How to Effectively Manage Project Risks

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HOW TO EFFECTIVELY MANAGE PROJECT RISKS

PMBOK defines risk as "an uncertain event or condition that, if it occurs, has a positive or negative effect on a project's objectives."[1]

RISK MANAGEMENT PLANNING

Risks can be foreseeable and unforeseeable. In both cases, astute project managers are prepared with some means of dealing with them. Many risk management plans address only foreseeable risks and fail to address the unforeseeable ones. For that reason, project planning must include a degree of schedule, cost, and scope margin. Margin management techniques are addressed later in this chapter.

The most effective way to manage project risks is to adopt a process that systematically deals with the overall problem of uncertain events and conditions that might affect a project's objectives. This process involves the following five steps:

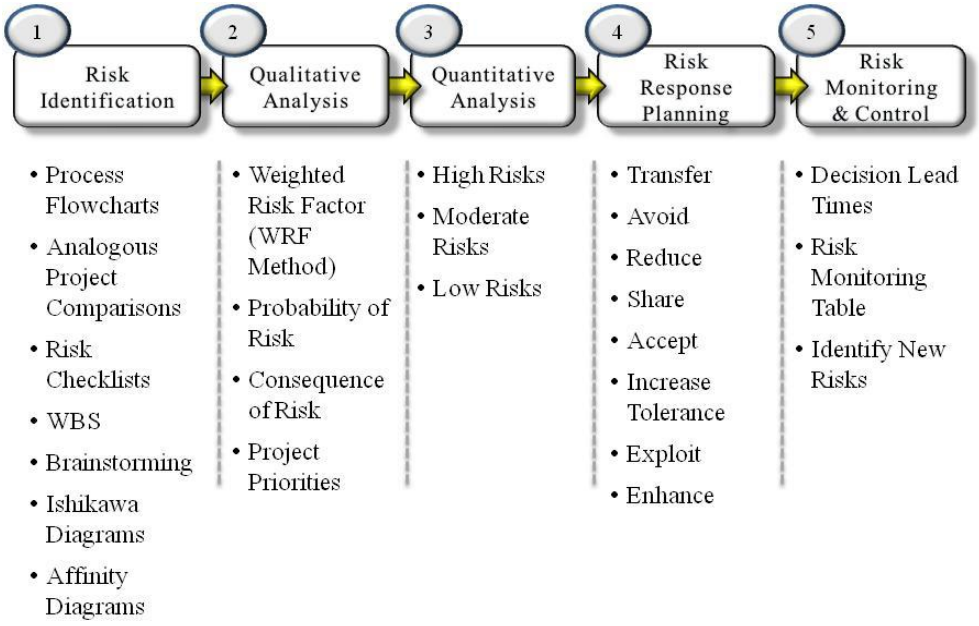

Figure 1: Risk Management Processes

[1] PMBOK, Glossary.

RISK IDENTIFICATION

Identification of project risks is not a one-time only event. As projects progress new risks will become evident and must be addressed accordingly. It is imperative that project managers take full advantage of the skills and experiences of subject matter experts, and other project managers of similar past projects. The challenge facing risk management teams is knowing where to begin the process of risk identification. It's not uncommon to see blank facial expressions when one asks the question, "What risks do we face on this project?"

Typical risk sources that should be examined are:

- Poorly defined product requirements
- Design "drift"
- Exceeding technical capabilities
- Accepting an unproven technology
- Making too many changes to an existing product
- Limited availability of needed skills
- Project deadlines
- Budget/funding limits
- Extensive sharing of resources
- Learning curve periods
- Effects of major holidays
- Activity bottlenecks
- Marketing risk

To avoid this phenomenon, the project manager can take advantage of any one of the following risk identification tools. Each of these tools enables the team to focus on parts of the project rather than the project as a whole. By doing this the focus is more concentrated and more likely to give better visibility of potential project risks.

Process Flowcharts. Focusing on project processes such as the schedule network diagram[2], communications, information flows, decision making, Intranet usages, documentation, e-mail, manufacturing, coding, testing, etc., will inevitably disclose potential project threats.

Analogous Project Comparisons. Previous similar projects, that have experienced certain problems, can be invaluable to the new project. Project managers of these previous projects can become a fountain of information regarding similar risks to be faced by those on the new project.

