

5.3.4.2 Centre of excellence

The concept of a centre of excellence is that of a central standards unit, which defines standards (such as processes, templates and tools), and provides skills, training and possibly independent assurance functions to a number of projects.

Example of a centre of excellence

An organization has established a centre of excellence that provides:

- A central filing system for all projects
- A configuration management system
- Expertise for estimating techniques
- Advice on the preparation of plans
- A historical database of how long specific activities take (metrics) and an analysis of productivity
- PRINCE2 expertise and advice
- Consolidated reports summarizing the status of all the projects in the portfolio.

A centre of excellence can be useful where:

- Resource shortages, either in numbers or skills, make it difficult to supply people to perform project administration for each current project
- There are a number of small projects of a diverse nature that individually require only limited support from Project Support
- There is a large programme, requiring coordination of individual projects
- A large project requires several resources to handle Project Support roles.

Refer to OGC's guidance *Portfolio, Programme and Project Offices* (TSO, 2008) for further information on the centre of excellence and its relationship to projects.

5.3.5 Working with stakeholders

5.3.5.1 Types of stakeholder

There are likely to be individuals or groups who are not part of the project management team, but who may need to interact with the project or who may be affected by the project's outcome. Such people may:

- Support or oppose the project
- Gain or lose as a result of project delivery
- See the project as a threat or enhancement to their position
- Become active supporters or blockers of the project and its progress.

It is important to analyse who these stakeholders are and to engage with them appropriately.

Example of stakeholder analysis

Stakeholder analysis identified the following stakeholders for a project to relocate a chemical factory:

- A number of unions
- An environmental pressure group
- An industry regulator
- The programme's quality assurance function
- A number of corporate management functions (e.g. internal audit, finance, legal)
- The external contractor
- Some members of the public affected by the project.

Note that some of these were external to the project management team but internal to the corporate or programme management organization.

5.3.5.2 Stakeholder engagement

Stakeholder engagement is the process of identifying and communicating effectively with those people or groups who have an interest or influence on the project's outcome. It is usually carried out at the programme level. All projects need to have some level of some stakeholder engagement, particularly if not part of a programme.

Parties external to the project management team can exert a powerful influence on a project. Effective communication with key stakeholders, both internal and external to the corporate organization, is essential to the project's success.

Example of stakeholder engagement

OGC's Managing Successful Programmes (MSPTM) identifies a six-step procedure for stakeholder engagement:

- **Identifying stakeholders (Who?)** Identifying the individual stakeholders involved in, or affected by, the project and perhaps grouping similar stakeholders together so that key messages can be targeted effectively
- **Creating and analysing stakeholder profiles (What?)** Gaining an understanding of the influences, interests and attitudes of the stakeholders towards the project and the importance and power of each stakeholder. For instance, is a particular group likely to be negative, irrespective of the message, and therefore require particular care? Stakeholders' influence and interests, whether rational or emotional, must all be taken into account. They have the potential to affect the success of the project. Perceptions may be mistaken, but they must be addressed. The stakeholder's perception of the benefits should be quantified where possible
- **Defining the stakeholder engagement strategy (How?)** Defining how the project can effectively engage with the stakeholders, including defining the responsibilities for communication and the key messages that need to be conveyed. For each interested party, agree the:
 - Information the party needs from the project
 - Method, format and frequency of communication
 - Sender and recipient of the communication
- **Planning the engagements (When?)** Defining the methods and timings of the communications. These are best planned after defining how the project will engage with the different stakeholders. When selecting the senders of information, it is important to select communicators who have the respect and trust of the audience. Their position in the corporate organization and expertise in the subject matter will

greatly influence their credibility. Many projects have a formal commencement meeting to introduce the project and its aims to the corporate organization. If this type of meeting is used, it is important that the members of the Project Board attend to show their support and commitment to the project

- **Engaging stakeholders (Do)** Carrying out the planned engagements and communications. The first two steps in stakeholder engagement – identifying and analysing – also engage stakeholders to some degree
- **Measuring effectiveness (Results)** Checking the effectiveness of the engagements. Project Assurance could be involved in checking all the key stakeholders, their information needs and that the most appropriate communication channels are covered.

5.3.5.3 The Communication Management Strategy

The Communication Management Strategy contains a description of the means and frequency of communication to parties both internal and external to the project. It facilitates engagement with stakeholders through the establishment of a controlled and bi-directional flow of information. Where the project is part of a programme, the Communication Management Strategy should also define what information the programme needs and how this is to be communicated.

If a formal stakeholder engagement procedure has been completed, such as that described earlier, this should also be documented as part of the Communication Management Strategy. Refer to Appendix A for more details of the suggested content for the Communication Management Strategy.

The Project Manager should be responsible for documenting the Communication Management Strategy during the Initiating a Project process. It is also important to review and possibly update the Communication Management Strategy at each stage boundary in order to ensure that it still includes all the key stakeholders. When planning the final stage of the project it is also important to review the Communication Management Strategy

to ensure it includes all the parties who need to be advised that the project is closing.

During a project, corporate or programme management retains control by receiving project information as defined in the Communication Management Strategy and taking decisions on project-level exceptions escalated by the Project Board.

If a project forms part of a programme, there will need to be consistency and communication between the project and programme levels of management. Refer to Chapter 19 for more detailed information on programme roles and how they may interact with project roles.

5.4 RESPONSIBILITIES

Table 5.1 outlines the responsibilities relevant to the Organization theme. Refer to Appendix C for further details of project management team roles and their associated responsibilities.

Table 5.1 Responsibilities relevant to the Organization theme

Role	Responsibilities
Corporate or programme management	Appoint the Executive and (possibly) the Project Manager. Provide information to the project as defined in the Communication Management Strategy.
Executive	Appoint the Project Manager (if not done by corporate or programme management). Confirm the appointments to the project management team and the structure of the project management team. Approve the Communication Management Strategy.
Senior User	Provide user resources. Define and verify user requirements and expectations.
Senior Supplier	Provide supplier resources.
Project Manager	Prepare the Communication Management Strategy. Review and update the Communication Management Strategy. Design, review and update the project management team structure. Prepare role descriptions.
Team Manager	Manage project team members. Advise on project team members and stakeholder engagement.
Project Assurance	Advise on selection of project team members. Advise on stakeholder engagement. Ensure that the Communication Management Strategy is appropriate and that planned communication activities actually take place.
Project Support	Provide administrative support for the project management team.

6 Quality

6.1 PURPOSE

The purpose of the Quality theme is to define and implement the means by which the project will create and verify products that are fit for purpose.

The Quality theme defines the PRINCE2 approach to ensuring that the project's products:

- Meet business expectations
- Enable the desired benefits to be achieved subsequently.

The 'product focus' principle is central to PRINCE2's approach to quality. It provides an explicit common understanding of what the project will create (the scope) and the criteria against which the project's products will be assessed (the quality). Without this understanding, the project would be exposed to major risks (such as acceptance disputes, rework, uncontrolled change, user dissatisfaction) that could weaken or invalidate the Business Case.

Only after establishing the quality criteria for the products and the quality management activities that have to be included in the project's plans can the full project costs and timescales be estimated. Underestimating or omitting quality management activities is likely to lead to slippages, overspends and/or poor quality results. The Quality theme addresses the quality methods and responsibilities not only for the specification, development and approval of the project's products, but also for the management of the project.

The Quality theme also covers the implementation of continuous improvement during the project – for example, looking for ways to introduce more efficiency or effectiveness into the management of the project and the project's products. Capturing and acting on lessons contributes to the PRINCE2 quality approach, as it is a means of achieving continuous improvement.

6.2 QUALITY DEFINED

Terms used in a quality context are sometimes interpreted differently or interchangeably by various people. This can lead to misunderstandings. For the purposes of PRINCE2, the terminology used

is derived from the ISO 9000 standards but is aimed specifically at project work.

6.2.1 Quality

Quality is generally defined as the totality of features and inherent or assigned characteristics of a product, person, process, service and/or system that bear on its ability to show that it meets expectations or satisfies stated needs, requirements or specification.

In PRINCE2, a product can also be a person, process, service and/or system, so the focus of quality is on a product's ability to meet its requirements.

6.2.2 Scope

The scope of a plan is the sum total of its products. It is defined by the product breakdown structure for the plan and its associated Product Descriptions.

6.2.3 Quality management and quality management systems

Quality management is defined as the coordinated activities to direct and control an organization with regard to quality. A quality management system is the complete set of quality standards, procedures and responsibilities for a site or organization.

In the project context, 'sites' and 'organizations' should be interpreted as the permanent or semi-permanent organization(s) sponsoring the project work, i.e. they are 'external' to the project's temporary organization. A programme, for instance, can be regarded as a semi-permanent organization that sponsors the project, and may have a documented quality management system.

It is frequently the case that more than one permanent organization will be involved in a project – for example, separate customer and supplier businesses – and it follows that each may have its own quality management system. Alternatively, if the project has a single key sponsoring organization, or is part of a programme, a single established quality management system is more likely to apply. These various circumstances must be addressed when determining the project's approach to quality.

6.2.4 Quality planning

To control anything, including quality, there must be a plan. Quality planning is about defining the products required of the project, with their respective quality criteria, quality methods (including effort required for quality control and product acceptance) and the quality responsibilities of those involved.

6.2.5 Quality control

Quality control focuses on the operational techniques and activities used by those involved in the project to:

- Fulfil the requirements for quality (for example, by quality inspections or testing)
- Identify ways of eliminating causes of unsatisfactory performance (for example, by introducing process improvements as a result of lessons learned).

6.2.6 Quality assurance

It is good practice to arrange for quality assurance independent of the project management team. Quality assurance provides a check that the project's direction and management are adequate for the nature of the project and that it complies with relevant corporate or programme management standards and policies. Quality assurance activities are outside the scope of

PRINCE2 as it is the responsibility of the corporate or programme organization.

Quality assurance is about independently checking that the organization and processes are in place for quality planning and control (i.e. not actually performing the quality planning or control, which will be undertaken by the project management team). It provides the project's stakeholders with confidence that the quality requirements can be fulfilled.

The term 'quality assurance' is used in two senses:

- As the function within an organization (or site or programme) that establishes and maintains the quality management system
- As the activity of reviewing a project's organization, processes and/or products to assess independently whether quality requirements will be met.

Note that, in both senses of the term, quality assurance involves contributions that are independent of the project management team, whereas quality planning and quality control are undertaken by the project. Nevertheless, it is a project management responsibility to ensure that adequate quality assurance is arranged.

Quality assurance should not be confused with Project Assurance. Project Assurance refers specifically to the Project Board's accountability

Table 6.1 The relationship between Project Assurance and quality assurance

	Project Assurance	Quality assurance
What they do	Provide assurance to the project's stakeholders that the project is being conducted appropriately and properly.	Provide assurance to the wider corporate or programme organization that the project is being conducted appropriately, properly and complies with relevant corporate or programme management standards and policies.
How they differ	Must be independent of the Project Manager, Project Support, Team Managers and project teams.	Performed by personnel who are independent of the project (i.e. not a member of the project management team).
How they relate	Responsibility of the Project Board, therefore undertaken from within the project.	Responsibility of the corporate or programme management organization, therefore external to the project.
	Quality assurance as a corporate or programme management function could be used by the Project Board as part of its Project Assurance regime (for example, having quality assurance perform a peer review).	Quality assurance would look for (or require) effective Project Assurance as one of the indicators that the project is being conducted properly.

for assuring that the project is conducted properly in all respects. This is, therefore, a responsibility within the project management team. Although Project Assurance is independent of the Project Manager, unlike quality assurance it is not independent of the project. However, Project Assurance and quality assurance do overlap, as illustrated in Table 6.1.

6.3 THE PRINCE2 APPROACH TO QUALITY

The specific treatment for quality in PRINCE2 is the focus on products from the outset, requiring systematic activities to:

- Identify all the project's products (i.e. to the level at which the project intends to exert control)
- Define them in Product Descriptions – including the quality criteria by which they will be assessed; the quality methods to be used in designing, developing and accepting them; and the quality responsibilities of those involved
- Implement and track the quality methods employed throughout the project.

The first two of these are covered by **quality planning** (section 6.3.1) and the last is covered by **quality control** (section 6.3.2) and **quality assurance** (section 6.2.6).

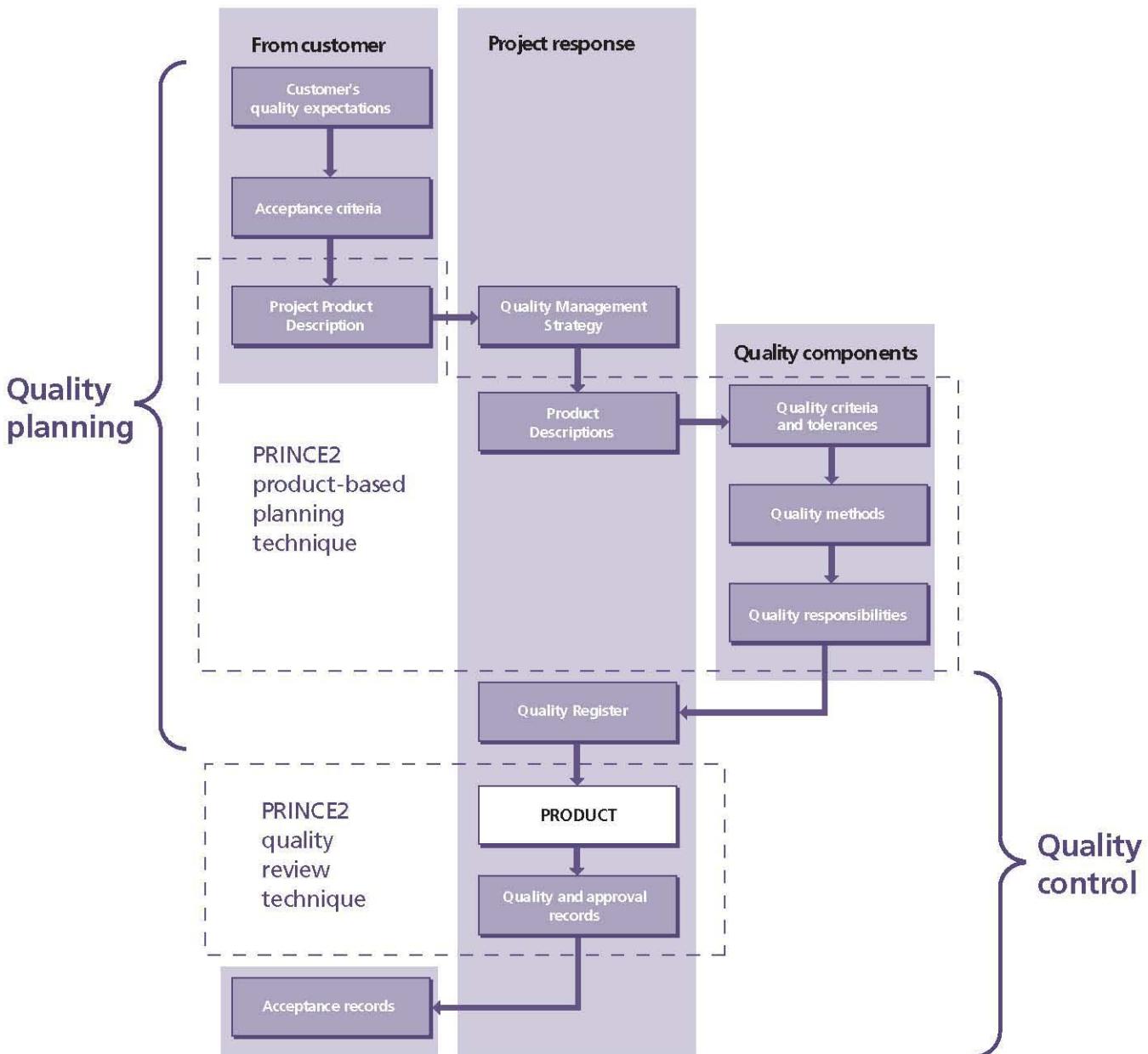


Figure 6.1 The quality audit trail

The PRINCE2 approach to quality can be summarized simply by the quality audit trail depicted in Figure 6.1. The terms used in the diagram are explained in the remainder of this section.

