

# Project Risk Management Techniques in Resource Allocation, Scheduling and Planning

Hossein Amoozad Khalili, Anahita Maleki

**Abstract**—Normally business changes are made in order to change a level of activity in some way, whether it is sales, cash flow, productivity, or product portfolio. When attempts are made to make such changes, too often the business reverts to the old levels of activity as soon as management attention is diverted. Risk management is a field of growing interest to project managers as well as in general business and organizational management. There are several approaches used to manage risk in projects and this paper is a brief outline of some that you might encounter, with an indication of their strengths and weaknesses.

**Keywords**—Risk Management, Project Management, Scheduling, Planning

## I. INTRODUCTION

IN order to manage risks, we have to define what risk is. Risk management is a field of growing interest to project managers as well as in general business and organizational management. There are several approaches used to manage risk in projects. Today, effectively managing risk is an essential element of successful project management. Proper risk management can assist the project manager to militate against both known and unanticipated risks on projects of all kinds. Failure to perform effective risk management can cause projects to exceed budget, fall behind schedule, miss critical performance targets, or exhibit any combination of these troubles.

## II. AIMS OF PROJECT RISK MANAGEMENT

Organizations are as likely to take on formal project risk management for what might be seen as negative reasons, such as a string of disasters or external demands to do so, as they are because they believe it is a sound way to do business. The aim of devoting attention to risk management is to achieve better and more reliable outcomes from projects and business activities. To do this it is necessary to:

- Understand where the major risk lie and the priority they deserve in amongst all the other demands on your resources.
- Establish realistic budgets, targets and contingencies for commercial contracts and internal performance agreements.

Hossein Amoozad Khalili is with Industrial Engineering Department Islamic Azad University Nowshahr Branch, Nowshahr, Iran (phone +989125988723; Amoozad\_ie@iauns.ac.ir).

Anahita Maleki is with Industrial Engineering Department, Iran University of Science and Technology, Tehran, Iran (Anahitamaleki@yahoo.com).

### A. Project management definition

Project management is the application of knowledge, skills tools and techniques to project activities in order to meet or exceed stakeholder needs and expectations from a project. Project Objectives are cost, time, and quality [1].

- Risk definition

Risk is an uncertain event or condition that, if it occurs, has a positive or negative affect on a project objective. Risk Quantification is the assessment of risks and how different risks are linked and communicated with each other. Organization normally uses three different approaches to risk management [2]:

- Project Management Institute, Project Management Body of Knowledge
- UK Association for Project Management Project Risk Analysis and Management
- AS/NZS 4360 Standard
- Risk management

Risk management is the systematic process of managing an organization's risk exposures to achieve its objectives in a manner consistent with public interest, human safety, environmental factors, and the law. It consists of the planning, organizing, leading, coordinating, and controlling activities undertaken with the intent of providing an efficient pre-loss plan that minimizes the adverse impact of risk on the organization's resources, earnings, and cash flows.

The illustration plots uncertainty against constraint. The curved line indicates the 'acceptable level of risk', whatever that may be in the individual case. The risk may be reduced to an acceptable level by reducing either or both of uncertainty and constraint. In practice, few people have the opportunity to reduce constraint, so most focus on the reduction of uncertainty. It is also worth noting from the diagram that total elimination of risk is rarely achieved. So we have to consider how to manage that remaining risk most effectively.

There are two stages in the process of Project Risk Management, Risk Assessment and Risk Control. Risk Assessment can take place at any time during the project, though the sooner the better. However, Risk Control cannot be effective without a previous Risk Assessment. Similarly, most people tend to think that having performed a Risk Assessment; they have done all that is needed. Far too many projects spend a great deal of effort on Risk Assessment and then ignore Risk control completely [3].

### B. Risk Management Plan

- identification,
- prioritization, assessment,
- analysis,
- response planning and tracking and control

### C. Risk Management Planning Inputs

- Project Definition
  - statement of need

- business case
- Organizational Risk Requirements
  - current organizational Risk Management Methodology
- Defined Roles and Responsibilities
  - roles and responsibilities
  - documented and indicate the decision making process
- Stakeholder Risk Tolerances
  - different tolerances for risk
  - identifying the risk tolerances of the different stakeholders will enable the project team to prioritize and respond appropriately to project risk
- Template for Risk Management Plan  
Pre-defined risk management plan templates [4,5].

