LECTURE 5

Risk management

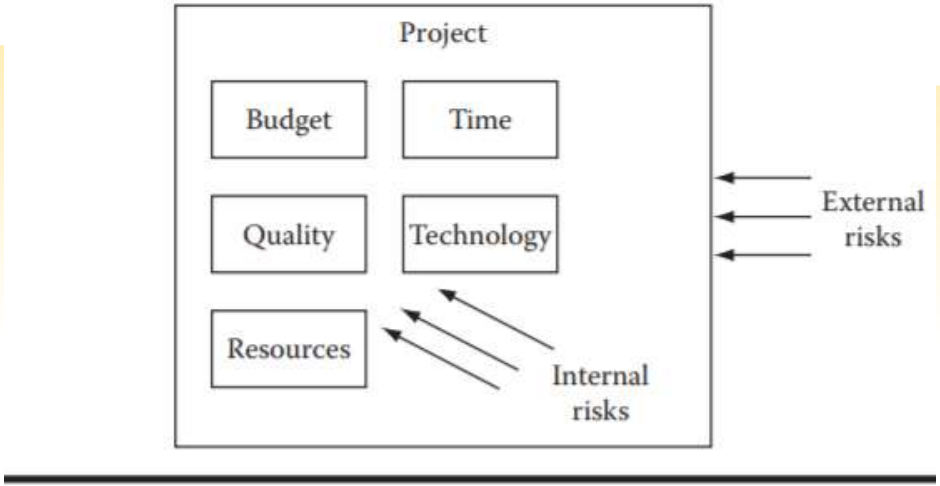
Content

Introduction to Risk Management

- Risks are unforeseen or unplanned happenings, which, when they occur, devastate or at least adversely affect our future plans.
- A project has these components: budget, time, resources, quality, and technology. If any risk occurs that might affect any of these components, then the project may fail.
- A project manager must develop a comprehensive risk mitigation plan so that if any risk arises during execution, he will be able to handle it comfortably. If he has not made a proper risk plan, then if anything wrong happens, he will not be able to handle it.

Introduction to Risk Management

- Risks can be categorized as external and internal. If a risk to the project arises due to an aspect being dealt with by the project team, then it is an internal risk. All other risks are external risks.

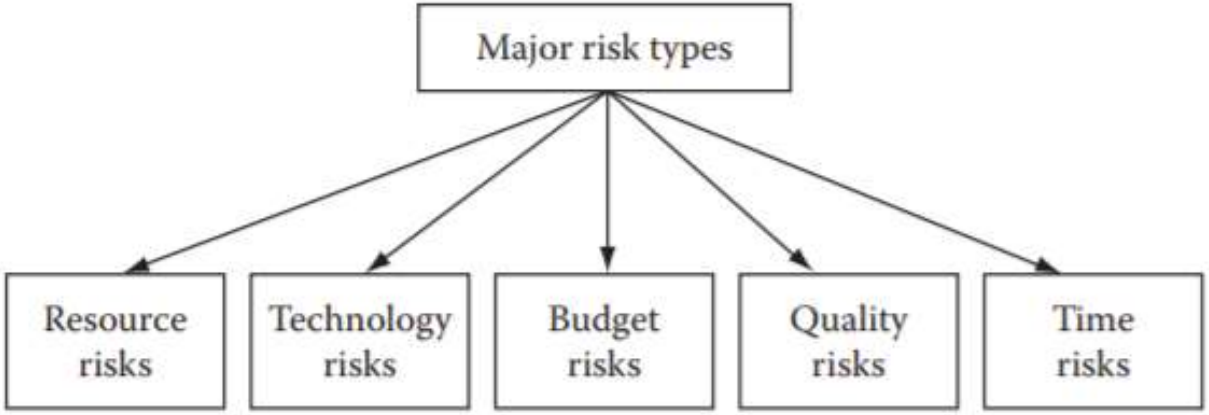


Internal and external risks for a project.

