WARWICK MANUFACTURING GROUP
Product Excellence using 6 Sigma (PEUSS)

Risk Management
# RISK MANAGEMENT

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RISK MANAGEMENT

1 Introduction

It is essential for effective management control that all significant risks and uncertainties in a project are systematically identified, quantified, analysed, owned, acted upon and monitored by the management team to maximise the likelihood of successful achievement of objectives within budget and schedule targets.

Risk management is a means of dealing with uncertainty – identifying sources of uncertainty and the risks associated with them, and then managing those risks such that negative outcomes are minimised (or avoided altogether), and positive outcomes are capitalised upon. The need to manage uncertainty is inherent in most projects which require formal project management [2]. Consider this illustrative definition of a project:

An endeavour in which human, material and financial resources are organised in a novel way, to undertake a unique scope of work of given specification, within constraints of cost and time, so as to achieve unitary, beneficial change, through the delivery of quantified and qualitative objectives. (Turner, 1992 as quoted by Chapman [2])

In highlighting the one-off, change-inducing nature of projects, this definition indicates that projects carry with them an inherent degree of uncertainty that requires attention as part of an effective project management process. The roots of this uncertainty are worth clarification. Chapman [2] has indicated that one obvious source of uncertainty and risk in the execution of a project is “the large-scale use of new and untried technology”. Chapman [2] also indicates that such sources of risk frequently become the prime motivator for the introduction of, and careful attention to, formal risk management processes (RMPs).

2 Definitions of risk

Some definitions of risk include:

“the implications of the existence of significant uncertainty about the level of project performance achievable” [2]
project risk
combination of the probability of an event occurring and its consequences for project objectives

risk management
systematic application of management policies, procedures and practices to the tasks of establishing the context, identifying, analysing, evaluating, treating, monitoring and communicating risk

both from BS IEC 62198:2001 Project risk management — Application guidelines

(risk) management process
consists of all the project activities related to the identification, assessment, reduction, acceptance, and feedback of risks


A source of risk is any factor that can affect project performance, and risk arises when this effect is both uncertain and significant in its impact on project performance. It follows that the definition of project objectives and performance criteria has a fundamental influence on the level of project risk. Setting tight cost or time targets makes a project more cost or time risky by definition, since achievement of targets is more uncertain if targets are “tight”. Conversely, setting slack time or quality requirements implies low time or quality risk. However, inappropriate targets are themselves a source of risk, and a failure to acknowledge the need for a minimum level of performance against certain criteria automatically generates risk on those dimensions [2]. Therefore, the setting of clear objectives and performance criteria which reflect the requirements of all relevant parties, is clearly an important initial step in project risk management.

3 What is risk?
3.1 Common description of risk
Risk is a measure of the probability and consequence of not achieving a defined project goal. Most people agree that risk involves the notion of uncertainty. Can the specified aircraft range be achieved? Can the computer be produced within budgeted cost? Can the new product launch date be met? A probability measure can be used for such questions; for example, the probability of not meeting the new product launch date is 0.15. However, it is now generally accepted that when risk is considered, the consequences or damage associated with failure must also be considered [4].

Goal A, with a failure probability of only 0.05, may present a much more serious (risky) situation than Goal B, with a failure probability of 0.20, if the consequences of not meeting Goal A are more severe than failure to meet goal B. Risk is not always easy to assess, since the probability of failure and the consequence of failure are usually not measurable parameters and must be estimated by statistical or other procedures. While formal risk analysis procedures deal with the “known unknowns,” there is also the issue of the “unknown unknowns.” Here, only qualitative assessments are usually possible [4]. Techniques employed in the qualitative and quantitative analysis of risk are discussed in Section X.