6.3.1 Quality planning

The purpose of quality planning is to provide a secure basis for:

- **Project Board agreement** on the overall quality expectations, the products required with their associated quality criteria (including corporate and other standards to be observed), the means by which quality will be achieved and assessed and, ultimately, the acceptance criteria by which the project's product will be judged
- **Communicating** these agreements unambiguously so that all the project stakeholders have a common understanding of what the project is setting out to achieve
- **Control**, i.e. establishing an effective baseline for the project's quality controls (including the quality tolerances) and a secure means of achieving products that are fit for purpose.

When these aspects of planning are neglected, the people involved in the project may have conflicting views on the scope of the solution, on what constitutes a successful result, on the approach to be adopted, on the extent of the work required, on who should be involved, and on what their roles should be.

Quality planning comprises:

- Understanding the customer's quality expectations (section 6.3.1.1)
- Defining the project's acceptance criteria (section 6.3.1.2)
- Documenting the customer's quality expectations and the project's acceptance criteria in the Project Product Description (section 6.3.1.3)
- Formulating a Quality Management Strategy (section 6.3.1.4)
- Writing clear Product Descriptions containing quality criteria, quality tolerances, quality method and quality responsibilities (section 6.3.1.5)
- Setting up the Quality Register (section 6.3.1.6).

6.3.1.1 The customer's quality expectations

The customer's quality expectations are a statement about the quality expected from the project product. They are defined and agreed early in the Starting up a Project process. The expectations are captured in discussions with the customer and then refined for inclusion in the Project Product Description.

To avoid misinterpretations and inaccurate assumptions about the project's quality requirements, the customer's quality expectations should cover:

- The key quality requirements for the project product
- Any standards and processes that will need to be applied to achieve the specified quality requirements, including the extent to which the customer's and/or supplier's quality management system should be used
- Any measurements that may be useful to assess whether the project product meets the quality requirements (for example, existing customer satisfaction measures).

The key quality requirements will drive the choice of solution and, in turn, influence the time, cost, scope, risk and benefit performance targets of the project.

Examples of quality expectation

The quality expectation for a water pump in a remote village is that it is robust enough to 'last a lifetime', whereas because the oil pump in a racing car needs to be as light as possible, it may only need to last the duration of one race.

The customer's quality expectations are often expressed in broad terms as a means to gain common understanding of general quality requirements. They are then used to identify more detailed acceptance criteria, which should be specific and precise.

Where possible, the customer's quality expectations should be prioritized as they will be used as inputs to define quality tolerances for the project's products.

The customer's quality expectations should be reviewed at the end of each management stage in case any external factors have changed them.

6.3.1.2 Acceptance criteria

The project's acceptance criteria form a prioritized list of measurable definitions of the attributes required for a set of products to be acceptable to key stakeholders. Examples are ease of use, ease of support, ease of maintenance, appearance, major functions, development costs, running costs, capacity, availability, reliability, security, accuracy, and performance.

Acceptance criteria should be prioritized as this helps if there has to be a trade-off between some criteria – high quality, early delivery and low cost, for example, may not be compatible and one of them may need to be sacrificed in order to achieve the other two.

Example of a prioritization technique – MoSCoW

Each acceptance criterion is rated as either Must have, Should have, Could have or Won't have for now (MoSCoW).

All the 'Must have' and 'Should have' acceptance criteria should be mutually achievable.

When the project can demonstrate that all the acceptance criteria have been met, the project's obligations are fulfilled and the project can be closed.

The acceptance criteria should be agreed between the customer and supplier during the Starting up a Project process and documented as part of the Project Product Description. It is important to recognize that little may be understood about the project's products at this early point. Consequently, it is often the case that acceptance criteria will be refined and agreed during the Initiating a Project process and reviewed at the end of each management stage. Once finalized in the Project Product Description, acceptance criteria are subject to change control and can only be changed with the approval of the Project Board.

In considering acceptance criteria, it is useful to select proxy measures that will be accurate and reliable indicators of whether benefits will subsequently be achieved.

Example of acceptance criteria

If a customer's quality expectation for a water pump is that it 'lasts a lifetime', the acceptance criteria should focus on those measures that provide sufficient indication or confidence that the pump is capable of lasting a lifetime (defined as a specific number of years). This may include complying with certain engineering standards relating to product durability.

Identifying the acceptance methods is crucial because they address the question: how do we prove whether and when the project product has been completed and is it acceptable to the customer?

6.3.1.3 The Project Product Description

The Project Product Description is created in the Starting up a Project process as part of the initial scoping activity and may be refined during the Initiating a Project process when creating the Project Plan. It is subject to formal change control and should be checked at stage boundaries (during Managing a Stage Boundary) to see if any changes are required. It is used by the Closing a Project process as part of the verification that the project has delivered what was expected of it and that the acceptance criteria have been met.

The Project Product Description includes:

- The overall purpose of the product
- Its composition (i.e. the set of products it needs to comprise)
- The customer's quality expectations
- Acceptance criteria, method and responsibilities
- Project-level quality tolerances.

The approved Project Product Description is included as a component of the Project Brief and is used to help select the project approach. The Project Product Description defines what the customer is expecting the project to deliver and the project approach defines the solution or method to be used by the supplier to create the project product.

The Project Product Description is a special form of Product Description in that it includes the customer's quality expectations and, at this level, the quality criteria and quality methods constitute the acceptance criteria and acceptance methods for the project overall.

6.3.1.4 The Quality Management Strategy

The Quality Management Strategy is prepared during the Initiating a Project process and approved subsequently by the Project Board. It augments the project approach and can be regarded as the project management team's proposals in response to the customer's quality expectations and acceptance criteria.

The Quality Management Strategy describes how the quality management systems of the participating organizations will be applied to the project and confirms any quality standards, procedures, techniques and tools that will be used. Where models and standards are to be tailored, the tailoring should also be outlined in the Quality Management Strategy for approval.

The Quality Management Strategy also provides a means by which the levels of formality to be applied in the quality plans and controls can be scaled and agreed according to the particular needs of the project.

It should outline the arrangements for quality assurance, including independent audits where these are required by the policies of the participating organizations.

Key responsibilities for quality should be defined (both within and outside the project management team), including a summary of the approach to Project Assurance.

Where there is already an established quality management system for projects, for example in a programme, only the measures specific to this project may need to be documented.

The Quality Management Strategy is maintained, subject to change control, throughout the life of the project.

6.3.1.5 Product Descriptions

Once detailed planning gets underway, Product Descriptions should be created for all of the project's products. Product Descriptions are not optional. They govern the development of the products and their subsequent review and approval.

The level of detail in a Product Description is a matter of judgement, with the primary aim being to select a level that provides a secure and appropriate measure of control sufficient to fulfil the customer's quality expectations.

The content of a Product Description is described fully in Appendix A. The 'purpose' section of the Product Description should clearly state who needs the product, why they need it and what it will do. In addition to the 'purpose', the sections specific to quality are: quality criteria, quality tolerances, quality methods, quality skills required and quality responsibilities. These define the quality controls that must be applied during product development and in the review and approval procedures for the completed product.

Care should be taken not to write Product Descriptions in too much detail. They exist to help support the planning, development, quality and approval methods. Product Descriptions that are too detailed can lead to an unnecessary increase in the cost of quality for the project. Incomplete or inaccurate Product Descriptions can lead to acceptance disputes if the delivered results do not match the customer's expectations. Where necessary, the Product Description should reference supporting information, such as any applicable standards or specialist design documents.

The time needed to create good Product Descriptions will depend on factors such as how important, complex and unique the product is, how many stakeholders will review and approve the product, and whether the organization has a library of standard Product Descriptions for reuse. Product Description libraries are frequently implemented by PRINCE2 users, to promote consistency and reuse.

Quality criteria

The Product Description should include the quality specifications that the product must meet, and the quality measurements that will be applied by those inspecting the finished product.

The quality criteria should be of sufficient detail and clarity to enable those reviewing a product to unambiguously confirm whether the product meets its requirements.

Quality tolerances

Quality tolerances for a product can be specified in quality criteria by defining an acceptable range of values. For example: 'Is the duration of the presentation 30 minutes (plus or minus 5 minutes)?', 'Is temperature maintained in the range of 1 to 5°C?'

Example of quality criteria

Consider a project to design and manufacture a new camera. One quality criterion is that the camera and its packaging must weigh no more than 1 kg. The product breakdown structure identifies a user guide product. It follows that the size and weight of the user guide is an important factor and not, for example, the number of pages.

Questions to be asked include: What is the target market for the camera? Does this also imply that the manual needs to be written in several languages? Will that mean it gets heavier? Or will a CD-ROM-based manual suffice? This could reduce the weight of the manual and allow the camera itself to be heavier.

Considering quality criteria often highlights connections and factors such as these which inform the subsequent planning process.

Quality methods

The quality methods section of the Product Description is used to specify the quality activities to be implemented during the development of a product, for review and approval on completion. Where specialized skills are implicit in the quality

methods, these should also be specified. There are two primary types of quality methods: in-process methods and appraisal methods (see section 6.3.2.1).

Quality responsibilities

To avoid doubt, the quality responsibilities for a product should be specified. The responsibilities will fall into one of three categories:

- **Producer** The person or group responsible for developing a product
- **Reviewer(s)** A person or group independent of the producer who assesses whether a product meets its requirements as defined in its Product Description
- **Approver(s)** The person or group, for example a Project Board, who is identified as qualified and authorized to approve a product as being complete and fit for purpose.

6.3.1.6 The Quality Register

The Quality Register is effectively a diary of the quality events planned and undertaken (for example, workshops, reviews, inspections, testing, pilots, acceptance and audits). It is created during the Initiating a Project process as the products and quality control measures are being defined. It is then maintained (in line with the current baseline plans) throughout the project.

Table 6.2 Example of a Quality Register

Quality Activity ID	Product ID	Product	Quality Method	Producer	Reviewer(s)	Approver(s)	Target Review Date	Actual Review Date	Target Approval Date	Actual Approval Date	Result
1	121	Test Plan	Inspection	Ali	Paulo	John, Rita	14-Feb	21-Feb	21-Feb	28-Feb	Pass
2	124	Water Pump	Performance Test	Paulo	Ali, Bob	John	20-Mar	20-Mar	27-Mar	NA	Fail
3	124	Water Pump	Maintenance Test	Paulo	Ali, Amir	Rita	21-Mar	21-Mar	27-Mar	27-Mar	Pass
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9	124	Water Pump	Performance Test	Paulo	Ali, Bob	John	14-Jun		21-Jun		

As the project progresses and records of the quality activities are received, the Quality Register is updated to reflect (in summary form) the actual results from the quality activities. The Quality Register provides key audit and assurance information, relating what was planned and agreed (in the Quality Management Strategy and Product Descriptions) to the quality activities actually performed.

The amount of information included in the Quality Register can vary considerably, depending on the extent to which quality metrics (e.g. 'defect counts') need to be analysed for process improvement purposes. An example of a Quality Register is shown in Table 6.2.

6.3.2 Quality control

Quality control is achieved by implementing, monitoring and recording the quality methods and responsibilities defined in the Quality Management Strategy and Product Descriptions (and subsequently agreed to in Work Packages).

Quality control comprises:

- Carrying out the quality methods (section 6.3.2.1)
- Maintaining quality and approval records (sections 6.3.2.2 and 6.3.2.3)
- Gaining acceptance (section 6.3.2.4).

6.3.2.1 Quality methods

The cost of correcting flaws in products increases the longer they remain undetected. It is much easier and cheaper to correct a design document early in the project than to correct a design fault that is only discovered when the finished product is being tested or, worse, when the product is already in operational use. It follows that quality inspections, implemented early in the design and development process, are potentially the most cost-effective quality methods available.

There are two types of quality methods:

- '**In-process'** methods These are the means by which quality can be 'built into' the products as they are developed. These might involve the use of specialist methods and/or techniques, including calibrated process controls, automation (e.g. robotics, software tools), piloting exercises, workshops, surveys and consultation, or, more simply, the use of

quality inspections during the course of product development as well as upon completion

- **Appraisal methods** These are the means by which the finished products are assessed for completeness and fitness for purpose. There are, in essence, two types of appraisal methods, depending on the extent to which it is possible to define objective quality criteria: **testing** (if the quality criteria are truly objective and quantifiable) or **quality inspection** (if some subjective judgement is required).

A quality inspection is a systematic, structured assessment of a product conducted in a planned, documented and organized fashion. A systematic but flexible approach to quality inspection can be used:

- During the development of products of this type, whether formally (i.e. in line with what was agreed during quality planning) or informally (simply as a means of assessing the quality of a 'work in progress')
- To mark the completion and approval of products
- To complement testing, e.g. simply for checking test results.

Quality inspection techniques are particularly applicable when professional judgement is required to assess the product's fitness for purpose. The techniques can be used within the project, as quality controls, and by independent experts, as part of quality assurance. Peer and gateway reviews are examples of quality assurance activities that can be implemented by using or adapting a generic inspection technique. Used as a project management team control, conducting systematic quality inspections can also have valuable team-building side-benefits.

Even when testing is the primary appraisal method, it is often the case that someone has to check that the test results meet the criteria for success and so a simple inspection is still required.

There are a variety of systematic inspection techniques, some being specific to certain industries or types of product. PRINCE2 accommodates the use of these techniques, but also provides a useful quality review technique, which complements the use of PRINCE2 Product Descriptions.

The PRINCE2 quality review technique

Objectives

- To assess the conformity of a product which takes the form of a document (or similar item, e.g. a presentation or test results) against set criteria
- To involve key interested parties in checking the product's quality and in promoting wider acceptance of the product
- To provide confirmation that the product is complete and ready for approval
- To baseline the product for change control purposes.

Review team roles

- **Chair** This role is responsible for the overall conduct of the review
- **Presenter** This role introduces the product for review and represents the producer(s) of the product. The presenter also coordinates and tracks the work after the review, i.e. applying the changes to the product agreed by the team
- **Reviewer** This role reviews the product, submits questions and confirms corrections and/or improvements
- **Administrator** This role provides administrative support for the chair and records the result and actions.

The minimum form of review (used for simple inspections, e.g. of test results) involves only two people: one taking the chair and reviewer roles, the other taking the presenter and administrator roles.

Note: quality review is a generic technique which can be used outside the project context. Thus the quality review roles have no specific relationship to roles in the project management team structure. However, team-building benefits can be realized where Project and Team Managers regularly chair reviews. Chairing quality reviews requires competence in facilitation and independence of the product being reviewed (the primary responsibility is to ensure that the review is undertaken properly).

Review preparation

- Make the administrative arrangements for the review (chair/administrator)

- Check the product is ready for review and confirm the availability of the reviewers (chair)
- Distribute copies of the product and the relevant Product Description to the review team, allowing sufficient time for reviewers to prepare (presenter)
- Review the product in line with the quality criteria in the associated Product Description (reviewers)
- Submit a question list to the chair and presenter ahead of the review (reviewers)
- Annotate the product copy where there are spelling/grammar mistakes and return to the presenter (reviewers)
- Produce a consolidated question list (chair) and send to the presenter in advance of the meeting.