[2] Project managers should carefully examine schedule network diagrams for burst and sink nodes that might be present potential risk areas.

Risk Checklists. With project schedules becoming increasingly shorter, project managers must find ways to identify project risks rapidly. One means of accomplishing this is by developing a checklist of project aspects that might present risks. This checklist should be very generic and can be carried from project to project.

Work Breakdown Structures. Because the project WBS is a decomposition of project elements it can also enable project risk teams to focus on specific smaller areas within the project.

Brainstorming. The convenient practice of brainstorming can also aid in the identification of project risks. Any possible condition or event that might prevent reaching project goals should be presented without evaluation. It is the combination of ideas that often generate new ideas and views, a phenomenon that might be called "idea hopping." Eliminating any ideas or suggestions prematurely can hamper this process.

Ishikawa Diagrams. The Ishikawa diagram (or *fishbone diagram* or also *cause-and-effect diagram*) are diagrams, that show the causes of a certain event. A common use of the Ishikawa diagram is in identifying potential factors that might present unfavorable events or conditions. Most Ishikawa diagrams have a box at the right hand side, where the effect to be examined is written. The main body of the diagram is a horizontal line from which stem the general causes, represented as "bones". These are drawn towards the left-hand side of the paper and are each labeled with the causes to be investigated, often brainstormed beforehand and based on the major causes listed above.

Affinity Diagrams. The affinity diagram is a business tool used to organize ideas and data. The tool is commonly used within project management and allows large numbers of ideas to be sorted into groups for review and analysis. The affinity diagram was devised by Jiro Kawakita in the 1960s and is sometimes referred to as the KJ Method. These diagrams work best when sound brainstorming processes are followed.

Risk Breakdown Structures. The Risk Breakdown Structures (RBS) is a hierarchically organized depiction of identified project risks arranged by risk category and subcategory that identifies the various areas and causes of potential risks.[3] An example is shown below:

[3] PMBOK, Fourth Edition, 280.

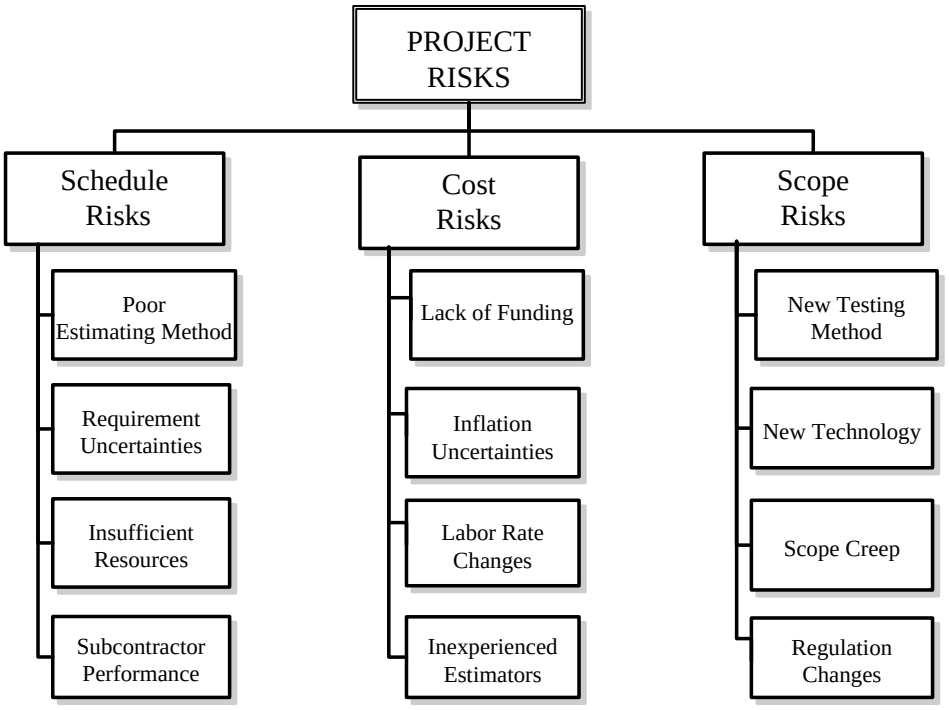

Figure 1: Risk Breakdown Structure

QUALITATIVE ANALYSIS

Risk is always to be analyzed by the *probability* of the event occurring and the *consequence* if it does occur, and should focus on the project schedule, costs, scope, and quality.

