
ASPERA

Project Management

Framework

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1 Overview

1.1 Introduction

This document is intended as a reference for anyone involved in the commissioning, development, delivery and monitoring of an Astroparticle Physics project. This could include funding agencies and scientific collaborations. However while the document has been written with scientific projects in mind, the principles are not specific to scientific projects and are applicable to projects in general.

The purpose is not to provide a comprehensive guide to project management but to set out core project management policies and principles together with useful techniques.

This Framework is based on the methodology set out in the Association of Project Management Body Of Knowledge (BoK). It also takes into account, and is compatible with, other recognised standards such as

- ISO9001-2008: Quality Management Systems
- PRINCE 2
- In the UK, BS6079 (Guidance on the planning and execution of projects and the application of project management techniques)

Inevitably there will be differences in detail and terminology between this Framework and these standards, but the underlying principles remain the same.

1.2 What is a project



A project is defined under BS6079 as:

“A unique set of co-ordinated activities, with definite starting and finishing points, undertaken by an individual or organisation to meet specific objectives within defined schedule, cost and performance parameters.”

If a piece of work conforms to this definition, and can benefit from the use of project management tools and techniques, then it should be treated as a project.

A piece of work is not a project if it consists of carrying out a well established set of tasks, in an environment that is well understood and stable, with personnel who are trained and experienced in those tasks; this is a routine process although many of the techniques described here will still be relevant.

1.3 15 Key Principles for Project Success

1	<p>Successful projects utilise a proven project life cycle model. We know what works - stick to it and ensure that best practice is implemented at the appropriate stages.</p>	<p>“Planning is an unnatural process – it’s much more fun to get on with it. The real benefit of not planning is that failure comes as a complete surprise and is not preceded by months of worry” Sir John Harvey-Jones</p>
2	<p>Insist upon a well defined <i>Project Specification</i> that has Customer approval and sign-off. Thorough analysis and documentation of the need for project deliverables is essential. When a project results in deliverables that are designed to meet a thoroughly documented need, then there is a greater likelihood of project success.</p>	
3	<p>Fight for the time to do things right. “We always have the time to do the project over; but not the time to do it right in the first place!” Project Managers must demonstrate to sponsors and senior managers why it’s necessary to make this time available in the pursuit of quality deliverables.</p>	
4	<p>Planning is everything – and ongoing. Detailed, systematic and team-involved plans that can be easily changed to reflect the inevitable changes.</p>	
5	<p>Project Risk must be assessed, reviewed and actively managed throughout the project life cycle. All projects should be assessed for technical and financial risk, with contingency plans developed for the more significant risks.</p>	
6	<p>Project Managers must focus on the three measures of project management success:</p> <p>Remember that these are interdependent and that the correct balance between them must be established at the outset and maintained on an ongoing basis.</p>	
7	<p>Project Managers must transmit a sense of urgency to their team members. Projects will have limited time, money and other resources available, and team members will have other priorities – keep the project moving.</p>	
8	<p>Acquire the best people available, for the project in hand, and look after them. Protect them from outside interruptions, and help them acquire the tools and working conditions to apply their talents.</p>	
9	<p>Make use of Post Implementation Reviews from previous projects. Learn from the past.</p>	
10	<p>Utilise trend and forecasting techniques. Understand exactly where you are, where you are to end up, where you should be and what you need to do to get you back on track.</p>	
11	<p>Manage the inevitable changes. Formal change control procedures are a must. Evaluate all potential changes but implement only those that are beneficial.</p>	
12	<p>Deliverables must evolve gradually. Build a little at a time, obtain incremental reviews and approvals, and maintain a controlled evolution.</p>	
13	<p>Projects must obtain clear Customer approvals and formal sign-off. Anyone who has the power to reject or to demand revision of deliverables after they are complete must be required to examine and approve them.</p>	
14	<p>Customers must be active – not merely passive - participants. Customers should help define deliverables in the early stages, and complete reviews of interim and final deliverables in a timely fashion.</p>	
15	<p>Senior management must actively set priorities. This helps provide the leadership necessary to reduce the frequency of scarce resource induced multi-project log-jams.</p>	