Review meeting agenda

- **Personal introductions**, if necessary (chair)
- **Product introduction** (presenter) A very brief summary, covering the product's purpose: who needs it, why they need it and what it will do
- **Major/global questions** (chair) Invite each reviewer to contribute any major or global questions with the product. Global questions are ones that appear repeatedly throughout the product. The review team agrees any action on each question as it is raised. The administrator records the actions and responsibilities
- **Product 'talk-through'** (presenter) Lead the review team through the product section by section or page by page, as appropriate, by reviewing the consolidated question list and inviting clarification where required. The review team agrees actions on each question as it is raised. The administrator records the actions and responsibilities
- **Read back actions** (administrator) Confirm the actions and responsibilities
- **Determine the review result** (chair) Lead the review team to a collective decision. The options are:
 - **Complete** (the product is fit for purpose, as is)
 - **Conditionally complete** (the product is fit for purpose subject to the actions)

- **Incomplete** (the product requires another quality review cycle)
- **Close the review** (chair)
- **Inform interested parties of the result** (chair).

Review follow-up

- Coordinate the actions (presenter)
- Sign off individual actions (reviewers, as agreed at the meeting)
- Once all actions are complete, sign off that the product is now complete (chair)
- Communicate the quality review outcome to appropriate managers/support personnel (administrator)
- Store the quality records (administrator)
- Request approval for the product (presenter).

Hints and tips

- **Reviewers** Review the product **not** the person. This means avoid personalizing issues ('You ...') and operate as a team ('We ...')
- **Reviewers** Operate as a team but defer to specialist areas of expertise. Some reviewers may be selected to address specific aspects of the product and their comments may be considered to carry more weight in those areas
- **Reviewers** Do not introduce trivia at reviews (spelling, punctuation etc.) unless it is a major/global issue (e.g. if the document will be communicated to an important audience, such as the public)
- **Chair** Encourage the presenter to maintain a steady pace during the product talk-through. The reviewers must have the opportunity to introduce their issues but allowing too much time invites comments that would not otherwise be made. The presenter should not be opening discussions unnecessarily
- **Chair** Resolve each point as it is raised by getting a decision from the review team. Does the product have to be changed or not? Do not allow discussions to drift. Remember, the purpose of the review is to identify defects, not to design solutions to them. Avoid the temptation to formulate and agree solutions. These should be done post-review
- **Chair** Focus on this product. Do not allow discussion to drift onto other related

products. If it appears that there may be a problem associated with a related product, handle it outside the meeting as an issue

- **Chair** Make sure the reviewers contribute effectively. It is your responsibility to ensure that the approved product is fit for purpose
- **Chair** If a reviewer cannot attend the review, accept the question list from them and either raise the questions on their behalf, accept a delegate or replace the reviewer
- **Presenter** It may be that a follow-up action is not feasible to implement or cannot be done within agreed tolerances, in which case an issue should be raised to the Project Manager
- **Approver** If the person (or group) who will approve the product participates in the quality review, it may be possible to approve the product as part of the review.

The formal approval of a product may or may not result from a quality review. Products that have been signed off as complete at an inspection or review may still have to be submitted to a separate authority for approval.

The PRINCE2 quality review technique (and other quality inspection techniques) can yield substantial side-benefits, particularly in terms of:

- **Stakeholder engagement** Quality inspections are opportunities for effective cross-functional communication. Many important stakeholders may only have direct contact with the project through these reviews, so they provide a 'window' into the project. This is particularly true for users. Structured quality inspections are among the most effective ways of encouraging buy-in to the project. Generally, the more systematic and effective the reviews, the better the impression for the stakeholders
- **Leadership** In many circumstances a focus on quality (as in 'fitness for purpose') elicits a better response from review team members (and users) than simply focusing on budgets and schedules. Quality inspection techniques often provide excellent tips and 'soft guidance' on effective behaviour and decision making in meetings

- **Team building** Formal and informal quality inspections are opportunities to focus on building an effective project team, where members understand each other's contributions, needs and priorities
- **Developing individuals** New starters learn from more experienced personnel and spot omissions that others take for granted. Experienced personnel learn from the fresh perspectives brought by newcomers
- **Quality documentation** Consistent and familiar quality records make for improvements in communication and in the analysis of quality metrics
- **Quality culture** The PRINCE2 quality review technique is generic. It can be employed on programmes, projects and services throughout an organization, resulting in a positive and familiar 'quality culture'.

6.3.2.2 Quality records

It is important that evidence is gathered to demonstrate that the planned quality activities have been carried out. The records support entries in the Quality Register by providing the Project Manager and the Project Board with assurance that:

- Products really are complete (and consequently that the related activities are finished)
- Products have met their associated quality criteria and are fit for their intended purposes (alternatively there are records of any quality failures and corrective action)
- The agreed processes have been observed
- Approval authorities and key product stakeholders are satisfied
- Planned audits have been conducted and reported.

Quality records should include references to the quality inspection documentation, such as a test plan; details of any 'defect' statistics and actions required to correct errors and omissions of the products inspected; and any quality-related reports (for example, an audit). When these records are received by Project Support, the Quality Register entries for the relevant products can be completed. During the project and at project closure, the quality records provide a valuable source of information for analysis in accordance with the PRINCE2 principle that projects should learn from

experience. For example, quality metrics, such as defect types and trends, can be used as a source for lessons learned and process improvements.

6.3.2.3 Approval records

While quality records provide evidence that each product has met its requirements as specified in its Product Description, it is good practice to obtain a record that the product has been approved.

PRINCE2 does not specify the format or composition of approval records as these will depend on the level of formality required, the customer/supplier relationship and the quality management system of the organizations involved. The format for approval records could include, for example, a note in the minutes of a meeting, an email, a letter, a signature on a document, or a certificate.

6.3.2.4 Acceptance records

Products are approved throughout the life of the project and ownership may even be transferred to the customer as part of a phased handover. But, during the Closing a Project process, it is important to check that all forms of approval have been obtained and records kept for audit and/or contractual purposes.

PRINCE2 uses the term 'acceptance' to describe the ultimate approval of the project's product. Acceptance is frequently required from more than one set of stakeholders, e.g. those using the project's products and those maintaining them (in which case both categories of stakeholder should have been involved in defining the relevant products, participating in quality inspections and granting approval during the course of the project).

Acceptance may be qualified, and documented 'concessions' can be granted (e.g. if there are faults in the solution or some performance criteria have not been fully achieved). Where concessions have been granted by the Project Board, it may be necessary to recommend follow-on actions for later improvements or remedies for the products concerned.

6.4 RESPONSIBILITIES

Table 6.3 outlines the responsibilities relevant to the Quality theme. Refer to Appendix C for further details of project management team roles and their associated responsibilities.

Table 6.3 Responsibilities relevant to the Quality theme

Role	Responsibilities
Corporate or programme management	Provide details of the corporate or programme quality management system. Provide quality assurance.
Executive	Approve the Project Product Description. Approve the Quality Management Strategy. Confirm acceptance of the project product.
Senior User	Provide the customer's quality expectations and acceptance criteria. Approve the Project Product Description. Approve the Quality Management Strategy. Approve Product Descriptions for key user products. Provide resources to undertake user quality activities and product approval. Provide acceptance of the project product.
Senior Supplier	Approve the Project Product Description (if appropriate). Approve the Quality Management Strategy. Approve the quality methods, techniques and tools adopted in product development. Provide resources to undertake supplier quality activities. Approve Product Descriptions for key specialist products.
Project Manager	Document customer's quality expectations and acceptance criteria. Prepare the Project Product Description (with users). Prepare the Quality Management Strategy. Prepare and maintain the Product Descriptions. Ensure that Team Managers implement the quality control measures agreed in Product Descriptions and Work Packages.
Team Manager	Produce products consistent with Product Descriptions. Manage quality controls for the products concerned. Assemble quality records. Advise the Project Manager of product quality status.
Project Assurance	Advise the Project Manager on the Quality Management Strategy. Assist the Project Board and Project Manager by reviewing the Product Descriptions. Advise the Project Manager on suitable quality reviewers/approvers. Assure Project Board members on the implementation of the Quality Management Strategy, i.e. the proper conduct of the project management and quality procedures.
Project Support	Provide administrative support for quality controls. Maintain the Quality Register and the quality records. Assist Team Managers and members with the application of the project's quality processes.

7 Plans

7.1 PURPOSE

The purpose of the Plans theme is to facilitate communication and control by defining the means of delivering the products (the where and how, by whom, and estimating the when and how much).

Effective project management relies on effective planning as without a plan there is no control. Planning provides all personnel involved in the project with information on:

- What is required
- How it will be achieved and by whom, using what specialist equipment and resources
- When events will happen
- Whether the targets (for time, cost, quality, scope, risk and benefits) are achievable.

The development and maintenance of credible plans provides a baseline against which progress can be measured. They enable planning information to be disseminated to stakeholders in order to secure any commitments which support the plan.

The very act of planning helps the project management team to think ahead to 'mentally rehearse the project'. It is such rehearsal that enables omissions, duplication, threats and opportunities to be identified and managed.

The Plans theme provides a framework to design, develop and maintain the project's plans (Project Plan, Stage Plans and Team Plans).

7.2 PLANS DEFINED

7.2.1 What is a plan?

When asked to describe a plan, many people think of a chart showing timescales.

A PRINCE2 plan is more comprehensive. It is a document describing how, when and by whom a specific target or set of targets is to be achieved. These targets will include the project's products, timescales, costs, quality and benefits.

A plan must therefore contain sufficient information and detail to confirm that the targets are achievable.

Plans are the backbone of the management information system required for any project. It is important that plans are kept in line with the Business Case at all times. A plan requires the approval and commitment of the relevant levels of the project management team.

7.2.2 What is planning?

Planning is the act or process of making and maintaining a plan. The term is also used to describe the formal procedures used in this exercise, such as the creation of documents and diagrams. Planning is essential, regardless of the type or size of the project; it is not a trivial exercise but is vital to the success of the project.

Without effective planning, the result of complex projects cannot be predicted in terms of scope, quality, risk, timescale, cost and benefits. Those involved in providing resources cannot optimize their operations.

Poorly planned projects cause frustration, waste and rework. It is therefore essential to allocate sufficient time for the planning stage.

PRINCE2 requires a product-based approach to planning.

7.2.3 Levels of plan

All aspects of planning become more difficult the further into the future they extend. The period of time for which it is possible to accurately plan is known as the planning horizon. Because of this, it is seldom desirable, or possible, to plan an entire project in detail at the start. Therefore plans need to be produced at different levels of scope and detail (see section 2.4).

PRINCE2 recommends three levels of plan to reflect the needs of the different levels of management involved in the project, stage and team. A Product Description for a plan can be found in Appendix A.

PRINCE2's planning levels are illustrated in Figure 7.1.

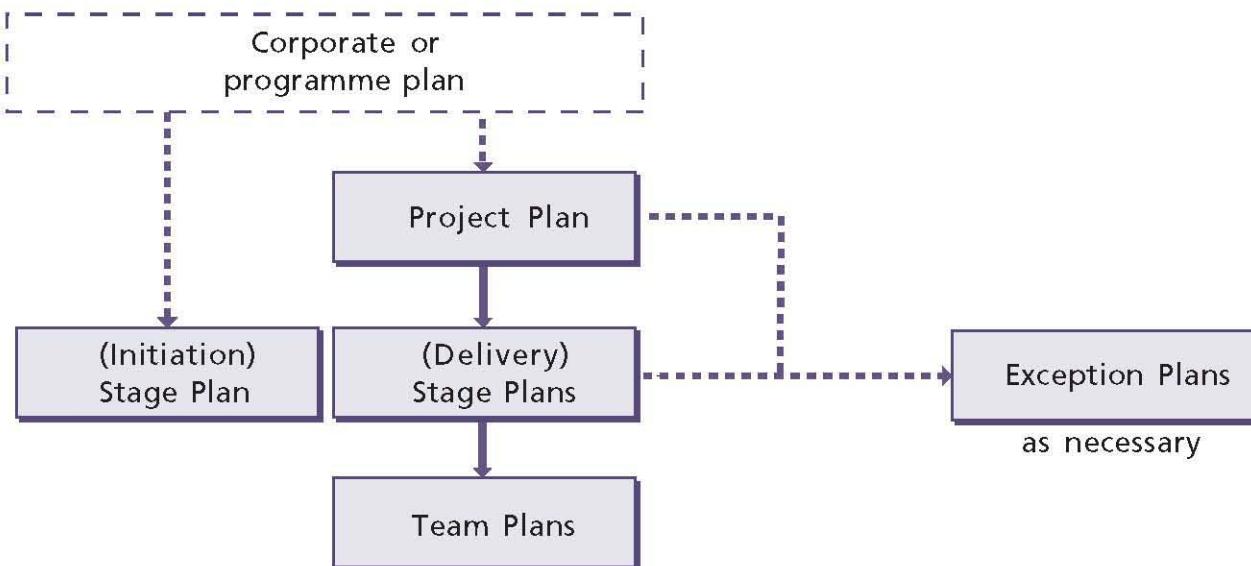


Figure 7.1 PRINCE2's planning levels

The Project Plan is created by the Initiating a Project process.

The Initiation Stage Plan is created by the Starting up a Project process and each subsequent Stage Plan is created by the Managing a Stage Boundary process. Note that since the Initiation Stage Plan is created prior to the Project Plan, it is influenced by the corporate or programme plan (or equivalent) from the organization commissioning the project.

Team Plans are created by the Managing Product Delivery process.

The only other plan in PRINCE2 is the Benefits Review Plan (see Chapter 4 for more details). This covers activities during and after the project and therefore may be part of a corporate or programme plan. The Benefits Review Plan covers corporate, project and stage levels.

7.2.4 The Project Plan

The Project Plan provides a statement of how and when a project's time, cost, scope and quality performance targets are to be achieved, by showing the major products, activities and resources required for the project. The Project Plan:

- Provides the Business Case with planned project costs and timescales, and identifies the major control points, such as management stages and milestones
- Is used by the Project Board as a baseline against which to monitor project progress stage by stage

- Should align with the corporate or programme management's plan.

7.2.5 Stage Plans

A Stage Plan is required for each management stage. The Stage Plan is similar to the Project Plan in content, but each element will be broken down to the level of detail required to be an adequate basis for day-to-day control by the Project Manager.

Each Stage Plan for the next management stage is produced near the end of the current management stage. This approach allows the Stage Plan to:

- Be produced close to the time when the planned events will take place
- Exist for a much shorter duration than the Project Plan (thus overcoming the planning horizon issue)
- Be produced with the knowledge of the performance of earlier management stages.

See Chapter 10 for further guidance on partitioning a project into management stages.

7.2.6 Team Plans

A Team Plan is produced by a Team Manager to facilitate the execution of one or more Work Packages. Team Plans are optional; their need and number will be determined by the size and complexity of the project and the number of resources involved.

PRINCE2 does not prescribe the format or composition of a Team Plan. There may be more than one team on a project and each team may come from separate organizations following different project management standards (not necessarily PRINCE2). In some customer/supplier contexts it could even be inappropriate for the Project Manager to see the details of a supplier's Team Plan; instead, summary information would be provided sufficient for the Project Manager to exercise control. Therefore the formality of the Team Plan could vary from simply appending a schedule to the Work Package to a fully formed plan in similar style to a Stage Plan.

The Team Manager(s) may create their Team Plans in parallel with the Project Manager creating the Stage Plan for the management stage.

7.2.7 Exception Plans

An Exception Plan is a plan prepared for the appropriate management level to show the actions required to recover from the effect of a tolerance deviation. If approved, the Exception Plan will

replace the plan that is in exception and it will become the new baselined Project Plan or current Stage Plan, as appropriate.

If a Stage Plan is being replaced, this needs the approval of the Project Board. Replacement of a Project Plan should be referred by the Project Board to corporate or programme management if it is beyond the authority of the Project Board.