Introduction to Risk Management

- Some of the external risks can be managed by a proactive approach. But many external risks cannot be managed.
- One good example is the obsolescence of a technology. When the project starts, a particular technology is chosen (a prebuilt vendor component, for instance) little realizing that the vendor will not support that component by the time the project finishes. Similarly, the customer may go out of business due to economic recession and the project may need to be scrapped.
- At the project level, risks impact any of these project deliverables: schedule, quality, or budget (risks affecting resources or technology ultimately impact budget, quality, or budget)

Introduction to Risk Management

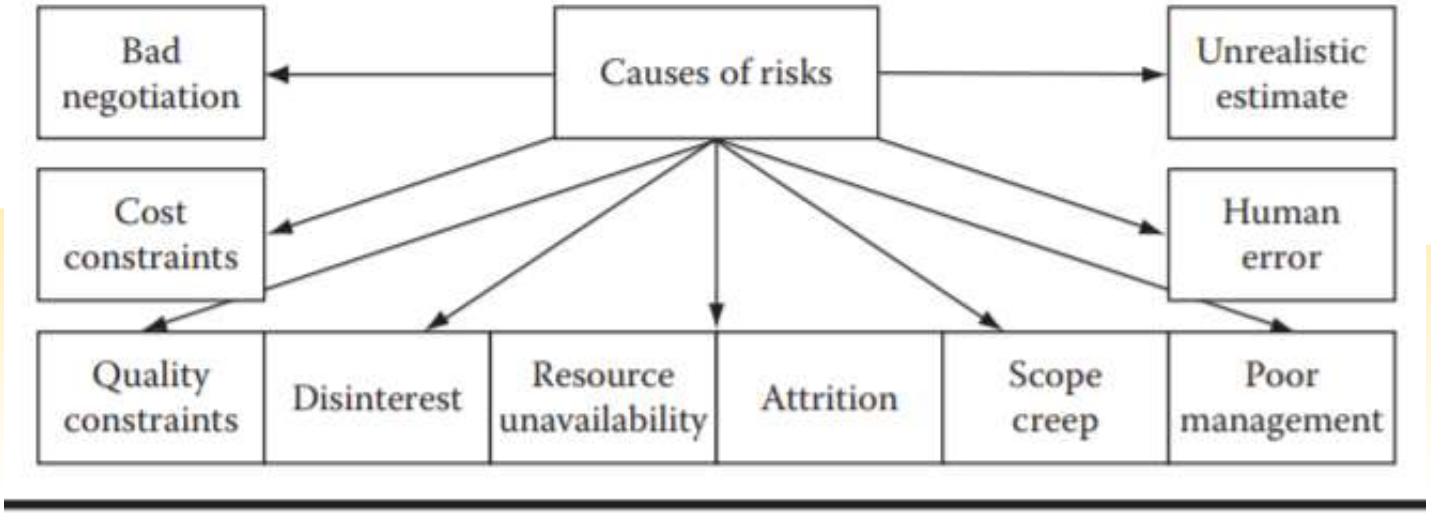


Major risk types.

Causes of Risks

- What are the probable causes of risks on a software project?
- What can be done to prevent or minimize the impact they can have on the project?
- How much impact do they have on the project?
- What is the probability that they may occur and might impact the project?
- For any good project manager, it is of utmost importance that he first of all makes a list of risks which his project faces. After that, he can find solutions for tackling them.

Causes of Risks



Major causes of risks.

Causes of Risks

- **Quality Constraints**:
  - Quality is one of the major concerns for software products, as the high cost of supporting these products is well understood, and thus, avoidance of providing product support for bad quality products is a top policy among software vendors.
  - So an elaborate set of quality constraints are imposed from the start of the project to the finish. In fact, nowadays, a separate software process group is formed that oversees the quality of projects.
  - Meeting quality requirements is a big risk for all projects.

Causes of Risks

- **Resource Unavailability**:
  - Resource unavailability is one of the major risk factors, as software professionals are in great demand the world over.
  - Finding and procuring a good software professional is a complete project in itself. Retaining him within the organization is yet another challenge.

Causes of Risks

- **Disinterest**:
  - Lack of interest is a concern that needs to be mitigated by project managers as it severely affects productivity.
  - A good motivation program for individuals who lack interest in the project can be organized.