- Probability – the ***likelihood*** that a risk condition will actually occur.
- Consequence – the ***impact*** that might occur from the risk

The estimates of probability and consequences are completely dependent upon subjective estimates. This means that if an estimator is unskilled or inexperienced the estimates will be inaccurate. "Garbage in—garbage out!" If the project manager is not confident in the estimator's judgments then subject matter experts from other projects should be invited to participate in the qualitative analysis process.

Even though these estimates are dependent upon subjective perspectives the project manager can offer "catch phrases" that can convert qualitative descriptions into quantitative assessments. The tables below illustrate how this can be accomplished.[4]

Probability (P)	Point Values
You'd be surprised if this happened.	0.1 to 0.2
Less likely to happen than not.	0.3 to 0.4
Just as likely to happen as not.	0.5 to 0.6
More likely to happen than not.	0.7 to 0.8
You would be surprised if this did not happen.	0.9 to 1.0

Table 1: Risk Probability Assessment

Consequence Point Value	Technical Consequence (C_t)	Schedule Consequence (C_s)	Cost Consequence (C_c)
Low (0.1 to 0.2)	Minimal impact to product performance	No impact to end date	Within budget
Minor (0.3 to 0.4)	Small reduction in product performance	End date will slip less than 10% of the project lifecycle	Less than a 10% cost overrun
Moderate (0.5 to 0.6)	Moderate reduction in product performance	End date will slip between 10% to 15% of the project lifecycle	10% - 20% overrun
Significant (0.7 to 0.8)	Significant reduction in product performance	End date will slip between 15% to 25% of the project lifecycle	20 – 50% overrun
High (0.9 to 1.0)	Product will not meet customer/user critical needs	End date renders the product useless to the customer	Overrun cannot be funded

Table 2: Risk Consequence Analysis

QUANTITATIVE ANALYSIS

[4] These tables are adapted from John M. Nicholas' "Project Management for Business and Technology: Principles and Practice," 2nd Edition (Upper Saddle River, NJ: Prentice-Hall, 2001), pp. 312-313.

Once the qualitative assessments of project risks are completed, the estimates can be examined to determine the magnitude of the risks. A technique that not only considers risk probability and risk consequence but also takes into account the project priorities is the "weighted risk factor (WRF)" technique. For each sets of project risks a WRF is calculated as follows:

$$WRF=W_1*RF_{TECH}+W_2*RF_{SCHED}+W_3*RF_{COST}$$

Where:

- "RF" means Risk Factor[5] = (P+C) – (P x C).
- The value for weight (W) is dependent upon its project priority within the triple constraint.
- W1, W2, and W3 are valued 0 through 1.0 depending on the priorities of the project, and together must sum to 1.0.

A completed WRF table might look like the following.

		Technical			Schedule			Cost			TOTAL
No.	Risk Description	P	C_t	WRF	P	C_s	WRF	P	C_c	WRF	WRF
1	Delayed Requirements Definition	0.8	0.8	0.19	0.8	0.8	0.48	0.8	0.8	0.29	0.96
2	Design Review Extended	0.4	0.5	0.14	0.4	0.8	0.44	0.4	0.7	0.25	0.83
3	Lack of Experienced Personnel	0.4	0.8	0.18	0.4	0.8	0.44	0.4	0.5	0.21	0.83
4	New Technology Required	0.6	0.5	0.16	0.6	0.5	0.40	0.6	0.6	0.25	0.81
5	Test Equipment Not Available	0.3	0.6	0.14	0.3	0.8	0.43	0.3	0.5	0.20	0.77
6	Delayed Specification Approval	0.3	0.2	0.09	0.3	0.4	0.29	0.3	0.8	0.26	0.64
7	Subcontractor Delays	0.2	0.5	0.12	0.2	0.9	0.46	0.2	0.4	0.16	0.74
8	Module-A Design Deficiency	0.7	0.6	0.18	0.7	0.5	0.43	0.7	0.5	0.26	0.86
9	Competitor Beats Us to Market	0.2	0.4	0.10	0.2	0.7	0.38	0.2	0.5	0.18	0.66
10	Uncertain Inflation Rate (Site)	0.2	0.3	0.09	0.2	0.2	0.18	0.2	0.9	0.28	0.54

Triple Constraint Aspect	Technical	Schedule	Cost	Total
Priority Weight	0.20	0.50	0.30	1.00

Table 3: WRF Table Example

[5] The above RF equation is based on the general disjunctive rule which means that as either P or C approaches zero, the RF will approach the other value. This is felt to be superior to the general conjunctive rule (RF = P x C) which tends to be too optimistic. The above risk factors are calculated for the technical, schedule, and cost aspects of the project. Other factors can be included.