An Exception Plan is prepared to the same level of detail as the plan it replaces. It picks up from the current plan actuals and continues to the end of that plan. Exception Plans are not produced for Work Packages. Should a Team Manager forecast that the assigned Work Package may exceed tolerances, they will notify the Project Manager by raising an issue. If the issue relating to the Work Package can be resolved within stage tolerances, the Project Manager will take corrective action by updating the Work Package or issuing a new Work Package(s) and instructing the Team Manager(s) accordingly.

For more explanation of the types and the use of tolerance in PRINCE2, see Chapter 10.

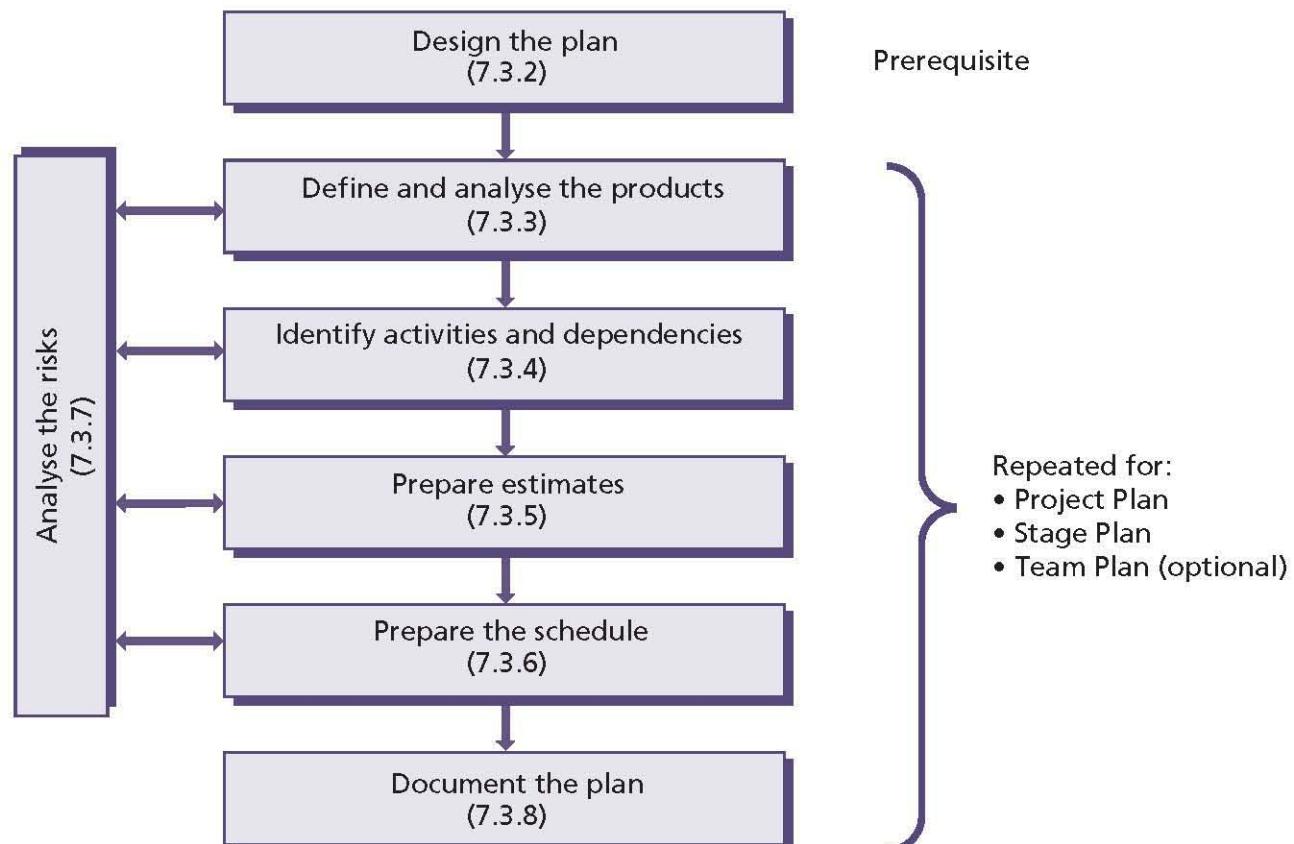


Figure 7.2 The PRINCE2 approach to plans

7.3 THE PRINCE2 APPROACH TO PLANS

7.3.1 Philosophy

The philosophy behind producing plans in PRINCE2 is that the products required are identified first, and only then are the activities, dependencies and resources required to deliver those products identified. This is known as **product-based planning** and is used for the Project Plan, the Stage Plan and, optionally, the Team Plan. Figure 7.2 illustrates the steps required in producing a PRINCE2 plan.

Each step in the planning procedure may need to be revisited on completion of later steps (for example, in preparing the schedule if additional activities or dependencies are identified).

7.3.2 Prerequisites for planning – design the plan

Decisions need to be made about how the plan can best be presented, given the audience for the plan and how it will be used, together with the presentation and layout of the plan, planning tools, estimating methods, levels of plan, and monitoring methods to be used for the project. This will include the use of diagrams versus text and will be driven, in part, by any standards adopted by the project.

Where the project is part of a programme, the programme may have developed a common approach to project planning. This may cover standards – for example, level of planning – and tools. These will be the starting point for designing any Project Plan. Any project-specific variations should be highlighted and the agreement of programme management sought. There may also be a company standard for planning and control aids, or the customer may stipulate the use of a particular set of tools. The choice of planning tool may depend on the complexity of the project – hence the choice may need to be deferred until the level of complexity is known.

The estimating methods to be used in the plan may affect the plan design, so decisions on the methods should be made as part of the plan design itself.

The use of planning tools is not obligatory, but it can save a great deal of time if the plan is to be regularly updated and changed. A good tool can also validate that the correct dependencies have been built in and have not been corrupted by any plan updates.

7.3.3 Define and analyse the products

PRINCE2 uses a technique known as product-based planning to identify, define and analyse the plan's products, as shown in Figure 7.3.

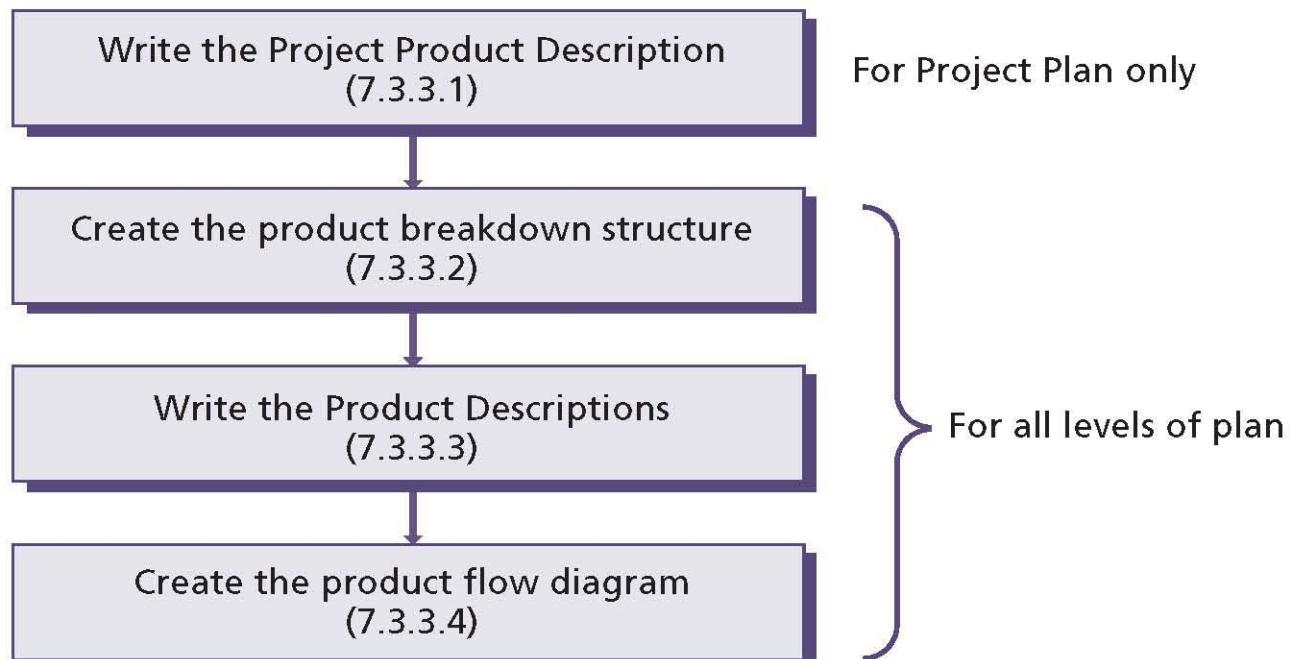


Figure 7.3 Product-based planning technique

Product-based planning is likely to be iterative. In the case of Product Descriptions, this means that at first it may comprise simply a title and a statement of purpose. Therefore, in the following note, 'write' (as in 'write a Product Description') should be interpreted as meaning 'commence to write, and proceed to complete as fully as appropriate as soon as convenient'.

The format and presentation of the product breakdown structure and product flow diagram is determined by personal preference. See Appendix D for examples.

The benefits of product-based planning include:

- Clearly and consistently identifying and documenting the plan's products and the interdependencies between them. This reduces the risk of important scope aspects being neglected or overlooked
- Removing any ambiguity over expectations
- Involving users in specifying the product requirements, thus increasing buy-in and reducing approval disputes
- Improving communication: the product breakdown structure and product flow diagram provide simple and powerful means of sharing and discussing options for the scope and approach to be adopted for the project
- Clarifying the scope boundary: defining products that are in and out of the scope for the plan and providing a foundation for change control, thus avoiding uncontrolled change or 'scope creep'
- Identifying products that are external to the plan's scope but are necessary for it to proceed, and allocating them to other projects or organizations
- Preparing the way for the production of Work Packages for suppliers
- Gaining a clear agreement on production, review and approval responsibilities.

7.3.3.1 Write the Project Product Description

The first task of product-based planning is to write the Project Product Description. Although the Senior User is responsible for specifying the project product, in practice the Project Product Description is often written by the Project Manager in consultation with the Senior User and Executive. Every effort should be made to make this Product Description as complete as possible at the outset.

See Appendix A for the suggested composition of the Project Product Description.

7.3.3.2 Create the product breakdown structure

The plan is broken down into its major products, which are then further broken down until an appropriate level of detail for the plan is reached. A lower-level product can be a component of only one higher-level product. The resultant hierarchy of products is known as a product breakdown structure.

When creating a product breakdown structure, consider the following:

- It is usual to involve a team of people in the creation of a product breakdown structure, perhaps representing the different interests and various skill sets involved in the plan's output
- It is common to identify products by running a structured brainstorming session (for example, using sticky notes or a whiteboard) to capture each product as it is identified
- When a team is creating a product breakdown structure, there is likely to be discussion on the way in which to break down the products. For example, if the output of the plan is a computerized accounts system, users might want to separate the system into Accounts Payable, Accounts Receivable, General Ledger etc. The suppliers, however, may prefer Screens, Reports, Databases etc. Neither breakdown is wrong, but the project management team must reach a consensus on which approach will be used in the product breakdown structure (and hence the plan)
- It is useful to identify any **external products** required by the plan. External products already exist or are being created or updated outside of the scope of the plan and are required in order to create one or more of the plan's products. For example, a procurement project would show the bidders' tender responses as external products. The Project Manager is not accountable for the creation of external products as they will be supplied by parties external to the project management team. For each external product there should be a corresponding entry on the Risk Register detailing the threat to the plan if they are late or not to the required specification. Consider whether external products require Product

Descriptions to reduce the likelihood of them not providing what's expected of them

- When using product-based planning, it is important to consider whether to include different **states** of a particular product. An example of product states is 'dismantled machinery, moved machinery and reassembled machinery'. It could be appropriate to identify the different states as separate products, where each state would require its own Product Description with different quality criteria and quality controls. This may be particularly useful when the responsibility for creating each state will pass from one team to another. Alternatively, a single Product Description could be used with a set of quality criteria that the product needs to meet in order to gain approval for each state
- When presenting the product breakdown structure, consider the use of different shapes, styles or colours for different types of product. For example, a rectangle could be used in a product breakdown structure to represent most types of product, but it may be helpful to use different shapes such as ellipses or circles to distinguish external products. Colours could be used to indicate which team is responsible for the product or in which stage the product will be created
- If the project is broken down into several stages, the products for each stage are extracted from the project product breakdown structure to form the stage product breakdown structure. These may be expanded to more levels of detail and thus 'extra products' may be added to give the detail required of the Stage Plan. Care must be taken to use the same names in the Stage Plan diagrams as were used in the Project Plan. The creation of Stage Plan diagrams may cause rethinking that requires further modification of the Project Plan's diagrams in order to retain consistency
- In some cases, the organization's lifecycle model may have a preset product breakdown structure and product flow diagram for common types of projects and a library of Product Description outlines for common products. In such cases the steps in the PRINCE2 product-based planning technique should not be skipped but used to verify the completeness of any library material. As every project is unique, there may be additional product requirements for this project

or subtle differences in the quality criteria; the locations may be different, or the people and responsibilities involved may be different. Moreover, lifecycle models frequently address only one aspect of a project's scope.

7.3.3.3 Write the Product Descriptions

A Product Description is required for all the identified products. When creating a Product Description, consider the following:

- Product Descriptions should be written as soon as possible after the need for the product has been identified. Initially, these may only be 'skeletons' with little more than the title and identifier as information. They will be refined and amended as the product becomes better understood and the later planning steps are done
- A Product Description should be baselined when the plan containing the creation of that product is baselined. If the product is later changed, the Product Description must also pass through change control
- Although the responsibility for writing Product Descriptions rests officially with the Project or Team Manager, it is wise to involve representatives from the area with expertise in the product and those who will use the product in question. The latter should certainly be consulted when defining the quality criteria for the product
- Successful Product Descriptions may be reused for other projects within that programme or organization. For this to happen, a library of Product Descriptions for reuse will need to be established and a mechanism for Product Descriptions to be placed in the library will also need to be implemented. The Project Manager should therefore refer to the library in order to see if any of the Product Descriptions within it are suitable for reuse and/or modification for the project
- If a detailed requirements specification for a product is already available, this may be used as a substitute for the Product Description as long as the requirements specification covers the components and meets the quality criteria expected of a Product Description. Alternatively a Product Description should be created referencing the requirements specification contents where appropriate

- For a small project, it may only be necessary to write the Project Product Description
- Quality criteria, aimed at separating an acceptable product from an unacceptable one, need careful thought. One way of testing quality criteria is by asking the question: how will I know when work on this product is finished as opposed to stopped?

7.3.3.4 Create the product flow diagram

A product flow diagram needs to be created to identify and define the sequence in which the products of the plan will be developed and any dependencies between them.

The product flow diagram also identifies dependencies on any products outside the scope of the plan. It leads naturally into consideration of the activities required, and provides the information for other planning techniques, such as estimating and scheduling.

When creating a product flow diagram, consider the following:

- Although the Project or Team Manager is responsible for the creation of the product flow diagram, it is sensible to involve those who are to develop or contribute to the products contained in the plan
- Rather than preparing the product flow diagram once the product breakdown structure has been drawn, some planners prefer to create the product flow diagram in parallel with the product breakdown structure
- A product flow diagram needs very few symbols. Each product to be developed within the plan in question is identified (for example, it may be enclosed in a rectangle), and the sequence in which they are to be created is shown (the rectangles may be connected by arrows, for example). Any products that already exist or that come from work outside the scope of the plan should be clearly identified as external products (for example, they may be enclosed in a different shape, such as an ellipse)
- It may be useful to add a starting point in the product flow diagram from which all entry points are attached. There is always one exit on a product flow diagram but when there are many entrances, such a place marker prevents

any from being overlooked. The symbol becomes the predecessor for all entry points and would be the only symbol on a product flow diagram that is not on the product breakdown structure.