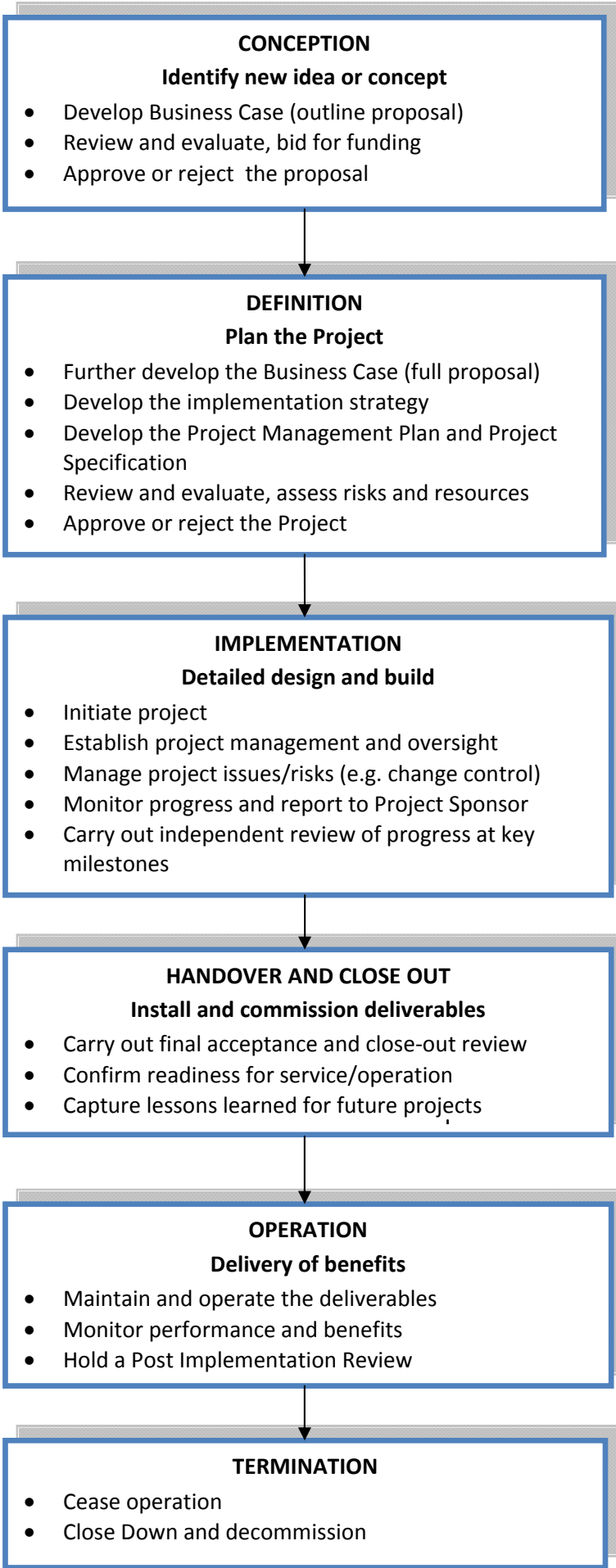
2 Project Lifecycle

This Framework covers the core project lifecycle from its conception through to handover of the specific output to the customer or project sponsor. This normally consists of the design, build and installation/ commissioning of new (or upgrades to) science instruments and facilities, and also includes R&D activities (e.g. design studies, prototyping). The completion of a project will normally be defined by a specific deliverable, for example a new detector.

In order to progress through each phase, a project has to pass key decision points or approvals. Project phases may be defined in different ways dependent on the industry standard for that sector, but the key steps and decision points are the same. These phases, and the associated steps and decision points, are described in the following sections.

A typical project lifecycle is illustrated on the following page.

Project Phase



2.1 Description

All projects are divided into four lifecycle phases: Conception, Definition, Implementation, and Handover and Close Out. There is an additional phase, Operation and Termination, when ongoing support is required. The Operation phase might have a separate funding and management mechanism.

2.2 Conception

The aim of the Conception phase is to manage new opportunities and to select the appropriate opportunities to go forward as formal Projects.

The key document in this phase is the Business Case which spells out why the work is being done, the likely costs, and the potential benefits and risks. If the Business Case is approved, and the funding is in place, the project moves to the Definition Phase.

If approval of the Business Case results in the submission of a bid then the project remains in Conception until the outcome of the bid is known. If the funding offered differs significantly from the bid then a rescope of the project and a further review is required before the project moves to the Definition phase.

2.3 Definition

A key aim of the Definition Phase is to fully develop the Business Case, including an agreed Project Management Plan, and if required, a Project Specification. Regular monitoring of progress takes place during this phase with the Project Manager reporting to the Project Sponsor.

Exploratory R&D may be included in this phase.

In larger projects this phase can be split into two, the development of the project strategy followed by detailed planning.

The strategy includes the definition of the roles in any collaboration or partnership, and the decision whether to outsource aspects of the project or use in house resources.

The Project Management Plan (PMP) will be produced during this phase and in almost all cases detailed planning and changes to the plan will continue after the implementation process starts. The PMP may be supplemented by other documents including Scientific and/or Technical Cases and a detailed Technical Specification. Some projects require a subset of the PMP, the project Specification, to sign off with the Customer.

This phase will also include tendering exercise where major parts of the project are being outsourced.