Risk has three primary components [4]:

- An event (an unwanted change)
- A probability of occurrence of that event
- Impact of that event (amount at stake)

Conceptually, risk for each event can be defined as a function of uncertainty and damage; that is:

\[ \text{Risk} = f(\text{event, uncertainty, damage}) \]

In general, as either the uncertainty or damage increases, so does the risk. Both the uncertainty and the damage must be considered in a risk analysis. Since risk actually constitutes a lack of knowledge of future events, we can define risk as the cumulative effect that these adverse events could have on the project's objectives. Future events (or outcomes) that are favourable are called opportunities, whereas unfavorable events are called risks.

Another element of risk is the cause of risk. Something, or the lack of something, induces a risky situation. This source of risk is often referred to as the hazard. The danger presented by the majority of hazards is minimised simply by being aware of them and taking action to overcome them. A large hole in the road is a much greater danger to a driver who is unaware
of it than to one who travels the road frequently and, knowing of the hole’s existence, slows down and goes around it. This leads to the second conceptual equation:

\[ \text{Risk} = f(\text{hazard, safeguard}) \]

Risk increases with hazard but decreases with safeguard. The implication of this equation is that good project management should be structured to identify hazards and to allow safeguards to be developed to overcome them. If enough safeguards are available, then the risk can be reduced to an acceptable level [4].

3.2 Sources of Risk

Risks to a project can be classified by their cause, as one of the following types [6]

3.2.1 External

These may be associated with global conditions in political and regulatory areas and markets. Generally, external sources of risk encompass factors which are beyond the control of the project team and/or the organisation(s) involved. These may include legislative requirements with regard to safety or the protection of consumers or the environment. Such regulations govern the operation of companies and enterprises, non-compliance with which lead to legal obstacles, or unofficial political demonstrations that can harm an organisation’s project operations and reputation. The public uproar and protest against Shell Oil over the proposed sinking of the Brent Spar oil platform in the North Sea showed the potential for damage to corporate PR. The Sea Empress oil spill in February 1996 ruined 190km of Welsh coastline in a valued conservation area. The authorities showed they had teeth when they fined the Milford Haven Port Authority £4 million. Damage to your project can be serious.

3.2.2 Internal

Internal sources of risk are within the control of the project team and/or the organisation(s) involved. These include risks arising as a result of project design or human behaviour. Corporate dispute, communication failure and technology failure, can all harm the project. Human performance, skills availability, capability and motivation are essential factors that
contribute to the success of the project. The project leader should have the skills to exercise consistent risk management in order to keep the project on track.

It is not possible to eliminate risk; it is possible to handle risk conditions. Some types of risk are avoidable and are within the realm of the project manager's control [6].

“Ensuring that the materials you order are delivered on time, seeing to it that the items you plan to sell are produced on schedule, and getting your sales facilities in place all must be planned before that moment when the customers show up and lay their money on the counter.”

The project manager is encouraged to take risk management actions to try to avoid the risk (risk mitigation), to build up reserves (risk contingency) and to establish a network of contacts to be able to better withstand project shocks. The concepts of risk mitigation and contingency are discussed in more detail below.

These types of risk can be further broken into 4 categories as:

- Technical
- Management
- Safety
- Business

It is important to understand that Technical and Safety Risk is quite different from Project Risk. Furthermore, the processes by which they are managed are not only different in themselves, but actually have different objectives. Individuals involved in Project Management and therefore Project Risk Management, often have a background in the technical world and so the processes and techniques developed there have conditioned their thinking. This can cause severe problems that must be managed carefully by the Project Risk Specialist.

Considering these 4 categories, it is important to understand that risks cannot be simply transferred between disciplines. It must be understood that any Technical or Safety Risk is likely to result in a Project Risk, but this is not automatic and the risks are not likely to be the same. Defining the Project Risk involves establishing how much it will cost and how long it
will take to remove the Technical or Safety Risk. Equally, any Project Risk is likely to generate Technical or Safety Risks, but this too is not automatic and again the risk may not be the same. A safety risk, for example, to a project manager may well be an issue, not a risk, this is because it is something he has to resolve, and frequently in today's environment, it is to be resolved by compliance with legislation, statutory requirement, or client requirement. Even those risks that remain risks within the project environment may well require interpretation. For example, a technical risk on the use of a new material intended to provide increased operational offerings to the client, may, if it fails, have project implications in terms of cost, and in terms of delay, and probably in terms of acceleration measures to get back on stream. This risk must be understood and provisioned for by the Project Manager in terms of schedule and cost, as well as being examined in terms of the reliability and maintainability and managed under the Technical and Safety Risk Management Process.

