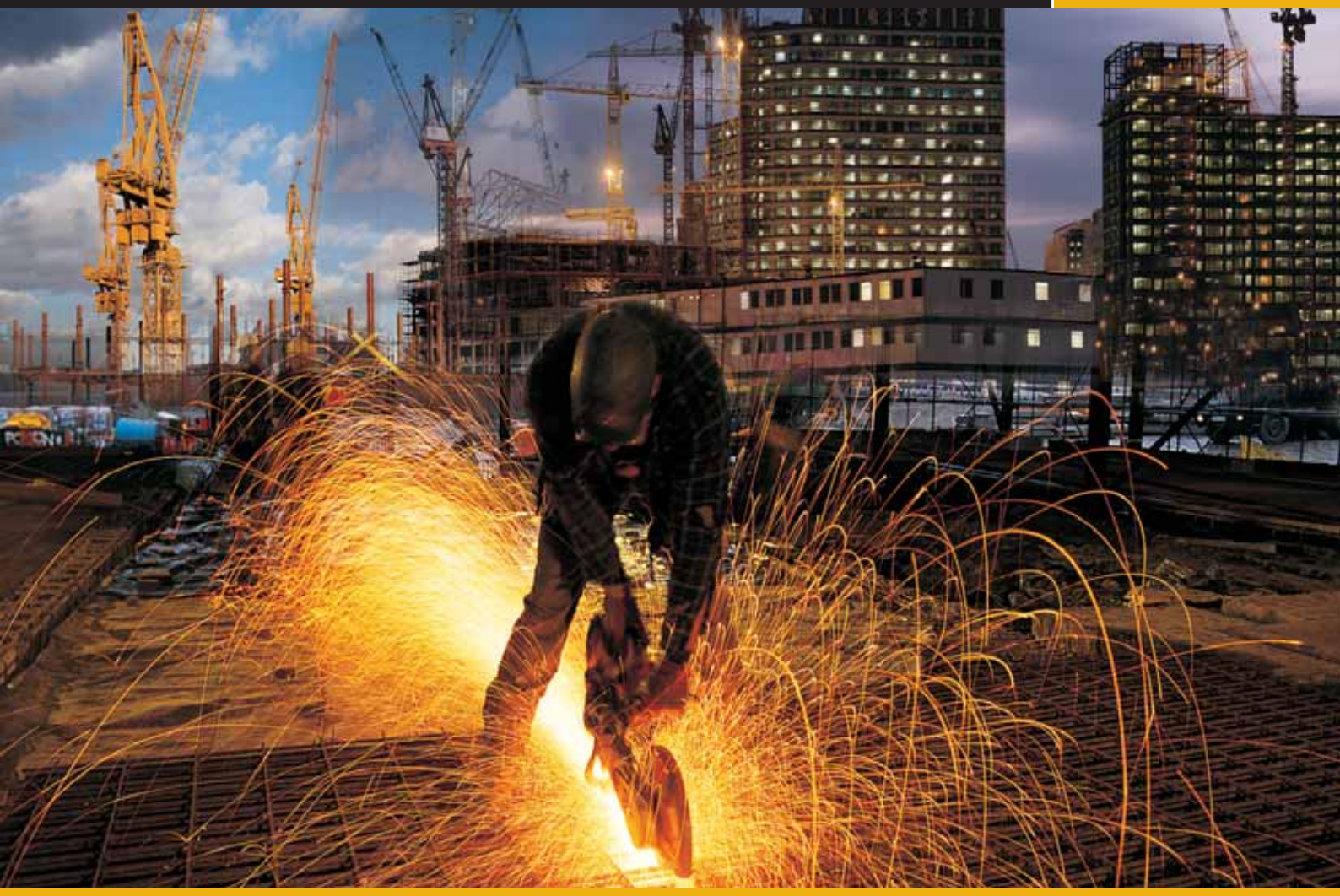
Office of Government Commerce

Risk and value management

Achieving Excellence in Construction Procurement Guide



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NAO endorsement

The NAO recognise that proactive client leadership and robust project management are prerequisites to the successful delivery of construction procurement.

They consider that procurement of construction should be on the basis of whole-life value for money and endorse the use of the good practice promoted by this suite of guides. They may investigate whether this good practice is applied in practice in any future examination.

Acknowledgements

This guide has been published after extensive consultation within government and valuable contributions from leading individuals and organisations across the construction industry.

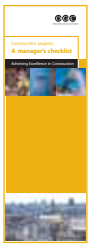
OGC would like to thank all who have contributed.

The Achieving Excellence
Procurement Guides

The *Achieving Excellence* suite of procurement guides replaces the *Construction Procurement Guidance Notes* series.

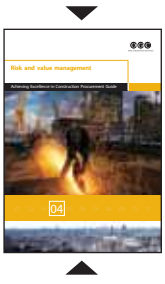
The new series reflects developments in construction procurement over recent years and builds on government clients' experience of implementing the *Achieving Excellence in Construction* initiative.

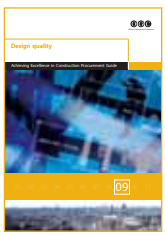
High level guides



Core guides

Supporting guides





04 Risk and value management

Introduction

This guide explains how risk and value are managed. These processes are fundamental to the successful delivery of projects and should be used throughout the life of the project. The guide summarises the key principles of risk and value management in the context of construction projects and describes the practical steps that need to be taken over the project lifecycle.

Achieving Excellence promotes the use of risk management and value management as essential tools for the successful delivery of construction projects. Value management helps the client to identify the best way of meeting business need. Risk management is used to manage the risks associated with the solution that offers best whole-life value to the business. Risk management should not be seen as a barrier to innovation; the most successful projects have well understood and effectively managed risks.

Principles

Overview

Risk and value management are interrelated tasks that should be carried out in parallel. For convenience, risk management is described first in this briefing, as poor risk management is known to be a major cause of project failure.

In practice, value management exercises are carried out first, to determine exactly what constitutes value to the business from delivery of the project. A preferred option (or options) is identified, together with the risks that are likely to occur if that option was implemented. The integrated project team repeats the parallel exercises of defining value and associated risks until they arrive at the optimum balance of value and risk.