This phase ends with formal agreement of the PMP with the Project Sponsor, and, if required, agreement of the PMP or Project Specification with the Customer. In the case of externally funded work the contract with the customer is agreed.

2.4 Implementation

The agreement of the PMP and Project Specification with all the relevant stakeholders initiates the Implementation phase. From this point forward changes to the PMP or Project Specification can only be made by formal agreement. These documents will define the approvals required.

The Project Manager and Project Sponsor should ensure that the appropriate governance arrangements are set up and that the budgets are secured.

A start up meeting at the beginning of this phase should be held between the Project Manager and Project Team to ensure a shared understanding of the project objectives, plans and deliverables, and how the Team will work together.

The work is performed to achieve the agreed project deliverables, and the Project Management Plan is used as a baseline against which project progress and performance may be monitored and controlled. Progress against specification, timescales and costs, and the risk and stakeholder plans are regularly monitored and progress reports are produced. Technical and management reviews are held at times defined in the Project Management Plan. Any changes to plans or specifications are made in a controlled way. A detailed final review is always undertaken before the production of the final deliverables.

Delivery to the Customer, including any installation, marks the end of this phase.

2.5 Handover and Close Out

Project Handover and Close-Out is normally the final phase of the project. During this phase the project deliverables are commissioned and handed over to the customer.

Commissioning is normally the first stage in the Handover phase. A commissioning programme will define acceptance criteria and include training and the finalisation of operating documentation for the deliverable. Final acceptance by the customer will normally follow the successful completion of commissioning of the project.

Close Out should be considered as the 'technical' completion of the project and will be undertaken by the Project Manager after commissioning to check that all aspects of the project have been completed, and to ensure the orderly close-down the project.

The whole project has been about achieving defined goals, aiming towards a specific target and meeting stated success factors. The Project Manager needs to keep the team focused until the clearly defined point when the project is declared complete.

The Close Out Review is to check that all aspects of the project have been completed. The Project Sponsor and/or Customer must ensure that the project meets their needs and that issues are resolved before signing off the review report.

A Post Implementation Review is normally held sometime after the Close Out Review when there has been the opportunity to evaluate the performance of the deliverables in service. The PIR differs from Close Out in that it concentrates on the success of the deliverables, the benefits achieved, and effectiveness of the management of the project rather than technical completion.

The purpose of the PIR is to:

- Confirm that the deliverables are performing as expected and that the expected benefits are being realised
- Evaluate the Economic Impact and identify further routes for exploitation
- Enable other Project Managers to learn from the experiences of this project
- Enable the continuous improvement of the Project Management System

2.6 Operation and Termination

This phase includes the ongoing support and maintenance of the project deliverables. Where continued support is being provided as part of the project, a plan for this support will be developed and agreed with the Project Sponsor and/or Customer. The plan will include the processes for regularly reviewing the support, dealing with further orders where applicable, and terminating the project.

Termination concludes the operational life of the project deliverables and completes their disposal.

3 Governance and Oversight

3.1 Principles

This Framework is designed to establish robust monitoring and control measures (in particular cost control) over the project to ensure its delivery to the defined schedule, cost and performance parameters, and provide assurance to management, customers and funding agencies that projects are being well managed. Following this Framework ensures that:

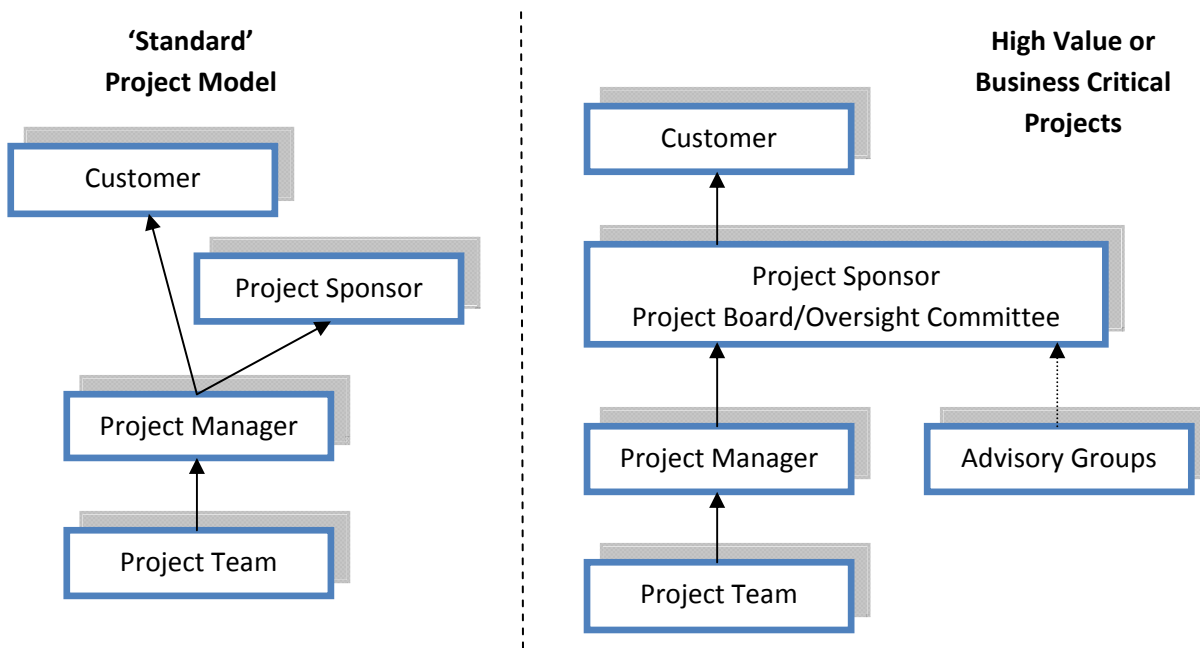
- The project operates a robust project control environment;
- Project issues/risks are mitigated effectively; and
- Senior management are kept aware of progress and performance.