7.3.4 Identify activities and dependencies

7.3.4.1 Activities

Simply identifying products may be insufficient for scheduling and control purposes. The activities required to create or change each of the planned products need to be identified to give a fuller picture of the plan's workload.

There are several ways to identify activities, including:

- Making a separate list of the activities, while still using the product flow diagram as the source of the information
- Taking the products from the product breakdown structure and creating a work breakdown structure to define the activities required.

The activities should include management and quality-checking activities as well as the activities needed to develop the specialist products. The activities should include any that are required to interact with external parties – for example, obtaining a product from an outside source or converting external products into something that the plan requires.

Guard against a proliferation of activities beyond the detail appropriate to the level of the plan. If in doubt, keep things simple.

7.3.4.2 Dependencies

Any dependencies between activities (and products) should also be identified. There are two types of dependency: **internal** and **external**. An example of an internal dependency is that activity C cannot start until activities A and B have been completed. External dependencies may, for example, be:

- The delivery of a product required by this project from another project
- The provision of a purchase order by the user
- A decision from programme management.

Examples of estimating techniques

- **Top-down estimating** Once a good overall estimate has been arrived at for the plan (by whatever means), it can be subdivided through the levels of the product breakdown structure. By way of example, historically development may be 50% of the total and testing may be 25%. Subdivide development and testing into their components and apportion the effort accordingly
- **Bottom-up estimating** Each individual piece of work is estimated on its own merit. These are then summed together to find the estimated efforts for the various summary level activities and overall plan
- **Top-down and bottom-up approach** An overall estimate is calculated for the plan. Individual estimates are then calculated, or drawn from previous plans, to represent the relative weights of the tasks. The overall estimate is then apportioned across the various summary and detailed-level tasks using the bottom-up figures as weights
- **Comparative estimating** Much data exist about the effort required and the duration of particular items of work. Over time an organization may build up its own historical data regarding projects that it has undertaken (previous experience or lessons learned). Where such data exists, it may be useful to reference it for similar projects and apply that data to the estimates
- **Parametric estimating** Basing estimates on measured/empirical data where possible (for example, estimating models exist in the construction industry that predict materials, effort and duration based on the specification of a building)
- **Single-point estimating** The use of sample data to calculate a single value which is to serve as a 'best guess' for the duration of an activity
- **Three-point estimating** Ask appropriately skilled resource(s) for their best-case, most likely and worst-case estimates. The value that the Project Manager should choose is the weighted average of these three estimates

■ **Delphi technique** This relies on obtaining group input for ideas and problem solving without requiring face-to-face participation. It uses a series of questionnaires interspersed with information summaries and feedback from preceding responses to achieve an estimate.

7.3.5 Prepare estimates

A decision about how much time and resource are required to carry out a piece of work to acceptable standards of performance must be made by:

- Identifying the type of resource required. Specific skills may be required depending on the type and complexity of the plan. Requirements may include non-human resources, such as equipment, travel or money
- Estimating the effort required for each activity by resource type. At this point, the estimates will be approximate and therefore provisional.

Estimating cannot guarantee accuracy but, when applied, provides a view about the overall cost and time required to complete the plan. Estimates will inevitably change as more is discovered about the project.

Estimates should be challenged, as the same work under the same conditions can be estimated differently by various estimators or by the same estimator at different times.

Basic rules for estimating

Many books and software packages include some basic rules to help ensure that an accurate and realistic estimate is produced. Examples of such planning rules include:

- Assume that resources will only be productive for, say, 80% of their time
- Resources working on multiple projects take longer to complete tasks because of time lost switching between them
- People are generally optimistic and often underestimate how long tasks will take
- Make use of other people's experiences and your own
- Ensure that the person responsible for creating the product is also responsible for creating the effort estimates

- Always build in provision for problem solving, meetings and other unexpected events
- Cost each activity rather than trying to cost the plan as a whole
- Communicate any assumptions, exclusions or constraints you have to the user(s).

This is an iterative task as the assigning of actual resources may affect the estimated effort and duration.

The amount of time that an activity can be delayed without affecting the completion time of the overall plan is known as the **float** (sometimes referred to as the **slack**). Float can either be regarded as a provision within the plan, or as spare time.

The critical path(s) through the diagram is the sequence of activities that have zero float. Thus, if any activity on the critical path(s) finishes late, then the whole plan will also finish late (for example, if task 4 in Figure 7.4 is delayed, then completion of the plan will be delayed).

Identifying a plan's critical path enables the Project Manager to monitor those activities:

- That must be completed on time for the whole plan to be completed to schedule
- That can be delayed for a time period if resources need to be re-allocated to catch up on missed activities.

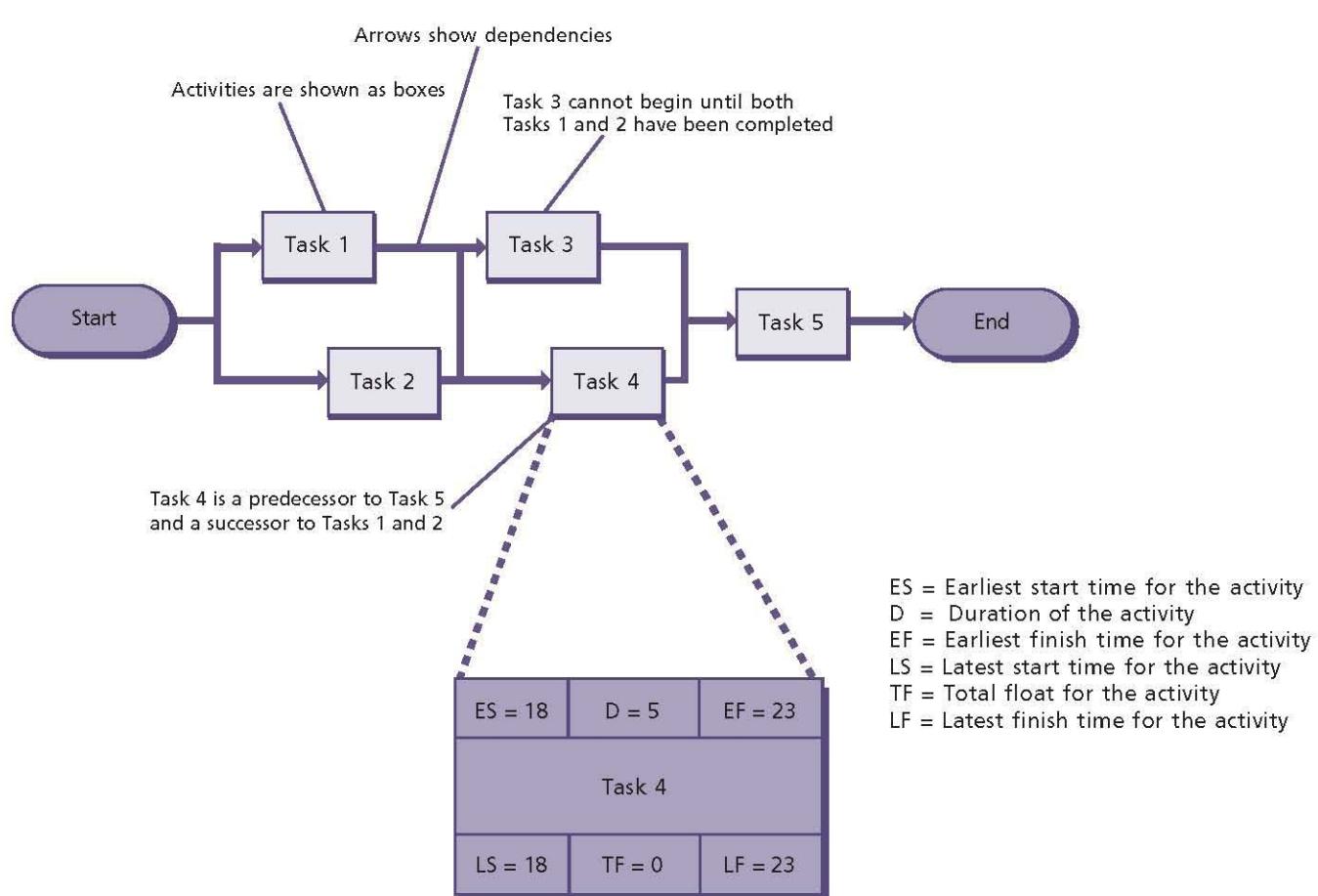


Figure 7.4 Simple activity-on-node diagram

Example of activity-on-node technique

An activity-on-node diagram (sometimes called an arrow diagram) can be used to schedule dependent activities within a plan. It helps a Project Manager to work out the most efficient sequence of events needed to complete any plan and enables the creation of a realistic schedule.

The activity-on-node diagram displays interdependencies between activities through the use of boxes and arrows. Arrows pointing into an activity box come from its predecessor activities, which must be completed before the activity can start. Arrows pointing out of an activity box go to its successor activities, which cannot start until at least this activity is complete. A simple activity-on-node diagram is shown in Figure 7.4.

7.3.6.2 Assess resource availability

The number of people who will be available to do the work (or the cost of buying in resources) should be established. Any specific information should be noted (for example, names, levels of experience, percentage availability, available dates).

7.3.6.3 Assign resources

Using the resource availability and the information from the activity sequence allows the Project Manager to assign resources to activities. The result will be a schedule that shows the loading of work on each person, and the use of non-human resources.

A useful approach is to allocate resources to those activities with zero slack first (by definition they are on the critical path). Those activities with the greatest slack are the lowest priority for resource allocation.

It is important that task owners be defined. If a group needs to complete a task, ask one person from the group to be accountable to the group for that task.

If any of the task owners do not participate in creating the schedule, make sure you check with them first on their availability and willingness to own the task. Do not assume that putting their names on a plan or schedule will automatically get the work done. Collaborate, communicate and follow up with each task owner to make sure that

they understand what it means to complete the task.

When assigning resources, it is important to re-check the critical path as actual resources assigned may be more or less productive than the assumption made when calculating activity effort and duration.

7.3.6.4 Level resource usage

The first allocation of resources may lead to uneven resource usage or over-utilization of some resources. It may therefore be necessary to rearrange resources – this is called **levelling**.

Activities may be reassigned, or they may have start dates and durations changed within the slack available.

The end result is a final schedule with all activities assigned and resource utilization equating to resource availability.

The critical chain technique

The critical chain method of planning puts more emphasis on the resources required to execute the plan and their availability. This is in contrast to traditional methods, which emphasize task order and rigid scheduling. A critical chain network will tend to keep the resources evenly loaded, but will require them to be flexible in their start times and to switch quickly between tasks and task chains to keep the whole plan on schedule.

7.3.6.5 Agree control points

The draft schedule enables the control points to be confirmed by the Project Board.

Activities relating to the end of a management stage (for example, preparing the End Stage Report and the next Stage Plan) should be added to the activity network and the schedule revised.

One common mistake when creating a schedule is not to allow time for approvals of products or releases.

7.3.6.6 Define milestones

A milestone is an event on a schedule which marks the completion of key activities. This could be the completion of a Work Package, a technical stage or a management stage. In a commercial

environment, reaching a milestone may be the trigger for a payment to a supplier.

Breaking the plan into intervals associated with a milestone allows the Project Manager to have an early indication of issues associated with the schedule itself, and also a better view of the activities whose completion is critical to the timeline of the plan.

While there is no 'correct' number of milestones or duration between them, they lose their value when there are too many or too few. There should be far fewer milestones than deliverables or Work Packages, but there should be enough milestones at major intervals to gauge whether or not the plan is proceeding as expected.

7.3.6.7 Calculate total resource requirements and costs

The resource requirements can be tabulated, and the cost of the resources and other costs calculated to produce the plan's budget.

The budget should include:

- Costs of the activities to develop and verify the specialist products, and the cost of the project management activities
- Risk budget (see Chapter 8)
- Change budget (see Chapter 9)
- Cost tolerances.

The use of risk budgets and change budgets is optional.

7.3.6.8 Present the schedule

A schedule is best presented in a graphical form. There are a number of ways of presenting a schedule and the choice of format will depend on the scale and complexity of the plan and the needs of the people who will receive it. Most planning tools will offer a choice of formats to view the schedule.

7.3.7 Analyse the risks

This planning activity will typically run parallel with the other steps, as risks may be identified at any point in the creation or revision of a plan.

Each resource and activity, and all the planning information, should be examined for its potential risk content. All identified risks should be entered into the Risk Register (or the Daily Log when planning the initiation stage).

Examples of presentation formats for the schedule

Gantt charts

A Gantt chart is a graphical representation of the duration of tasks against the progression of time. It allows the Project Manager to:

- Assess how long a plan should take
- Lay out the order in which tasks need to be carried out
- Manage the dependencies between tasks
- See what should have been achieved at a certain point in time
- See how remedial action may bring the plan back on course.

Critical path diagram

A critical path diagram highlights those tasks which cannot be delayed without causing the plan to be delayed, and those tasks that can be delayed without affecting the end date of the plan. It helps with monitoring and communication.

Spreadsheets

It is possible to create a list of tasks 'down' the spreadsheet and a timeline 'across' it, then colour in the cells to represent where the tasks will occur in the timeline, and progress to date. For simple projects where the timeline is unlikely to change, this may be adequate. For large or complex projects, the timeline may change frequently. This means that the Project Manager may spend a significant amount of time changing the schedule while neglecting the day-to-day tasks required in order to manage the project.

Product checklist

A product checklist is a list of the major products of a plan, plus key dates in their delivery. An example of a product checklist is shown in the Product Description outline for a plan in Appendix A.

Once the plan has been produced, it should still be considered a draft until the risks inherent in the plan have been identified, assessed and the plan possibly modified.

See Chapter 8 for more details on identifying and analysing risks.

Examples of planning risks

- Omission of plans at the appropriate management level(s)
- Lots of resources joining the project at the same time can slow progress and cause communication issues (plotting an S-curve for the resource profile over time can identify this – steep curves should be avoided)
- The plan includes unnamed resources, causing the productivity of the actual resource to differ from the estimated productivity in the plan
- The plan contains a high proportion of external dependencies
- The plan uses untested suppliers or is dependent on new technologies
- There is a high proportion of activities on the critical path – a delay to any one of them will delay the plan
- The plan does not allow for sufficient management decision points such as stage boundaries
- There is not much float in the plan (creating a histogram showing the number of activities by amount of float is a useful way of identifying this risk)
- A large number of products are to be completed at the same time
- The plan is time-bound by fiscal boundaries (e.g. the budget cannot be transferred from this year to the next) or by calendar boundaries (e.g. millennium bug projects were calendar-bound)
- The schedule shows many paths narrowly paralleling the critical path are likely to become critical themselves if there is a minor slip.

7.3.8 Document the plan

Having completed the schedule satisfactorily, the plan, its costs, the required controls and its supporting text need to be consolidated in accordance with the plan design.

Narrative needs to be added to explain the plan, any constraints on it, external dependencies, assumptions made, any monitoring and control required, the risks identified and their required responses.

It is a good discipline to keep plans as simple as is appropriate. Consider summary diagrams if the plan is to be presented to the Project Board.

It may be sensible to have one plan format for presentation in submissions seeking approval, and a more detailed format for day-to-day control purposes. Also consider different levels of presentation of the plan for the different levels of readership. Most planning software packages offer such options.

See Appendix A for the suggested composition of a plan.

7.4 RESPONSIBILITIES

Table 7.1 outlines the responsibilities relevant to the Plans theme. Refer to Appendix C for further details of project management team roles and their associated responsibilities.