4 Risk Management

Risk management is an organized means of identifying and measuring risk and developing, selecting, and managing options for handling these risks. Several tools are available to assist in the management of risk in technical areas. These tools can help the project manager to understand the danger signals that may indicate that the project is off track, and prioritize corrective actions as necessary.

According to the Project Management Institute Body of Knowledge (PMBOK) [3], there are three definitions of risk management:

- Risk management is the formal process by which risk factors are systematically identified, assessed, and provided for

- Risk management is a formal, systematic method of managing that concentrates on identifying and controlling areas or events that have a potential for causing unwanted change

- Risk management, in the project context, is the art and science of identifying, analyzing, and responding to risk factors throughout the life of a project and in the best interest of its objectives.
Risk management implies control of possible future events, and is proactive rather than reactive. As an example, an activity in a network requires that a new technology be developed. The schedule indicates six months for this activity, but the technical employees think that nine months is closer to the truth. If the project manager is proactive, he might develop a contingency plan right now. If the project manager is reactive, then he will do nothing until the problem actually occurs. At that time the project manager must react rapidly to the crisis, and may have lost valuable time when contingencies could have been developed. Risk management will not only reduce the likelihood of an event occurring, but also the magnitude of its impact [4].

5 The Relationship between Risk Management & Project Management

In the early days of project management, great emphasis was placed on managing cost and schedule. This occurred because more was known about cost and scheduling than about technical risks. Technology forecasting was very rarely performed other than by extrapolating past technical knowledge into the present [4].

Risk management operates on the premise that a risk identified is a risk shared. If the project team identifies, discusses and collectively accepts some risks, the team, the client and the programme management will all go ahead with the project with their eyes wide open - with the risks understood and acknowledged [1]. But risk management systems are designed to do more than just identify risk. The system must also quantify the risk and predict the impact on the project. The outcome is therefore a risk that is either acceptable or unacceptable [4].

A project, by definition, is something that has not been done previously and will not be done again in the future. Because of this uniqueness, a “live with it” attitude to risk has developed. A risk management system which is set up as a continuous, disciplined process of problem identification and resolution, will operate in harmony with a company’s more established systems of organization, planning, budgeting, and cost control. But most importantly, surprises will be minimised because emphasis will be on proactive rather than reactive management [4].

Risk management can be justified on almost all projects. The level of implementation can vary from project to project, depending on such factors as size, type of project, who the customer is, relationship to the corporate strategic plan, and corporate culture. Risk analysis is particularly important when the overall stakes are high and a great deal of uncertainty
exists. While planning effectively focuses on what is already known, risk management forces us to focus on the future where uncertainty continues to increase.

6 Risk Management Process

6.1 Discussion of Risk Management Process

The project risk management process starts by establishing the context in which the project is undertaken. This includes identifying the interested parties, understanding the objectives and outputs of the project and defining the scope and boundaries of the risk management activity for a particular project. The interface to, and overlap with, any other projects and the organizational and strategic constraints within which the project operates, should be defined.

The next step in the risk management process is risk identification. This task is fundamental to the risk management process. Each identified risk should be subjected to subsequent project risk management activities of risk assessment, risk treatment and review and monitoring. The process may be applied first at a broad level to identify general risk issues, then at a more detailed level to look at particular risks and how they might arise. Risks should be managed at each phase of the project and risks to the project itself and to its product should be reviewed.