3.2 Project Structures

The simplest projects have a structure where the Project Manager deals directly with the Customer and reports to the Project Sponsor. In some cases the Project Sponsor is the Customer.

More complex projects have a Project Board chaired by the Project Sponsor. The Project Manager reports to the Project Board. The Project Board may set up Advisory Boards where required.

The project structure is determined during the Definition phase and captured in the project management plan (PMP).



3.3 Project Boards

For larger, more complex or business critical projects an oversight body, independent of the project, may be set up by the Project Sponsor to oversee progress and performance and provide expert advice on cost, schedule and scope issues. Oversight bodies normally take one of two forms:

- Project Boards, which are responsible for overseeing the delivery of the project, performing both an oversight and top-level management function.
- Oversight Committees, which provide independent scientific, technical and management advice, reporting to the Project Sponsor responsible for overseeing the delivery of the project.

These bodies will normally meet at least every six months, but often more frequently, and will receive a defined suite of information and reports from the Project Manager. The membership should provide the Sponsor with the appropriate technical, financial, and managerial advice. Note that projects will require either a Project Board **or** Oversight Committee **but not both**.

For very large-scale projects the Project Board should have an element of independence from the Department that owns the project. Examples of good practice are:

- Including a representative of the funding body
- Appointing a Board member(s) from a Department or management position that is independent of the project
- Including an independent Project Management specialist.

3.4 Project Monitoring and Reporting

All projects must be regularly reviewed with monitoring of progress against scope, time and cost reported to the Project Sponsor. The scope and frequency of information and reporting requirements will vary depending on the scale and complexity of the project and will be agreed as part of the project's approval. Wherever possible progress reports produced under the internal project management procedures should be tailored to match the project oversight requirements so the process does not become duplicated or onerous. The project reporting format used must enable tracking of performance and cost at completion.

As a minimum, reports should include:

- Progress summary (including the overall status of the project, demonstrating whether it is on track, key successes/problems)
- Financial summary, including latest forecast of future requirements
- Key Milestone /Deliverable Summary (showing baseline, revised and completion dates)
- Issues/Risk Log (not just costed engineering risks)

3.5 Project Review and Escalation

Project Sponsors need to satisfy themselves that the project continues to meet the objectives set out in the Project Management Plan, and the broader programme objectives of the organisation. If this is not the case then the project should be re-planned or terminated.

Problems identified should be investigated, particularly if they will mean a call on the project's working margin or contingency. An appropriate action plan should be put in place to mitigate the problem. The precise arrangements of accessing working margin/contingency must be agreed and defined within the PMP.

The Project Manager can escalate issues or risks if required to the Project Sponsor, through the Project Board where appropriate; for example, where there is a significant change to the cost, scope or schedule.

During the design and implementation phases periodic review points will be established, the frequency of which should be defined in the Project Management Plan. This will include technical design reviews as well as milestone reviews during implementation including final close out prior to handover to the customer.

When serious issues are identified that the project cannot resolve satisfactorily within approval levels these should be investigated (eg by the Project Board/OsC with additional expertise brought in as required) and subject to formal review. The outcome of these reviews will be either:

- De-scope and/or re-schedule
- Release of contingency or re-approval at a higher level
- Phased withdrawal
- Cancellation – e.g. where a project cannot be de-scoped to within original approval limits.

A cancellation review may be triggered by financial or technical factors and any decision will take account of the risk and complexity of the project.

4 Roles and Responsibilities

The ultimate success of the project, delivery to time, cost and specification, relies on the quality of the planning and management, and the people involved. To ensure the best possible chance of success, it is important that everyone knows what they are responsible for and what they should be doing.