Table 7.1 Responsibilities relevant to the Plans theme

Role	Responsibilities
Corporate or programme management	Set project tolerances and document them in the project mandate.
	Approve Exception Plans when project-level tolerances are forecast to be exceeded.
	Provide the corporate or programme management planning standards.
Executive	Approve the Project Plan.
	Define tolerances for each stage and approve Stage Plans.
	Approve Exception Plans when stage-level tolerances are forecast to be exceeded.
	Commit business resources to Stage Plans (e.g. finance).
Senior User	Ensure that Project Plans and Stage Plans remain consistent from the user perspective.
	Commit user resources to Stage Plans.
Senior Supplier	Ensure that Project Plans and Stage Plans remain consistent from the supplier perspective.
	Commit supplier resources to Stage Plans.
Project Manager	Design the plans.
	Prepare the Project Plan and Stage Plans.
	Decide how management and technical stages are to be applied and design Stage Plans.
	Instruct corrective action when Work Package-level tolerances are forecast to be exceeded.
	Prepare an Exception Plan to implement corporate management, programme management or the Project Board's decision in response to Exception Reports.
Team Manager	Prepare Team Plans.
	Prepare schedules for each Work Package.
Project Assurance	Monitor changes to the Project Plan to see whether there is any impact on the needs of the business or the project Business Case.
	Monitor stage and project progress against agreed tolerances.
Project Support	Assist with the compilation of Project Plans, Stage Plans and Team Plans.
	Contribute specialist expertise (for example, planning tools).
	Baseline, store and distribute Project Plans, Stage Plans and Team Plans.

8 Risk

8.1 PURPOSE

The purpose of the Risk theme is to identify, assess and control uncertainty and, as a result, improve the ability of the project to succeed.

Risk taking in projects is inevitable since projects are enablers of change and change introduces uncertainty, hence risk.

Management of risk should be systematic and not based on chance. It is about the proactive identification, assessment and control of risks that might affect the delivery of the project's objectives.

The project should establish and maintain a cost-effective risk management procedure. The aim is to support better decision making through a good understanding of risks – their causes, likelihood, impact, timing, and the choice of responses to them.

Management of risk is a continual activity, performed throughout the life of the project. Without an ongoing and effective risk management procedure it is not possible to give confidence that the project is able to meet its objectives and therefore whether it is worthwhile for it to continue. Hence effective risk management is a prerequisite of the continued business justification principle.

8.2 RISK DEFINED

8.2.1 What is a risk?

A risk is an uncertain event or set of events that, should it occur, will have an effect on the achievement of objectives. It consists of a combination of the probability of a perceived threat or opportunity occurring, and the magnitude of its impact on objectives, where:

- **Threat** is used to describe an uncertain event that could have a negative impact on objectives
- **Opportunity** is used to describe an uncertain event that could have a favourable impact on objectives.

8.2.2 What is at risk?

In the context of a project, it is the project's objectives that are at risk. These will include completing the project to a number of targets, typically covering time, cost, quality, scope, benefits and risk.

For more information on these targets, see section 2.5.

8.2.3 What is risk management?

The term risk management refers to the systematic application of procedures to the tasks of identifying and assessing risks, and then planning and implementing risk responses. This provides a disciplined environment for proactive decision making.

For risk management to be effective, risks need to be:

- **Identified** This includes risks being considered that could affect the achievement of the project's objectives, and then described to ensure that there is a common understanding of these risks
- **Assessed** This includes ensuring that each risk can be ranked in terms of estimated likelihood, impact and immediacy, and understanding the overall level of risk associated with the project
- **Controlled** This includes identifying appropriate responses to risks, assigning risk owners, and then executing, monitoring and controlling these responses.

Risk management applies from the strategic, operational, programme and project perspectives. The approach to the management of risk can be common across all of these perspectives but risk management procedures should be tailored to suit each one. See Figure 8.1 for organizational perspectives.

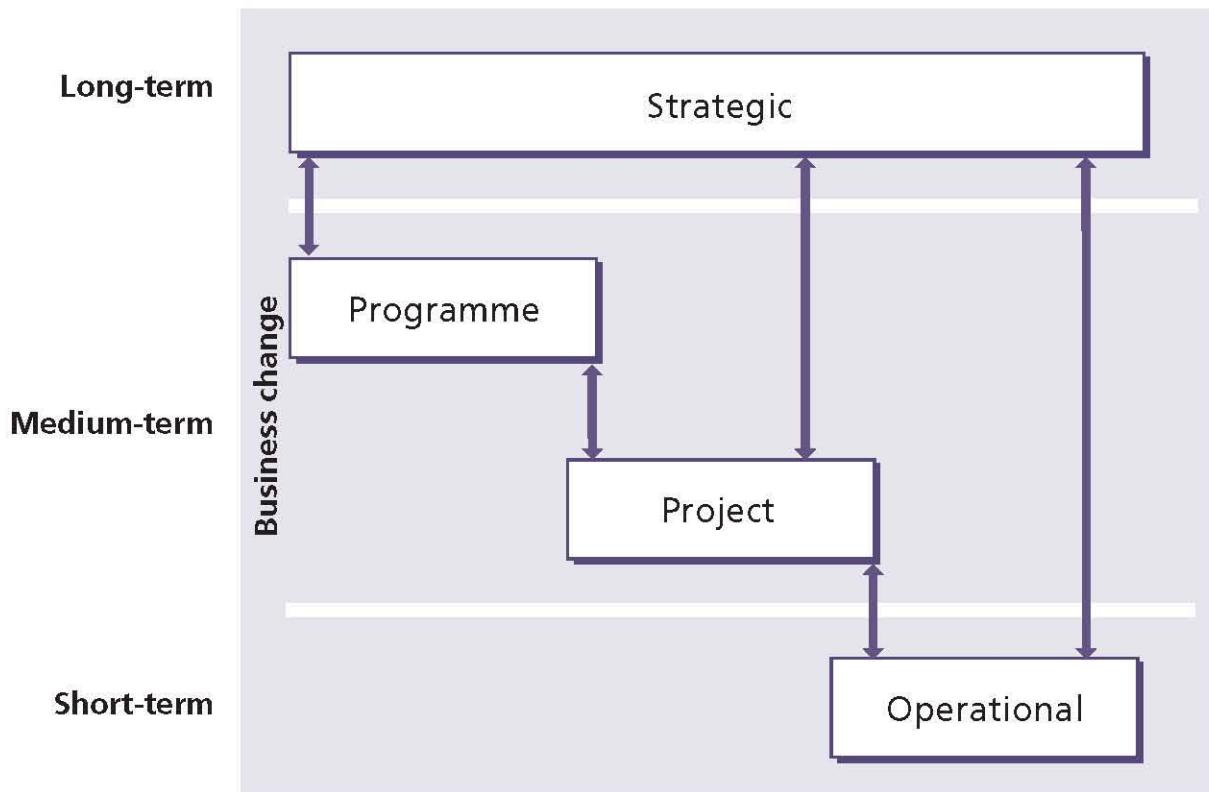


Figure 8.1 Organizational perspectives

8.3 THE PRINCE2 APPROACH TO RISK

8.3.1 Management of Risk (M_o_R[®]) principles

PRINCE2's approach to the management of risk is based on OGC's publication *Management of Risk: Guidance for Practitioners* (TSO, 2007).

Management of risk is based on a number of risk management principles, of which the following are appropriate within a project context:

- Understand the project's context
- Involve stakeholders
- Establish clear project objectives
- Develop the project risk management approach
- Report on risks regularly
- Define clear roles and responsibilities
- Establish a support structure and a supportive culture for risk management
- Monitor for early warning indicators
- Establish a review cycle and look for continual improvement.

8.3.2 Risk management in projects

A starting point for all projects will be to identify whether there are any corporate or programme policies and processes that need to be applied. This information may be in the form of a risk management policy and/or a risk management process guide (or similar documents).

- An organization's risk management policy should communicate how risk management will be implemented throughout the organization to support the realization of its strategic objectives. This will include information such as the organization's risk appetite (an organization's unique attitude towards risk taking that in turn dictates the amount of risk that it considers acceptable), risk tolerances, procedures for escalation and defined roles and responsibilities
- An organization's risk management process guide should describe the series of steps and their respective associated activities necessary to implement risk management. This guide

should provide a best-practice approach that will support a consistent method of risk management across the organization.

Where the project forms part of the programme, the project's approach to risk management will be determined by the programme's Risk Management Strategy.

PRINCE2 recommends that every project should have its own Risk Management Strategy (defining the project procedures for risk management from identification through to implementation) and a means of control, i.e. the Risk Register.

For more information on the risk management policy and process guide documents, see OGC's *Management of Risk: Guidance for Practitioners* (TSO, 2007).

8.3.3 Risk Management Strategy

Having reviewed the organizational- and programme-level documents, and before embarking on any risk management activities, a Risk Management Strategy should be developed for the project. The purpose of this strategy is to describe how risk management will be embedded in the project management activities.

A key decision that needs to be recorded within the Risk Management Strategy is the Project Board's attitude towards risk taking, which in turn dictates the amount of risk that it considers acceptable. This information is captured in the form of risk tolerances, which represent the levels of exposure that, when exceeded, will trigger an Exception Report to bring the situation to the attention of the Project Board.

Example of risk tolerance

A large electrical retailer would not tolerate any unnecessary disruption to its support systems during the peak trading period, which extends from the middle of November through to the end of January. Projects are not permitted to introduce any changes to the support systems during this period. Therefore any risks in the Risk Register that mean the support systems would change in this peak trading window would need to be escalated to the Project Board.

See Appendix A for the Product Description of a Risk Management Strategy.

8.3.4 Risk Register

The purpose of the Risk Register is to capture and maintain information on all of the identified threats and opportunities relating to the project. Each risk on the Risk Register is allocated a unique identifier as well as details such as:

- Who raised the risk
- When it was raised
- The category of risk
- The description of the risk (cause, risk event, effect)
- Probability, impact and expected value
- Proximity
- Risk response category
- Risk response actions
- Risk status
- Risk owner
- Risk actionee.

Project Support will typically maintain the Risk Register on behalf of the Project Manager. The Risk Management Strategy will describe the procedure for registering risks and maintaining the risk register.

See Appendix A for the Product Description of a Risk Register.

8.3.5 Risk management procedure

PRINCE2 recommends a risk management procedure comprising the following five steps:

- Identify (context and risks)
- Assess (i.e. Estimate and Evaluate)
- Plan
- Implement
- Communicate.

The first four steps are sequential, with the 'Communicate' step running in parallel because the findings of any of the other steps may need to be communicated prior to the completion of the overall process. All of the steps are iterative in nature in that when additional information becomes available, it is often necessary to revisit earlier steps and carry them out again to achieve the most effective result.

Figure 8.2 shows the elements of the risk management procedure, which are described in sections 8.3.5.1–8.3.5.5.

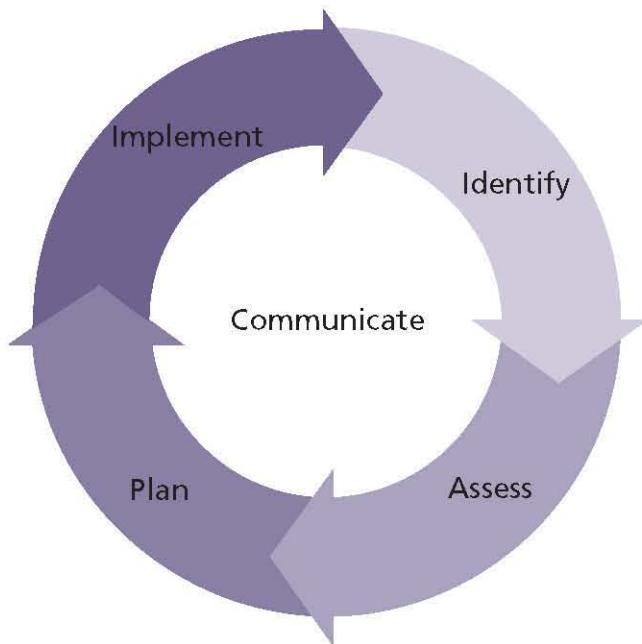


Figure 8.2 The risk management procedure

8.3.5.1 Identify

Identify context

The primary goal of the 'Identify context' step is to obtain information about the project in order to understand the specific objectives that are at risk and to formulate the Risk Management Strategy for the project. The Risk Management Strategy describes how risks will be managed during the project. It is created during the initiation stage and then reviewed and possibly updated at the end of each stage. The project's Risk Management Strategy should be based on the corporate risk management policy or on the programme's Risk Management Strategy.

The following will have an influence on the project's Risk Management Strategy:

- Customer's quality expectations
- Number of organizations involved and the relationship between them
- The needs of the stakeholders involved with the project
- The importance, complexity and scale of the project
- What assumptions have been made
- The organization's own environment (e.g. legislative or governance requirements)
- The organization's approach to risk management as described by its risk management policy.

This information will be derived from the project mandate, the Project Brief and the Project Product Description. The Risk Management Strategy will include decisions on the:

- Risk management procedure
- Tools and techniques to be used
- Records to be kept
- Risk reporting
- Timing of risk management activities
- Roles and responsibilities for the risk management procedure
- Risk scales to be used (for likelihood, impact, proximity)
- Any categorization of risks (and possibly the risk breakdown structure to use)
- Risk response categories to be used
- Early warning indicators
- Any risk tolerances
- Whether a risk budget will be established and, if so, how it will be controlled.

The early warning indicators (relevant to the project) will provide advanced warning that one or more of the project's objectives could be at risk. Early warning indicators could include progress performance data (see Chapter 10) such as:

- Percentage of Work Packages accomplished/not accomplished to schedule
- Percentage of approvals accomplished/not accomplished to schedule
- Number of issues being raised (per week/month)
- Percentage of issues that remain unresolved
- Average number of days that issues remain unresolved
- Average number of defects captured in quality inspections
- Adherence to budget (e.g. rate of spend behind or ahead of planned spend)
- Adherence to schedule (e.g. days behind or ahead of schedule).

Other early warning indicators could include non-project data such as customer satisfaction, absenteeism levels, staff attrition rates etc., if they are relevant to the project. It is also useful to analyse and report on the direction of travel of these early warning indicators (i.e. are they improving/deteriorating) as that can be of more significance than their snapshot value.

Risk identification techniques

Risks can be identified using a number of techniques, such as:

- **Review lessons** Risks are driven by uncertainty, so one of the most effective ways to reduce uncertainty is to review similar previous projects to see what threats and opportunities affected them
- **Risk checklists** These are in-house lists of risks that have either been identified or have occurred on previous similar projects. Risk checklists are useful aids to ensure that risks identified on previous projects are not overlooked
- **Risk prompt lists** These are publicly available lists that categorize risks into types or areas and are normally relevant to a wide range of projects. Risk prompt lists are useful aids to help stimulate thinking about sources of risk in the widest context
- **Brainstorming** This enables group thinking, which can be more productive than individual thinking. However, it is important to avoid criticism during the brainstorm as this can stop people contributing. In addition to identifying risks, brainstorming can also be used to understand the stakeholders' views of the risks identified
- **Risk breakdown structure** This is a hierarchical decomposition of the project environment assembled to illustrate potential sources of risk. Each descending level represents an increasingly detailed definition of sources of risk to the project. The structure acts as a prompt and an aid to support the project management team in thinking through the potential sources of risk to the objectives. There are numerous ways to break down risk and it may be useful to do more than one list. For example, a risk breakdown structure could be broken down by PESTLE (political, economical, sociological, technological, legal/legislative, environmental), product breakdown structure, stage, benefits/objectives etc. Figure 8.3 shows a risk breakdown structure relating to financial risk. These structures will help to identify appropriate risk owners to develop responses.

Identify risks

The primary goal of the 'Identify risks' step is to recognize the threats and opportunities that may affect the project's objectives.

PRINCE2 recommends the following actions:

- Capture identified threats and opportunities in the Risk Register
- Prepare early warning indicators to monitor critical aspects of the project and provide information on the potential sources of risk
- Understand the stakeholders' view of the specific risks captured.