The 1999 NAO report *Modernising Construction* highlighted inadequate use and understanding of value management and risk management as major barriers to improvement in construction performance. Weak risk management features regularly in Gateway review recommendations and is one of the most common areas of concern. Strategic management issues are often overlooked; the focus is usually on technical issues; with a tendency to overlook the need for ongoing risk management throughout the project lifecycle.

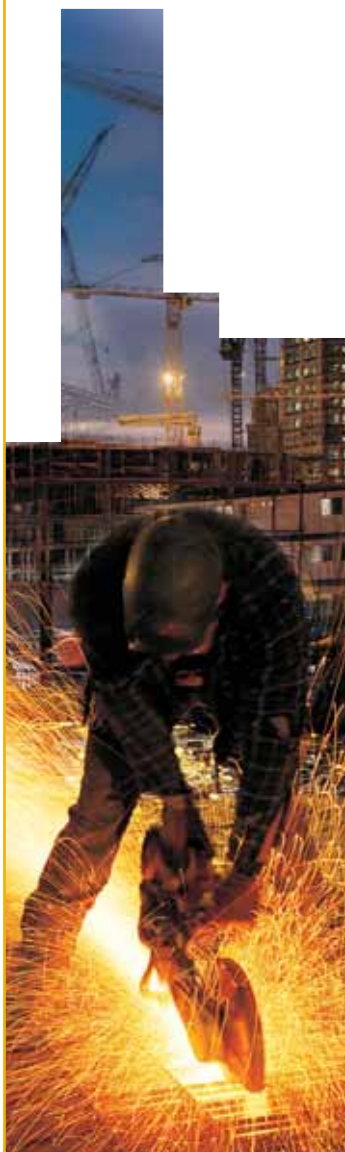
Risk and risk management

Risk is defined by HM Treasury as uncertainty of outcome, whether positive opportunity or negative impact. Some amount of risk-taking is inevitable, whatever the project. There has to be a deliberate acceptance of some degree of risk because the value to the business makes it worthwhile. **Risk management** includes all activities required to identify and control the risks relating to the preferred project option.

Successful risk management requires senior management commitment, ownership and understanding of the process, and an active risk management regime reviewed regularly in a constructive 'no-blame' culture. Attitudes to risk have a significant effect on the success of the project. An objective of 'not failing' will have a very low tolerance of risks of any kind. Conversely, an objective of 'succeeding' will encourage participants to be more innovative, to take more risk where appropriate and to make more effort to monitor and manage the recognised risks.

Risk management in construction projects involves:

- identifying and assessing the risks in terms of impact and probability
- establishing and maintaining a joint risk register, agreed by the integrated project team



- establishing procedures for actively managing and monitoring risks throughout the project and during occupation on completion
- ensuring that members of the team have the opportunity to engage in a dialogue that will promote agreement of an appropriate allocation of risk
- updating risk information throughout the life of the project
- ensuring control of risks by planning how risks are to be managed through the life of the project to contain them within acceptable limits
- allocating responsibility for managing each risk with the party best able to do so.

Management of risk is an ongoing process throughout the life of the project, as risks will be constantly changing. Risk management plans should be in place to deal quickly and effectively with risks if they arise. It is important to work as an integrated project team from the earliest possible stages on an open book basis to identify risks throughout the team's supply chains.

Key messages about managing risk

A common risk management process should be understood and adopted at all levels within the integrated project team, and the risk register regularly reviewed and updated throughout the project lifecycle. Risks inherent in the maintenance and demolition of a facility should be considered during design development and the decisions about risks kept on the register for future reference. The buildability and maintainability of the facility are central to its long-term value; there must be ownership and management of these risks. If the integrated project team does not include the facilities manager, the FM risks should be considered and owned early on – usually by the client. The project lifecycle runs until the facility is demolished or disposed of. Whoever acquires it in a disposal will need to know the risks on transfer.

There must be adequate time and effort early on to identify and analyse the risks, and to develop a risk management plan governing how they are to be managed and funded (the calculation of the risk allowance). Risks should be allocated to individual risk owners within the integrated project team, who should fully understand the risks for which they are responsible. Clients should not make any financial commitment to a project or a major change, unless the integrated project team has identified and assessed the risks, allocated them and ensured that management action is in place. The risks should be managed actively throughout the life of the project in accordance with the risk management plan; the plan should deal with all risks, whether retained by the client or transferred to others in the integrated project team. The business case should include a time element and the risks of that changing should be kept constantly under review.

Risk management arrangements should include risk allocation that:

- is clear and unambiguous
- achieves best value for money
- represents a fair balance between risk and control
- does not create conflicts of interest in those required to give independent advice to the client.

Client ownership of risks and responsibility for their management involves:

- the investment decision maker, who should be aware of the risks to the department
- the senior responsible owner, who should ensure that the risks are adequately considered in the project preparation and management
- the project sponsor, who should manage, monitor and report on the risks.

Risk management and the procurement route are interrelated. Risk allocation should be considered as part of the procurement route, as different routes will entail differing degrees of risk transfer. For advice on procurement routes see *AE6:Procurement and contract strategies*.

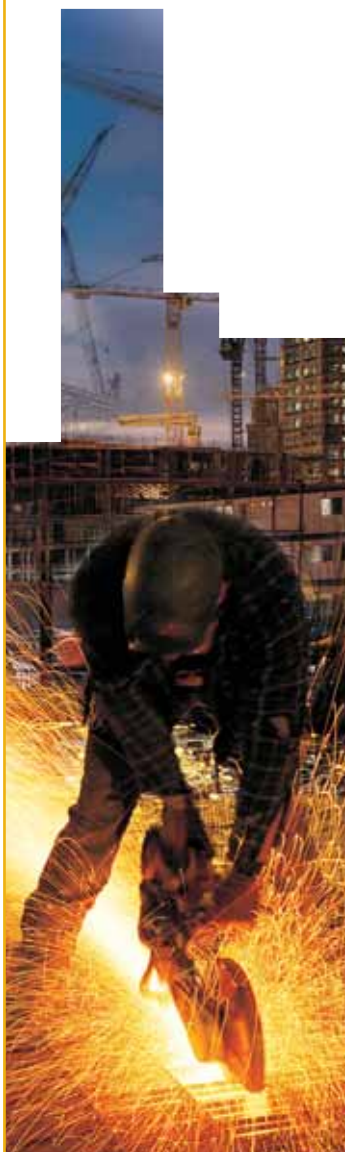
Value and value management

Value, in its broadest sense, is the benefit to the client – that is, the project is worth doing and can be quantified in business terms (though not necessarily in financial terms); for example, creating a better working environment or improving the experience of patients during treatment. In this guide, value means ensuring that the right choices are made about obtaining the optimum balance of benefit in relation to cost and risk. Value management provides a structured approach to the assessment and development of a project to increase the likelihood of achieving these requirements at optimum whole life value for money.