Typical project roles are:

- Customer
- Project Sponsor
- Project Manager
- Team Member

4.1 Customer

The customer is the person or organisation to whom the project is being delivered and will benefit from or use the end results. The role of the Customer is:

- Approving the final Project Management Plan or Project Specification in consultation with the Project Manager or Sponsor
- Approving any other documentation as agreed
- Keeping the Project Manager or Sponsor informed of changes, if any, in their requirements
- Taking responsibility for any contribution to the project by the Customer's organisation

The relationship with the customer can vary from the formal, contractual approach with a commercial company, to the completely open and collaborative relationship with an international partner institute or host laboratory. Managing this relationship effectively is an important role for the Customer and Project Manager or Sponsor

4.2 Project Sponsor

The term Project Sponsor is widely used, and is the term used in this Framework, but other names for the role include Senior Responsible Owner (SRO), Project Executive, and Project Director. The Project Sponsor is ultimately accountable for the project. For scientific projects the Project Sponsor may also be the Customer.

For collaborative projects the Project Sponsor role may encompass a group of funding agencies who share accountability and responsibility for the project. For all projects there needs to be a single individual nominated as Project Sponsor who has overall responsibility for the management and delivery of the project. For large projects this could be an international spokesperson for the project or the Chair of the Project Board. The roles of the Sponsor include:

- Chairing the Project Board where applicable
- Providing the senior management ownership of the project
- Ensuring that the project is actively managed and meets its objectives
- Representing the Customer's interests
- Agreeing the Project Management Plan with the Project Manager

4.3 Project Manager

The key role in the project team is that of Project Manager. Their primary responsibility is to deliver the project to specification, in time, and on budget within the constraints and critical success factors in the project specification, strategy, and management plan.

The Project Manager is accountable to the Project Sponsor and their main duties can be summarised as:

- Working with the Project Sponsor and Customer to develop and agree the Project Management Plan and Project Specification
- Ensuring that the project team, both internal and external, is thoroughly familiarised with the contents of the Project Management Plan once full agreement has been reached on its contents
- Ensuring that any changes to the Project Specification, throughout the life of the project, are reviewed and agreed with the Customer or Project Sponsor
- Identifying, and where appropriate agreeing with managers, the correct skills and resources to achieve the objectives
- Establishing detailed budgets, allocating individual responsibilities and defining the budgetary control process
- Acting as a common focal point throughout the project lifecycle from initiation to closure
- Maintaining a proactive management environment within the project team. This means foreseeing problems and taking appropriate and timely pre-emptive action
- Liaising with specialists, suppliers and commercial departments as required
- Monitoring and controlling the physical progress and budget expenditure and reporting to the Project Sponsor and Customer.
- Undertaking reviews as defined in the quality plan.
- Working closely with the Project Sponsor and Customer so that the project objectives are fully satisfied with respect to time, cost, quality and performance
- Ensuring that that comprehensive project Close Out and Post Implementation Reviews are carried out

4.4 Project Team Member

Team members are responsible to the Project Manager. In all projects the team members' duties will include:

- Ensuring that their tasks, work packages or sub-projects, are completed to the agreed specification, time and budget
- Reporting to the Project Manager on the progress and performance of their task
- Escalating issues that are outside their authority to the Project Manager. Escalation points should be determined before the start of the project
- Taking part in reviews as required

5 Documentation

5.1 Essential Documentation

There is a minimum set of documentation that should be created for every project.

A formal Business Case may be required for some projects, particularly those with a high value.

Project planning is a key process that will normally start during the project definition phase and will continue into the implementation phase. All projects require a Project Management Plan (PMP). This document defines what will be delivered, the timescales and the costs, and sets out the structures and mechanisms for managing the project. The PMP is equivalent to the Project Initiation Document (PID) in PRINCE2. The PMP may reference additional documents such as a Risk Management Plan or a Stakeholder Plan. Any requirement for these additional documents is set out in the PMP.

A Project Specification may be required where a more focussed document is required for sign off, for example with an external customer.

Once the PMP, and Project Specification where required, are signed off all changes have to be formally recorded through Change Requests.

The process for monitoring the progress of the project is set out in the PMP and must include some written records, for example regular project reports.

Project Close Out and Post Implementation Reviews must be recorded.

The requirements for these documents are set out in the following sections. Pro formas are available as listed in section 7.

