BACHELOR OF COMPUTER APPLICATIONS

SEMESTER 6

DCA3245

SOFTWARE PROJECT MANAGEMENT

Unit 7

Risk Management

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1. INTRODUCTION

In the previous unit, we have discussed project monitoring and controlling. In this unit, let's discuss risk management which is an important management activity. As you are aware, the software project is a complex task. It involves a lot of team work and collaborative effort to be a successful venture. Hence any unforeseen event might adversely affect the project from the costing, quality and timelines of the project. This is where the Risk Management plays important role. Risk Management tries to predict the unforeseen events and also tries to reduce the impact of such events by having a proper mitigation plan. Managing the risk again, is a team activity like the project itself and all the team members like managers, developers, and leads would involve in risk management.

1.1 Objectives:

After studying this unit, you should be able to:

- ❖ *Explain the concepts of risk management*
- ❖ *List the various risk management activities*
- ❖ *Describe effective risk management techniques*
- ❖ *Categorize risks and identify them*
- ❖ define the risk components and drivers
- ❖ prioritize risks

Understanding Risk Management in Software Development:

What is Risk in Software Engineering?

Software development is a complex endeavour that calls for in-depth expertise and makes use of cutting-edge technologies. These and other factors mean that every software development project contains some degree of uncertainty. It's a known hazard of any project. Software development projects rely heavily on the amount of risk associated with each activity. It's not enough for a project manager to merely be aware of the hazards involved in their work. Creating new software requires a lot of time, effort, and expertise, not to mention a wide range of cutting-edge tools.

The creation of software is a challenging venture that requires in-depth knowledge and the application of cutting-edge technologies. Because of these and other considerations, there is always an element of mystery around any software development project. It's an inevitable risk in any endeavour. Estimating the potential harm from each step is crucial for software development efforts. A project manager's awareness of the risks they face is insufficient. Developing original software is a laborious process that calls for a wide variety of high-tech resources.

Risk management includes the following tasks:

- ✓ Identify risks and their triggers
- ✓ Prioritize the risks
- ✓ Craft a plan linking each risk to a mitigation
- ✓ Monitor for risk triggers during the project
- ✓ Implement the mitigating action if risk materializes
- ✓ Communicate risk status of project

For most software development projects, we can define five main risk impact areas:

1. New, unproven technologies
2. User and functional requirements
3. Application and system architecture
4. Organizational Problems
5. Performance
1. New, Unproven Technologies: New technologies are often required for the majority of software development projects.

   Technology hazards are more likely to arise in any significant software engineering effort due to the rapid evolution of software development tools, techniques, protocols, standards, and frameworks. From the realms of IT and healthcare to those of energy and transportation, new and untested technologies are continuously making their way into the spotlight. While many of these technologies have the potential to bring about revolutionary improvements, they are not without their fair share of risks and unknowns.

2. User and functional requirements: Needed Software Prerequisites capture all requirements from users in terms of the software's features, functions, and quality of service The process of requirements definition is sometimes drawn out and difficult to understand. Additionally, needs shift as a result of discovery, prototyping, and integration efforts. A modification to the user's needs may not directly translate to a change in the project's functional requirements, and vice versa.

3. Application and system Architecture: Making a wrong turn with a platform, component, or piece of architecture might have disastrous results.
   Because of the technical dangers involved, it is crucial that the team include specialists who are familiar with the building's design and can make informed decisions.

4. Organizational problems: Issues with the three pillars of an organisation, or the "trinity," can have a negative impact Effective project management requires a plan that takes into account both the requirements of the development team and the wants and needs of the end users.

5. Performance: The effectiveness of risk assessment and risk mitigation are two areas where performance plays a crucial role in risk analysis.

<u>Monitor and Mitigate</u>

The term "monitor and mitigate" refers to a method of risk management utilised for a wide range of endeavours and technology. It entails keeping a close eye on things, doing an honest evaluation, and acting to mitigate any potential damage. approach is a proactive and flexible method of risk management that ensures prospective problems are dealt with quickly and efficiently to lessen their impact.

This surveillance consists of:

Share project updates and address any risks or concerns with risk management.

Adjust the risk management strategy in light of the project's new timeline.

Analyse and reprioritize risks, getting rid of the ones with the lowest probability.

Changes to the project's timeline or scope can cause a panicked mental assessment of potential new dangers.

Mitigation Options for reduction include:

Acceptance: Recognising that a Threat Affects the Project Accept the risk and proceed with the project as planned. Project management approval is required in this case. reduce the impact of a risk by modifying the project's scope, schedule, or constraints

control: to act so as to lessen the severity or frequency of an adverse event

Transfer: Change the accountability, responsibility, or authority structure of an organisation. to other stockholders who are willing to take the plunge

Risk Management Process in Project Management

Project managers must pay close attention to risk management. Risk management is the process of recognising, evaluating, and eliminating threats to a project's goals, schedule, finances, and overall success. Proactively addressing potential concerns, decreasing uncertainty, and increasing the likelihood of project success are all made possible by effective risk management in project management. This is an iterative procedure that needs constant monitoring and adjustment over the duration of the project.Although this line of reasoning may appear pessimistic at first, experienced project managers know otherwise. Problems are inevitable, therefore it's important to have a plan in place for dealing with them when they arise.

How do you Accurately Estimate Software?

Underestimating a project's duration, milepost, or iteration rate can lead to inaccurate estimates.

Software estimates can be a source of contention between developers and clients because they often result in extended development times and higher budget projections.

Despite the fact that estimates are often necessary in software development (due to pressure from customers or other stakeholders to obtain a price or timeframe), they can also pose a threat if such projections turn out to be too optimistic.

Scope Variations: When an iteration's scope changes after a timeline has been agreed upon, this is known as a "scope variation."

Customers' feedback is invaluable, thus stakeholders and product owners often request changes to the project's scope as a result. Some Useful Methods for Handling Scope Variations: Quick, manageable cycles (or the Agile methodology). Provide for more regular chances to reflect on and change the project's scope;

How to we mange project variation: The process of handling project changes, often known as "change management" or "change control," is essential. Scope, time, money, and quality are all things that might be affected by changes in a project. Proper evaluation and control of project variations is essential for minimising disruptions, cost overruns, and changes in the scope of a project, all of which can be attained through effective change management. It helps keep the project on track when changes are made to accommodate new information or requirements from stakeholders. An important risk mitigation strategy is managing customers' expectations regarding how scope variation can affect the original estimates of a project.

Why is user engagement important? The success of a product is directly tied to the number of people who utilise it. For a business developing software for an external client, this indicator will correlate with financial success. If a business is developing software for internal usage, it can learn whether or not such software will actually increase productivity.