Value engineering is a continuous process in which all the components and processes involved in construction are critically appraised to determine whether better value alternatives or solutions are available. It is helpful for reducing wasteful processes and inefficiency in specific aspects of the design, construction and maintenance.

Why value management is important

It enables stakeholders to define and achieve their needs through facilitated workshops that encourage participation, teamworking and end-user buy-in. The focus of value management is on function and value for money, not reducing cost.



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The benefits that can be achieved through this approach include:

- a better understanding of the business needs, including the flexibility required to meet future needs
- simple, clear definition of specific stakeholder needs
- consideration of all options, alternatives and innovative ideas
- achievement of optimum value for money while satisfying the range of user requirements
- prevention of unnecessary expenditure through reducing waste and inefficiency
- improved teamworking with joint ownership of solutions.

Key messages about value management

Value management is about enhancing value and not about cutting cost, although this may be a by-product. The principles and techniques of value management aim to achieve the required quality at optimum whole-life cost during the process of developing a project. The principles centre on the identification of the requirements that will add demonstrable value in meeting the business need. Workshops led by value management facilitators are often used to identify value to the business. These workshops should involve stakeholders (or their representatives) and members of the integrated project team.

Value management aims to maximise project value within time, cost and quality constraints. However, it should be recognised that improving whole-life project value sometimes requires extra initial capital expenditure. The key differences between value management and cost reduction are that the former is:

- positive, focused on value rather than cost, seeking to achieve an optimum balance between quality, whole-life cost and time
- structured, auditable and accountable
- multidisciplinary, seeking to maximise the creative potential of all project participants (including the client) working together as an integrated project team.

Value engineering is a part of value management which considers specific aspects of the design, construction, operation and management. All projects are likely to include some unnecessary costs. However, cutting cost without proper analysis is likely to lessen value; only unnecessary cost should be removed where wasteful processes and/or practices contribute to cost. There must be no loss of functionality or quality, otherwise value is diminished. Investment in developing the brief is often cut; however, this is likely to lead to delay and cost overruns further on in the project due to changes and potential misunderstandings.

Whole-life costing is a vital element of value management; it covers all the costs relating to a facility from project inception through to disposal (see *AE7:Whole-life costing and cost management*). It is essential that the value management approach is based on the whole-life cost of ownership rather than acquisition alone.

Issues of health and safety, sustainability, design quality, buildability, operation and maintenance and disposal should all be considered during value management reviews and evaluation of options.

Project sponsors should establish a workable value management framework for the continuous review of project development against the client's needs and objectives.

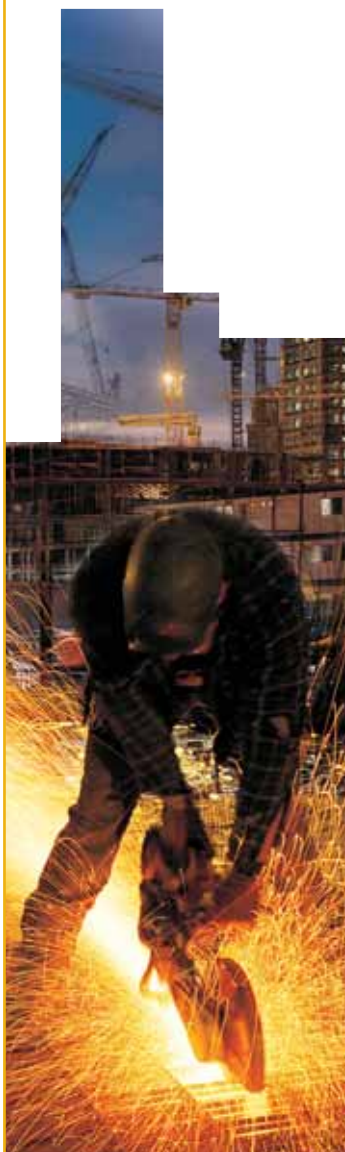
Case Study

Benefits of value engineering: Dudley Southern Bypass

Considerable effort went into conducting a value engineering exercise and planning the Dudley Southern Bypass road. As a result no works were carried out until the team was satisfied that it knew the site conditions, the likely risks to the project and had adequate plans in place. The project was completed five months ahead of schedule and within the target cost and the agreed budget. These results were achieved despite a major enhancement to the scheme, with the decision taken after the start of the project to construct a new Metro line parallel to a section of the road. The team altered its plans to take account of this in constructing the road. This work is estimated to have saved over £3 million on the cost of the Metro line.

Value engineering achieved savings. For instance, the original specification required the removal of large amounts of waste, to be replaced with quarry material. Much of the waste material was contaminated, but by working together and involving the Environment Agency in developing solutions, they were able to reuse most of the waste material within the project and prevented heavy traffic movements around Dudley.

[Source: NAO]



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Practice

When to manage risk and value

Risk and value management are continuous processes throughout the procurement lifecycle. These activities inform key decision points as shown below. Figure 1 shows the main points in the procurement process where risk and value management activities take place and summarises these activities.