5.2 Business Case

The Business Case defines why the project should be undertaken, what benefits would be derived, and what level of resources is likely to be required. The Business Case should include, but not be restricted to, the following areas:

- Project Overview
 - Context – project type/ source of funding (eg internal/commercial/grant/EU funding); role in any consortium or collaboration; customers
 - Description of the project – summary of objectives, scope, cost and timescales
- Project Definition
 - Objectives
 - Business fit (alignment to strategy, relevance and/or potential impact)
 - Key Stakeholders – including potential customers and/or partners
 - Scope – key deliverables; what is included, and excluded)
 - Resources – Estimated costs (eg staff, equipment, consumables, travel) including working margin, contingency; availability of staff, infrastructure, equipment
 - Schedule - timescales including key milestones
 - Funding/Affordability – expected funding sources, surplus/deficit including the funding of any deficits
 - Inter-dependencies – related projects/previous investment, longer term implications/liabilities (including key decision points for any future investment)
 - Benefits
 - Major Risks
 - Opportunities for Knowledge Exchange or Economic Impact – including confidentiality or IPR issues
- Project Management

- Project Strategy – this section becomes the separate Project Management Plan

The level of detail provided should be appropriate for the size and risk of the project and will be determined by the Project Sponsor /Department being asked to approve the project. The Business Case document will be developed as the project moves from the concept to project definition phase and will be a key input to the Project Management Plan. The use of this document is discussed further in the later sections on project approval.

5.3 The Project Management Plan (PMP)

The PMP sets out the deliverables for the project, the timescales and costs, and the way in which the project will be managed. It is the reference document for managing the project. The PMP is owned by the Project Manager and formally agreed with the Project Sponsor.

The Customer will either sign off the PMP or a subset of the information, a Project Specification, as appropriate.

A well known characteristic of projects is the rapidly increasing cost of making changes as the project progresses. Investment at the beginning of the project in effective planning and careful reviews of the requirements and specifications can be repaid many times over in the life of the project.

The PMP documents or references all of the planning information for the project including:

- A brief description of the project
- Project organisation
- Objectives and Deliverables
- Work Breakdown Structure
- Project schedule, including key review/decision points
- Finance (Cost plan and profile, management of contingency)
- Funding and income profile
- Resources – including staffing, accommodation, equipment
- Procurement Plan
- Risk Management Plan
- Stakeholder Communication Plan
- Monitoring and reporting
- Quality plan including documentation control, change control, and project and technical reviews
- Impact Plan /Benefits realisation
- SHE Plan
- Consideration of diversity issues

The chapter on techniques expands on the requirements in many of these areas.

As with the Business Case, the level of detail required varies from project to project and will be determined by the Project Sponsor in consultation with the Project Manager. In all except the simplest projects separate Risk Management and Stakeholder Management Plans should be produced and referenced from the PMP. Often the description of the objectives and deliverables will be supplemented by a detailed specification. In larger projects some of the other sections will also justify separate documentation.

5.4 Risk Management Plan

A standard, recommended pro forma is available. Other formats may be used but at a minimum should address, for each risk:

- The nature of the risk
- Measures of the likelihood, impact and overall risk
- The mitigating action taken
- The residual risk

The Risk Management Plan must be maintained during the life of the project to take into account new risks and changes to the existing risks.

5.5 Stakeholder Communication Plan

As with the Risk Management Plan, the Stakeholder Plan is a live document that should be updated as the project progresses. The plan should identify each stakeholder and record:

- Their interest in the project
- Their influence
- Proposed actions to address their needs
- Progress against these actions

5.6 Project Change Request

Formal Project Change Requests are essential once the initial PMP is agreed to prevent scope creep and to formally approve any descope, change to timescales, or change to budget.

The document must include:

- A clear description of the change (referencing additional detailed documents if necessary)
- The impact of the change on the specification of the deliverables, the cost, and the timescales
- A record of approval by the Project Manager and Project Sponsor

5.7 Project Progress Report

A pro forma Project Report is provided. If the minutes of meetings or different forms are used to report progress then the following should be covered:

- Project successes, opportunities, failures and threats
- Progress against milestones or plan
- Spend against plan
- Current outturn forecast against budget
- Active risks or issues
- Changes to specification

5.8 Close Out Report

The report from the Close Out Review should include:

- The status of the project: the completeness of the deliverables, any variations against the specification, any requirement for ongoing support
- Further actions required including the date of the Post Implementation Review
- The final milestone summary
- The final financial summary
- Initial comments on the performance of the project

5.9 Post Implementation Review (PIR)

The report from the Post Implementation Review references the Close Out Report and includes:

- The status of the project: the performance of the deliverables and any ongoing support
- Progress against the actions from the Close Out Report
- Benefits realisation
- Feedback and lessons learned

A very important aspect is an objective review of the project and the performance of the organisation. A lot is learned during the lifetime of a project; effort must be made to pass that learning onto other projects and Project Managers.

5.10 Documentation Control

The documentation associated with the project, for example plans and design data, requires formal control. There should be processes for version control, distribution, backing up, archiving and disposal. It is likely that a Department will have such processes in place and these should be followed. Alternatively the control processes should be set out in the PMP Quality Plan.

