Managing Risk

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SE 4381, Software Project Planning and Management

Management Topics

1. Modern project management

PMBOK

2. Organization strategy and project selection

3. Organization: structure and culture

4. Defining the project

5. Estimating times and costs

6. Developing a project plan

7. Managing risk

8. Scheduling resources and cost

9. Reducing project duration

10. Leadership

11. Teams

12. Outsourcing

13. Monitoring progress

14. Project closure

15. International projects

16. Oversight

17. Agile PM

Critical chain project management

Defining "Risk"

An uncertain event or condition that, if it occurs, has a positive or a negative effect on one or more project objectives such as scope, schedule, cost, and quality.

- **PMBOK**

Risk has its origins in the uncertainty present in all projects.

Risk Exposure =
**Probability (Unsatisfactory Outcome) *
Loss (Unsatisfactory Outcome)**

How well are the probability and loss values known?

Opportunities

An event that can have a positive impact on project objectives

Exploit

- **act to ensure that it happens (assign best people…)**

Share

- **allocate some or all of ownership of the opportunity to another party who is best able to capture it**

Enhance

- **increase the probability and/or impact**

Accept

- **take advantage of it if it occurs but do not pursue**

Project Risk Management (PMBOK)

Includes the processes of conducting risk management planning, identification, analysis, response planning, and controlling risk on a project.

- **plan risk management**
- **identify risks**
- **perform qualitative risk analysis**
- **perform quantitative risk analysis**
- **plan risk responses**
- **control risks**

Risk Identification Techniques (PMBOK)

Documentation reviews

Information gathering techniques
- **brainstorming**
- **Delphi technique**
- **interviewing**
- **root cause identification**
- **strengths, weaknesses, opportunities, and threats (SWOT) analysis**

Checklist analysis

Assumptions analysis

Diagramming techniques
- **cause-and-effect diagrams**
- **system or process flow charts**
- **influence diagrams**

Risk Breakdown Structure (RBS) Example (Figure 7.3)

1. Project

1.1 Technical

1.1.1 Requirements
1.1.2 Technology
1.1.3 Complexity and interfaces
1.1.4 Performance and reliability
1.1.5 Quality

1.2 External

1.2.1 Subcontractors and suppliers
1.2.2 Regulatory
1.2.3 Market
1.2.4 Customer
1.2.5 Weather

1.3 Organizational

1.3.1 Project dependencies

1.3.2 Resources

1.3.3 Funding

1.3.4 Prioritization

1.4 Project management

1.4.1 Estimating

1.4.2 Planning

1.4.3 Controlling

1.4.4 Communication

Risk Profile Example (Figure 7.4)

Technical requirements

- **Are the requirements stable?**

Design

- **Does the design depend on unrealistic or optimistic assumptions?**

Testing

- **Will testing equipment be available when needed?**

Development

- **Is the development process supported by a compatible set of procedures, methods, and tools?**

Schedule

- Is the schedule dependent upon the completion of other projects?

Budget

- How reliable are the cost estimates?
- (How reliable is the funding source?)

Quality

- Are quality considerations built into the design?

Management

- Do people know who has authority for what?
- (Unity of command → matrix structure weakness)

Work environment

- Do people work cooperatively across functional boundaries?

Staffing

- Is staff inexperienced or understaffed?
- (Do we have the right skills represented on the team?)

Customer

- Does the customer understand what it will take to complete the project?
- (How “mature” is the customer? The customer’s processes?)

Contractors

- Are there any ambiguities in contractor task definitions?

Top Ten Software Risk Items

B.W. Boehm, "Software Risk Management: Principles and Practices," IEEE Software, January 1991.

- **Personnel shortfalls**
- **Unrealistic schedules and budgets**
- **Developing the wrong functions and properties**
- **Developing the wrong user interface**
- **Gold-plating**
- **Continuing stream of requirements changes**
- **Shortfalls in externally furnished components**
- **Shortfalls in externally performed tasks**
- **Real-time performance shortfalls**
- **Straining computer science capabilities**

Ten Most Common Management Problems

D.J. Reifer, Software War Stories: Case Studies in Software Management, 2014.

- **unrealistic expectations**
- **impossible schedules**
- **inadequate budgets**
- **staffing issues**
- **poor planning**
- **gold plating**
- **lack of focus during execution**
- **inadequate risk management**
- **process mismatches**
- **cultural and organizational issues**

Common Project Problems

S. Baker and K. Baker, The Complete Idiot's Guide to Project Management, 1998

The floating start date

- **the project may start late but the stakeholders expect it to finish on time**

There's not enough time for everything

- **things always take longer than we expected**
- **there's always more things to do than we have time for**

Too many reports and not enough communication

- **visit key team members on a regular basis (management by walking around, MBWA)**

They always need it faster

The 90% done syndrome

- binary inch-pebbles (tasks, work packages) are intended to address this

The never-ending story of the reorganization

Moving target objectives

- for the typical software project, requirements change at a rate of about 1.6% per month (Capers Jones)

The key person always quits

- there may not be an indispensable person on your team but wait until one or two key people leave!