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Stake holder expectations: Those who have a vested interest in the success of the software project are referred to as "stakeholders."

Stakeholders are defined as "any person or group who can impact, or will be impacted by, an outcome of the software project."

Managing the expectations of all these stakeholders can be difficult because of their close connection to the project's outcome.

Our experience has taught us the following factors should be taken into account:

To establish baselines with relevant parties

Efficient communication;

gain the stakeholder's approval and acknowledgement of the project on a regular basis;

Adhere to tried-and-true development methods (like the Way of Working);

Include key decision-makers at crucial gatherings, and

Technical Debt: The term "technical debt" is commonly used in the fields of software development and engineering to refer to the accumulated costs of making design or implementation decisions in a project that put urgency and immediate needs ahead of sustainability and future upkeep. It's a metaphor for the give-and-take involved in balancing the benefits of rapid software delivery against the drawbacks of short-term expediency.Technical debt refers to any code that slows down a software development project over time. Decisions about when and how to address technical debt need to be managed actively. It's possible to tolerate some technical debt in order to complete a project on time or under budget. In order to prevent unintended repercussions, this issue must be addressed as part of continuing development activities. Techniques like refactoring, code reviews, documentation, and setting aside time in development cycles to focus on paying down technical debt are all effective ways to keep it under control.

It's typically made by skipping steps in the coding process in order to get to the end result more quickly.

How can you Improve Code Quality?

- Maintaining a good standard for one's code is essential for developers. You can accomplish this by thinking about the following tactics:
- Adopting a User-Centered Approach criteria to ensure stakeholders agree the project meets expectations;
- Article critiques;
- understand the rules and regulations of coding;
- All code must be tested;

Poor Productivity: When a project team fails to meet its planned deadlines, its productivity may be examined.

It's highly improbable, yet low productivity could be to blame. A major obstacle that can cause delays, increased costs, and discontent among team members is low productivity. Effective solutions to this problem require a methodical investigation of its sources.

2. CONCEPTS OF RISKS AND RISK MANAGEMENT

A Risk is indication of occurrence of a loss. It is the combination of both the possibility of occurrence of adverse event and the impact of such bad event that could result in performance issue or revenue and time loss to the company. Risk is indicator to the problem that might turn up later during the project. Because of the occurrence of the events listed under the risk, the project might not be able to meet its goals. Risk cannot be eliminated from a project, but luckily can be managed. Risk management is a critical activity of the software project management and planning.

Software risk management has grown into a matured set of practices and processes. It is a rich collection of methodologies and practices to manage the possible risks of a project. It provides an efficient and controlled environment for valid assessment of the events that could cause risk and proactive decision making based on the dynamics of the project. Risk management involves activities like typical strategies, processes, techniques, and tools involved in containing the adverse impacts of risks on the software project. Risks can be generated from any one of the following:

1) High employee attrition
2) Failure of team coordination
3) Requirements changes
4) Too many changes to the software code
5) Change in rupee value (financial risk) etc.

Essential concepts in the field of risk management are as follows:

1. Root cause analysis
2. Risk categorization
3. Avoidance
4. Mitigation
5. Transfer
6. Contingency planning
7. Passive acceptance

1. Root cause analysis: Root cause analysis is the initial building block of risk management since it clarifies the causes of known project risks and reveals the best strategies for mitigating them.

    When the causes are beyond your control, the only way to control the risk is to get back on your feet.When conducting a risk analysis, the first step is to identify and describe the potential dangers that could arise. This is not a difficult process. In order to conduct an effective root cause analysis, it is necessary to first ensure that all parties involved in the project have a shared understanding of the potential dangers that it faces. Determine if the danger is due to avoidable, controllable factors or external, uncontrolled sources by tracing it back to its origin.

    Instead of treating the symptoms of a problem, root cause analysis digs deeper to find out what exactly is causing it. Understanding the factors that contributed to the occurrence of a risk is essential in order to effectively deal with that risk.

Categories of Risk

The process of classifying risks into similar groups is known as risk classification. Using these headings, threats can be sorted and prioritised. Technical, financial, operational, and strategic risks are the most frequently encountered types of risks.

Here are some of the main types of danger: The categories of risk are as follows:

1. Controllable Know Risks
2. Uncontrollable Know Risks
3. Unknown Risks

The project team has some degree of control over the controllable hazards.

Examples of such dangers include the introduction of a new technology, even a slight increase in the complexity or performance of a deliverable, or the imposition of unrealistically short deadlines. With this knowledge in hand, you may be able to modify your project plans to avoid or reduce the likelihood of certain problems. Known hazards that are controllable are those that have been identified and researched to some extent by the

company. These threats are often well-documented, and methods to lessen their impact or likelihood can be created and put into action.

Risk Response Planning:

There are two primary strategies for minimising danger: addressing both the causes and the consequences

Many variations exist on both of these topics, though. Dealing with causes necessitates risk prevention, which can be achieved through eradication (avoidance) or reduction (mitigation) of the risk in question. Risk avoidance entails modifying your project's strategy or tactics in order to do away with the thing that gives rise to the risk in the first place.

One way to prevent falling off a cliff is to avoid cliffs entirely. While preventative measures can't eliminate danger entirely, they can lessen its impact.

Timelines for know risks:

Risk awareness timeline:

Each potential hazard associated with an activity has a telltale sign—or several—that it has graduated from "possibility" to "certainty."

This warning sign or triggering event may occur before or simultaneously with the hazard.

Dealing with Risk Causes: You can start developing preventative measures like avoiding, mitigating, and transferring risks once you've categorised them all and determined which ones the project team can have the most impact on.

Analyse all of the options you and your team come up with, including both the expense and the potential gains.

Good, efficient ideas are candidates for inclusion in your draught project plan if they are proposed. Prevention ideas need to fight their way into the project's blueprint.

If the expected "loss times likelihood" of the risk is more than the whole cost of an excellent idea to eliminate the risk, then the idea should be rejected.

Strategies for Avoiding Risks

Find the bare bones of what can be delivered; Do not overdesign.

All expected deliverables from other projects should be negotiated and clearly discussed.

Avoid "bleeding edge" or "unproven" technologies if at all possible. By eliminating their origins, risks can be eliminated, making risk avoidance the most efficient approach. Many project hazards are inextricably linked to the specifications of technical initiatives, making avoidance of them difficult, if not impossible. Re-evaluating your project's definition and planning decisions can help you avoid potential problems.