Essentially, risk management is something that we all do every day, mostly without thinking about it. Difficulties arise when risks are hard to identify and assess, or when the work is unfamiliar or complex. When this happens it can be helpful to have an explicit process to follow, i.e., to apply an established risk management methodology. There are a number of these: the PRAM (Project Risk Analysis & Management) process, developed by Chapman & Ward [2] in conjunction with the Association of Project Managers (APM), RISKMAN developed by Carter et al [7], Risk Management Guide for the Department of Defence (DoD). However, without too close an examination, it is evident that these methodologies are very similar in concept and, for the most part, consist of essentially similar stages. Four key stages are evident from the literature regarding project risk management. These are [1-3, 5, 7]:

- Risk Identification
- Risk Quantification
- Risk Response
- Risk Control

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The *identification* stage is concerned with identifying any issue(s) that could jeopardise the success of the project in question. This is followed by an assessment of that issue (which may involve *quantification* of the risk posed), following which the issue might be rejected as insignificant, or if it is significant it might be referred up or down in the management structure for discussion and appropriate action (denoted by the *Escalate/Delegate* decision point in Figure 5 below). For any remaining risks, containment plans (risk mitigation plans) should be developed and added to the main plan, and contingency plans invoked if containment fails – *risk response* stage. Associated with containment and contingency plans is the *control* stage in which the containment of identified risks is monitored and mechanisms are employed which will trigger the execution of the contingency plan, should it become necessary [5]. Figure 5 depicts how these four key stages are integrated to manage risk. What is meant by risk *mitigation* and *contingency* is outlined below.

![Figure 1 Four Key Risk Management Stages](After Grey [5])

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6.2 Risk Management Methodology – the Four Generic Stages

6.2.1 Risk Identification

The process of risk identification generally involves the use of qualitative risk analysis techniques. These include [1, 5, 6, 7, 8]:

- Observation – close examination of a current system or project may help identify risks that may also be inherent in a new project;

- Reference to previous documentation/existing databases - past experiences may be recorded on company files, reports, third-party company analytical reports, etc;

- Interviews - bringing people with the greatest direct experience of similar situations or projects, into face-to-face sessions to determine the nature and extent of the risks;

Qualitative risk analysis is used to deal with Qualitative Risks, i.e. the general type of risk that can be imagined and foreseen but can only be discussed in general terms. The use of techniques such as brainstorming and herringbone diagrams can also be valuable in ensuring that all significant risks have been identified, Figure 6.

![Herringbone Diagram](image-url)

Figure 2 Risk Identification using a Herringbone Diagram

(After Reiss [1])

Qualitative risk analysis, at its simplest, involves only a description of the obvious risks being undertaken as a part of the project. In some circumstances, risk identification via these
qualitative techniques may be all the risk analysis that is required. In other cases where more in-depth analysis is warranted, the identification, discussion and recording of significant risks, will essentially represent the first stage and will be followed by the use of quantitative analysis techniques, i.e. *Risk Quantification* [1].

6.2.2 *Risk Quantification*

Once risks have been identified a simple mathematical approach can be used to quantify them. This involves assigning each risk two values on an appropriate scale. One value relates to the likelihood of the risk's manifestation and the second value relates to its impact on the project. The first is a measure of how likely the thing is to go wrong, the second is the effect it will have on the project. By multiplication of the two values you get a weighting for each risk. This information can be tabulated to produce what is often called a **risk register**. A risk register can cover more ground than the above implies - it can discuss at length the nature of the risk, the impact and the things that can be done to prevent or reduce the impact of the risk. Table 1 is a very simple example for a small house building project in Coventry [1]. The values are rated out of ten:

**Table 1** An Example of a Simple Risk Register

<table>
<thead>
<tr>
<th>Risk element</th>
<th>Likelihood value</th>
<th>Impact value</th>
<th>Weighting of hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front gate not available in chosen design</td>
<td>9</td>
<td>0.01</td>
<td>0.09</td>
</tr>
<tr>
<td>Earthquake</td>
<td>0.01</td>
<td>10</td>
<td>0.1</td>
</tr>
<tr>
<td>Heavy snow</td>
<td>3</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Heavy rain</td>
<td>6</td>
<td>2</td>
<td>12</td>
</tr>
</tbody>
</table>