Causes of Risks

- **Attrition**:
  - Due to the high demand for software professionals, most professionals have many job offers in hand at any given time.
  - When they find a lucrative offer, they quit an organization to join another organization, thus leaving a project midway.
  - Attrition has become such a big issue that managements at big corporations have specialized programs to tackle it.

Causes of Risks

- **Scope Creep**:
  - Scope creep is one risk that affects most software projects, and it always impacts the project severely.
  - Requirements keep changing and new requirements keep piling up even after the project has completed the testing phase and is into the implementation phase.
  - A good change management mechanism can tackle this menace effectively.

Causes of Risks

- **Cost Constraints:**
  - Once a project is approved for commencement, a budget is allocated and procured for the project. But due to unavoidable reasons, the budget can be constrained.
  - In such situations, the project cannot proceed as sources of funds have dried up and project expenses cannot be met.
  - There is no solution for this problem, but if this risk is known in advance (an unlikely occurrence), then the project could be cut short and scrapping of the project could be avoided.

Causes of Risks

- **Bad Negotiation:**
  - If the project manager has good negotiation skills, then he can procure an additional/modified budget, support, and resources, whenever the need arises.
  - But sometimes due to bad negotiation skills or for lack of foresight on the part of the customer, this kind of support is not provided and the project lands in troubled waters.

Causes of Risks

- **Unrealistic Estimate:**
  - An unrealistic estimate is yet another risk that is very common on most projects.
  - It is also a fact that effort estimates for software projects are difficult to make because of the uncertainties involved.
  - So, it is always possible that it is understated. It is always better to keep a buffer when an estimate is made, to take care of uncertainties.

Causes of Risks

- **Human Error:**
  - The human brain has a processing power that no computer can match, but it has a limitation. It cannot do repetitive work without making errors.
  - These human errors are caused by the distractions of the brain which results in errors in the work.
  - Due to human error, the requirements or design, or the construction may get injected with defects.
  - To overcome this, we must have review processes for the work done to remove any defects.

Causes of Risks

- **Poor Management:**
  - Poor management is yet another human risk factor.
  - If a project manager lacks experience in managing a project, then it is a big liability for the project and it will show up in project results.
  - Even if a project manager has experience, personal traits dictate whether he can handle the project well or not.
  - So the project manager for a project must be chosen carefully, taking into account his experience and personal traits.

Risk Categories

- **Budget Risks:**
  - Risks that impact the project budget need the foremost consideration, and they need to be controlled throughout the project.
  - If for some reason the budget goes above the permissible limit, then the project manager must do something to control it.
  - To reduce the impact of budget risks, the budget allowance should include reserve funds.
  - So when such risks occur, allowances can be taken up from the reserves to avoid the project from failing.

Risk Categories

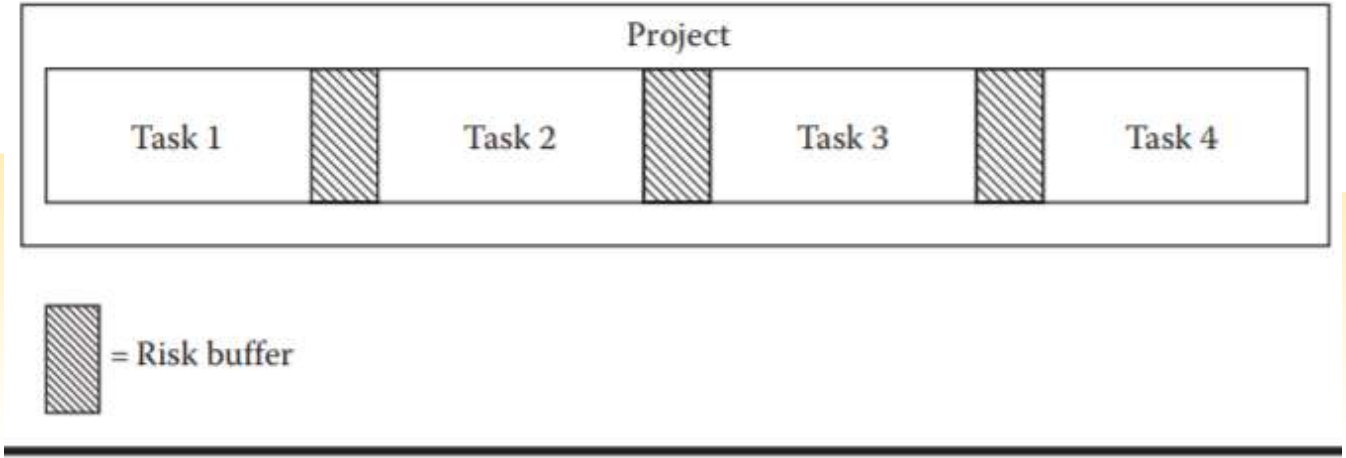
- **Time (Schedule) Risks:**
  - If the project looks to be slipping away from the targeted date of deployment, then it will be a great business opportunity loss for the customer.
  - For this reason, the project should never be allowed to cross the targeted release dates.
  - Nevertheless, due to unforeseen circumstances, the project dates may get affected.
  - Sometimes, unexpected rework to be done on software construction will lead to the slippage of the task schedule.