General Risk Mitigation Strategies

Some generic risk mitigation strategies include:

- Good communication
- Use of specialists and generalists
- Strong sponsorship
- Continuing user involvement
- Clear decision priorities

Mitigation Strategies for Schedule Risks

To keep a project on track and finish on time, it is crucial to reduce potential delays. Keep in mind that maintaining a flexible and vigilant approach is essential for effectively mitigating scheduling risks. As the project develops and new risks arise, it is important to regularly examine and update your risk mitigation methods. Here are some ways to deal with potential delays:

Make use of redundant, parallel development.

Ship items in advance.

Be conservative when estimating the cost of training and new equipment.

Division of labour for large-scale projects

Break down large projects into manageable chunks

Review of the Project Timeline

Work should be rescheduled to avoid conflicts with holidays and other important events.

Track your progress with diligence and self-control.

Mitigation Strategies for Resource Risks

There are several strategies for mitigating resource risks, just as there are for scheduling hazards. Here are a few suggestions for lowering resource uncertainty:

- avoid scheduled overage
- In cases where worst-case activity costs are high, the project team can work together and gain confidence by using "expected" cost estimates.
- Secure a definite financial and human resource commitment.
- Keep your customers involved.
- expect voids to be filled
- Reduce potential hazards to health and safety.
- Inspire your team to account for potential dangers in their own ways.
- Hire proven problem-solvers to handle hazardous tasks.
- Controlling outsourcing meticulously

Risks Resulting from Staffing Gaps

Risks caused by information gaps can be mitigated or spotted earlier with better communication.

Estimate how likely it is that project staff, including yourself, will be joining the project late due to obligations in earlier projects that have run over.

Determine the likelihood that the people working on these projects will be available to work on your project by obtaining credible status reports from them. Take into account the affected team members' requirement for recovery time and more conservative estimates if

the previous projects were stressful and ran long. When the potential impact of a risk is mostly monetary, risk transference is most useful.

The most common type of risk transfer is insurance, in which one party pays another to take on the financial consequences of a risk.

Risk Transfer:

The buyer of the insurance avoids the risk of a potentially catastrophic monetary loss in exchange for paying a relatively small yearly premium, and the seller of the insurance gains from collecting the fees necessary to manage the risk and remitting them in one lump sum to the buyer. This type of transfer is not widely used in technological projects, but it is occasionally employed.

Principles of risk management

The International Organization for Standardization (ISO) identifies the following principles of risk management: Risk management should:

- generate value
- be made part of organizational strategies
- be integral part of decision making mechanism
- clearly address the uncertainties involved in the project
- be properly structured and approach should be systematic
- be based on the available information
- be modified based on needs of the project
- take into account human factors
- be transparent and complete
- be dynamic, iterative and responsive to change
- be aimed at continuous improvement

3. RISK MANAGEMENT ACTIVITIES

In a software project management, typical risk management activities are listed below:

- Preparing the plan of risk management – risk management will also need to be carried out like another project, hence needs proper planning, responsibilities identification, resource distribution and budget allocation.

- Identify and assign a risk officer who can report to project manager and update the risk related activities.

- Record the project risks in common project forum like share-point or in a database where every team member can view the details. Typical attributes that are recorded with each risk are risk identification or opening date, short description, probability of occurrence, and priority. Additionally, the person responsible for following up on the risk can be mentioned.

- Create environment such that each team member can express his/her views and communicate any possible risks anonymously.

- Prepare the risk mitigation plan after thorough brainstorming with the team. This mitigation plan should describe about the risk being handled, activities to be carried as mitigation plan, and resource to whom the activities are assigned.

- Summarize the risks that were faced, analyzed, and mitigated on a regular basis

4. EFFECTIVE RISK MANAGEMENT

Project Risk Management is a two step process viz. Risk Assessment and Risk Control. Risk Assessment can take place at any stage of the project. But it will be better if the risk assessment is done as soon as possible during the life cycle of the project. The Risk Control on the other hand need to be carried out only after the Risk Assessment is complete. Further, for a successful risk management both the risk assessment and risk control exercises need to be controlled. It is not enough if only risks are assessed without taking any action to control them. Figure 7.1 shows the steps necessary for effective risk management.

Fig. 7.1: Effective Risk Management Steps

Risk Assessment

Risk Assessment deals with estimation of level of risk involved in the project. It basically is the methodology of identifying the probability of occurrence of adverse event and estimating the intensity of the effects in case of occurrence of the said event. Hence risk assessment can be thought of being at the heart of risk management assisting the information gathering needed to respond to a risk.

As the type of risk can change from project to project and process of risk evaluation might have to look beyond the project set up alone, Risk Assessment is a very complicated process. Once the risks are identified and properly assessed, the rest of the steps can be followed programmatically in a more organized manner. The risk assessment has following three aspects:

- *Identify Uncertainties*

  The first step is to explore the entire project plan looking for any areas or activities which can lead to some uncertainties during the execution.

- *Analyze Risks*

  Once the uncertainties are identified, explore more deeply into these scenarios to establish how these uncertainties impact the performance of the project in terms of cost, schedule.

- *Prioritize Risks*

  Now that we have identified the all possible risks, we need to prioritize these risks to determine which of this need to eliminate completely, which of these can be partially addressed. Also, the decision has to be based on the nature of the project and risks will be ranked according to the importance and impact of its occurrence on the project and those which need to be regularly monitored.

In the same way, Risk Control has three elements, as follows:

- *Mitigate Risks*

  Try to take the actions in advance to mitigate or avoid the occurrence of risk. It would be better to avoid the occurrence of a problem rather than taking contingency plan to tackle the problem once it affects the project.

- *Plan for Emergencies*

  all the important risks have a contingency plan or emergency plan of action before the risk itself occurs.

- *Measure and Control*

  Track the effects of the risks identified and manage them to a successful conclusion.

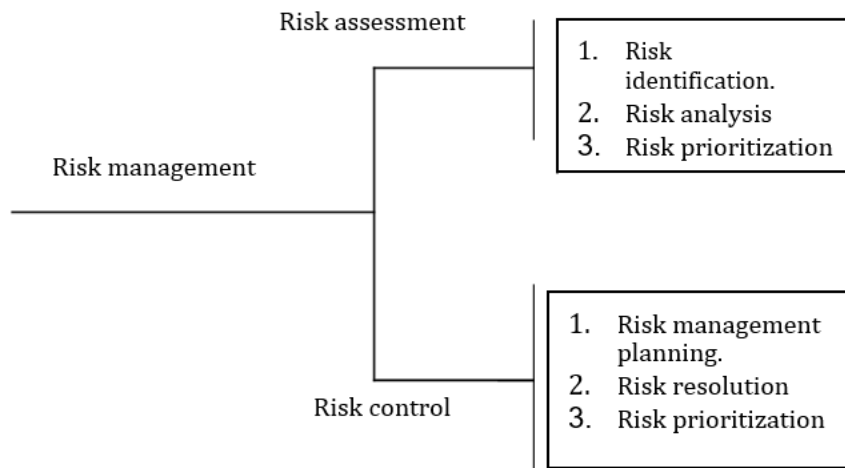Figure 7.2 shows various risk management activities.

