



Risk & Risk Management



Why manage risks?



- It is a fact of life that chance events will occur and affect the outcome of your project
- Murphy's Laws codify this "knowledge"
 - If anything can go wrong, it will!
 - Of things that could go wrong, the one that causes the most damage will occur!



1982 Darwin Award Honorable Mention
given to "Lawn Chair" Larry Walters.

[Cartoon by Jay Ziebarth, 2002](#)

- Project risks are defined as the undesirable event, the chance this event might occur, and the consequences of all possible outcomes
- Risk management attempts to identify such events, minimize their impact & provide a response if the event is detected
 - *The essence of Project Management is Risk Management!*



Risk during the project



- Risk and the associated cost to address the risk, varies over the project life cycle
 - For initial phase there is high chance of risk events, but low cost impact
 - For final phase there is low chance of risk events, but cost impact is high
- Identifying and managing risks will greatly affect project success

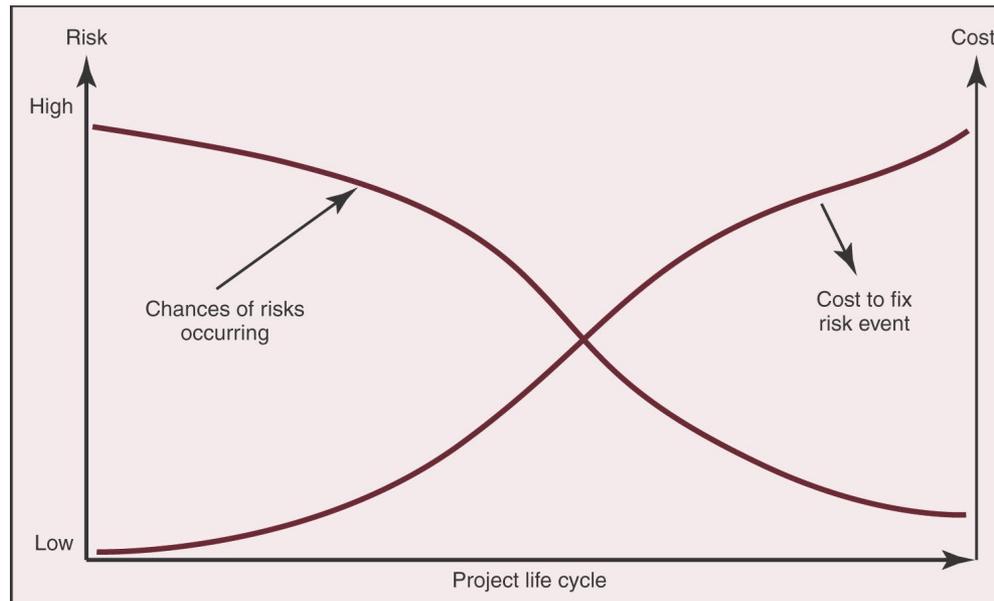


Figure from "Project Management" by Gray and Larson



Risk Management Steps



- There are four major steps to developing a risk management plan
 - Identify all the possible risk events that could affect the project
 - Assess each risk in terms of probability, impact severity and controllability
 - Develop a strategy and/or contingency for responding to each risk
 - Monitor and control risks dynamically
- A Risk Management Plan should be developed during the initial project phase and immediately implemented
- The plan should reviewed & revised as needed during each project phase

Figure from "Project Management" by Gray and Larson



Identify the project risks



- Generate a list of risks by “brainstorming” among team members
- Do not attempt to assess risk probability; that is for a later step
- Focus on risk events, rather than risk consequences
 - For example, “instrument does not return correct data” is a consequence of events like a component failure or assembly error
- First focus on overall project risks, then identify specific risks
- Seek input from sources from outside your group
- Emphasize critical thinking



Assessing the risk impact



- Not all risks need to be subject to monitoring and control
- Use a **Scenario Analysis** to assess the risk event impact
 - Determine all consequences and their severity if the event happens
 - Identify when, during the project, the event is likely to happen
 - Estimate the probability that the risk event will occur
 - Determine how difficult it will be to detect the event occurrence

Risk Event	Likelihood	Impact	Detention Difficulty	When
Interface problems	4	4	4	Conversion
System freezing	2	5	5	Start-up
User backlash	4	3	3	Post-installation
Hardware malfunctioning	1	5	5	Installation

