develop models and use simulations to analyze and respond to various risks. There are also several s/w packages created specifically for project risk management . If a risk is not identified.

Software should be used as a tool to help make good decisions in project risk management, not as a scapegoat for when things go wrong.

4.11 SUMMARY

Risk Management is always forgotten when managing projects but the irony is that all projects have risk. People in general think that risk management is just a blaming session to uncover flaws in a particular project. This perception has to be abolished.

Management and Project managers have to understand that Risk Management is the one of the few practical way to manage uncertainties and doubts towards a particular project.

Risk can never be abolished, but can only be reduced to an acceptable level. Risk Management is a must for any projects and it has to be done from the initiation phase throughout the project lifecycle. Risk Management is not free, and it isn't cheap. There may need to have third party audits which incur cost. There must always be continual management support and commitment to ensure the success of projects.

This chapter we discussed the importance of risk management in the projects and also were able to understand the different processes in the risk management, which consists of the following actions

 Project risk management is the art and science of identifying, analyzing, and responding to risk throughout the life of a project and in the best interests of meeting project objectives.

Main processes include:

- Risk management planning
- Risk identification
- Qualitative risk analysis
- Quantitative risk analysis
- Risk response planning
- Risk monitoring and control

Sample Questions

1. Discuss the common sources of risk on information technology projects and suggestions for managing them**. (Ans:section 4.4)**

2. Explain how to use decision trees and Monte Carlo analysis for quantifying risk. **(Ans Hint: section 4.7.1)**

Suggested Readings:

1. Boehm ,Barry W. " Software Risk management: Principles and practices"
2. Kathy Schwalbe : Information Technology project management
3. Hillson , David. : The risk breakdown structure as an aid to effective risk management
4. DeMarco,Tom and Timothy Lister: Managing Risk on software projects
4. www.risksig.com

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