Fig. 7.2: Risk Assessment Activities

SELF-ASSESSMENT QUESTIONS - 1

1. Risk the combination of both the possibility of occurrence of adverse event and the impact of such bad event. (True / False)

2. _____ involves activities like typical strategies, processes, techniques, and tools involved in containing the adverse impacts of risks on the software project.

3. _____ can take place at any time during the project, though the sooner the better. (Pick right option)

   a. Risk assessment

   b. Risk management planning

   c. Risk resolution

   d. Risk prioritization

5. RISK CATEGORIES

Let's see the various risk categories.

Project risks: Project risks identify the risks related to project plan. These project risks are those risks that could result in project slippage, budget constraints related issues, resource and customer requirement related issues etc.

Technical risks: Technical risks correspond to the potential risks involved in the technology used for developing the project, hence could result in poor quality software and also might challenge the timeliness of the software delivery.

Business risks: Business risks threaten the applicability of the software product being built.
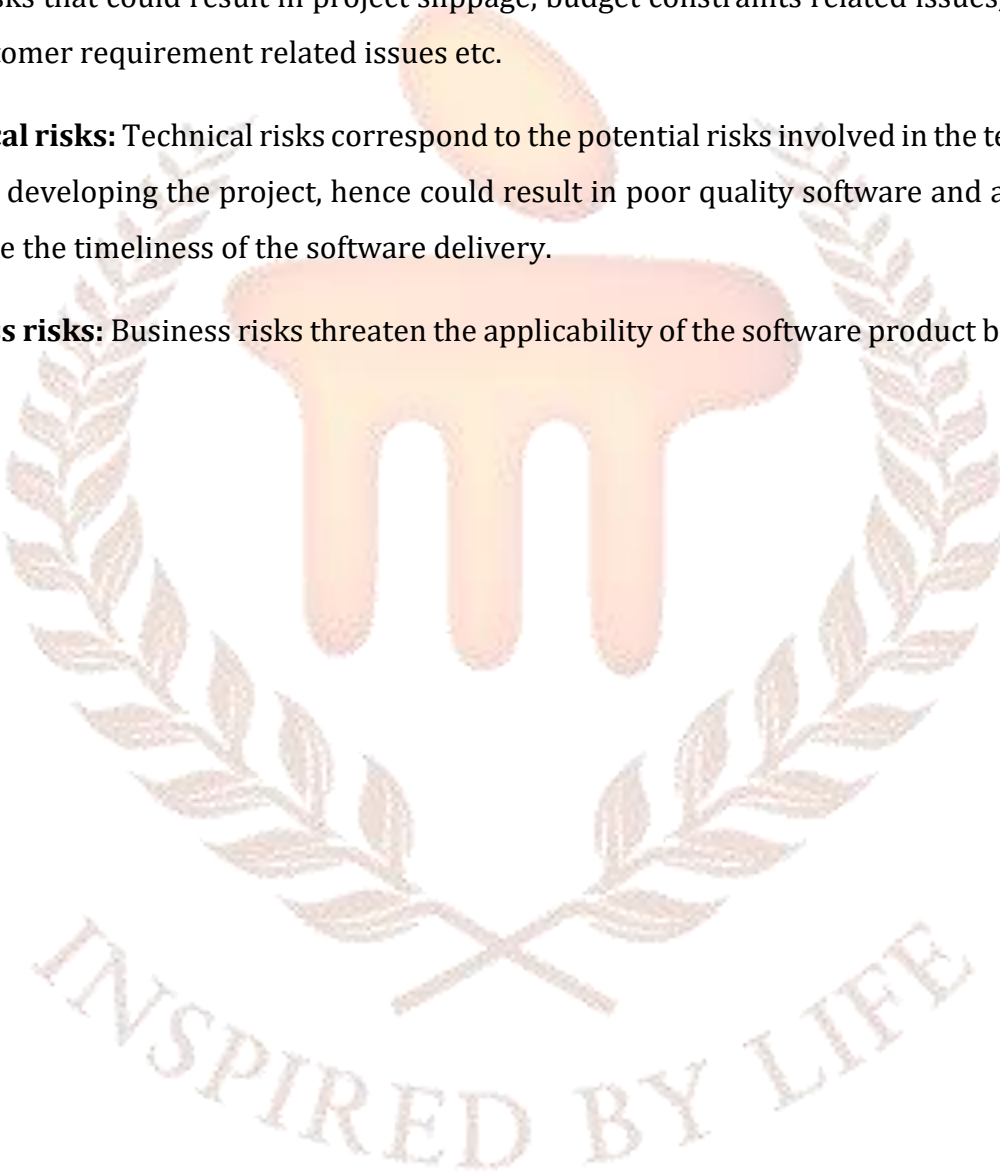
6. AIDS FOR RISK IDENTIFICATION

For any project, any condition, situation or event that can occur would jeopardize the success of the project constitutes a risk. Identifying a risk is therefore an exercise in predicting sections of the project that can go wrong. Following list provides some of the common methods used in Risk Identification:

1) Check list of possible risks
2) Surveys
3) Meetings
4) Brainstorming
5) Review plans

Checklist of most commonly occurring risks are probably the most common tool for risk identification. Checklist details are as follows:

- Product size.
    - Risks associated with the overall size of the software to be built or modified.
- Business impact.
    - Risks associated with constraints imposed by the management.
- Process identification
    - Risks associated with the degree with which software process has been defined and is followed by the development organization.
- Technology to be used.
    - Risks associated with the complexity of the system to be built and the newness of the technology that is packaged by the system.

Project managers use their past experience and past project database to identify potential risks.

Assessing the overall project risk

Some of the questions found from the risk data obtained by surveying experienced software project managers are as follows:

- Is project scope stable?
- Does a project requirement stable?
- Is the number of employees sufficient to do the job?
- Have top managers and customer mangers formally committed to support the project?
- Have customers involved in satisfying the customer requirements?