Risk Categories

- **Time (Schedule) Risks:**
  - There may also be instances when due to a lack of proper communication, customer requirements are completely misunderstood, resulting in an inappropriate product being delivered to the customer, and thus, complete rework is required to prepare the software.
  - This will again lead to project schedule slippage.
  - To reduce the impact of schedule slippages, a schedule allowan ce should be taken for each time-related risk

Risk Categories

- **Time (Schedule) Risks:**



Schedule risk buffer provisions in a project.

Risk Categories

- **Resource Risks:**
  - Project team members are the most costly resources in software projects.
  - Creating reserved resources for the project is a difficult proposition.
  - On one hand, the project manager needs to keep project costs at the bare minimum, and on the other, he has to make a provision for reserved project resources as contingency for any risk of losing any project team member at any time during the execution of the project.

Risk Categories

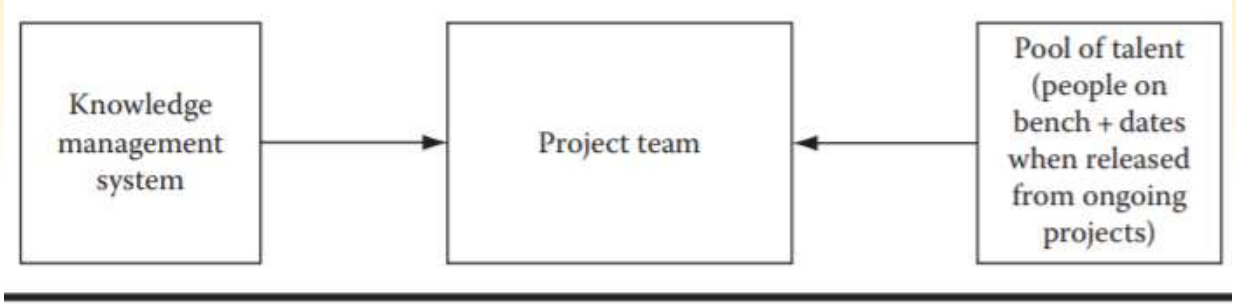
- **Resource Risks:**
  - It is a reality that software professionals are in great demand, and most projects run the real risk of team members leaving the project for more lucrative offers.
  - In such a situation, a project may suffer if any team member decides to leave the project midway.
  - This risk can be mitigated by keeping a reserve in the project schedule for any delay in resource replacement.
  - This reserve pool can consist of people sitting on the bench or list of people who are working on other projects and the dates on they will be available.

Risk Categories

- **Resource Risks:**
  - Project team members leaving in the middle of the project is one of the biggest risks any project may face.
  - Such team members take the project task (the task he was working on) knowledge with them as well. This results in a big loss to the project.
  - This risk can be mitigated to some extent by implementing a knowledge management system that will store all the knowledge acquired by team members during the project.
  - It will also store all the work performed by the project team.

