**CSC 408**

**Summary of chapter 7: Risk**

Project risk management (and much of mainstream project management) is concerned with attempting to identify all the foreseeable risks, assessing the chance and severity of those risks, and then deciding what might be done to reduce their possible impact on the project or avoid them altogether. Freak events have been known to disrupt projects, such as the unexpected discovery of important archaeological remains or the decision by a few members of a rare protected species to establish their family home on what should have been the site of a new project.

**INTRODUCTION TO PROJECT RISK MANAGEMENT**

For any project that breaks new ground or is complex and large, a risk management strategy must be developed, first to identify as many potential risks as possible and then to decide how to deal with them. For very large projects it might be necessary to appoint a risk manager, who can devote all or most of his or her time to ensuring that a comprehensive risk strategy is put in place and then reviewed from time to time throughout the project to ensure that it remains valid. Some projects, because they are small or similar to projects that the contractor has undertaken in the past, might not need special attention to risk management other than considering some of the insurance issues discussed later in this chapter. There are several techniques for assessing and dealing with project risks, some of which are shared with other management disciplines (particularly with quality management and reliability engineering). This chapter will outline a few of the methods commonly used.

**IDENTIFYING THE POSSIBLE RISKS**

With this vast breeding ground for possible risk events it is apparent that the risk manager’s first problem is to identify the risks that might affect his or her project. Risks events can occur in any kind of project and they can range from the ‘accident waiting to happen’ variety to the most unexpected and bizarre. Risks are unforeseen (and often unforeseeable) events that can result in a change of project plans or even total project failure. Studying the history of similar projects can also highlight possible problems and help the project manager to learn from the mistakes and experiences of others. Checklists, which grow in size and value as companies gain more project experience, are a good starting point for listing the foreseeable risks. They can even occur late in the project life history, after the project is finished and handed over (design modifications needed for the Millennium Bridge project in London)

**RISK APPRAISAL AND ANALYSIS**

Qualitative risk analysis involves considering each risk in a purely descriptive way, to imagine various characteristics of the risk and the effect that it might have on the project.

Qualitative risk analysis goes at least one stage further than qualitative analysis by attempting

to quantify the outcome of a risk event or to attach a numerical score to the risk according to its perceived claim for preventive or mitigating action.

**Qualitative cause and effect analysis**

* Fault-tree analysis (not described here) and Ishikawa fishbone diagrams are methods commonly used by reliability and safety engineers to analyse faults in design and construction.
* Failure mode and effect analysis (FMEA): Failure mode and effect analysis has also been imported into project risk management from reliability and quality engineering, but this method is possibly more helpful because it starts by considering possible risk events (failure modes) and then proceeds to predict all their possible effects.
* Risk classification matrices: As with failure mode and effect analysis, this again is a qualitative method, in which no attempt is made to evaluate any risk numerically. Each risk item is considered for its likelihood of occurrence (chance) and for the relative scale of the impact on the project should it occur.

**Quantitative analysis**

Although all quantitative methods produce actual numbers they can give a false sense of

precision. Quantitative analysis methods attempt to assign numerical values to risks and their possible effects. Ranking numbers denote the priority. Those contributing assessments might be fundamentally flawed, mistaken or simply too difficult for any person to make with any degree of certainty.

* **Qualitative risk assessment matrix**

**\*** Failure mode effect criticality analysis (FMECA)

**RISK REGISTER**

When all the known risks have been listed, assessed and ranked it is time to consider what might be done about them. That process requires that all potential risks be listed in a risk register (risk log). The risk register should be reviewed and updated regularly throughout the life of the project. It is advisable to use the computer to sort the risks according to their ranking, with the highest ranked risks placed at the top.

**METHODS FOR DEALING WITH RISKS**

When all the known risks have been identified, assessed, ranked and registered it is time to consider what might be done about them. The project manager usually has a range of options:

1. Avoid the risk – The only way to avoid a risk is to abandon the possible causes, which could even mean deciding not to undertake a project at all.
2. Take precautions to prevent or mitigate risk impact – This is a most important part of risk management, requiring the active participation of all managers and staff.
3. Accept the risk – There are numerous small things that can go wrong during the course of any project, and most of these risks can be accepted in the knowledge that their effect is not likely to be serious, and that they can be overcome by corrective measures or replanning
4. Share the risk – If a project, or a substantial part of it, appears to carry very high risk, the contractor might seek one or more partners to undertake the work as a joint venture.
5. Limit the risk – There are occasions when project risks should only be accepted with safeguards in place to limit their potential effect. A good example is an internal project, perhaps for pure research, that cannot be adequately defined at the outset.
6. Transfer the risk – Some risks, or substantial parts of them, can be transferred to another party on payment of a fee or premium. This leads to the important subject of insurance, which is discussed in the next section.

**INSURANCE**

The financial impact of many risks can be offset by insuring against them. The client pays the insurance company a premium for this service, and the insurer might itself choose to spread the risk by sharing it with one or more other insurance companies.