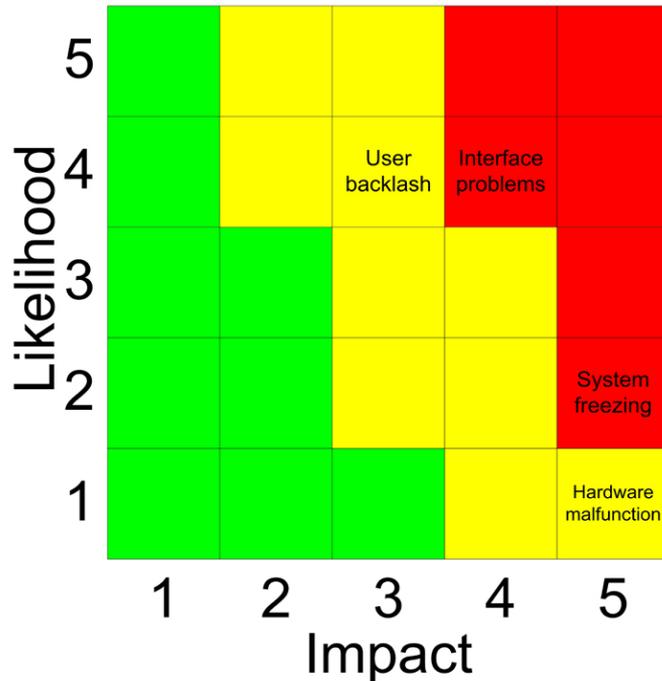
Figure from "Project Management" by Gray and Larson



Identify the important risks



Risk Severity Matrix



Based on figure from "Project Management" by Gray and Larson

- Rank risks from those that can be neglected to those that require elevated vigilance
- A Risk Severity Matrix can be helpful in prioritizing risks
 - Plot of event probability versus impact
- Red zone identifies the most important events
- Yellow zone lists risks that are moderately important
- Green zone events probably can be safely ignored

- Note that the zones are not symmetrical across the matrix
 - High-impact low low-probability events are much more important than likely low-impact events



Risk response strategies



- Mitigating risk
 - Actions are taken during the project to either A) reduce the likelihood of a risk, or B) reduce the impact of the risk
 - For example, testing electrical components after receipt would reduce the likelihood that “bad” parts would be used in a circuit
- Retaining risk
 - Usually for events with low probability but high impact when no alternate strategy is feasible
 - Have a contingency plan ready in case event occurs
- Transferring risk
 - Risk is assumed and managed by a unit outside the immediate project
 - For example, risks associated with the balloon vehicle are transferred to the LA ACES Project management



Develop a response for risks



- A risk response plan identifies the primary components necessary for managing the risk
 - What response strategy will be used
 - How will the risk event be detected and the response triggered
 - What plan will be put in place in response to the event
 - Who will be responsible for monitoring and controlling the risk

Risk Event	Response	Contingency Plan	Trigger	Who Is Responsible
Interface problems	Reduce	Work around until help comes	Not solved within 24 hours	Nils
System freezing	Reduce	Reinstall OS	Still frozen after 1 hour	Emmylou
User backlash	Reduce	Increase staff support	Call from top management	Eddie
Equipment malfunctions	Transfer	Order different brand	Replacement doesn't work	Jim

Figure from "Project Management" by Gray and Larson



Contingency Planning



- Risks associated with the technical aspects of a project can have the most severe outcomes
 - Can be mitigated by building and testing prototypes of critical components, but that means these steps must be included in schedule and cost estimates
 - Have available backup or alternate designs that have much lower risk
- Risks associated with the schedule usually require a trade-off
 - Manage “slack” time to provide resources for delayed components
 - Bring in more people (increase costs) or reduce performance
- Risks associated with costs usually result from estimate errors and omissions
 - Time & cost are related; trade-off schedule delays with lower cost
 - “Descope” options that remove components of the project, but still allow the primary mission to proceed
- All “budgets” (mass, power, schedule, cost) should include a reserve percentage that can be expended as risk events occur



Risk response process control



- The Risk Management Plan should specify the risks, risk responses, and mechanisms used to control the process
- Need to continuously monitor for risk triggers
 - Potential risk events should be identified early in a project, and monitoring for such events commences immediately
- Each risk is assigned to a specific person
 - Has the expertise & authority to identify & response to an event
- Needs an environment where problems are readily reported, embraced & solved
- Changes in any aspect of the project need to be documented and communicated
 - Who will have the authority to approve a change
 - Use written form to track hardware, software & document changes
 - Who is notified of what changes when