If any of these questions is answered negatively, mitigation, monitoring and management steps should be instituted without fail.
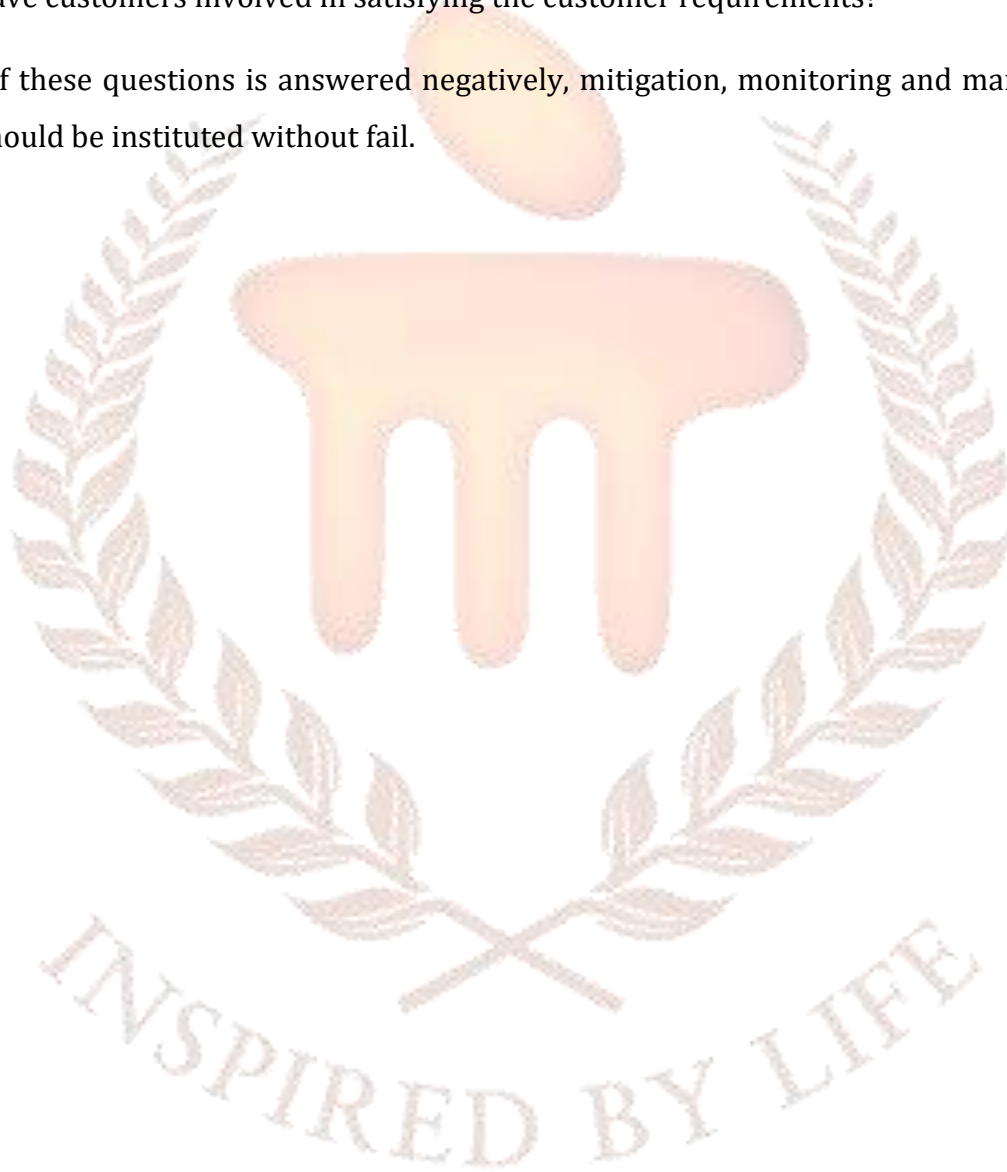
7. POTENTIAL RISK TREATMENTS

After the risks have been identified and assessed, all techniques to manage the risk fall into one or more of these four major categories:

- **Avoidance**
- **Reduction**
- **Sharing**
- **Retention**

Exact use of these strategies may not be possible for all the projects. Some of the strategies might have to be customized based on the needs of the project. These categories are also known as **ACAT** which stands for Avoid, Control, Accept, and Transfer. This term was coined by US Department of Defense, Defense Acquisition University.

Risk avoidance

Risk avoidance as the name suggests means not performing some activities which could have some risk associated with it. This is like not doing a grocery shop business to avoid the risk of items being not available in time. Avoiding thus can be seen as sure way of stopping the risk from occurring; but this is not the right approach. We might lose out on potential gain we could get by doing a particular activity (like running a grocery store and making profit out of it as stated above), if we stop the activity completely for the avoidance of risk in it.

Hazard Prevention

This refers to the risk prevention mechanism as an emergency situation handling. The risks are allowed to be present in the system till the time the effect seems to be serious enough to be handled. Once the risk level is identified as emergency situation, then the mitigation plan is applied as an emergency hazard prevention activity.

Risk reduction

Risk reduction refers to the efforts spent on reducing the impact of the risk in case the risk becomes a reality in the project. These refers to having the risk mitigation plans and also have a contingency plan in place for tackling the risk from adversely affecting the project.

The risk reduction is also termed as risk optimization. Hence the steps followed to reduce the risk might be based on the analysis of the risk; accordingly the set of activities can have positive or negative effect on the project. Hence maintaining the overall balance in optimization activity becomes a top priority.

Newer software development methodologies try to reduce the risk involved with the project by delivering the software in iterative and incremental mode. The traditional approach of water fall model suffered from the non-iterative

nature; hence a project is delivered only after the final phase causing the risk to be also present in the project for a longer time resulting in costly rework and defect fixing situations.

Outsourcing can be another example of risk reduction. Outsourcing involves transferring the work that needs special technical skills to a different work group or company. This reduces the work of training the company's work force on the technical areas that needed only for the current project. Instead the company can focus on business development activities by which the company can be more profitable and leave the work force development to the outsourced company.

Risk sharing

This is like the risk identified for a particular activity is shared across the organization with other projects being run by the company. In this way any cost of risk prevention, or risk reduction activity can be jointly carried out resulting in lesser cost and also the loss or benefit due to the risk is shared across the organization

Risk retention

Risk retention means going ahead with the activity and be ready to accept the loss in case of occurrence of risk associated with the activity. This strategy can be a viable option for the risks that are small and cost of prevention of the risk is much higher when compared to the loss attributed to the occurrence of the risk itself. Hence all the risks that are not mitigated or insured are deemed to be retained by default.