Risk Categories

- **Resource Risks:**
  - So, when a team member leaves the project, the knowledge acquired and the work done by him is in the knowledge management system. Thus, the project team will not lose all the work that has been done and the knowledge acquired by the person who is leaving.



Resource risk strategy.

Risk Categories

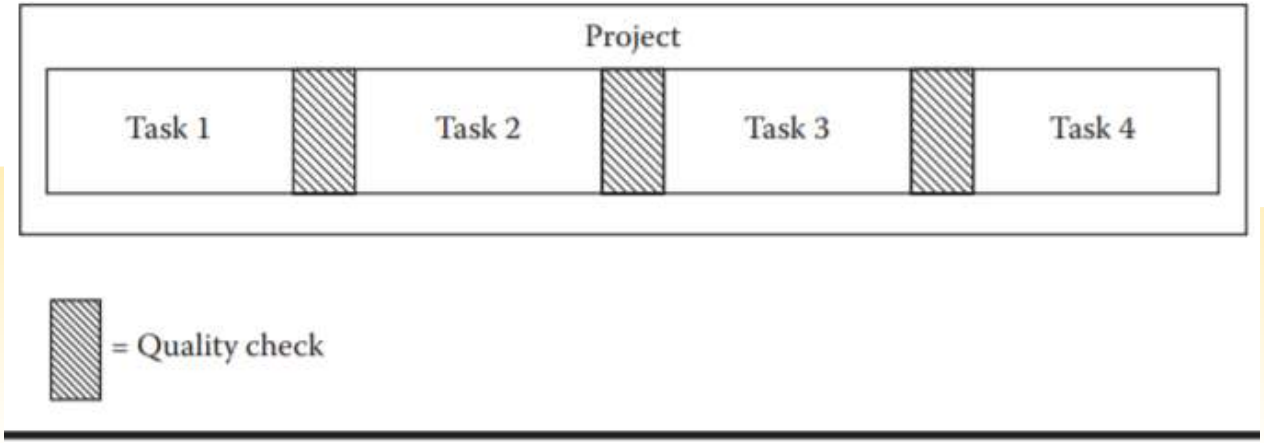
- **Quality Risks:**
  - The quality of the software product is always a concern and a big risk.
  - The quality of the product may be poor due to bad software design or bad software construction.
  - Even if it is good, there is still a chance of defects inadvertently creeping in due to complexity, large integration interfaces, or due to the large number of changes in the design when the requirements are altered.
  - To deal with quality risks, the best policy is to have a check for quality integrated in the project schedule itself (quality planning).

Risk Categories

- **Quality Risks:**
  - This will ensure that the quality at the work product level is on par with the desired level, which in turn will ensure overall product quality.
  - Peer reviews, code reviews, and other formal quality review processes should be strictly followed for all work products.
  - In fact, ensuring quality of the software product being developed has become so critical. Quality planning must be integrated tightly in the entire project plan to reduce quality related risks.

Risk Categories

- **Quality Risks:**



Quality checks at the end of a project task.

Risk Categories

- **Technology Risks:**
  - Technology obsolescence is a fact of life.
  - Many projects face the prospect of having an outdated technology on which the software product is being built.
  - In such cases, the software product becomes unusable even before it is implemented.
  - Similarly, if any hardware component that may have been integrated with the software and the hardware becomes obsolete, the software product becomes unusable.

Risk Categories

- **Technology Risks:**
  - An appropriate selection of programming language, hardware platform, and user access methods will make sure that the software product does not become obsolete during the expected lifespan usage of the product.
  - When selecting technology tools and techniques, contact the vendors to make sure that they will be providing support in future as well for the tools you are buying from them.

Risk Analysis

- Dealing with any kind of risk requires some risk analysis.
- The analysis should consider the kind of impact risk can have on the project as well as the chance of it happening. Based on the analysis, you then need to sort risks and put them in order.
- Risks with high probability and high impact will be put on top of this list, while risks with low impact and low probability will be put at the bottom.
- The project manager will then be better prepared to deal with all kinds of risks in a systematic manner .
- Different risks occur at different times in the project.