The Gateway process

The Gateway process helps to reduce overall project risk by examining the project at critical stages in its lifecycle to provide assurance that it can progress successfully to the next stage. The SRO should arrange for a 'Risk Potential Assessment' (RPA downloadable from http://www.ogc.gov.uk/ogc_gateway_review_for_programmes_projects_planning_and_initiating_a_review.asp) to assess Gateway risk levels relating to their project's scale, complexity and/or innovation. The RPA will help the SRO to determine whether an external or internal Gateway review is needed.

Early in the process, before Gate 1, there will be decisions about the balance of cost and risk in relation to the value that would be delivered to the client in terms of business benefit. In later stages the focus is on managing risk and opportunities for added value, having made decisions about the optimum way forward.

1 Risk management and value management – review points

Before Gate 0	**Value management** to identify stakeholder needs, objectives and priorities **Risk analysis** (high level) of potential project options
Gate 0	**Strategic assessment**
Before Gate 1	**High level risk assessment. Value management** study to evaluate options that could meet user needs
Gate 1	**Business justification**
Before Gate 2	**Value management** to develop output-based specification, to refine and evaluate options that satisfy project brief and objectives **Risk management** to identify risks for each procurement option, cost of managing them (through avoidance, design/reduction, acceptance, share or transfer). Revise risk allowance
Gate 2	**Procurement strategy**
Before Gate 3	**Value management** to apply selection and award criteria **Risk management** – update risk register and revise base estimate and risk allowance

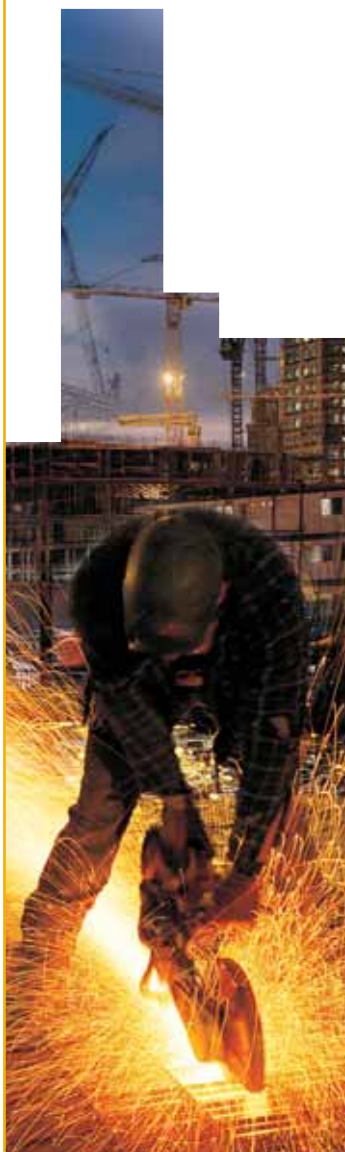
Gate 3	Investment decision
Before Decision point 1: Outline design	**Value engineering** study to optimise whole-life design quality and cost. Integrated project team to assess buildability of options **Risk management** – identify residual risks and continue to manage risks and risk allowance. Agree and implement collective risk management approach
Decision point 1	Outline design
Before Decision Point 2: Detailed design	**Value engineering** study to optimise whole-life design quality and cost. Integrated project team to assess buildability of design **Risk management** – identify residual risks and continue to manage risks and risk allowance. Continue to implement joint risk management approach
Decision point 2	Detailed design
Before Gate 4	Finalise design and start construction **Risk management** ongoing during construction Value engineering for detail of finishes etc
Gate 4	**Readiness for service (construction complete)**
Before Gate 5	**Risk management** ongoing (service contract management phase for PFI, Prime Contract or Design & Build/manage and/or operate)
	Value management review and feedback of lessons learned
Gate 5	Benefits evaluation

Risk management activities

The aim of risk management is to ensure that risks are identified at project inception, their potential impacts allowed for, and where possible the risks or their impacts minimised.

Risk management involves several stages:

- risk identification – to determine what the risks are
- assessment of risks to determine the probability of occurrence and potential impact or severity. (These first two processes are sometimes referred to collectively as risk analysis)
- responding to risks to contain them within acceptable limits (taking countermeasures)
- monitoring, updating and controlling risks
- feedback on how well risks were managed and lessons learned.



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There should be a **risk owner** for each risk, who is responsible for taking forward any management action to minimise the probability and impact of the risk.

The **risk register** is the document used to record the above information. It should be maintained collectively by the integrated project team and regularly updated throughout the project lifecycle, as risks will be constantly changing. Risk management plans may be recorded on the risk register or, if required, as separate risk management action plans with links to the risk register.

Risk Identification

Successful risk management depends on accurate risk identification. When identifying potential risks, it is important to distinguish between the origin of a risk and its impact. A common way of identifying risk is via a workshop approach, backed up by a checklist of common risks. On larger or more complex projects, a risk manager may be appointed with specific responsibility for coordinating risk management.

Risk assessment

The purpose of risk assessment is to understand and quantify the likelihood of occurrence and the potential impacts on the project outturn. Various analytical techniques are available, but the key features are:

- **qualitative assessment** – to describe and understand each risk and gain an early indication of the more significant risks. A descriptive written statement of relevant information about a risk should consider:
  - the stages of the project when it could occur
  - the elements of the project that could be affected
  - the factors that could cause it to occur
  - any relationship or interdependency on other risks
  - the likelihood of it occurring
  - how it could affect the project.