#### D. Risk Response Planning Inputs

- Risk Management Planning
- Risk Identification
- Risk Assessment and Prioritization
- List of Potential Responses (In the risk identification process, actions may be identified that respond to individual risks or categories of risk)
- Common Risk Causes (This situation may reveal opportunities to mitigate two or more project risks by Consolidating the risks under one heading and responding with one generic mitigation plan)
- Risk Champions (Risk Champions or Risk Owners must be appointed who will take responsibility for managing the high priority risks)
- Risk Mitigation Planning
  - ✓ Mitigation plans should be completed for the high level priority risks by Risk Champion/Owners
  - ✓ Mitigation seeks to reduce the probability and/or consequence of an adverse risk event to an acceptable threshold
  - ✓ Risk mitigation may take the form of implementing a new course of action that will reduce the problem, or changing conditions so that the probability of the risk occurring is reduced
  - ✓ Where it is not possible to reduce probability, a mitigation response might address the risk impact by targeting linkages that determine the severity
- Risk Mitigation Plan (The risk mitigation plan should be written to the level of detail at which the actions will be taken). It should include some or all of the following:
  - ✓ Identified risks, their descriptions and impacts
  - ✓ Risk Champions/Owners
  - ✓ Specific actions to be taken to prevent the risk arising or to respond to a risk that does arise
  - ✓ Risk strategy (method selected to deal with the risk) – Hold, Evade, Lower, Pass, Share (HELPS)
  - ✓ Results from risk prioritization
  - ✓ Cost of risk should it materialize
- Risk Management involves how management responds to risks. It includes:
  - ✓ recognizing preventive measures to minimize risk
  - ✓ implementing contingency plans to counter risk
  - ✓ reduce doubts via investigation through useful information

- ✓ transfer of risk to another asset
- ✓ Risk allocations in contractual agreements [6,7,8].

### III. PROJECT RISK MANAGEMENT PRINCIPLES

The principles of project risk management can be stated very simply. Any project organization is subject to risks. One which finds itself in a state of perpetual crisis is failing to manage risks properly. Failure to manage risks is characterized by inability to decide what to do, when to do it, and whether enough has been done. Risk Management is a facet of Quality, using basic techniques of analysis and measurement to ensure that risks are properly identified, classified, and managed [9,10,11].

### IV. 10 GOLDEN RULES OF PROJECT RISK MANAGEMENT

The benefits of risk management in projects are huge. You can gain a lot of money if you deal with uncertain project events in a proactive manner. The result will be that you minimize the impact of project threats and seize the opportunities that occur. This allows you to deliver your project on time, on budget and with the quality results your project sponsor demands. Also your team members will be much happier if they do not enter a "fire fighting" mode needed to repair the failures that could have been prevented.

#### A. Rule 1: Make Risk Management Part of Your Project

The first rule is essential to the success of project risk management. If you don't truly embed risk management in your project, you cannot reap the full benefits of this approach. You can encounter a number of faulty approaches in companies. Some projects use no approach whatsoever to risk management. They are either ignorant, running their first project or they are somehow confident that no risks will occur in their project (which of course will happen). Some people blindly trust the project manager, especially if he (usually it is a man) looks like a battered army veteran who has been in the trenches for the last two decades. Professional companies make risk management part of their day to day operations and include it in project meetings and the training of staff.

#### B. Rule 2: Identify Risks Early in Your Project

The first step in project risk management is to identify the risks that are present in your project. This requires an open mind set that focuses on future scenarios that may occur. Two main sources exist to identify risks, people and paper. People are your team members that each bring along their personal experiences and expertise. Other people to talk to are experts outside your project that have a track record with the type of project or work you are facing. They can reveal some booby traps you will encounter or some golden opportunities that may not have crossed your mind. Interviews and team sessions (risk brainstorming) are the common methods to discover the risks people know. Paper is a different story. Projects tend to generate a significant number of (electronic) documents that contain project risks. They may not always have that name, but someone who reads carefully (between the lines) will find them. The project plan, business case and resource planning

are good starters. Other categories are old project plans, your company Intranet and specialized websites.

Are you able to identify all project risks before they occur? Probably not. However if you combine a number of different identification methods, you are likely to find the large majority. If you deal with them properly, you have enough time left for the unexpected risks that take place.

#### *C. Rule 3: Communicate About Risks*

Failed projects show that project managers in such projects were frequently unaware of the big hammer that was about to hit them. The frightening finding was that frequently someone of the project organization actually did see that hammer, but didn't inform the project manager of its existence. If you don't want this to happen in your project, you better pay attention to risk communication.

A good approach is to consistently include risk communication in the tasks you carry out. If you have a team meeting, make project risks part of the default agenda (and not the final item on the list!). This shows risks are important to the project manager and gives team members a "natural moment" to discuss them and report new ones.

Another important line of communication is that of the project manager and project sponsor or principal. Focus your communication efforts on the big risks here and make sure you don't surprise the boss or the customer! Also take care that the sponsor makes decisions on the top risks, because usually some of them exceed the mandate of the project manager.