(After Reiss [1])

Weighting equals likelihood x impact. Some people call this derived value the **hazard** or the **hazard rating**. There are events that would ruin the projects but are very unlikely – the earthquake for example. An earthquake would ruin the project but they are rare in Coventry. There are events that are very likely but have only a small effect, e.g. not finding the preferred gate is something that is quite likely to happen. However, its effect would be quite small as an alternative could easily be found. This technique allows each risk to be listed in order of greatest hazard. This table can be extended to include extra columns containing additional

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useful information, e.g. who has ownership of the risk. A column noting secondary risk or “knock-on effects” might also be considered useful. An example might be that high winds over 14 knots will cause the crane to stop working, the secondary effect of which will be reduced stockpiles of heavy steel stock as without the crane, unloading will have to stop.

Such analysis is a useful part of a project definition and is a worthwhile exercise to carry out early in the project (especially when you take over someone else's project). The result is a one or two page overview of the major risks on the project which forms a part of your project definition document. In this way, by the time the project achieves approval the risks are all identified with appropriate personnel assigned to take responsibility for them, hence making the life of the project manager a little easier [1]. Without any hard data, it may be necessary to use qualitative rather than quantitative data to assess potential damage. The most common form of qualitative risk rating is as follows [4]:

**High risk** - Likely to cause significant disruption to schedule, cost and performance, or quality even with additional support.

**Moderate risk** - Has the potential to cause some disruption even with additional support. However, potential problems may be overcome.

**Low risk** - Has little potential to cause disruption to schedule, cost and performance, or quality. Normal effort by the project team and contractors will probably overcome most difficulties.

Alternative methodologies use slightly different notation, e.g. the *RISKMAN* methodology of Carter *et al* [7] use the notation Category 1, Category 2 and Category 3 risks, but these categories are essentially comparable with the above low, moderate and high risk classifications.

This kind of risk analysis is not always easy and it certainly is not inherently accurate. Many types of risk are very difficult to measure in any kind of meaningful way and your subjective viewpoint will probably colour your judgement when asked to give a risk a score out of ten [1]. Other risks are very much more numeric – the weather records for example, can be analysed and accurate predictions made. Continuing problems exist in attempting to estimate the probabilities accurately. Risk analysis, as a professional iterative process, must have inherent features which strive to obtain the appropriate risk perception for the job. Again,
previous experience, past documentation of similar cases, consultations with a panel of experts, and the use of heuristics (rules-of-thumb) and simulation tools can all help in making accurate estimates of risk probability [6]. Quantitative methods of risk analysis can and should be used wherever possible.

Techniques such as HAZOP, FMEA, Event Tree analysis and Fault tree analysis are commonly used to inform a technical risk analysis. References here.

6.2.3 Risk Response & Control

The ultimate purpose of risk management is one of risk mitigation, taking appropriate actions to achieve the project's objectives by revising the project's schedule, budget, scope, or quality. Appropriate actions are the techniques we select to respond to the risks [4]. The final phases of risk management involve establishing specific plans to mitigate the risks and, most importantly, the identification of fall-back plans and the dates by which those plans must be implemented. The management of risk demands an active process of regular risk reviews and the commitment to actually enact the fall-back plan and adopt its deadline. The situation must not be allowed to drift so that deadlines pass and no positive action is taken [8].

Essentially the action to mitigate a risk can either be a “passive” one, in which the mitigation action is only taken once the risk has materialised, or it can be an “active” one in which early steps are taken to ensure that if the risk does materialise then its impact is much reduced or effectively eliminated entirely. Inevitably any action taken to mitigate the effect of a risk has a cost associated with it. Thus an active mitigation action may have an “upfront” cost which may be a prudent investment to make or it may prove to be an unnecessary expenditure. For example, building a road tunnel which needs the fabrication of a special tunnelling machine runs the risk that the work will be delayed if that unique machine breaks down. Clearly the passive risk mitigation strategy would be to repair the machine if it breaks.