Risk Analysis

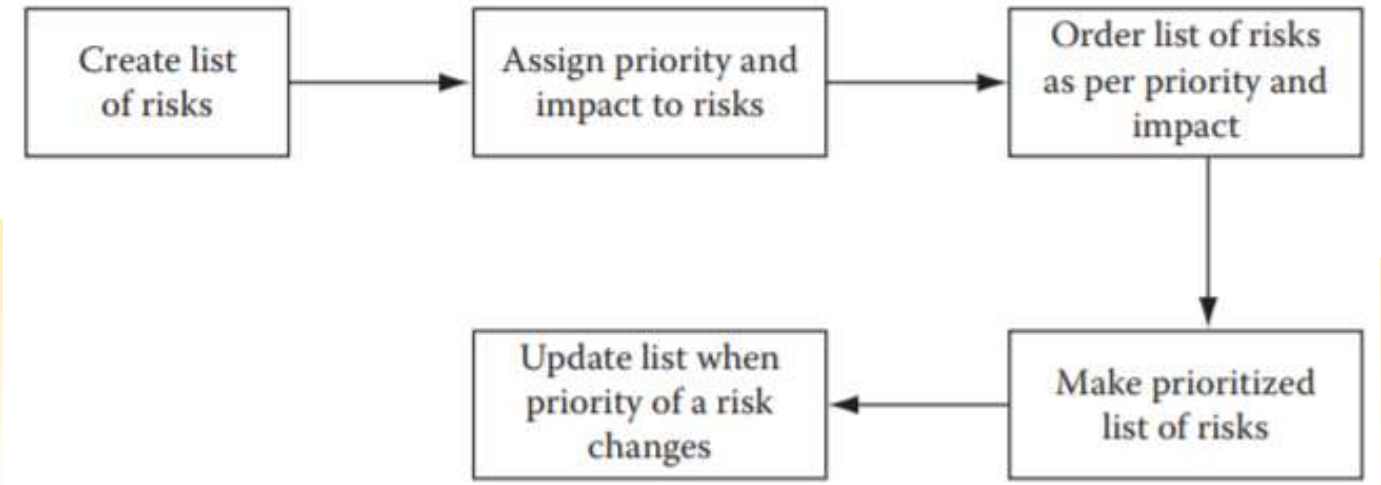
Matrix of Risks: Their Impact and Probability

Risk Category	*Risk*	*Probability*	*Impact*
Budget	Task budget overrun	High	High
Budget	Wrong budget estimate of a task	Medium	High
Resource	Not available	High	Medium
Resource	Skill training	Medium	Medium
Schedule	Wrong estimate of a task		
Project scope	Scope creep		
Quality	Bad quality of product		
Quality	Product reliability issues		
Technology	Technology obsolescence		

Risk Analysis

- In a nutshell, project risks are dynamic in nature. They can occur at any stage of the project.
- So the project risk matrix where the project manager has listed risks and their impact as well as their probability needs to be revised at regular intervals and the risks that are likely to happen at that moment in time need to be assessed and remedial action should be taken.

Risk Analysis



Risk analysis life cycle.

Balancing Act

- No project can be executed 100% as per the project plan.
- There is bound to be something different than planned due to the occurrence of any kind of risk and the subsequent impact it has on the project.
- At the top level, quality level considerations come from the kind of application being developed, and for what purpose.
- If the application is meant for a general purpose information displaying system, and the end users do not mind occasional bugs, then the quality level for the project can be compromised in preference for costs or schedules.

Balancing Act

- On the other hand, if the application needs accurate transactions without any compromise, then quality cannot be undermined. In that case, costs or schedules can be allowed to overrun to get the desired level of quality.
- These are all subjective considerations. The project manager must decide what limits to cross and what limits to abide with. In doing so, he also should have consent from the project stakeholders.
- Clear, well defined, and feasible requirements lead to a better control over the project. At the same time, priorities should also be set appropriately.

Balancing Act

- Delivering low priority requirements at the cost of high priority requirements will lead to unsatisfactory project performance.
- From a software engineering point of view; clear requirements are the most vital inputs to a project.
- But every experienced project manager knows that clear requirements are not enough to do the job.
- Priorities are equally important. It is this balancing act that each project manager must perform to succeed in the project at hand.