Costs spiral out of control

- bad estimating, insufficient detail in the plan, schedule delays, unforeseen technical problems, changes in supplier/service costs, scope changes, …

The staff has more enthusiasm than talent

The impossible remains impossible

- **optimism and over-commitment**

Politics

- **a political situation: two people in a room trying to get something done**

Dopey fads mandated by the boss

- **complement fads with the basics of good management, inspired leadership, and common sense**

Prepare three envelopes

1. **Blame problems on the last manager.**
2. **Blame problems on the inept project team.**
3. **Prepare three envelopes…**

Risk Assessment

Not all risks deserve attention

Scenario analysis is the most commonly used technique for analyzing risks

- **probability of the event**
- **impact of the event**

Probability of the event may be known very roughly or with some precision

Impact of the event of the event may differ depending on which objective (cost, schedule, …) is affected

Impact Scales for a Risk (Figure 7.5)

Project Objective	1 Very Low	2 Low	3 Moderate	4 High	5 Very High
Cost (increase)	Insignificant	<10%	10-20%	20-40%	>40%
Time (increase)	Insignificant	<5%	5-10%	10-20%	>20%
Scope (reduction)	Barely noticeable	Minor areas of scope affected	Major areas of scope affected	Unacceptable to sponsor	Project end item is effectively useless
Quality (degradation)	Barely noticeable	Only very demanding application s are affected	Requires sponsor approval	Unacceptable to sponsor	Project end item is effectively useless

Risk Exposure and Ease of Detection

Risk exposure = impact * probability

May be useful to include ease of detection

- **5 → no warning**
- **1 → lots of time to react**

Risk value = Impact * Probability * Detection

Note that this formula treats

- ***impact=1, probability=5, detection=5***
- ***impact=5, probability=5, detection=1***

as the same value!