**CATEGORIES OF INSURANCE**

There are four main classes of insurance:

1. legal liabilities (payments to others as a result of statutory, contractual or professional commitments, compensation awarded by the courts, legal expenses, but not fines imposed by the courts);
2. protection against loss or damage to property, including temporary works and work in progress, owned construction plant, hired-in plant and employees’ effects;
3. cover relating to personnel;
4. pecuniary loss.

A policy may combine cover for two or more of the above classes of risk.

* **Obligatory insurances**

Legal requirements oblige companies to obtain adequate insurance cover against some risks. These obligations arise either from various government laws and regulations or from conditions contained in a binding commercial contract.

1. Statutory requirements
2. Contractual requirements and other legal liabilities

**\*other risk that can be covered by insurance**

1. Decennial insurance
2. Accident and sickness insurance
3. Key person insurance
4. Pecuniary insurance

**NOTE: There are risks which cannot be covered by insurance. There are risks which an underwriter will either refuse to insure, or for which the premium demanded would be prohibitive.**

**Obtaining insurance**

Insurance can be sought directly from an underwriter, or through a broker; preferably one with a good reputation and experienced in the insured’s type of project activity. The insurer will need to be supplied with sufficient information for the risk to be adequately defined, and the contractor will be expected to inform the insurer of any change of circumstances likely to affect the risks insured. The insurer may wish to make investigations or even follow up the project work using its own experts. Professional advice from insurers can often be of great benefit in reducing risks, especially in the areas of health and safety and crime prevention.

It is, therefore, now more important than ever for a project manager to involve an insurance specialist at a very early planning stage, lest they should find that no insurance cover is available at short notice

**PLANNING FOR A CRISIS**

Some risk events can have such a potential impact on a project that special crisis management contingency plans must be made Such contingency plans can extend to projects that would need to be set up specially and rapidly to deal with the sudden crisis.

**Organization**

Once the possibility of a crisis has been established, the first step in devising a contingency plan is to identify the key people who will take charge of the crisis management project. Each person should have the authority to instruct others within their home organization and the permission to identify the relevant resources that could be made available should the crisis happen.

**Contingency planning**

Lists of secondary organizations and other helpers must be established, which although not part of the action committee could be called upon to give urgent and immediate assistance. These secondary associations might include, for example, specialist engineering or chemical contractors, explosives or decontamination experts, building and demolition contractors, caterers, and a wide range of charitable organizations that could offer relief services.

**Table top and other exercises**

A table top exercise can contribute to this process, where the members of the action committee carry out a role-playing exercise to consider as exactly as possible what might happen and what they themselves and their subordinates might do should the crisis happen.

Field exercises can reveal shortcomings in the contingency plans and test vital aspects such as mobility, response speeds, and how to communicate and coordinate the various participants under emergency conditions, when power, water and telephones might all be out of action.

**Summary of Chapter 9: Project Organisation Structures**

Every company has its own ideas about how to organize itself and its work. It is highly probable that if three companies doing similar work could be compared, three different organization structures would be found. Further, all three companies might be equally successful (or equally unsuccessful), implying that it is not always possible to say with any degree of confidence that there is one best organization solution.

**EFFECTIVE ORGANIZATION AND COMMUNICATIONS**

An effective organization will have clear lines of authority and every member of the project will know what he or she is expected to do to make the project a success. The complement of good management communications is the provision of adequate feedback paths through and across the organization. These facilitate cooperation and coordination. A badly informed group is likely to be poorly motivated, slow to achieve results, costly to run and extremely frustrating to work with.

**ORGANIZATION CHARTS**

It is not possible to discuss organizational structures in any depth of detail without the aid of charts (or ‘organigrams’ as they are often unfortunately known). No organigram can adequately depict all the nuances and politics of a particular organization, but we all need to understand, as far as possible, the meanings of the charts that we encounter during our working lives.

**Shortcomings of organigrams**

Organizations thrive on fast and effective communications, whether electronic or face to face. The only difficulty is that organigrams cannot possibly show every communication channel, and they are certainly incapable of defining every subtle influence that one person might be able to exert over another. The issue of a new organization chart can also give rise to feelings of envy or injustice when individuals feel that their particular box should have been placed higher up in the hierarchical pecking order. At least one company has attempted to solve this problem by issuing circular charts, but that is a not a complete solution because those nearest the outer rim of the circle might feel that they should be nearer the centre.

**Work management in a conventional manufacturing organization**

Organizations of this type are known as ‘line and function’, because they are set up to manage work within departmental (functional) boundaries or specialist disciplines. Thus the chief engineer is responsible for design and development but very little else. The works manager concentrates on the production aspects of the business. Managers concentrate on those reporting directly to them in the line and they generally have no direct responsibilities outside their own functions. Nevertheless, any cross-functional relationships that do exist are

regarded as secondary to the main line structure.