The active strategy might be to fabricate a second “back-up” machine at the outset. If the primary machine does not fail the money will have been wasted; if it does break the back up will be invaluable. Clearly the choice between active and passive strategies requires a careful cost benefit analysis. In the example given, the passive strategy would be preferable if the cost of the second machine is greater than the likely cost of delay, or indeed greater than the cost of insuring against the consequences of delay [8].
Risk managers draw on methods, techniques, and tools available in decision analysis disciplines to determine the preferred course of action. It should be remembered however, that risk techniques merely assist management, they are aids to decision making.

*Risk tools do not make decisions.*

6.3 Mitigation

Mitigation strategies are plans and means devised in order to reduce the impact of the risk, prevent its occurrence, avoid it altogether, or to determine whether or not contingencies need to be put in place to compensate for the risk should it occur. During project execution, risk mitigation is aimed at the implementation of the previously identified mitigation strategy. Risk control also includes the estimation and calculation of the risk exposure, in financial terms, caused by the impact of the risk on the project, with due consideration of the moderating effect of the mitigation strategy [7].

6.4 Contingency

Contingency can be thought of as the antidote to risk. The project manager who can insert a lot of contingency will bear very little residual risk. Contingency is most often associated with schedule and cost dimensions because projects will inevitably encounter difficulties there. Many things that occur simply require more time and money than planners think. For instance, whenever you must interact with other people, obtaining your boss’s approval perhaps, their schedules constrain you. You will not have instant access, and a delay will occur. External items that are key to the successful operation of a new product can often be a source of unexpected problems or delay. For example, interface hardware or sample data sets for computer programming projects, frequently do not arrive when expected or in the condition promised. Work done at remote locations often takes longer than work done in your own organization’s facilities because things like copying machines or other support resources are simply not as conveniently available. If your project involves hiring people, it takes time to train them and make them effective workers on the job. These and other tasks, some of which are included in the following list, make it important to build in schedule and cost contingency [9]:

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<table>
<thead>
<tr>
<th>Resource availability</th>
<th>Replace sick and vacationing personnel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resources conflicts</td>
<td>Cope with personnel resignations</td>
</tr>
<tr>
<td>Motivation</td>
<td>Obtain security clearances</td>
</tr>
<tr>
<td>Something else becomes higher priority</td>
<td>Make mistakes</td>
</tr>
<tr>
<td>Interface with others</td>
<td>Inefficiency</td>
</tr>
<tr>
<td>Miscommunications</td>
<td>Train people</td>
</tr>
<tr>
<td>Get approvals</td>
<td>Obtain equipment/data from external source</td>
</tr>
<tr>
<td>Get support from other groups</td>
<td>Work at remote locations</td>
</tr>
<tr>
<td>Place major subcontracts and purchase orders</td>
<td>Currency rate fluctuations</td>
</tr>
<tr>
<td>Subcontractor delays</td>
<td>Overhead and other rate changes</td>
</tr>
<tr>
<td>Adjust for labor strikes</td>
<td>Cope with travel delays</td>
</tr>
<tr>
<td>Comply with customer procedures</td>
<td>Accommodate computer downtime</td>
</tr>
<tr>
<td>Advance the state of the art</td>
<td>Handle customs duty clearance</td>
</tr>
</tbody>
</table>

**Example**

The IT millennium bug – An Example of Risk Mitigation & Contingency
After Chong & Brown [6]

This risk of computer chaos arose because dates were not programmed, for example, '97, 98 and 99', meaning the millenium could easily read as 1900 ‘instead of 2000. The risk of disruption or complete shutdown was greatest in mission-critical IT-based systems such as air traffic control, hospital life-support systems, and bank systems trading billions of dollars. It was necessary to define risk impact first, then prioritize action. The slow response to the problem by many private companies and the public sector meant that time to deal with it was running out fast, i.e. risk mitigation was poor. Given the tight schedules involved, analysis was trimmed down to:

- likely case - the most probable outcomes
- worst case - the highest damage caused.

