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Paper

Title: Planning for Project Surprises - Coping with Risk

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Whether or not you think your project (software product or process improvement effort) is plagued with problems, you might need effective risk management to keep you out of trouble. Risk management is similar to performing preventive health care and buying insurance for your project. It involves identifying potential problems (risks), analyzing those risks, planning to manage them, and reviewing them.

Many software development groups run projects without any consideration for the problems that might occur. Risk management is insurance for software projects, and can help reduce your cost and efforts when trouble strikes. It can also help you prevent problems. When risk management techniques are used, you can prevent problems and anticipate others to make the project run smoothly.

When to Perform Risk Management?
The risk process, described below, should be performed at the beginning of a project, at the beginning of major phases in a project (e.g., requirements, design, coding, and deployment) and when there are significant changes (e.g., feature changes, target platform changes and technology changes).

At the end of this paper we have provided you with a copy of our risk process. It is simple, effective, and takes 90 to 120 minutes for projects that are 12-60 person-months. Projects smaller than 12 person-months take 40-60 minutes. You can control the length of the session by controlling the scope you pick. Most sessions usually take less than two hours.

There are four steps to risk management: risk identification, risk analysis, risk management planning, and risk review.

Risk Identification
To identify risks, we must first define risk. Risks are potential problems, ones that are not guaranteed to occur. When people begin performing risk identification they often start by listing known problems. Known problems are not risks. During risk identification you might notice some known problems. If so, just move them to a problem list and concentrate on future potential problems.

Risk identification can be done using a brainstorming session. The brainstorm typically takes 15-30 minutes. Be sure to invite anyone who can help you think of risks. Invite the project team, customers, people who have been on similar projects, and experts in the subject area of the project. Limit the group size to nine people. In the brainstorming session, people call out potential problems that they think could hurt the project. New ideas are generated based on the items on the brainstorm list.

During the brainstorm, consider the following items:

- Weak areas such as unknown technology.
    - new, or new to the team (e.g., development tools, target machine.)
- Things that are critical or extremely important to the effort.
    - such as the timely delivery of a vendor's database software, creation of translators, or a user interface that meets the customers' needs.
- Things that have caused problems in the past.
    - such as loss of key staff, missed deadlines, or error-prone software.

Example risks are: "We may not have the requirements right," "The technology is untested," "Key people might leave," "The server won't restart in situation X," and "People might resist the change." Any potential problem, or critical project feature, is a good candidate for the risk list.

Once you have created a list, work with the group to clarify each item. Duplicate items can be removed.

Risk Analysis
The first step in risk analysis (process step 4) is to make each risk item more specific. Risks such as, "Lack of Management buy-in," and "People might leave," are a little ambiguous. In these cases the group might decide to split the risk into smaller specific risks, such as, "Manager Jane decides that the project is not beneficial," "Database expert might leave," and "Webmaster might get pulled off the project."

The next step is to set priorities and determine where to focus risk mitigation efforts. Some of the identified risks are unlikely to occur, and others might not be serious enough to worry about. During the analysis, you will discuss each risk item to understand how devastating it would be if it did occur, and how likely it is to occur. For example, if you had a risk of a key person leaving, you might decide that it would have a large impact on the project, but that it is not very likely.

In the process below we have the group agree on how likely it thinks each risk item is to occur, using a simple scale from 1 to 10 (where 1 is very unlikely and 10 is very likely). The group then rates how serious the impact would be if the risk did occur, using a simple scale from 1 to 10 (where 1 is little impact and 10 is very large). To use this numbering scheme, first pick out the items that rate 1 and 10, respectively. Then rate the other items relative to these boundaries. To determine the priority of each risk item, calculate the product of the two values, likelihood and impact. This priority scheme helps push the big risks to the top of the list, and the small risks to the bottom. An example is given below.

Risk Items (Potential Future Problems derived from the brainstorm)	Likelihood of Risk Item Occurring	Impact to Project If Risk Item Does Occur	Priority (Likelihood x Impact)
New operating system might not be stable	10	10	100
Communication problems over system issues	8	9	72
We may not have the requirements right	9	6	54
Requirements may change late in the cycle	7	7	49
Database S/W might be late	4	8	32
Key people might leave	2	10	20

Now that the group has assigned a priority to each risk, it is ready to select the items to manage. Some projects select a subset to take action upon, while others choose to work on all of the items. To get started, you might select the top 3 risks, or the top 20%, based on the priority calculation.