The question facing the risk management team is what to do with the results. As can be seen in the above table, WRFs range from 0.96 to 0.54. Values for each WRF can be used to place risks into one of three categories—low, medium, and high which can these be used to determine the proper risk response.

Weighted Risk Factor (WRF)	Risk Level	Risk Response
0.0 to 0.4	Low	None
0.4 to 0.7	Moderate	Judgment call
0.7 to 1.0	High	Develop abatement plans

Table 4: Risk Response Planning Table

Risk quantification may also be made using stochastic techniques such as those described in the article, "How to Make Reliable Project Schedule and Cost Estimates."[6]

RISK RESPONSE

Risks may be viewed as negative or positive. Negative risks are those that might impact the ability to reach project goals. Positive risks are those that can be exploited, as opportunities, for positive benefits.

Responses to negative risks may include the following:

Transfer the risk. PMBOK describes this as a risk transference that requires shifting the negative impact of a threat to another party. Buying fire insurance is an example of risk transference. If the insured house is destroyed by fire, the impact falls on the insurance company, not the owner.

Avoid the risk. Changing the scope, schedule, or available resources of a project may result in risk avoidance. Other risks may be avoided by relaxing or clarifying product requirements, obtaining additional information, or bringing in more skilled personnel.

Reduce the risk. If risks cannot be completely avoided they may be reduced (mitigated) by the same means as avoidance but having a lesser effectiveness.

Share the risk. Risks may be shared between two parties where both participate in the impact of an actual risk condition. Using share ratios in cost-plus or fixed-price incentive contracts is a common way to share the negative impacts of risks.[7]

Increase risk tolerance. When risk responses cannot completely eliminate a threat a tolerance for some residual effects must be accepted.

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[6] This article can be found at: www.projectmgt.com.

[7] For more on contract share ratios see James A. Myers, "Introduction to Contracts," November 8, 2003. [http://www.washingtonscea.com/Presentations/2A-Introduction%20to%20Contracts_James_Mayers.pdf]

Accept the risk (do nothing). In some cases risks cannot be avoided, mitigated, transferred, or shared. In such cases potential risk impacts must be accepted. This is usually the most inferior response to project risks.

Product Modeling. Modeling a new product early in the project will determine if its requirements can be met. If this is demonstrated prior to the final acceptance of a new product's design, significant risk impacts can be avoided.

Responses to positive risks (opportunities) may include the following:

Exploit the Risk. This strategy takes advantage of risk uncertainties that might be turned into benefits. For example, it may be possible to not only meet a customer's expectations but to go beyond them. This extra effort may present obstacles but if it is achieved it may produce a higher degree of customer satisfaction and cause the customer to keep coming back for more business.

Share Ratios. As described previously, share ratios can be used to place the impacts of negative risks on two parties; however, they can also result in a benefit to both parties under contract when actual project costs fall below target costs. Customers reap the benefit of well-managed subcontracts, and subcontractors reap the benefit of achieving a higher fee.

Enhance the Risk. Enhancing a risk involves the pursuit of activities that might produce a greater return-on-investment. This is accomplished by strengthening or maximizing the chances for a positive benefit.

MANAGING UNPREDICTABLE RISKS

Not all potential project risks can be identified, some risks may be unpredictable. In such cases it is imperative that project managers ensure some degree of margin in the project schedule, the project budget, and in the scope of the project.

RISK MONITORING AND CONTROL

As stated previously, risk management is not a one-time-only effort. New risks may present themselves as projects progress. For this reason project risk teams must constantly be on the lookout for potential risks. New risks that surface at various points in the project must then be subjected to the same risk management process. Risk control takes place when project managers remain aware of possible imminent threats and take adequate measures to implement responses in time. Inserting decision points in the project schedule will prevent project managers from getting caught off guard.