6 Processes and Techniques

6.1 Project Approval

The project initiation and approval process comprises two key steps and decision points. The concept phase establishes the need for the project and its feasibility. If supported, the project continues to the definition phase where feasibility is fully evaluated and the case for support, and plans necessary to implement the project, developed. If supported at the end of this stage the project proceeds to the implementation phase.

6.2 Project Organisation

An essential requirement in all projects is the appointment of a Project Manager. In many projects it is adequate to define the Project Manager and the key team members. Accountability and upwards reporting for the Project Manager is to the Project Sponsor and Customer.

In more complex projects a formal organisational structure is required to show the relationships between the management team, for example between the Project Manager, Sub-Project Managers, Project Board and Sponsor. Refer to the section on Project Roles and Responsibilities.

6.2.1 Work Breakdown Structure

A Work Breakdown Structure can be used to sub-divide the project into pieces of work, or Work Packages, that can be assigned to the project team and managed effectively. The WBS represents a hierarchical view of the project where the term Task is used at the lowest level of detail. This is equivalent to the Product Breakdown Structure (PBS) in PRINCE2.

The detail of the WBS depends on the complexity of the project. In general tasks should be sufficiently detailed to enable:

- Accurate estimation of effort and cost
- Control of risk
- Clear accountability

6.3 Scheduling and resourcing

A wide range of scheduling techniques is available and it is for the Project Manager to choose those that are appropriate for the size and complexity of the project. Brief guidance is given here but this Framework is not prescriptive on the techniques to be used. Project Managers should refer to the literature for detailed information.

A **Milestone Plan** is the minimum requirement for any project. It lists key events in the project with dates. Milestones should be defined in sufficient detail so that it is clear when they have been met, and be sufficiently frequent to enable effective monitoring of the project.

Most projects will use a **Gantt Chart** or **Network Diagram** for more detailed planning. They can be used to illustrate simple time dependency or full resourcing and costing.

Project Managers should be pragmatic in their use of staff resource planning – for much of the work that we undertake it is not realistic to turn staff on and off projects on a day by day basis or to split their effort over a number of tasks. For projects constrained by staff resources consideration can be given to use of overtime, sub-contracting or hiring additional resource.

Other resources such as equipment and accommodation should also be considered – and if appropriate can be built into the planning process in the same way as staff.

A useful technique is **rolling wave planning** where projects are planned in detail in the early stages, and at a higher level for the remaining stages. This can be helpful where the project definition is

uncertain, for example in some R&D or software projects or where the implementation phase of the project is too large to be planned in detail at the outset.

There is no requirement to use particular **planning software**. Microsoft Project is widely used and would be the default for many Project Managers but other factors may drive the choice, for example customer requirements, compatibility with related projects, or suitability for particular types of project.

6.4 Financial Planning

Analysis of the resourcing, recurrent and capital expenditure leads to the development of a Cost Plan, a plot of budgeted expenditure against time. Where a Work Breakdown Structure is being used costs will be broken down in the same way.

The following items need to be considered appropriately in any costing:

- Direct Payroll Costs
- Overtime and Allowances
- Overhead charges
- Sub Contract work
- Capital purchases
- Recurrent costs
- Use of facilities
- Recovering Feasibility Phase costs
- Insurance: Notional and Project specific
- Cost of Capital
- Depreciation

Other project specific costs may also include tax, shipping, contingency and a margin. Where the project spans more than one financial year inflation will also need to be taken into account.

6.5 Estimating time and costs

Both time and cost estimates should:

- Be based upon experience
- Be developed Top Down initially, but Bottom Up when the WBS has been fully defined
- Include an agreed amount of contingency as a direct result of risk analysis
- Not include 'hidden' contingency
- Use the experience documented in previous project Post Implementation Reviews

Contingency allowance, covering both cost and schedule, should be considered for all projects. This allowance has two parts, the Working Margin and the Contingency Reserve.

Working Margin

The Working Margin is used to cope with the uncertainties that occur in all projects (sometimes call "known unknowns") such as increased cost of materials, complexity of design and manufacture of components. It can be calculated in a number of ways and should take account of the project risks and their mitigation.

If estimates are based on the 'most likely' cost or timescales then the distribution of outcomes will usually be skewed, with costs and timescales more likely to be over than under budget. There should be a reasonable chance (i.e. greater than 75%) that the project can be completed within the budget of the base cost plus the working margin.

The working margin is normally held by the Project Manager and released on the approval of the Oversight Committee or Project Board. It is normally included in the project's cost and schedule baseline.

Contingency Reserve

The Contingency Reserve is for the unknown and unexpected things that can occur within a project and which could not reasonably be predicted (sometimes called "unknown unknowns"). For example, an international project may be subject to fluctuating exchange rates. It should be calculated on the basis of an understanding of the risks of the project and there should be a high expectation that the project can be completed without the use of contingency.