**Communications throughout the project cycle and the need for a project**

**manager**

Engineering projects, in common with most other customer-funded projects, are partly cyclical in nature. When a manufacturing project is compared with routine production, the emphasis has shifted from looking principally at the line relationships to consideration of the functional connections. This will have to be reflected in the formal organization structure if the project is to be coordinated and managed satisfactorily. Someone must be made responsible for managing the project as an entity, rather than having this responsibility spread vaguely over a number of managers in the line structure. Thus, at the hub of the project cycle, a new figure has emerged– the *project manager*

**PROJECT MATRIX ORGANIZATIONS**

**Matrix organization for a single project**

It allows the general line organization of the company and its departmental management structure to continue normally, but the project manager is asked to give undivided attention to the ‘intruding’ project. Here the project manager acts principally as a coordinator, and has no direct line authority over any other manager or their staff. The names given to this organizational arrangement are a ‘functional matrix’ or a ‘coordination matrix’.

**Matrix organization for multiple projects**

The case for the functional matrix becomes a little more complicated when a

company is handling several projects at the same time.

Both of these examples are matrix organizations. Permanently established groups of people are organized according to their special skills or functional disciplines.

**Different matrix strengths**

The question now arises of how the degree of authority given to a project manager in a matrix

compares with that enjoyed by the departmental or functional managers. That balance of power must be decided mainly by more senior management and can vary enormously from one matrix organization to another. The organigrams used conventionally to depict matrix organizations therefore remain valid whether project managers have weak authority or are given supreme power. Different matrices strength are described below;

**Weak matrix**

In a ‘weak matrix’, each project manager’s degree of authority and control is less than that enjoyed by the managers of the functional departments.

**Stronger forms of the matrix**

In a ‘project matrix’ the authority of each project manager takes precedence over the authority of the functional managers, at least as far as the allocation and progressing of work is concerned. In a ‘secondment matrix’, which is the strongest form of the matrix, the functional managers must nominate and assign members of their departments to work full-time for the project managers.

**PROJECT TEAMS AND TASK FORCES**

**Pure project team organization**

It is, of course, possible to arrange things differently from the matrix options described above. A complete workgroup or team can be created for each project as a self-contained unit with the project manager placed at its head. The project manager is given direct line authority over the team and is responsible not only for planning, progress and work allocation but also for all technical aspects of the project. Communications across the various technical and professional disciplines are easier when the project manager is in total command.

**Task force organization**

A task force is a form of pure project team, but its name implies a particular urgency and common sense of purpose.

**Use of a task force to rescue a late-running manufacturing project**

Now suppose that a project is running extremely late and is in dire need of a rescue operation.

In other words, there is an existing or impending crisis. In those circumstances, the company’s management would be well advised to consider setting up a task force to finish the remainder of that project in the shortest possible time. The task force members will communicate more effectively and make better and faster decisions if they can be located together, away from their usual offices or workplaces. Although the project might still depend on the use of resources and facilities shared with other work, the seniority of the task force members will ensure that all critical project tasks get top priority.

**Construction site organizations**

Team organization is the customary arrangement where a project construction site manager and all those working on the project have been assembled at a site that is some distance away from the company’s home office. It is then usually more sensible to place all site staff under the direct command of the most senior manager located at the site, rather than depend on multiple lines of command back to the home office.

**ORGANIZATION OF CENTRAL ADMINISTRATION FUNCTIONS**

A mistake sometimes made is to show all company functions, whatever their purpose, as part of the project team or lying within the project boundaries in a matrix. Functions such as accounting, marketing, human resources, facilities management and general administration, although they might provide essential support to projects, are not usually involved directly in performing scheduled project tasks. But, for most industrial projects the project manager must regard these other company functions as general supporting services rather than resources under their control.

**WHICH TYPE OF PROJECT ORGANIZATION IS BEST?**

Consider a company which is about to embark upon a project for the first time. If asked to advise, the project manager might immediately be faced with the question that often causes much controversy:

Should the company take all the key people destined to work on the project and place

them under the direct management of the project manager, so that a purpose-built team

will carry out the project?

Or, at the other extreme:

Would it be better to have a weak or balanced functional matrix in which the project manager, although held responsible for the whole project, has no direct line authority over

the workforce. The project manager must then rely on the goodwill and cooperation of all

the line managers for the success of the project.

**The case for a dedicated project team**

Project teams have the advantage that they can each be directed to a single purpose: the successful completion of one project. It is provided with and relies upon its own resources.

* Short-term leadership and motivation
* Good cross-functional Communication
* Security and confidentially

**The case against the team**

* Inflexibility and inefficiency in the use of resources
* Isolation of specialists
* Administrative Difficulties
* Life after the project

**The case for the matrix**

The matrix option allows the establishment of specialist functional groups which, in theory, have ‘eternal life’, independent of the duration of individual projects. There is usually a clear promotion path within each group, and any person with sufficient drive and ambition should be able to compete fairly against their colleagues for more senior positions as vacancies arise, with chief engineer or department manager and beyond being seen as achievable longer-term goals. Performance assessments of each individual, and recommendations for promotion, improved salary or other benefits, are carried out by a manager of the same professional skill within the stable group.

**The case against the matrix**

Most of the advantages connected with a project team (listed above) are denied to the project

manager in a weak matrix, but this situation is improved when the matrix is made stronger (with more authority given to the project manager).