Types of Risk Analysis Assessment:

- Strategic and Capability Risk Analysis: goals, objectives, and abilities by recognising, analysing, and prioritising risks

- Threat Analysis: Emphasis is placed on recognising, assessing, and prioritising threats in order to lessen their influence on military security.

- Investment and Portfolio Risk Analysis: Investments and alternatives are identified, analysed, and prioritised in order of risk.

- Program Risk Management: Risk management is concerned with locating, assessing, prioritising, and controlling any threats to a project's goals and prospects for success.

- Cost Risk Analysis: The emphasis here is on quantifying the potential financial impact of technological and economic hazards to a system.

Criteria for selecting the right tool for detecting the Risk Analysis:

- Aligned to risk analysis objectives: Does the tool aid in the analysis being conducted by the organisation? Is the organisation trying to establish an ongoing risk management process, or is it just performing a one-off risk assessment?Supports decision making: Does the tool give you the data you need to make decisions?

- Accessibility: Is the tool accessible to all users and key stakeholders? Can the tool be located/hosted where all necessary personnel can access it?

- Availability of data: Does the tool give you the data you need to make decisions?

- Level of detail: Is the tool detailed enough to support decision making?

- Integration with other program management / systems engineering processes: Does the tool allow for integration with other system engineering and programme management procedures?

Programme Risk Management Tools: Selecting a tool that helps with the various parts of the risk management process is crucial in programme risk management.

Risks associated with projects, businesses, and even entire ecosystems can be managed with the help of a variety of tools.

Numerous tools exist to aid in the implementation of programme risk management.

Project, enterprise, and system-of-systems risks can all be better managed with the help of a variety of tools.

MITRE-Developed Tools: RiskNav (a trademark of The MITRE Corporation) is a tried-and-true tool created by MITRE to aid in the risk assessment and management processes. RiskNav allows you to collaboratively collect, analyse, prioritise, monitor, and visualise risk data. This tool gives you three graphical dimensions of data: Priority, likelihood, and the progress of risk mitigation and management

Government Emphasized Risk Management Tools: Risk management strategies that involve both the government and contractors are sometimes used in government programmes. contractor-provided risk management procedure Several large government contractors have created their own risk management procedures. applications

Many applications are comparable to currently available MITRE and commercial tools, and they effectively support programme risk management.

Best Practices for Tool Selection

Adjust the instrument to the required procedure or evaluation. There are a variety of financial, cost-risk, and traditional programme management risk analysis and management tools available today.

Before choosing a tool, it's important to gain an appreciation for the program's reporting, analysis (e.g., the ability to modify risk impact scales to reflect the need), and accessibility (e.g., a multi-user environment). Avoid letting your tools dictate your workflow.

Risk Matrix: Software like Risk Matrix can be used to help pinpoint, prioritise, and control the most pressing threats to a project's success.

MITRE developed it to go along with their risk assessment method. The BASELINE RISK ASSESSMENT PROCESS is an expanded and improved version of the original process developed by the Department of Defense's (DOD) sponsor, MITRE, and the sponsor.

Risk Identification : Additional risks for the project might be generated using the checklist of risk categories.

Analysing Assumptions. The identification and evaluation of the project's various assumptions contributes to the process of locating potential threats to the undertaking.

Risk Register: Throughout the project's lifetime, the Risk Register will evolve and change. It becomes a part of the project documentation and is included in the project history records. Included in the risk log are:

- List of Risks
- List of Potential Responses
- Root Causes of Risks
- Updated Risk Categories

Risk Data Quality Assessment: For each risk, in Risk Data Quality Assessment, the project manager needs to determine:

- Extent of the understanding of the risk
- Data available
- Quality and reliability of the data
- Integrity of the data

Purpose of Quantitative Risk Analysis

- Risk responses that need immediate attention are identified.
- Figure out where the project is most vulnerable to failure.
- Determine the effect that risk will have on the project's goal.
- Find out how much money will be needed in case of risk, and put that money aside.
- Determine which threats require additional focus.

Determining Quantitative Probability and Impact

- Interviewing
- Cost and time estimating

_____

- Delphi technique

- Historical Records

- Expert judgment

- Expected monetary value analysis

- Monte Carlo Analysis

- Decision tree

SELF-ASSESSMENT QUESTIONS - 2

4. Project risks are those risks that could result in project slippage, budget constraints related issues, and resource and customer requirement related issues. (True / False)

5. _____ threaten the applicability of the software product being built.

6. ACAT stands for _____.

_____

8. RISK COMPONENTS AND DRIVERS

Risk components are defined as follows:

- **Performance risks:** The degree of uncertainty that the product will meet its requirements and be fit for its intended use.
- **Cost risks:** The degree of uncertainty that the project budget will be maintained.
- **Support risks:** The degree of uncertainty that the result software will be easy to correct, adapt and enhance.
- **Schedule risks:** The degree of uncertainty that the project schedule will be maintained and that the product will be delivered on time.
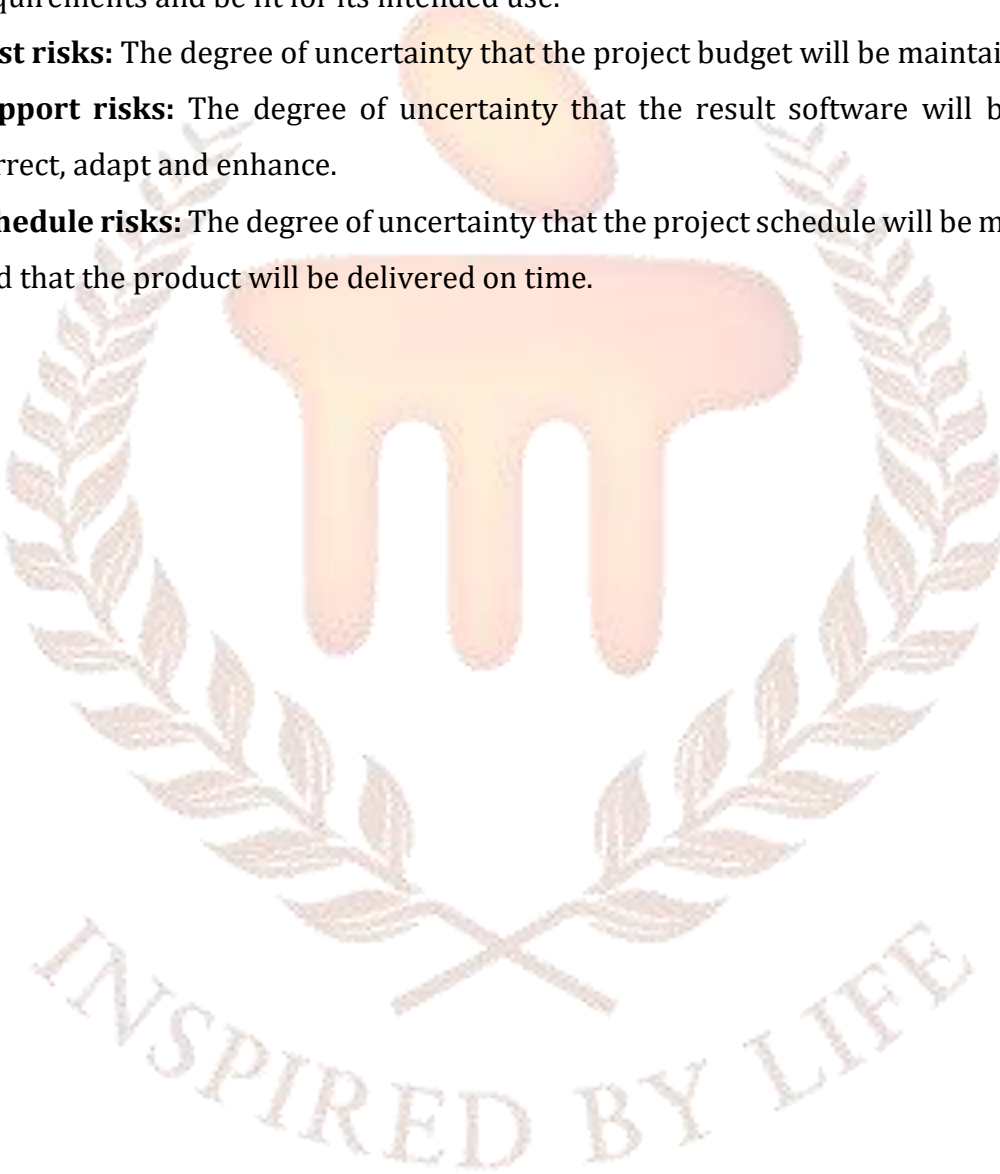
9. RISK PRIORITIZATION