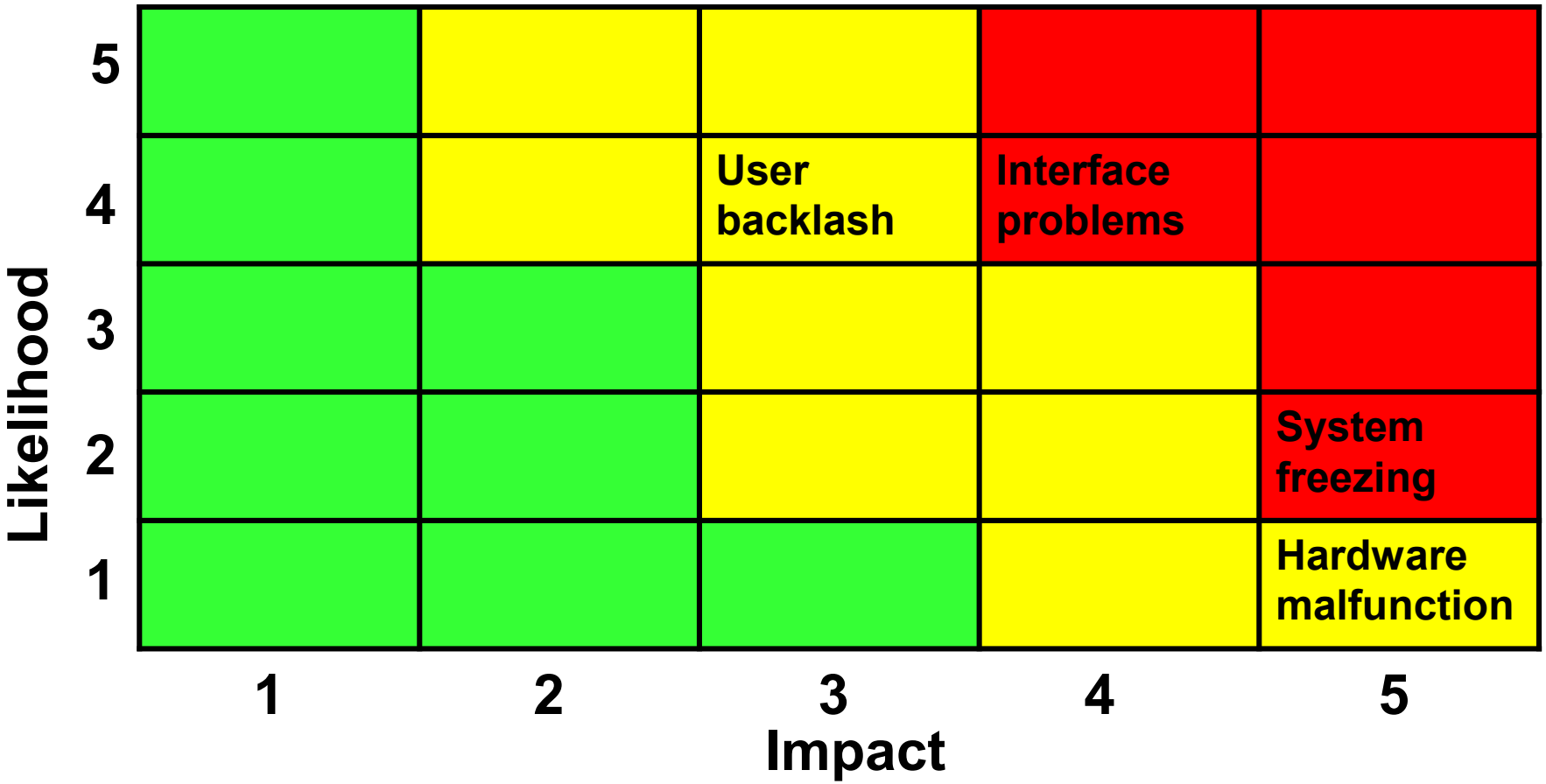
Risk Assessment Form

(Figure 7.6)

Risk Event	Likelihood	Impact	Detection 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

Risk Severity Matrix

(Figure 7.7)



Avoiding Risk

Changing the project plan to eliminate the risk or condition

- **adopting proven technology rather than experimental (leading-edge) technology**
- **choosing suppliers from politically stable economies**

Ellipsus example

- **apps linking computer systems to mobile phones**
- **WAP vs Java?**
- **side-by-side prototypes**

Mitigating Risk

Reduce the likelihood that the event will occur

- **testing**
- **prototyping**
- **root cause analysis**

Reduce the impact that the adverse event will have on the project

- **alternative suppliers**

Transferring Risk

Passing risk to another party

- **does not change risk**
- **almost always results in paying a premium**
- **cost-plus vs fixed-price contracts**
- **insurance (frequently impractical)**
- **performance bonds, warranties, and guarantees**

Retaining Risk

Make a conscious decision to accept the risk of an event occurring

- **chance of the event occurring is slim, even if impact is large**
- **cost can be absorbed if they occur**

Contingency Plan

An alternative plan that will be used if a possible risk becomes a reality

Represents actions that will reduce or mitigate the negative impact of the risk event

Addresses what, where, when, and how much action will take place

Conditions for activating the contingency plan should be decided and clearly documented

Risk Response Matrix (Figure 7.8)

Risk Event	Response	Contingency Plan	Trigger	Who Is Responsible
Interface problems	Mitigate: test prototype	Work around till help comes	Not solved within 24 hours	Nils
System freezing	Mitigate: test prototype	Reinstall OS	Still frozen after one hour	Emmylou
User backlash	Mitigate: prototype demonstration	Increase staff support	Call from top management	Eddie
Equipment malfunctions	Mitigate: select reliable vendor Transfer: warranty	Order replacement	Equipment fails	Jim

Risk Responses

Technical risks
- **contingency plans**
- **prototype high-risk items**

Schedule risks
- **contingency funds to "crash" the project**
  - **increasing parallelism**
  - **assigning top people**

Cost risks

Funding risks
- **budget cuts**
- **market changes**

Contingency Funds

Established to cover project risks – both identified and unknown

- **budget reserves cover identified risks**
- **management reserves cover unknown risks**
- **time buffers (critical chain project management)**

Can be viewed as "slush funds"

Contingencies typically run 1-10% for similar projects

Contingencies may run 20-60% for unique, high-tech projects

Risk Register

Details all identified risks

Includes

- **description**
- **category**
- **probability of occurring**
- **impact**
- **responses**
- **contingency plans**
- **owners**
- **current status**

Risk Control

Involves

- **executing the risk response strategy**
- **monitoring triggering events**
- **initiating contingency plans**
- **watching for new risks**

Change management → deal with events that require formal changes in the scope, budget, and/or schedule of the project

Don't shoot the messenger!

Document responsibility

- **"not my job" is not acceptable**

Summary

The essence of project management is risk management

Managers engage in risk management to compensate for the uncertainty inherent in the project

- **things never go according to the plan**
- **"Planning is everything – plan is nothing."**
  - **Dwight D. Eisenhower**

Risk management is an iterative process that occurs throughout the lifespan of the project

- **threats are embraced, not denied**
- **problems are identified, not hidden**

Questions and Answers