#### *D. Rule 4: Consider Both Threats and Opportunities*

Project risks have a negative connotation: they are the "bad guys" that can harm your project. However modern risk approaches also focus on positive risks, the project opportunities. These are the uncertain events that beneficial to your project and organization. These "good guys" make your project faster, better and more profitable.

Unfortunately, lots of project teams struggle to cross the finish line, being overloaded with work that needs to be done quickly. This creates project dynamics where only negative risks matter (if the team considers any risks at all). Make sure you create some time to deal with the opportunities in your project, even if it is only half an hour. Chances are that you see a couple of opportunities with a high pay-off that don't require a big investment in time or resources.

#### *E. Rule 5: Clarify Ownership Issues*

Some project managers think they are done once they have created a list with risks. However this is only a starting point. The next step is to make clear who is responsible for what risk! Someone has to feel the heat if a risk is not taken care of properly. The trick is simple: assign a risk owner for each risk that you have found. The risk owner is the person in your team that has the responsibility to optimize this risk for the project. The effects are really positive. At first people usually feel uncomfortable that they are actually responsible for certain risks, but as time passes they will act and carry out tasks to decrease threats and enhance opportunities.

Ownership also exists on another level. If a project threat occurs, someone has to pay the bill. This sounds logical, but it

is an issue you have to address before a risk occurs. Especially if different business units, departments and suppliers are involved in your project, it becomes important who bears the consequences and has to empty his wallet. An important side effect of clarifying the ownership of risk effects, is that line managers start to pay attention to a project, especially when a lot of money is at stake. The ownership issue is equally important with project opportunities. Fights over (unexpected) revenues can become a long-term pastime of management.

#### *F. Rule 6: Priorities Risks*

A project manager once told me "I treat all risks equally." This makes project life really simple. However, it doesn't deliver the best results possible. Some risks have a higher impact than others. Therefore, you better spend your time on the risks that can cause the biggest losses and gains. Check if you have any showstoppers in your project that could derail your project. If so, these are your number 1 priority. The other risks can be prioritized on gut feeling or, more objectively, on a set of criteria. The criteria most project teams use is to consider the effects of a risk and the likelihood that it will occur. Whatever prioritization measure you use, use it consistently and focus on the big risks.

#### *G. Rule 7: Analyze Risks*

Understanding the nature of a risk is a precondition for a good response. Therefore take some time to have a closer look at individual risks and don't jump to conclusions without knowing what a risk is about.

Risk analysis occurs at different levels. If you want to understand a risk at an individual level it is most fruitful to think about the effects that it has and the causes that can make it happen. Looking at the effects, you can describe what effects take place immediately after a risk occurs and what effects happen as a result of the primary effects or because time elapses. A more detailed analysis may show the order of magnitude effect in a certain effect category like costs, lead time or product quality. Another angle to look at risks, is to focus on the events that precede a risk occurrence, the risk causes. List the different causes and the circumstances that decrease or increase the likelihood. Another level of risk analysis is investigate the entire project. Each project manager needs to answer the usual questions about the total budget needed or the date the project will finish. If you take risks into account, you can do a simulation to show your project sponsor how likely it is that you finish on a given date or within a certain time frame. A similar exercise can be done for project costs. The information you gather in a risk analysis will provide valuable insights in your project and the necessary input to find effective responses to optimize the risks.

#### *H. Rule 8: Plan and Implement Risk Responses*

Implementing a risk response is the activity that actually adds value to your project. You prevent a threat occurring or minimize negative effects. Execution is key here. The other rules have helped you to map, prioritize and understand risks.

This will help you to make a sound risk response plan that focuses on the big wins.

If you deal with threats you basically have three options, risk avoidance, risk minimization and risk acceptance. Avoiding risks means you organize your project in such a way that you don't encounter a risk anymore. This could mean changing supplier or adopting a different technology or, if you deal with a fatal risk, terminating a project. Spending more money on a doomed project is a bad investment.

The biggest category of responses is the ones to minimize risks. You can try to prevent a risk occurring by influencing the causes or decreasing the negative effects that could result. If you have carried out rule 7 properly (risk analysis) you will have plenty of opportunities to influence it. A final response is to accept a risk. This is a good choice if the effects on the project are minimal or the possibilities to influence it prove to be very difficult, time consuming or relatively expensive. Just make sure that it is a conscious choice to accept a certain risk.

Responses for risk opportunities are the reverse of the ones for threats. They will focus on seeking risks, maximizing them or ignoring them (if opportunities prove to be too small).