An effective way of identifying risks is to use a risk workshop. This is a group session designed to identify threats and opportunities. The session should be facilitated by someone who is able to use a range of identification techniques, such as those listed in the boxed example. Workshops should lead to the identification of a broad range of risks and possible risk owners.

An important aspect of identifying risks is being able to provide a clear and unambiguous expression of each one. A useful way of expressing risk is to consider the following aspects of each risk:

- **Risk cause** This should describe the source of the risk, i.e. the event or situation that gives rise to the risk. These are often referred to as risk drivers. They are not risks in themselves, but the potential trigger points for risk. These may be either internal or external to the project
- **Risk event** This should describe the area of uncertainty in terms of the threat or the opportunity
- **Risk effect** This should describe the impact(s) that the risk would have on the project objectives should the risk materialize.

The cause, event and effect relationship is shown in Figure 8.4.

The cause, event and effect relationship could also be expressed in a sentence, for example:

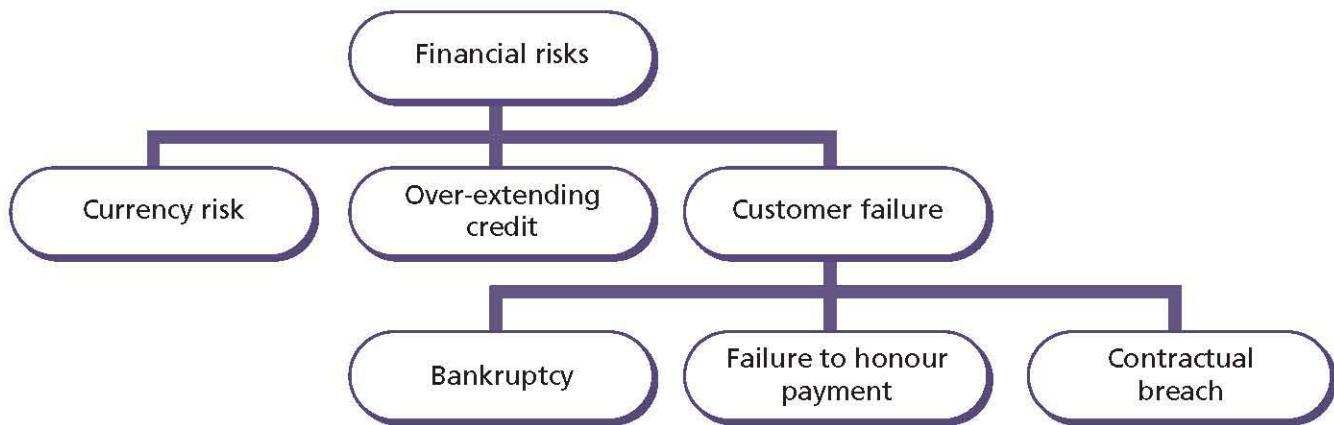


Figure 8.3 Example of a risk breakdown structure

- **Threat** Because it has been raining heavily (risk cause), there is a threat that the river flowing through the farmer's field might overflow (risk event), which would severely damage the farmer's crop (risk effect)
- **Opportunity** Because the weather has been particularly mild this winter (risk cause), there is an opportunity that fewer people will be hospitalized with influenza (risk event), which will mean that there will be less disruption to planned routine operations (risk effect).

8.3.5.2 Assess

Estimate

The primary goal of the 'Estimate' step is to assess the threats and the opportunities to the project in terms of their probability and impact. The risk proximity will also be of interest to gauge how quickly the risk is likely to materialize if no action were taken.

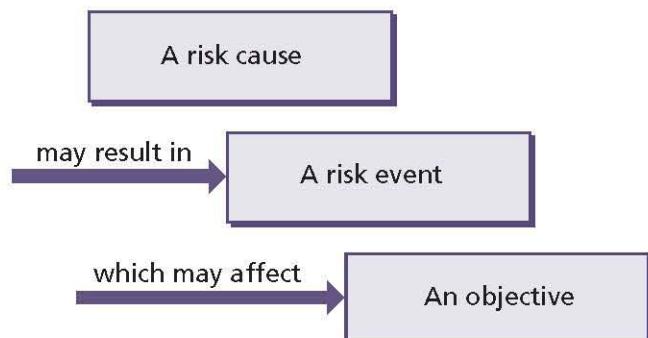


Figure 8.4 Risk cause, event and effect

Risk estimation techniques

Risks can be estimated using a number of techniques, such as:

- **Probability trees** These are graphical representations of possible events resulting from given circumstances. A probability tree can be used to predict an outcome in a qualitative way when historical data is used to populate the likelihood of each circumstance happening. Probability trees assist in communicating to project participants or decision makers the likelihood of the different possible outcomes to a set of circumstances
- **Expected value** This technique quantifies risk by combining the cost of the risk impact with the probability of the risk occurring. Expected value is useful when a tangible measure of risk is required to enable risks to be prioritized. For example, if the cost of a risk was £160,000 and its likelihood of occurrence was estimated at 25%, then the expected value would be £40,000
- **Pareto analysis** This technique ranks or orders risks once they have been assessed to determine the order in which they should be addressed. Pareto analysis can be used to focus management effort on those risks that have the potential to have the greatest impact on the project objectives
- **Probability impact grid** This grid contains ranking values that may be used to rank threats and opportunities qualitatively. The probability scales are measures of probability derived from percentages, and the impact scales are selected to reflect the level of

impact on project objectives. The values within the grid cells are the combination of a particular probability and impact, and are determined by multiplying the probability by the impact. A probability impact grid can be used to provide an assessment of the severity of a risk and enable risks to be ranked so that management time and effort can be prioritized. For example, the Project Board may set their risk tolerance at any risk with a value of greater than 0.18, and they may require a proactive response for any risk with a value of greater than 0.045, as depicted by the dark shading shown in Figure 8.5.

PRINCE2 recommends that the following is understood:

- The probability of the threats and opportunities in terms of how likely they are to occur
- The impact of each threat and opportunity in terms of the project objectives. For example, if the objectives are measured in time and cost, the impact should also be measured in units of time and cost
- The proximity of these threats and opportunities with regard to when they might materialize
- How the impact of the threats and opportunities may change over the life of the project.

A useful way of summarizing the set of risks and their estimations is to plot them onto a summary risk profile, an example of which is shown in Figure 8.6. This profile represents a situation at a specific point in time, i.e. a snapshot of the risk environment. The numbered markers in the matrix represent unique risk identifiers used in the Risk Register on which this is based. The risks above and to the right of the dotted risk tolerance line represent those that the organization will not tolerate except under special circumstances. In the depicted case, the Project Manager would refer risks 1, 3 and 4 to the Project Board.

The summary risk profile can also be used to show trends. For example, risk 6 may have previously been recorded as 'low probability, high impact', indicating that its likelihood of occurring is increasing.

Evaluate

The primary goal of the 'Evaluate' step is to assess the net effect of all the identified threats and opportunities on a project when aggregated together. This will enable an assessment to be made of the overall severity of the risks facing the project, to determine whether this level of risk is within the risk tolerance set by the Project Board and whether the project has continued business justification.

Risk evaluation techniques

Risks can be evaluated by using techniques such as:

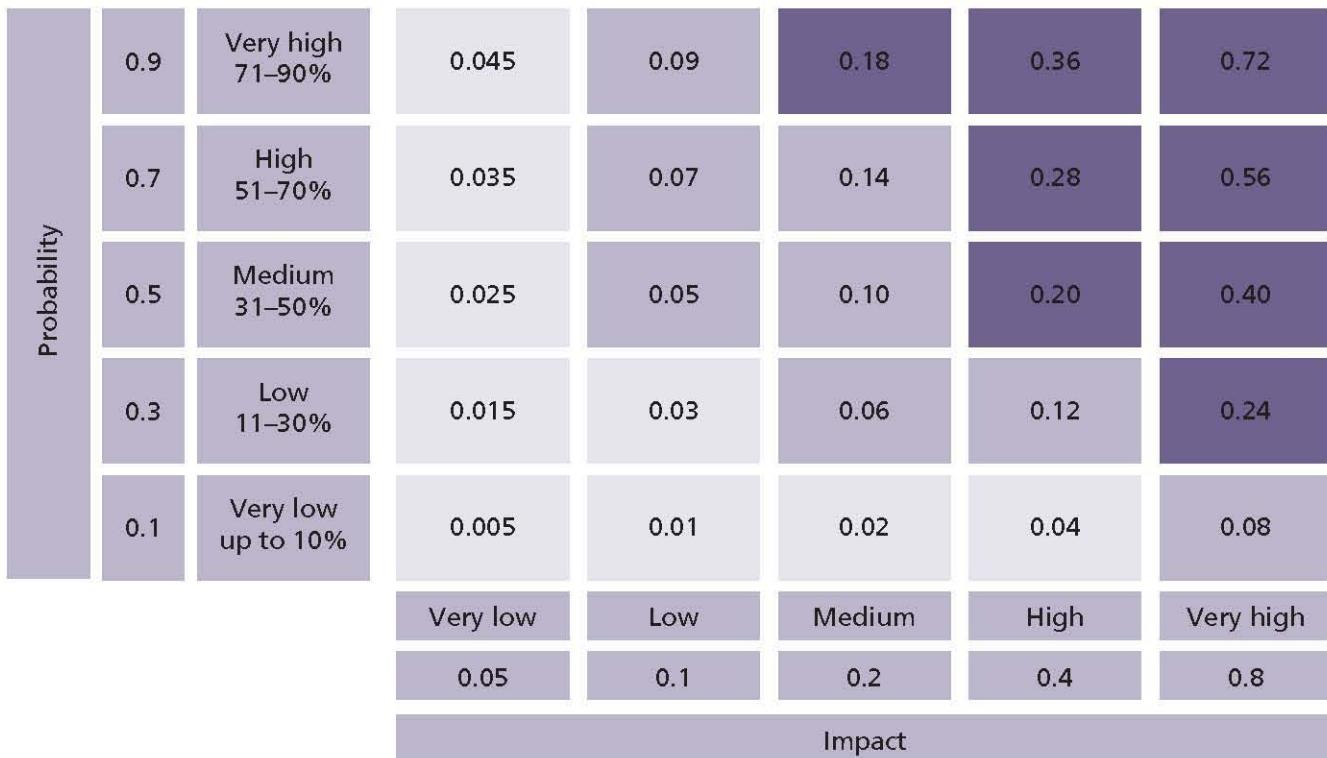
- **Risk models** Take, for example, the Monte Carlo analysis. This model enables simulation of 'what if' scenarios using random numbers to determine whether each risk within a given range occurs or not. The simulations are repeatedly run to predict the 'average' level of risk to the project's time or cost. The scenarios can also be used to model extreme cases (e.g. if nearly all the risks occur)
- **Expected monetary value** This technique takes the expected values of a number of risks and sums them to arrive at an overall value. It provides a quick and easy assessment of a group of risks to understand their combined effect. An example is shown in Table 8.1.

Table 8.1 Example of the expected monetary value technique

Risk ID	Likelihood (%)	Impact (£)	Expected value (£)
1	60	20,000	12,000
2	30	13,000	3,900
3	10	4,000	400
4	5	10,000	500
Expected monetary value			16,800

8.3.5.3 Plan

The primary goal of the 'Plan' step is to prepare specific management responses to the threats and opportunities identified, ideally to remove or reduce the threats and to maximize the opportunities. Attention to the Plan step ensures as far as possible that the project is not taken by surprise if a risk materializes.

**Figure 8.5 Probability impact grid**

The Plan step involves identifying and evaluating a range of options for responding to threats and opportunities. It is important that the risk response is proportional to the risk and that it offers value for money. A key factor in the selection of responses will be balancing the cost of implementing the responses against the probability and impact of allowing the risk to occur. Any chosen responses should be built into the appropriate level of plan, with a provision made for any fallback plans.

Very high				① ③	
High	②				④
Medium		⑧		⑥	
Low		⑩		⑦	
Very low	⑨		②		⑤
Prob. Impact	Very low	Low	Medium	High	Very high

----- Risk tolerance line

Figure 8.6 Summary risk profile

The various types of response for threats and opportunities are summarized in Figure 8.7.

The types of response are explained further in Table 8.2.

Risk responses do not necessarily remove the inherent risk in its entirety, leaving residual risk. If the inherent risk was significant and the risk response was only partially successful, the residual risk can be considerable. It may be appropriate to select more than one risk response.

In some cases, implementing a risk response will reduce or remove other related risks. It is also possible that the responses to risks, once implemented, will change some aspect of the project. This in turn may lead to secondary risks, i.e. risks that may occur as a result of invoking a risk response. It is essential that these are identified, assessed and controlled in the same way as the inherent risk.

It is advisable to review lessons from previous similar projects when planning risk responses. This will help in identifying the range of responses available and in evaluating how effective they are likely to be.

Threat responses	Opportunity responses
Avoid	Exploit
Reduce (probability and/or impact)	
Fallback (reduces impact only)	Enhance
Transfer (reduces impact only, and often only the financial impact)	
Share	
Accept	Reject

Figure 8.7 Threat and opportunity responses

Consideration should also be given to the effect the possible responses could have on:

- The Project Plan, Stage Plan and Work Packages
- The Business Case
- Corporate and/or programme management.

8.3.5.4 Implement

The primary goal of the 'Implement' step is to ensure that the planned risk responses are actioned, their effectiveness monitored, and corrective action taken where responses do not match expectations.

An important part of the Implement step is to ensure that there are clear roles and responsibilities allocated to support the Project Manager in the management of project risks. The main roles in this respect are:

- **Risk owner** A named individual who is responsible for the management, monitoring and control of all aspects of a particular risk assigned to them, including the implementation of the selected responses to address the threats or to maximize the opportunities

- **Risk actionee** An individual assigned to carry out a risk response action or actions to respond to a particular risk or set of risks. They support and take direction from the risk owner.

Example of a risk owner and risk actionee

There is a risk that a key supplier may go bankrupt. The commercial director has been appointed as the risk owner. A number of risk responses have been identified and selected. One of the risk responses (fallback) is to identify possible alternative suppliers who have the capacity to undertake the affected Work Packages at short notice, and to obtain some quotes from them. The Procurement Manager is the risk actionee for this particular risk response.

In many cases, the risk owner and risk actionee are likely to be the same person. The risk owner should be the person most capable of managing the risk. Allocating too many risks to any one individual should be avoided.