Balancing Act

Internal and external risks, and balance in product quality, project budget, and project schedule.

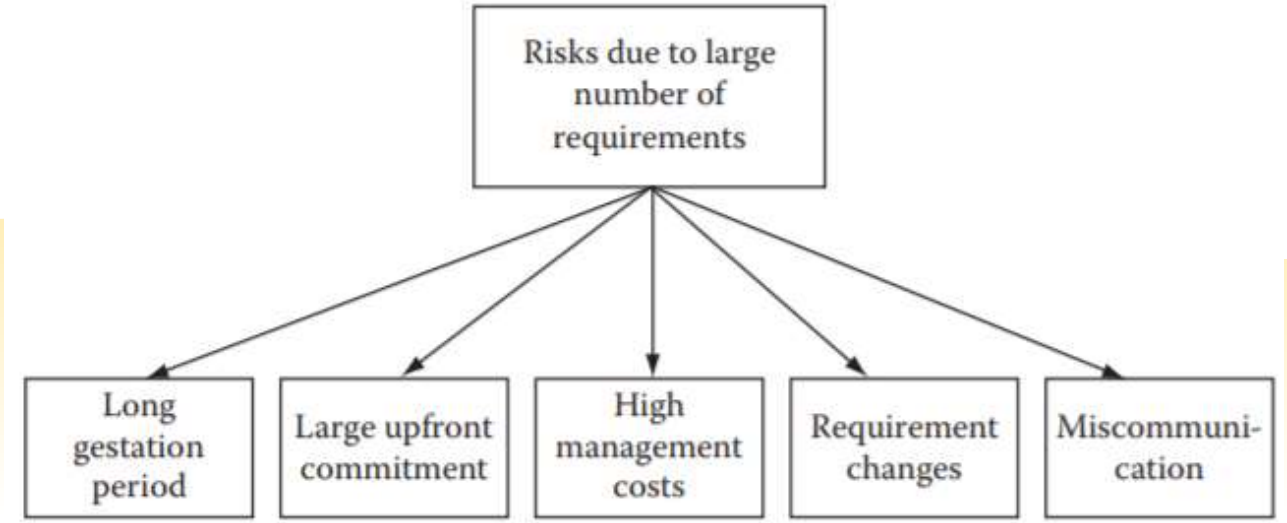
Project Risk Management in Agile Models

- Using a waterfall model to execute your project is a big risk.
- It is because the outcome of the project (the software product) is ready only after the whole project is completed after a prolonged period of time.
- To reduce this risk, iterative approaches to software development have been tried.
- Instead of taking all the requirements and doing the entire product development in one go, requirements are broken into small sets of manageable requirements.

Project Risk Management in Agile Models

- Each small set of requirements is then used to develop a small product. The duration for making these small products (software features) is kept at 4–6 weeks or even less.
- After each iteration, there is a demonstrable product that can be tested to see if it works as intended, and as per the requirements.
- This approach reduces the big risk into a set of small risks.
- All the risks associated with the waterfall model are either miniaturized or totally eliminated in the iterative model.
- They can be managed in a better way as well due to the small size of these iterative projects.

Project Risk Management in Agile Models



Major risks in traditional software development.

Artifacts of Project Risk Management (PRM)

- The outcome of risk management planning is the risk management document.
- It contains the list of risks, their impact, probability, and what measures are to be taken to overcome them if they occur.
- Since risk can occur at any time during the entire course of the project, and their chances of occurring vary from time to time, they are dynamic in nature.
- So the risk management document should be updated regularly to keep risk information current.

Practical Considerations for PRM

- All of the risks on a project can be categorized as manageable and unmanageable.
- The project manager must make mitigation strategies for all manageable risks. The unmanageable risks at hand cannot be managed, and thus cannot have a mitigation strategy.
- So for all unmanageable risks, the project manager can at best rely on external help if possible.
- But for all manageable risks (that he can manage), he should make mitigation strategies. These strategies will help him when these risks occur and impact the project in any way.

THANK YOU !