An assessment is made of the probability of each risk occurring and its potential impact in terms of cost, time and performance. Each risk is given a numerical probability, which could be measured in a number of ways such as on the following scale:

0 = impossible for risk to occur

0.5 = even chance of risk occurring

1 = risk will occur

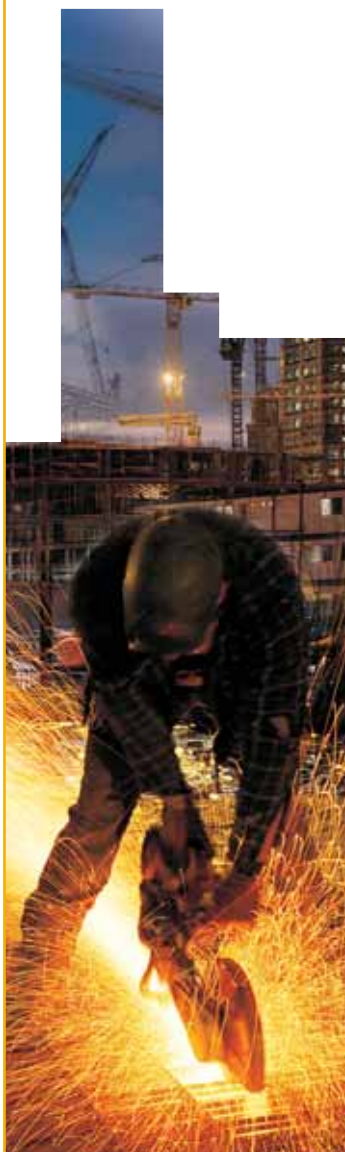
- **quantitive assessment** – to quantify the impact in the event of a risk arising in terms of:
  - cost: additional cost, above the base estimate for the project outturn (see risk allowance section later in this guide)
  - time: additional time, beyond the base estimate of the completion date for the project
  - performance: the extent to which the project would fail to meet the user requirements for standards and performance
  - any health and safety, sustainability or design quality implications
  - political or reputational risk
  - other risks occurring because of this risk (that is, knock-on risk effect).

Details of the risks should be captured in the risk register. However, the detailed nature of the risk register means that it can be difficult to capture a meaningful summary of the current exposure to risk. The status of key risks should be reported regularly to the SRO and project board; when a previously identified key risk materialises, the SRO immediately understands the impact and can make an informed decision on the way forward. A suggested approach is to assess each risk against a matrix of its probability (high/medium/low probability) and impact (high/medium/low impact).

Risks that have a high score on both probability and impact, or a high score on one and medium on the other, are assigned a Red status (high risk requiring careful attention); those that are low probability and low impact, or low on one and medium on the other, are given Green status (low risk and not a significant concern) and those in between are given Amber status (risk needs watching but not a priority concern). Regular recording of the progress of risks is essential, because their status can change rapidly. A summary of the Red risks could be reported to senior level via project board meetings for example, so as to concentrate on the areas of highest risk. Lower level risks would then be dealt with at project team meetings.

2 Risk matrix of probability and impact

Risk		Probability		
		Low	Medium	High
Impact	Low	Green	Green	Amber
Impact	Medium	Green	Amber	Red
Impact	High	Amber	Red	Red



Risk response

A risk response should only be decided after a risk's possible causes and effects have been considered and fully understood. It will take the form of one or more of the following management actions:

- **avoidance** – where risks have such serious consequences on the project outcome that make them totally unacceptable, measures might include a review of the project objectives and a re-appraisal of the project, perhaps leading to the replacement of the project, or its cancellation
- **reduction** (including elimination) – typical action to reduce risk can take the form of:
  - re-design: including that arising out of value engineering studies
  - more detailed design or further site investigation: to improve the information on which estimates and programmes are based
  - different methods of construction: to avoid inherently risky construction techniques
  - changing the procurement route: to allocate risk between the project participants in a different way.

Risk reduction measures lead to a more certain project outturn. They usually result in a direct increase in the base estimate and a corresponding reduction in risk allowance (see Annex A)

- **transfer** – to another party in the integrated project team, who would be responsible for the consequences should the risk occur. Risks should not be transferred until they are clearly understood. The object of transferring risk is to pass the responsibility to another party better able to manage it.

A premium may be paid when a risk is transferred to another party; if so, this results in a direct increase in the base estimate and a reduction in risk allowance. Cost may not be the only criterion; it may be more efficient or effective to transfer risk.

Factors that should be considered in risk transfer include:

- who is best able to control the events that may lead to the risk occurring?
- who can control the risk if it occurs?
- is it preferable for the client to be involved in the control of the risk?
- who should be responsible for a risk if it cannot be controlled?
- if the risk is transferred to a member of the integrated project team:
  - is the total cost to the client likely to be reduced?
  - will the integrated project team member be able to bear the full consequences if the risk occurs?
  - could it lead to different risks being transferred back to the client?
  - would the transfer be legally secure (will the transfer be accepted under common law)?
- **retention/acceptance** – risks that are not transferred or avoided are retained by the client although they may have been reduced or shared. These risks must continue to be managed by the client to minimise their likelihood and potential impact. A 'do-nothing' approach is unacceptable.

Even when risks have been transferred, the client still needs to track management of the risk to ensure the aims of the project continue to be delivered satisfactorily.

Key considerations in risk allocation:

- understand the risk
- determine who is best placed to manage it
- determine what it will cost and whether it should be transferred.

Care should be taken when considering the management actions available, to ensure that the potential impact of each risk is not outweighed by the direct costs to the client from:

- the cost of reducing the risk
- the cost of transferring the risk (or the cost of insuring against the risk).

Risk monitoring, updating and control

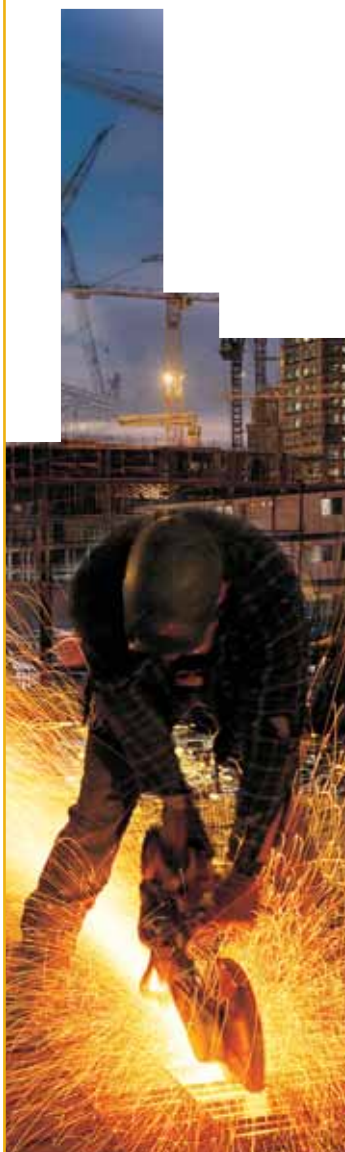
There should be ongoing risk management reviews throughout the project, with actions recorded in the risk register. In addition there are some key stages of the project lifecycle where risk management reviews should be undertaken – these are shown above in Figure 1 together with the suggested value management/engineering review points.