The identified risks for a project merely give the possible events that can hinder it from meeting the goal. The consequences of various risks, however, may differ. So before we proceed with management risks, project mangers prioritize them so that management energies can be focused on high risks.

Prioritization requires analyzing the possible side effects of the risk event in case it actually occurs. Based on the possible consequences and the probability of the risks event occurring, you can compute the risk exposure, which you can then use for prioritizing risks.

In risk prioritization, each identified risk is evaluated and assigned values for the following elements:

1	The probability that the risk condition will actually occur
2	The impact if the risk condition does occur
3	The risk exposure

Multiplying the risk probability by the impact would yield risk exposure, which is then compared against all other risk exposures to determine which risk will be given priority for risk mitigation. Since exposure is a relative measurement based on the numeric value assigned to risk probability and impact, consistency in assigning the probability and impact values is critical. A prioritized risks list that ranks risks by their exposure value determines the order in which risks will be addressed in risk mitigation and contingency planning.

Risk Prioritization Methods

The objective of Risk Prioritization is to prioritize the identified risks for mitigation. Both qualitative and quantitative methods can be used to categorize the risks as to their relative severity and potential impact on the project. To effectively compare identified risks, and to provide a proactive perspective, the risk prioritization method should consider the following factors:

1)   The probability of the risk occurring

2)   The consequence of the risk

3)   The cost and resources required to mitigate the risk

The Risk Factor Product prioritization methodology consists of identifying project risks, assessing the probability of each risk's occurrence and the consequence of each risk's occurrence, and prioritization of the identified risks by calculating the Risk Factor (RF) Product for each risk, and mitigation of the highest risks to resolution.

Once the probability of failure (*Pf*) and consequence of failure (*Cf*) factors have been determined, they can be plotted on an ISO risk contour chart to graphically portray their relative importance and impact on the project as demonstrated in the figure 7.3.
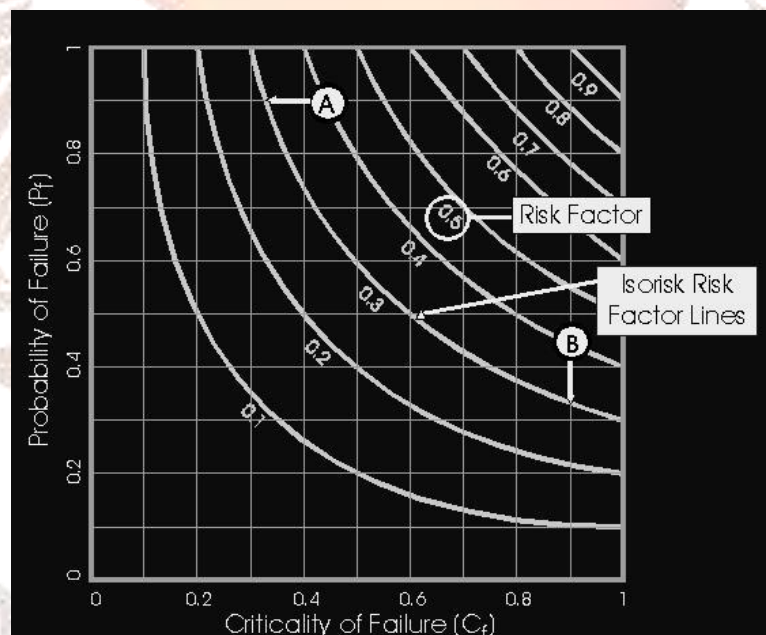

Fig. 7.3: Risk prioritization using ISO risk contour

Prioritization requires analyzing the possible side effects of the risk event in case it actually occurs. Based on the possible consequences and the probability of the risks event occurring, you can compute the risk exposure, which you can then use for prioritizing risks. Note that the location of Risk Items on the ISO risk Contour Chart (shown below) provides insight as to the most cost effective manner by which they may be mitigated. Risk A is best mitigated

by a strategy that reduces the criticality of the risks occurrence, while Risk B is best mitigated by a strategy that reduces the probability of the risks occurrence.

### SELF-ASSESSMENT QUESTIONS - 3

7. The risk associated with the degree of uncertainty that the project schedule will be maintained and that the product will be delivered on time is a schedule risk. (True / False)

8. The risk associated with the degree of uncertainty that the result software will be easy to correct, adapt and enhance is a_____.

9. The risk associated with the degree of uncertainty that the product will meet its requirements and be fit for its intended use is a _____. (Pick right option)
    a. Cost risk
    b. Performance risk
    c. Support risk
    d. Schedule risk

10. SUMMARY

Let's summarize the important points covered in this unit:

- Risk analysis is a common procedure to be followed whenever a lot is riding on software project.