Contingency work for a possible millennium bug disaster entailed substantial forward planning. Hospitals arranged to put important staff on 48 hour shifts over the critical 31 December-1 January 2000 period. Prior analysis and planning in the best run hospitals included the designation of many spare beds in case of emergencies. Police forces in England and Wales decided to cancel staff leave for the millennium in case of civil disturbances. Backup telecommunications and electricity facilities were installed in various companies.

Many organizations produced operations manuals with details of what staff should do if computer problems arose. The names of essential staff, with their addresses and telephone numbers, were given to emergency services. Emergency procedures were practised, to help expose potential glitches. If a company wanted to have effective use of its resources should things go wrong, then practice makes near-perfect.
Obviously, some companies and organizations come out of such crises much better than others. In the Millenium Bug example, some had recognized the nature of the risks and problems early on and so they were well organized. This took the luck element out of project management. They may later have asked with justification: “What crisis?” However, some companies go bust simply because their systems cannot cope with the demands of technology and the market, thus demonstrating the extent of the damage that could have resulted had risk management not been employed.

7 People Factors & Risk

It is often said that people are a company’s biggest asset, but in the project environment they are also one of the biggest risk factors. Chong & Brown [6] sum-up one key aspect of people-related risk in this way:

“It is not always true that a company or client will welcome a risk manager. Like a pest control worker, they are resisted. Calling them in is like admitting you have a problem, and there is some social stigma. Part of risk management lies in controlling your staff, especially if they are untrained, incompetent or corrupt. Some of your staff in influential project roles could be at fault and could be putting your project success at risk. Pressure could come from higher echelons to keep them on a risky path. Someone in your company could be making accidental project errors, or they could be passing on your confidential data, taking bribes, making secret transfers or losses. Sometimes, you just have to call in a rat-catcher. But no one really wants the public to know they have vermin in the house.”

So, one important message, which is recurrent throughout project management and broader management spheres, is to manage all people-related issues carefully, though always also with sensitivity. The NASA Space Shuttle case study demonstrates very clearly how significant an impact people-related factors can have on the success (or otherwise) of a project.

But this is not the only people-related issue which has relevance with respect to project risk management. Another issue is related to attitudes toward risk, primarily the project manager’s attitude toward it. The acceptance or non-acceptance of a risk is usually dependent on the project manager’s tolerance level for risk. Older or more experienced project managers become risk avoiders perhaps due to their fear of failure, and often with the belief that failure could affect their job security and pension. Younger individuals are willing to accept more risk but often lack experience in deciding whether a risk should be taken at all [4].

The three commonly used classifications of tolerance for risk are:

- The risk averter or avoider,
• The neutral risk taker, and
• The risk seeker or lover.

With the risk averter, the project manager's satisfaction or tolerance diminishes as the amount of money that is at stake increases. With the risk lover, the project manager's satisfaction increases when more money is at stake (i.e., an increasing slope to the curve). A risk averter prefers a more certain outcome and will demand a premium to accept risk. A risk lover prefers the more uncertain outcome and may be willing to pay a penalty to take a risk [4].

8 Summary

Risk is associated with identifying, measuring, mitigating and controlling uncertainty. It is present in all aspects of life and in particular in any new project. Risks if not dealt with can have catastrophic situations within projects if they are not managed. Risk management is therefore one the key success factors of any new product developed and therefore should be included in the project plan.

A risk management process includes: risk identification, quantification, response and control. The process is iterative and is linked with the product life cycle so consequently aligned with and included in all design reviews. Often a risk register is developed for a project and this is completed and/or update prior to each design review. Tools such as FMECA, FTA, ETA and HAZOPs are used to inform the risk register as well as data collected from eliciting expert judgement from project workers.

More information on risk management can be found in the references below.

9 References


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