Risk Management Planning
There are two things one can do to manage risk. The first is to take action to reduce (or partially reduce) the likelihood of the risk occurring. For example, some projects that work on process improvement make their deadlines earlier and increase their efforts to minimize the likelihood of team members being pulled off the project due to changing organizational priorities. In a software product, a critical feature might be developed first and tested early.

Second, we can take action to reduce the impact if the risk does occur. Sometimes this is an action taken prior to the crisis, such as the creation of a simulator to use for testing if the hardware is late. At other times it is a simple backup plan, such as running a night shift to share hardware.

For the potential loss of a key person, for example, we might do two things: 1) Plan to reduce the impact by making sure other people become familiar with that person's work, or 2) Reduce the likelihood of attrition by giving the person a raise, or by providing daycare.

Here is another example, using the priority scheme described in the process below:

Risk Items (Potential Future Problems derived from the brainstorm)	Likelihood of Risk Item Occurring	Impact to Project If Risk Item Does Occur	Priority (Likelihood x Impact)	Actions to Reduce Likelihood	Actions to Reduce Impact	Who Should Work on Actions	When Should Actions be Complete	Status of Actions
New operating system might not be stable	10	10	100	Test OS more	Ident. 2nd OS	Joe	3/3/99	
Communication problems over system issues	8	9	72	Develop sys. interface document	Add replan milestone	Cathy	5/6/99	
We may not have the requirements right	9	6	54	Build prototype of UI	Limit distribution	Lois	4/6/99	
Requirements may change late in the cycle	7	7	49	Prototype top 10 reqs.	Limit distribution	Cecil	1/2/99	
Database S/W might be late	4	8	32	Check with supplier	Develop a backup plan	Joe	2/2/99	
Key people might leave	2	10	20	Make sure Jim is happy	Earmark Fred as a backup	Pete	3/4/99	

Risk Review
You will want to review your risks periodically so you can check how well mitigation is progressing. You can also see if the risk priorities need to change, or if new risks have been discovered. You might decide to rerun the complete risk process if significant changes have occurred on the project. Significant changes might include the addition of new features, the changing of the target platform, or a change in project team members. Many people incorporate risk review into other regularly scheduled project reviews.

In summary, risk management is the planning for potential problems, and the management of actions taken related to those problems.

Risk Management Process

1. **Determine scope of the risk session.**
2. **Select the team and moderator.**
   The moderator explains the risk process to new team members.
3. **Identify risks** (potential future problems).
   - **Brainstorm areas of risk, e.g.,**
     - Weak areas such as unknown technology.
       – new, or new to the team (e.g., development tools, target machine.)
     - Things that are critical or extremely important to the effort.
       – such as the timely delivery of a vendor's database software, creation of translators, or a user interface that meets the customers' needs.
     - Things that have caused problems in the past.
       – such as loss of key staff, missed deadlines, or error-prone software.

   - **Remove invalid or irrelevant.**
   Current problems should be treated as problems, not risks.

4. **Analyze risks.**
   - **For each risk item:**
     - Does the team understand the risk item?
       - If necessary, split into separate risk items, e.g.,
         – Disk may overload under condition X.
         – Disk may overload under condition Y.
     - Discuss and determine its scope:
       - What would the consequences be if this risk item did happen?
     - Determine what the **impact** would be if the worst happened, using a scale of one to ten.
     - Determine how **likely** it is that the risk item will occur, using a scale of one to ten.
     - Determine the **priority** of the risk items and thus which to work on (**impact x likelihood**).

5. **Plan to mitigate risks.**
   - Select the most important risk issues, such as the top 2 or 3, or top 20%.
   - Brainstorm on actions that could be taken to reduce the **likelihood** of the risk item occurring.
   - Brainstorm on actions that could be taken to reduce the **impact** if the risk item does occur.
   - Decide which actions to pursue.
   - Select a person to be responsible for each action chosen.
   - Document the information in the risk management plan.

6. **Review risks.**
   - **Establish how often risks should be reviewed (once a month is typical).**
     - Risk reviews can be incorporated into existing project status and phase reviews.
   - **Update the list based on risk review sessions.**