Table 8.2 Risk responses

Response	Definition	Example
Avoid (threat)	Typically involves changing some aspect of the project, i.e. the scope, procurement route, supplier or sequence of activities, so that the threat either can no longer have an impact or can no longer happen.	A critical meeting could be threatened by air travel disruption so the project chooses to hold the meeting by conference call instead.
Reduce (threat)	Proactive actions taken to: <ul style="list-style-type: none"> ■ Reduce the probability of the event occurring, by performing some form of control ■ Reduce the impact of the event should it occur. 	To reduce the likelihood of users not using a product, the number of training events is increased. To reduce the timescale impact should a prototype be damaged in transit, two prototypes are built.
Fallback (threat)	Putting in place a fallback plan for the actions that will be taken to reduce the impact of the threat should the risk occur. This is a reactive form of the 'reduce' response which has no impact on likelihood.	The company's test facility is only available for two weeks in August. To reduce the impact should the product not be available in time, there is a fallback plan to hire an alternate test facility (at a greater expense).
Transfer (threat)	A third party takes on responsibility for some of the financial impact of the threat. (For example, through insurance or by means of appropriate clauses in a contract.) This is a form of the 'reduce' response which only reduces the financial impact of the threat.	To reduce the financial impact should a prototype be damaged in transit, it is insured. To reduce the financial impact if a product is not available to launch in time for a trade show, the contract with the supplier includes liquidated damage clauses for any delays.
Accept (threat)	A conscious and deliberate decision is taken to retain the threat, having discerned that it is more economical to do so than to attempt a threat response action. The threat should continue to be monitored to ensure that it remains tolerable.	There is a threat that a competitor may launch a rival product first, thus affecting the expected market share for the product. The choice is to accelerate the project by increasing the resources, to reduce the product's scope so that it can be finished earlier, or to do nothing. Accelerating the project may lead to product quality issues; reducing the scope may make the product less appealing; so the risk is accepted and the 'do nothing' option is chosen.
Share (threat or opportunity)	Modern procurement methods commonly entail a form of risk sharing through the application of a pain/gain formula: both parties share the gain (within pre-agreed limits) if the cost is less than the cost plan; and share the pain (again within pre-agreed limits) if the cost plan is exceeded. Several industries include risk-sharing principles within their contracts with third parties.	The cost of the project could be adversely affected due to fluctuations in the cost of oil. The customer and supplier agree to share the cost of price increases or the savings from price reductions equally from a midpoint fixed at the time of agreeing the contract.
Exploit (opportunity)	Seizing an opportunity to ensure that the opportunity will happen and that the impact will be realized.	There is a risk that the project will be delayed. If it is delayed, a later version of software could be implemented instead which would reduce ongoing maintenance. The Project Board agree to change the project timescale and scope, enabling the later version of the software to be bought and implemented.

Enhance (opportunity)	<p>Proactive actions taken to:</p> <ul style="list-style-type: none"> ■ Enhance the probability of the event occurring ■ Enhance the impact of the event should it occur. 	<p>It is possible that the product completes user acceptance testing in a single test cycle, rather than the scheduled two, enabling it to be delivered early and prior to a competitor's rival product. The Project Board decide to hold a test rehearsal to increase the likelihood that the product will pass its first user acceptance tests, and prepare for the option of an earlier launch date.</p>
Reject (opportunity)	<p>A conscious and deliberate decision is taken not to exploit or enhance the opportunity, having discerned that it is more economical not to attempt an opportunity response action. The opportunity should continue to be monitored.</p>	<p>It is possible that the product completes user acceptance testing in a single test cycle, rather than the scheduled two, enabling it to be delivered early and prior to a competitor's rival product. The Project Board decide not to take advantage of an early release and to stick with the planned launch date.</p>

8.3.5.5 Communicate

Communication is a step that is carried out continually. The 'Communicate' step should ensure that information related to the threats and opportunities faced by the project is communicated both within the project and externally to stakeholders. Risks are communicated as part of the following management products:

- Checkpoint Reports
- Highlight Reports
- End Stage Reports
- End Project Reports
- Lessons Reports.

Care should be taken in using these reports to communicate risks with external stakeholders and reference should be made to the Communication Management Strategy for the most appropriate method.

There are numerous other communication methods, such as bulletins, notice boards, dashboards, discussion threads, briefings etc., that could be considered alongside the PRINCE2 management products.

A number of aspects of communication should be recognized and addressed if risk management is to be effective:

- A project's exposure to risk is never static: effective communication is key to the identification of new risks or changes in existing risks. This depends on the maintenance of a good communications network, including relevant contacts and sources of information, to facilitate the identification of changes that may affect the project's overall risk exposure
- Effective risk management is dependent on participation and, in turn, participation is dependent on effective communication.

8.3.6 Risk budget

A risk budget, if used, is a sum of money included within the project budget and set aside to fund specific management responses to the project's threats and opportunities (for example, to cover the costs of any fallback plans should they need to be implemented).

In order to arrive at a risk budget for the project, a financial approach to risk management is needed. Each risk must be fully analysed for the impact costs, response costs and likelihood. The aggregation of the costs (for responses and impact) weighted by each risk's probability generates the expected monetary value for the set of risks. The expected monetary value can be used to determine a risk budget. The assumption is that the risk budget is expected to be used over the course of the project. Care needs to be taken that the aggregation of the factored costs is not skewed by a small number of large risks. This is where analytical techniques, such as Monte Carlo analysis and associated software tools, can help.

As the risk budget is part of the project budget, there may be a tendency to treat it as just another sum of money that the Project Manager can spend. This culture should be discouraged in favour of the Risk Management Strategy defining the mechanisms for control of, and access to, this budget. As the project progresses, some of the risks previously identified will occur and others will not. New risks may be identified during the life of the project whose response costs will not have been included within the risk budget. It is always prudent to set the risk budget to cover the known risks (as identified) and to make a provision for unknown risks (yet to be identified).

8.4 RESPONSIBILITIES

Table 8.3 outlines the responsibilities relevant to the Risk theme. Refer to Appendix C for further details of project management team roles and their associated responsibilities.

Table 8.3 Responsibilities relevant to the Risk theme

Role	Responsibilities
Corporate or programme management	Provide the corporate risk management policy and risk management process guide (or similar documents).
Executive	Be accountable for all aspects of risk management and, in particular, ensure a project Risk Management Strategy exists. Ensure that risks associated with the Business Case are identified, assessed and controlled. Escalate risks to corporate or programme management as necessary.
Senior User	Ensure that risks to the users are identified, assessed and controlled (such as the impact on benefits, operational use and maintenance).
Senior Supplier	Ensure that risks relating to the supplier aspects are identified, assessed and controlled (such as the creation of the project's products).
Project Manager	Create the Risk Management Strategy. Create and maintain the Risk Register. Ensure that project risks are being identified, assessed and controlled throughout the project lifecycle.
Team Manager	Participate in the identification, assessment and control of risks.
Project Assurance	Review risk management practices to ensure that they are performed in line with the project's Risk Management Strategy.
Project Support	Assist the Project Manager in maintaining the project's Risk Register.

9 Change

9.1 PURPOSE

The purpose of the Change theme is to identify, assess and control any potential and approved changes to the baseline.

Change is inevitable during the life of a project, and every project needs a systematic approach to the identification, assessment and control of issues that may result in change.

As changes may arise from project team members, stakeholder requests, complaints or a wide range of other factors, PRINCE2 provides a common approach to issue and change control.

PRINCE2 provides both a systematic and common approach, which ensures that issues possibly affecting the project's performance targets (time, cost, quality, scope, risk and benefits) are appropriately managed.

Issue and change control is a continual activity, performed throughout the life of the project. Without an ongoing and effective issue and change control procedure, a project will either become totally unresponsive to its stakeholders or quickly drift out of control.

The aim of issue and change control procedures is not to prevent changes; it is to ensure that every change is agreed by the relevant authority before it takes place. Change can only be considered in relation to an established status quo, i.e. a baseline. Therefore, a prerequisite of effective issue and change control is the establishment of an appropriate configuration management system which records baselines for the project's products and ensures that the correct versions are delivered to the customer.

9.2 CHANGE DEFINED

9.2.1 Issue and change control

Issue and change control procedures ensure that all issues and changes which may affect the project's agreed baselines are identified, assessed and either approved, rejected or deferred.

9.2.2 Configuration management

Configuration management is the technical and administrative activity concerned with the creation, maintenance and controlled change of configuration throughout the life of a product (or item).

A configuration item is an entity that is subject to configuration management. The entity may be a component of a product, a product or a set of products that form a release. For example:

- A component of a product: an electronic motor that is part of a piece of machinery
- A product: a piece of machinery
- A release: a piece of machinery, the refitted machine room, training materials, and the necessary health and safety certificates.

A release is a complete and consistent set of products that are managed, tested and deployed as a single entity to be handed over to the user(s).

Issue and change control procedures need to be integrated with the configuration management system used by the project.

9.2.3 Issues

PRINCE2 uses the term 'issue' to cover any relevant event that has happened, was not planned, and requires management action. It can be a concern, query, request for change, suggestion or off-specification raised during a project. Project issues can be about anything to do with the project.

9.2.4 Types of issue

Issues may be raised at any time during the project, by anyone with an interest in the project or its outcome.

Table 9.1 provides a summary of the different types of issue that need to be dealt with during a project.

Table 9.1 Types of issue

Types of issue	Definition	Examples
Request for change	A proposal for a change to a baseline.	The Senior User would like to increase the capacity of a product from 100 to 150 users.
Off-specification	Something that should be provided by the project, but currently is not (or is forecast not to be) provided. This might be a missing product or a product not meeting its specification.	Advice from a supplier that they can no longer deliver one of the products specified by the customer.
Problem/concern	Any other issue that the Project Manager needs to resolve or escalate.	Advice from a Team Manager that a team member has been taken ill and as a result the target end date for a Work Package will slip by a week.
		Notification that one of the suppliers has gone bankrupt, resulting in the need to identify and engage a new supplier.

9.3 THE PRINCE2 APPROACH TO CHANGE

9.3.1 Establish controls

The project's controls for issues, changes and configuration management will be defined and established by the Initiating a Project process and then reviewed and (if necessary) updated towards the end of each management stage by the Managing a Stage Boundary process. The following management products are used to establish and maintain the project's controls for issues, changes and configuration management:

- Configuration Management Strategy
- Configuration Item Records
- Product Status Accounts
- Daily Log
- Issue Register
- Issue Reports.

The importance and use of each of these management products are described in sections 9.3.1.1–9.3.1.6.

9.3.1.1 Configuration Management Strategy

Effective issue and change control is only possible if it is supported by a configuration management system that facilitates impact assessments (relationships between products) and maintains product baselines (the basis from which the entity will change).

The starting point for all projects will be to identify whether there are any corporate or programme policies and processes that need to be applied,

and incorporate them into the project's own Configuration Management Strategy. The project's Configuration Management Strategy should define:

- The configuration management procedure (e.g. planning, identification, control, status accounting, verification and audit)
- The issue and change control procedure (e.g. capturing, examining, proposing, decision making, implementing)
- The tools and techniques that will be used
- The records that will be kept
- How the performances of the procedures will be reported
- Timing of configuration management and issue and change control activities
- The roles and responsibilities for configuration management and issue and change control activities (including whether any corporate or programme management roles are to be involved).

The Configuration Management Strategy should define the way issues are handled. During the initiation stage, the Project Manager and Project Board need to agree:

- The scale for prioritizing issues
- The scale for rating the severity of issues
- What severity of issues can be handled at what management level.

Example of priority and severity

There are numerous ways to prioritize issues, one of which is called MoSCoW where (for requests for change) the issue is rated as either:

- **Must have** The change is essential for the viability of the project
- **Should have** The change is important and its absence weakens the Business Case
- **Could have** The change is useful but its absence does not weaken the Business Case
- **Won't have (for now)** The change is not essential nor important and can wait.

There are numerous ways to rate the severity of issues, such as numeric (e.g. 1–4) or descriptive (e.g. minor, significant, major, critical). The Project Manager and Project Board might agree that minor issues can be dealt with by the Project Manager, and significant issues by a Change Authority, but that major issues need to be escalated to the Project Board, and critical issues to corporate or programme management.

When deciding what severity of issues can be dealt with by what level of management, the Project Board may consider delegating some decision making for accepting/rejecting requests for change or off-specifications to a Change Authority and whether to provide a budget to pay for changes:

- **Change Authority** It is the Project Board's responsibility to review and approve requests for change and off-specifications. In a project where few changes are envisaged, it may be reasonable to leave this authority in the hands of the Project Board. But for projects where there are likely to be lots of changes, the Project Board may choose to delegate some decisions to a person or group, called the Change Authority. The Project Manager and/or the people with delegated Project Assurance responsibilities may act as the Change Authority. It may be appropriate, for example, to make the Project Manager the Change Authority for Work Packages so that any changes that are within the delegated authority limits can be made without referral to the Project Board for approval
- **Change budget** This is a sum of money that the customer and supplier agree will be used to fund the cost of requests for change, and

possibly also their analysis costs. Unless the anticipated level of change on a project is low, it is advisable for a budget to be set up to pay for changes. This arrangement can reduce the number of trivial exceptions arising in projects where the frequency of requests for change is forecast to be high. Including a change budget provides for a more realistic expectation of the overall costs/timeframe of the project. Where a change budget is given to a Change Authority, the Project Board may wish to put a limit on (a) the cost of any single change, and (b) the amount spent on change in any one stage without reference to the Project Board. The change control procedure would then be defined in such a way as to control access to the change budget. If used, the change control budget is documented in the relevant plan.

See Appendix A for a Product Description of a Configuration Management Strategy.

9.3.1.2 Configuration Item Records

The purpose of the Configuration Item Records is to provide a set of records that describe information such as the status, version and variant of each configuration item and any details of important relationships between the items.

See Appendix A for the Product Description of the Configuration Item Records.

9.3.1.3 Product Status Account

The purpose of the Product Status Account is to provide information about the state of the products within defined limits. The limits can vary. For example, the report could cover the entire project, a particular stage, a particular area of the project or even the history of a single product. It is particularly useful if the Project Manager wishes to confirm the version numbers of products.

See Appendix A for the Product Description of a Product Status Account.

9.3.1.4 Daily Log

A Daily Log is used to record problems/concerns that can be handled by the Project Manager informally. Issues initially captured on the Daily Log may later be transferred to the Issue Register if, after examining them, it is decided they need to be treated more formally.

The Daily Log can also be used to record required actions or significant events not caught by other PRINCE2 registers and logs. It acts as the project diary.

See Appendix A for the Product Description of a Daily Log.

9.3.1.5 Issue Register

The purpose of the Issue Register is to capture and maintain information on all of the issues that are being managed formally. The Issue Register should be monitored by the Project Manager on a regular basis.

See Appendix A for the Product Description of an Issue Register.

9.3.1.6 Issue Report

An Issue Report is a report containing the description, impact assessment and recommendations for a request for change, off-specification or a problem/concern. It is only created for those issues that need to be handled formally.

9.3.2 Configuration management procedure

Configuration management procedures can vary, but they typically comprise five core activities:

- **Planning** Deciding what level of configuration management will be required by the project and planning how this level is to be achieved. The level of control required will vary from project to project. The maximum level of control possible is determined by breaking down the project's products until the level is reached at which a component can be independently installed, replaced or modified. However, the level of control exercised will be influenced by the importance of the project and the complexity of the relationship between its products
- **Identification** Specifying and identifying all components of the project's products (known as configuration items) at the required level of control. A coding system should be established, enabling a unique identifier for each configuration item to be allocated and various attributes of the product recorded
- **Control** The ability to approve and baseline products and to make changes only with the

agreement of appropriate authorities. Once a product has been approved, the motto is 'Nothing moves and nothing changes without authorization'. A baseline is a reference level against which an entity is monitored and controlled. In configuration management terms, it is a snapshot of a release, product and any component products, frozen at a point of time for a particular purpose. This purpose may be when a product is ready to be reviewed or when it has been approved. If the product that has been baselined is to be changed, a new version is created to accommodate the change, and the baseline version is kept unchanged. Old baseline versions should be archived where possible, not discarded. Configuration control also includes: the storing and retrieving of all information relevant to the management of the project; ensuring the safety and security of configuration items and controlling who has access to them; distribution of copies of all configuration items; and the archiving of all documentation produced during the project lifecycle. Both management and specialist products are subject to configuration control.

- **Status accounting** The reporting of all current and historical data concerning each product in the form of a Product Status Account. The Project Manager may call for a Product Status Account towards the end of a stage, at the end of the project, or as part of examining issues and risks
- **Verification and audit** A series of reviews and configuration audits to compare the actual status of all products against the authorized state of products as registered in the Configuration Item Records, looking for any discrepancies. These reviews and audits also check that the configuration management procedure is being undertaken in accordance with the Configuration Management Strategy. The reviews are typically undertaken at the end of each stage and at the end of the project.

9.3.3 Issue and change control procedure

PRINCE2 provides a common approach to dealing with requests for change, off-specifications and problems/concerns, as shown in Figure 9.1.