Risk feedback

To complete the cycle, feedback should be encouraged from all those involved in the delivery of the project on how well risks were managed, and how this could be improved. This information can be used to improve risk management performance in future projects; it should normally form part of the post-project review.

The project execution plan should contain the risk register and risk management plan. This should:

- define acceptable levels of risk in the areas of quality, cost and time
- detail the risk reduction measures to be taken to contain risks within those levels
- outline cost-effective fallback plans for implementing if and when specific risks materialise
- identify the resources to be deployed for managing risks
- explain the roles and responsibilities of all parties involved in risk management
- describe how risks are to be monitored
- include incentivisation of all to promote pain/gain share in risk/value management.



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Risk allowance

The budget should comprise two elements of cost – base estimate and risk allowance. A risk allowance should be included in the budget for the project to cover the potential financial impact of the client's retained risks as estimated in the risk analysis. It should not be based on an arbitrary percentage of the total project budget (a contingency), but be costed out as accurately as possible. The risk allowance should be used exclusively to mitigate the impact of the identified risks. Before a project is submitted for approval there should be:

- adequate resources to manage the client's retained risks
- appropriate financial provision, in the form of a properly calculated risk allowance to cover the risks, based on the average risk estimate – an amount midway between the most optimistic assessment (minimum) and most pessimistic (maximum). The maximum risk estimate, for the purpose of overall project approval, should also be provided to the investment decision maker.

Risks should be reviewed regularly throughout the project, and the risk allowance reduced if fewer risks materialise than expected, if their impact is minimised by good risk management or if funding is transferred to the base estimate to undertake mitigating action (via investigations etc). If unexpected risks materialise, additional separate provision should be sought from the investment decision maker via a change control procedure (as detailed in *AE3:Project procurement lifecycle*); similarly, where there is inadequate provision for a risk in the risk allowance, additional provision may need to be sought. (See Annex A for further information about risk allowances.)

Roles and responsibilities relating to risk

Project sponsors should have responsibility for overall risk management. They should produce the risk management plan with the support of the project managers, independent client advisers and the remainder of the integrated project team, and monitor its implementation. They should review the risk management plan throughout the life of the project and in particular at each major decision point in the project; the review should include risks transferred to other parties in the integrated project team. A requirement for risk management arrangements should be incorporated in tender documentation.

SROs should ensure that risk is being addressed properly. They should:

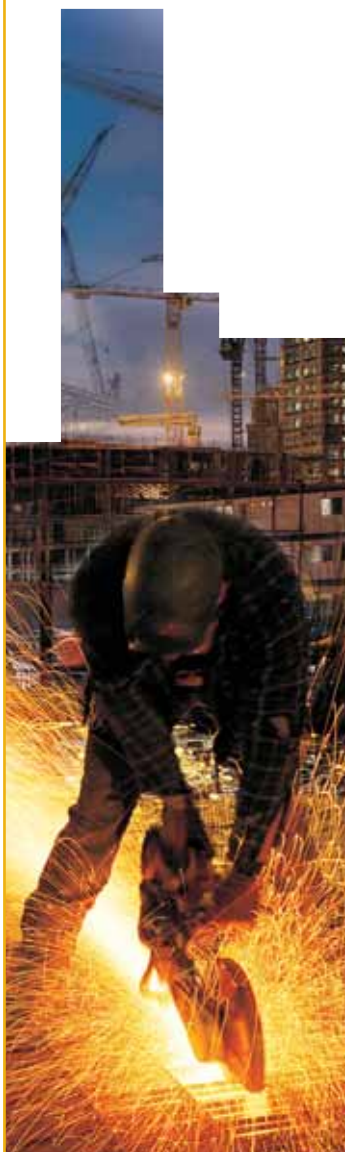
- approve a project only where risk allocation and management have been clearly dealt with and where the procurement route fits the risk that the client intends to retain
- keep risk monitoring and management on the agenda of progress review meetings during the life of the project
- ensure that the risk analysis is revisited if project objectives or key assumptions change
- inform the investment decision maker if the client's risk exposure changes.

Before any financial commitment is made, the investment decision maker should also understand and accept the degree of risk to which the project exposes the client organisation and be satisfied that appropriate management plans and risk allowance are in place, as set out in the business case. Reporting to the investment decision maker should thereafter be on a highlight basis to show that the level of exposure remains acceptable (using summary reporting on Red, Amber and Green status of risk, for example, as described above). Reporting should also show that, before approval, the budget implications of any proposed major changes to the project have been identified and adequate provision made or sought.

Value management activities

Value management and value engineering should be carried out at regular stages in the project (see Figure 1). They can be used for any or all of the following:

- establishing what value means to the client in terms of business benefits and priorities
- identifying and agreeing business needs
- identifying and evaluating options (including Private Finance Initiative options) for meeting business needs (a construction project may be one such option)
- selecting and agreeing the best option to meet business needs (that is, confirming whether or not a project is required)
- defining clearly and agreeing the project objectives (through stakeholder buy-in)
- selecting and agreeing the best project option, drawing on the expertise of independent client advisers
- setting and weighting the selection and award criteria for the appointment of the integrated supply team
- evaluating the integrated supply teams' bids against the selection and award evaluation criteria
- refining the design to maximise value and eliminate waste and those aspects not directly related to meeting the project objectives.



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A value management approach helps with decision making at all levels. The concept of value relies on the relationship between satisfying many differing needs and the resources used in doing so. The fewer resources used and the greater the satisfaction of needs, the greater the value. Stakeholders (including internal and external customers) may all hold differing views of what represents value. The aim of value management is to reconcile these differences and enable an organisation to achieve the greatest progress towards its stated goals with the use of minimum resources.

The process

The project sponsor should ensure that a value management plan is drawn up and incorporated in the project execution plan.