#### *I. Rule 9: Register Project Risks*

This rule is about bookkeeping (however don't stop reading). Maintaining a risk log enables you to view progress and make sure that you won't forget a risk or two. It is also a perfect communication tool that informs your team members and stakeholders what is going on (rule 3). A good risk log contains risks descriptions, clarifies ownership issues (rule 5) and enables you to carry out some basic analyses with regard to causes and effects (rule 7). Most project managers aren't really fond of administrative tasks, but doing your bookkeeping with regards to risks pays off, especially if the number of risks is large. Some project managers don't want to record risks, because they feel this makes it easier to blame them in case things go wrong. However the reverse is true. If you record project risks and the effective responses you have implemented, you create a track record that no one can deny. Even if a risk happens that derails the project. Doing projects is taking risks.

#### *J. Rule 10: Track Risks and Associated Tasks*

The risk register you have created as a result of rule 9, will help you to track risks and their associated tasks. Tracking tasks is a day-to-day job for each project manager. Integrating risk tasks into that daily routine is the easiest solution. Risk tasks may be carried out to identify or analyze risks or to generate, select and implement responses.

Tracking risks differs from tracking tasks. It focuses on the current situation of risks. Which risks are more likely to happen? Has the relative importance of risks changed? Answering these questions will help to pay attention to the risks that matter most for your project value.

The 10 golden risk rules above give you guidelines on how to implement risk management successfully in your project. However, keep in mind that you can always improve. Therefore rule number 11 would be to use the Japanese Kaizen approach: measure the effects of your risk management efforts and continuously implement improvements to make it even better.

## V. PROJECT RISK MANAGEMENT

A risk is something that may happen and if it does, will have a positive or negative impact on the project. A few points here. "That may happen" implies a probability of less than 100%. If it has a probability of 100% - in other words it will happen - it is an issue. An issue is managed differently to a risk and we will handle issue management in a later white paper.

A risk must also have a probability something above 0%. It must be a chance to happen or it is not a risk.

The second thing to consider from the definition is "will have a positive or negative impact". Most people dive into the negative risks but what if something goes right?

Take the example I came across recently where we identified a project finishing ahead of schedule as a risk. It might seem to be a bonus but the completion date happened to occur at the busiest time of the year for the company.

The last thing they needed was a project going live in their peak period. The mitigation was that if we were ahead of schedule, we would slow the project down by reducing resources.

#### *A. Risk Management Plan*

The four stages to risk management planning are as follows:

- Risk Identification
- Risks Quantification
- Risk Response
- Risk Monitoring and Control

#### *B. Risk Identification*

In this stage, we identify and name the risks. The best approach is a workshop with business and IT people to carry out the identification. Use a combination of brainstorming and reviewing of standard risk lists. There are different sorts of risks and we need to decide on a project by project basis what to do about each type. Business risks are ongoing risks that are best handled by the business. An example is that if the project cannot meet end of financial year deadline, the business area may need to retain their existing accounting system for another year. The response is likely to be a contingency plan developed by the business, to use the existing system for another year. Generic risks are risks to all projects. For example the risk that business users might not be available and requirements may be incomplete. Each organization will develop standard responses to generic risks. Risks should be defined in two parts. The first is the cause of the situation (Vendor not meeting deadline, Business users not available, etc.). The second part is the impact (Budget will be exceeded, Milestones not achieved, etc.). Hence a risk might be defined as "The vendor not meeting deadline will mean that budget will be exceeded". If this format is used, it is easy to remove duplicates, and understand the risk.

#### *C. Risk Quantification*

Risk needs to be quantified in two dimensions. The impact of the risk needs to be assessed. The probability of the risk occurring needs to be assessed. For simplicity, rate each on a 1 to 4 scale. The larger number, the larger of impact or probability. By using a matrix, a priority can be established.

## VI. PROGRAM AND PROJECT PLANNING AND SCHEDULING

Program and project delivery are critical to business success. But as programs and projects increase in complexity, number and value, constraints tighten. Managing resources, time and budget across an organization has never been a greater challenge. Today, this challenge falls on a range of participants, from project managers to task leads to program managers.

Our integrated planning and scheduling approach provides program and project managers qualitative and quantitative tools and techniques to ensure resource optimization, project risk management, and execution of all project deliverables and milestones throughout the program and project life cycle.

- PMO establishment, sustainment, improvement and augmentation
- WBS development
- IMP design and development
- IMS design, development and implementation
- Schedule analysis, verification and validation
- Resource- loaded schedules
- Risk analysis and mitigation planning
- Tools implementation/training: introductory, intermediate and advanced
- Transition to earned value management

## VII. CONCLUSION

Risk management is not a complex task. If you follow the four steps, you can put together a risk management plan for a project in a short space of time without a plan, the success of the project, and your reputation as a project manager, are on the line. Follow these steps and you will increase your chances of success.

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