- Most software project managers do it informally and superficially. If they do it at all, the time spent in identifying, analyzing and managing risk pays itself back in many ways.

- Risk analysis consumes significant amount of project planning effort. Identification, projection, assessment, management and monitoring all take lot of time.
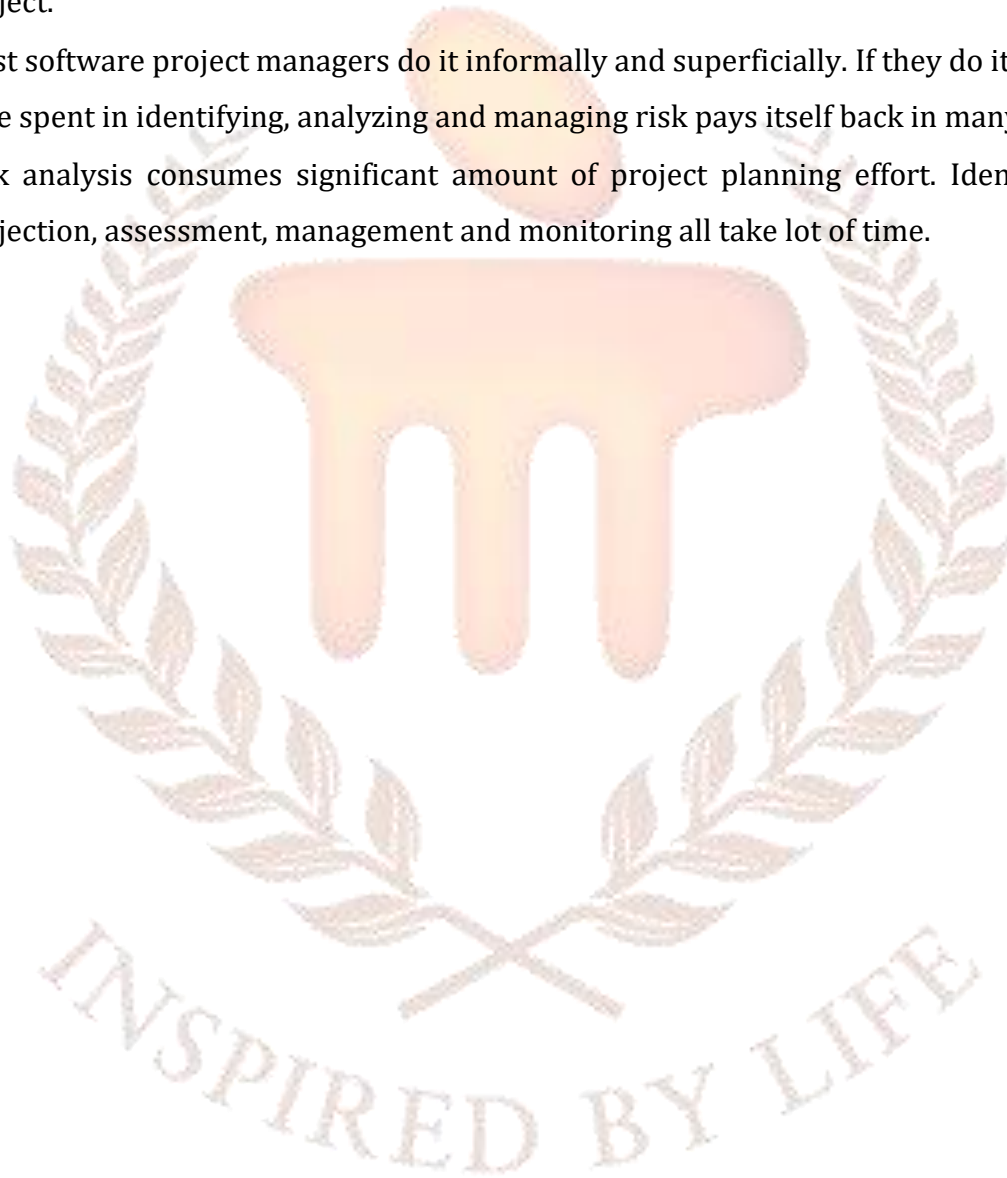
11. TERMINAL QUESTIONS

1. Explain the following:

    a) Risk

    b) Software risk management.

2. Explain in detail about risk management activities.

3. What is risk prioritization? Explain risk prioritization technique.

4. Explain the steps involved in effective risk management.

12. ANSWERS

Self Assessment Questions

1. True
2. Software risk management
3. a) Risk assessment
4. True
5. Business risk
6. Avoid, Control, Accept or Transfer
7. True
8. Support risk
9. b) Performance risk

Terminal Questions

1. *Risk:* The Risk is indications of occurrence of a loss. It is the combination of both the possibility of occurrence of adverse event and the impact of such bad event that could result in performance issue or revenue and time loss to the company. Risk is indicator to the problem that might turn up later during the project. Because of the occurrence of the events listed under the risk, the project might not be able to meet its goals.

    Software risk management: Software risk management has grown into a matured set of practices and processes. It is a rich collection of methodologies and practices to manage the possible risks of a project. It provides an efficient and controlled environment for

valid assessment of the events that could cause risk and proactive decision making based on the dynamics of the project. (Refer Section 2)

2. In a software project management, typical risk management activities are listed below:

- Preparing the plan of risk management – risk management will also need to be carried out like another project, hence needs proper planning, responsibilities identification, resource distribution and budget allocation.

- Identify and assign a risk officer who can report to project manager and update the risk related activities.

- Record the project risks in common project forum like share-point or in a database where every team member can view the details. Typical attributes that are recorded with each risk are risk identification or opening date, short description, probability of occurrence, and priority. Additionally the person responsible for following up on the risk can be mentioned.

- Create environment such that each team member can express his/her views and communicate any possible risks anonymously.

- Prepare the risk mitigation plan after thorough brainstorming with the team. This mitigation plan should describe about the risk being handled, activities to be carried as mitigation plan, and resource to whom the activities are assigned.
  Summarize the risks that were faced, analyzed, and mitigated on a regular basis (Refer Section 3)

3. Prioritization requires analyzing the possible side effects of the risk event in case it actually occurs. Based on the possible consequences and the probability of the risks event occurring, you can compute the risk exposure, which you can then use for prioritizing risks. (Refer Section 9)

4. There are two stages in the process of Project Risk Management: Risk Assessment and Risk Control. (Refer Section 4)