It should establish reviews at key stages:

- project inception (before Gate 0): this review identifies the needs of the stakeholders and informs the decision on whether or not a project is required. Value management is the tool for strategic options appraisal and making a choice: do something/do nothing/maintain status quo. It should result in:
  - a description of the stakeholder needs and priorities
  - confirmation that a project is needed
- options appraisal (before Gate 1): this review identifies key priorities and constraints; it also identifies and examines possible solutions. It makes explicit the client's values and priorities, the project needs and objectives, and key project constraints and risks. It aims to eradicate the need for late changes. It should result in:
  - a description of the project: what has to be done to meet the objective and priorities
  - a statement of the primary objective
  - expected lifespan of the facility and projected payback period
  - ranking of project priorities
  - a preferred option for further development
  - a decision to proceed

This balanced statement of need, objectives and priorities, agreed by all stakeholders, helps the project sponsor to produce the project brief

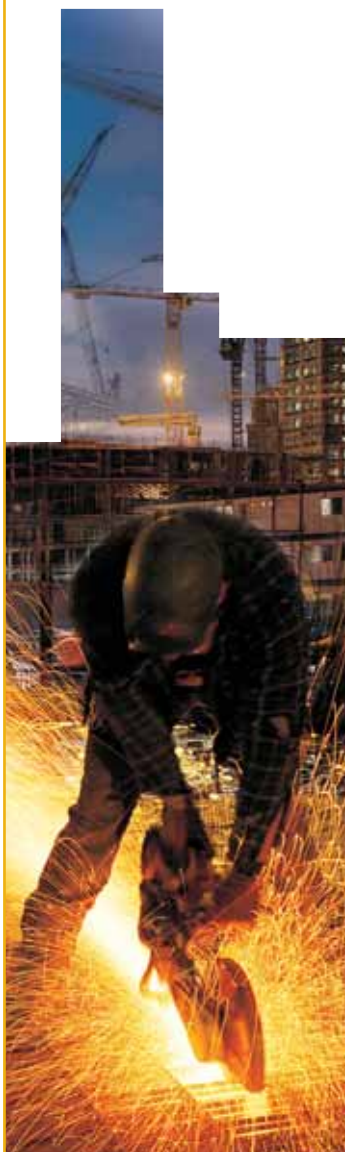
- procurement strategy (before Gate 2): to evaluate options and define the procurement strategy. This review should help ensure that the option finally selected will meet the objectives set for it. It is concerned with the means of achieving project objectives (procurement strategy and contract strategy) as well as the objectives themselves. It depends on the ability to structure project objectives into a hierarchy that is acceptable to key stakeholders. It should result in:
  - a clear statement of the processes to be provided and/or accommodated
  - a preferred procurement route, including contract strategy
  - the basis of a case for the continuation of the project (Outline Business Case)
  - value management in making choices between design options

- output specification (also before Gate 2): this review considers the output specification against the background of project needs, priorities and the objectives hierarchy developed at earlier reviews. It should result in:
  - a thorough evaluation of the output specification
  - clear recommendations for a response from an existing integrated supply team or new external procurement
  - the basis of a submission for final approval to invite expressions of interest for tenders for the design and construction of the project where a new project is required
- outline design: to ensure that the required functionality and quality are confirmed before proceeding to detailed design
- detailed design (before approval for construction to begin): value engineering reviews of the design. These focus on the integrated project team's expertise in improving buildability so that works are implemented faster, more efficiently and safely and at lower whole-life cost
- construction (after Decision Point 2 and before Gate 4): to resolve any issues on site as required
- in-use (before Gate 5): to inform the ongoing management and operation of the facility.

Each of these reviews provides an additional opportunity to undertake concurrent risk assessments on the options under consideration.

The precise format and timing of reviews will vary according to circumstances – too many and the design and construction process may be disrupted and delayed; too few and the opportunities for improving definition and the effectiveness of design proposals may be lost.

Lessons should be captured and learned about particular approaches that improve speed of construction, reduce whole-life costs and/or improve value, including health and safety. For large or complex projects there may be a number of value engineering reviews, each focused on individual elements of the design. The usual way that value management is implemented is through structured workshops that are usually led by an independent facilitator.



Value engineering usually follows a job plan, which involves a series of steps that need to be followed in order to determine the most promising options or proposals:

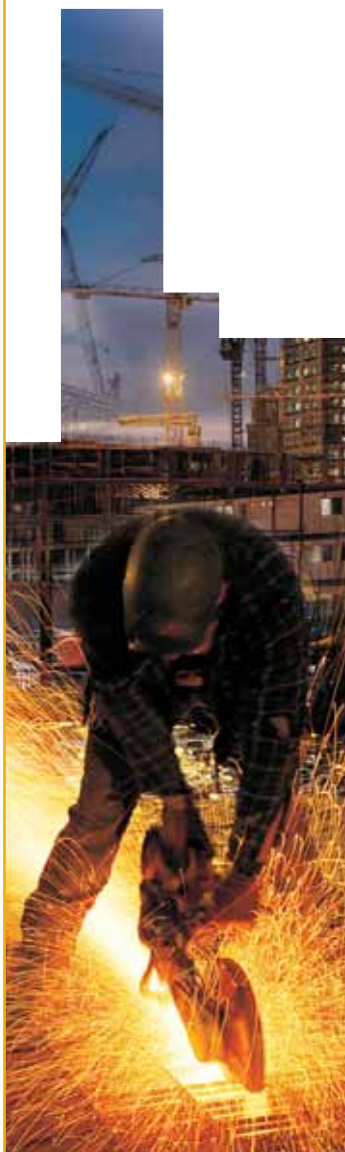
- **orientation/identification**: this involves the identification of the business problem, the customer needs and priorities
- **information**: this step involves the collection of information/data regarding values, costs, risks, programme and other project constraints
- **speculation generation**: this involves the generation of ideas to meet the needs and priorities previously identified. This is usually best undertaken via a workshop with all the stakeholders and project team members. The principle is that ideas are generated in a 'criticism-free' atmosphere, which promotes free-thinking and creative ideas
- **idea evaluation**: this step identifies the most promising options from the last stage
- **idea development**: the most promising options are developed and appraised. This may be undertaken by sub-groups of the workshop
- **recommendation/decision/implementation**: the results from the last stage are presented to the workshop group and a decision is made on which proposal to pursue. An action plan is prepared to take the proposal forward
- **feedback**: the success of the options implemented is assessed to provide lessons learned and inform future projects.

Annex A: Risk allowances

Estimates are made of the maximum and minimum risks likely to occur; the average risk between the two extremes is used as the basis of the risk allowance. In the early project stages, the risk allowance for each element may be greater than the base estimate. As the project develops and becomes more clearly defined, funding is spent on investigations, feasibility studies, etc. The risk allowance is steadily reduced as the risks or their consequences are minimised by good risk management and required funds are transferred to the base estimate to cover the costs of risks. At the same time the base estimate of the project will steadily increase as risks are realised – shown in Figure 3. Risk allowances should be reviewed regularly through the life of the project, and appropriate adjustments made to the base estimate and risk allowance depending on the risks materialising or not.

Variation of price due to inflation and/or currency fluctuations is a risk and should be treated in the same way as any other risk. The risk should be managed and either retained, shared, transferred or minimised according to the specific project.

3 Change in base estimate, risk allowance and expenditure with time

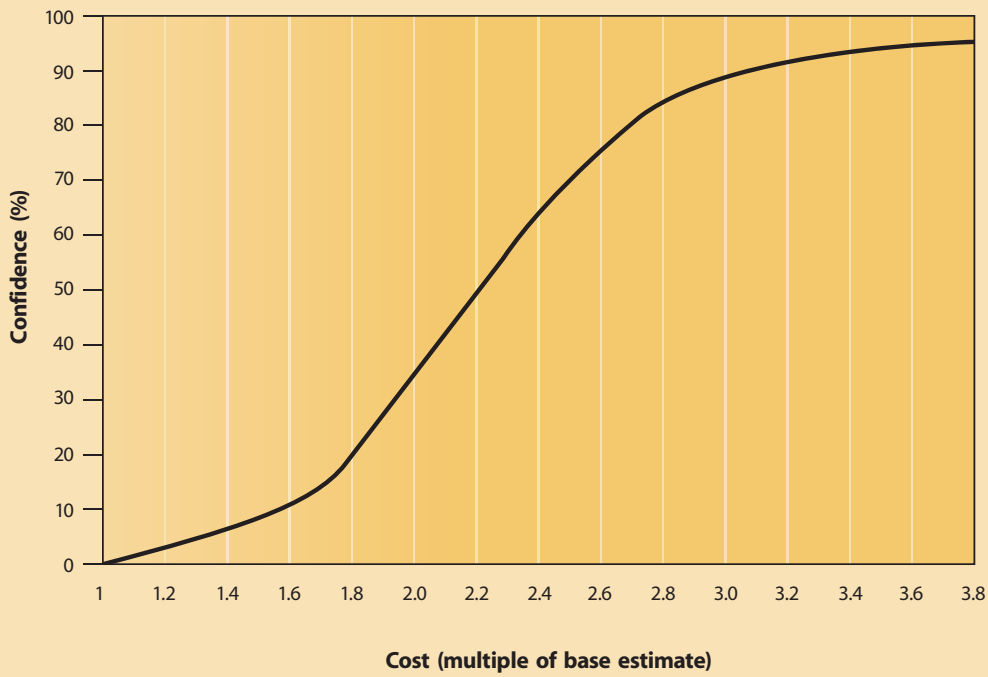


04 Risk and value management

Risks are assessed on the basis of the probability (likelihood) that they will occur and their impact if they do occur. Given the uncertainties as to whether risks will occur or not, it is impossible to predict the outturn cost with absolute certainty. The best that may be achieved is a graph of the type shown in Figure 3, which shows the confidence limits of a cost not being exceeded. As an example, reading across the graph at the 50% confidence limit, it identifies the cost which has a 50% probability of being exceeded.

The slope of the line in the graph should become steeper as the project progresses during the planning, development and construction stages. The increase in the slope of the line represents greater predictability of the outturn cost.

4 Confidence limits of project cost being achieved



There are a number of commercially available computer software packages that will produce a plot of the type given in Figure 4 from the information available in a properly maintained risk register. For details of how to compile a risk register go to: *www.ogc.gov.uk/documentation_and_templates_risk_log_risk_register.asp*

Further information

Risk management

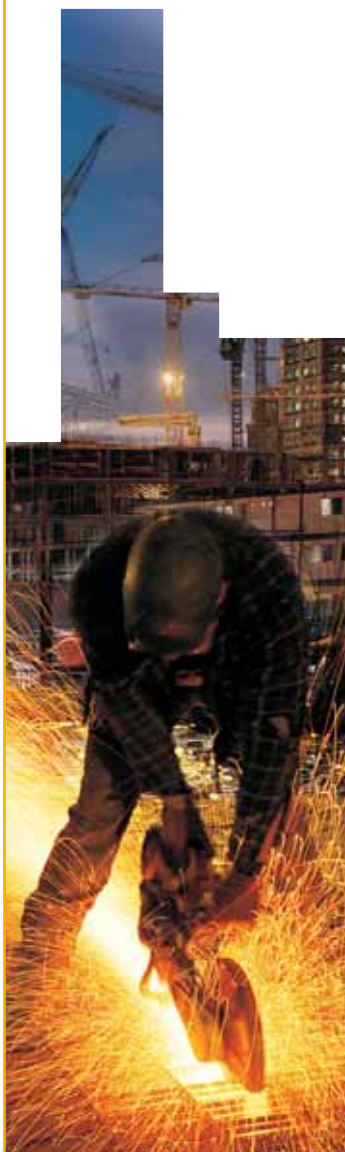
See the Risk Allocation Model at *www.ogc.gov.uk/introduction_to_procurement_risk_allocation_model.asp* and *Business Case Workbooks* at *www.ogc.gov.uk/introduction_to_procurement_business_case.asp*

Value management

The British Standards publications for value management are:

- BS EN 12973:2000
- BSI Guidelines for PD 6663:2000

For more information see the BSI website: *www.bsi-global.com*



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