By its nature it is difficult to estimate the Contingency Reserve and it is best held at a top level in the organisation, accessed by the Project Manager through the Project Board and Project Sponsor. At the start of the project the Project Manager should determine the source of Contingency Reserve for the project and the process for accessing the reserve.

Proper consideration of the Working Margin and Contingency Reserve is essential; otherwise projects will frequently run over time or over budget. An important principle is: if the estimates for a project are sound and include reasonable contingency, then an allocation of funding or time below the estimate must be balanced by a reduction in the scope of the project.

6.6 Planning Procurement

Many projects involve a significant procurement activity and the relevant finance or procurement departments should be consulted, for example to advise on recovering VAT if items are being exported. For large contracts, tendering, or the legislative requirement to go to European tender, can introduce significant delays and the process should be started as soon as possible.

6.7 Risk Management

Risk is defined in PRINCE2 as 'uncertainty of outcome (whether positive opportunity or negative threat)'. Projects are, by their very nature, risky enterprises. Some form of risk management is essential on even the smallest of projects.

Risk Management looks ahead and considers what could go wrong, and then puts in place strategies to eliminate or mitigate the risks.

Risk management is an activity that is ongoing throughout the life of a project and the Risk Management Plan (see section 5.4) must be regularly reviewed.

The process for managing risk is:

- Identify potential risks using techniques such as group discussions, risk workshops, checklists, and interviews
- Analyse the risks to determine which are the most serious by assessing the probability of the risk occurring and assessing the impact should the risk occur
- Devise action plans to mitigate risks (updating the baseline plan where necessary) by either avoiding the risk, transferring the risk, reducing the probability and/or the impact of the risk, or accepting the risk
- Implement the action plans and control the risks as they occur by putting risk plans into action when foreseen risks occur, or taking appropriate actions when unforeseen risks occur

6.8 Project Monitoring and Reporting

The PMP defines the methods to be used for progress reporting and control in the Implementation phase up to Handover and Close Out. The plan includes frequency and attendance for progress meetings, the acceptance process for key deliverables and milestones, and the frequency and content of progress reports.

6.8.1 Earned Value Analysis

Earned Value Analysis (EVA) is a powerful project performance measurement technique which is particularly useful in monitoring larger and more complex projects. It compares the value of the work done with the planned cost for that work and the cost of the work that was planned to be done. To be effective it is important that this is agreed and planned from the outset.

EVA produces two indices, the Cost Performance Index (CPI) and the Schedule Performance Index (SPI).

The CPI is the budgeted cost of the work done to date divided by the actual cost of the work done. A value of less than 1 indicates that the project will run over budget.

The SPI is the budgeted cost of the work done divided by the budgeted cost of the work planned to have been done by that date. A value of less than 1 indicates that the project will run late.

These indices can be used to plot cost and schedule trends to date, and to compare the performance of projects on a 'like for like' basis, even though those projects may be of different sizes.

The CPI and SPI can then be used to forecast Estimated Cost at Completion (EAC) and Estimated Time to Completion (ETC), based on performance to date.

6.9 Quality Planning and Reviews

A Quality Plan should be developed for all projects, either as part of the PMP or as a separate document. The Plan documents the processes used by a project team in quality assurance and quality control in the project.

Where the customer has specific quality requirements they will be documented here together with the arrangements for accommodating those requirements within a Department's Quality System.

The Quality Plan includes the processes for Documentation Control and Change Control, and the plans for Project and Technical Reviews.

6.10 Change Control

An effective, formal change control procedure is essential to successful Project Management. The procedure must ensure that the Project Manager, and the Customer or Project Sponsor, take into account the impact of the change on all aspects the project and then agree and sign off the change.

Situations in which a formal change is required include:

- Changes to the Technical Specification
- Changes in financing or delivery requirements
- Changes to the baseline plan to address lateness or overspend
- Change of Project Manager
- Termination of the project

A change control procedure must contain the following key elements:

- A record of the request for a change
- Assessment of the impact of the change in terms of cost, time, specification, risk, resources and its effect on other changes
- Approval or rejection of the request
- Feedback to the person who made the request
- Distribution of the updated plans
- Implementation of the change
-

6.11 Reviews

Project milestones should include the project and technical reviews, and the Close Out and Post Implementation reviews. The dates should be included in the schedule and there should be an outline of the scope and attendance for each review, including the role of the Project Sponsor or Customer.

6.12 Safety, Health and Environmental (SHE) Management

As with other aspects of project planning, considering safety issues as they arise during project execution is expensive, but this can be avoided with careful planning up front.

A project safety plan should mirror that of the project plan, for specific tasks there will be SHE issues that may need to be considered, and together these form the basis of a safety plan based upon Risk Assessment.

Projects may generate many hazards, and it may be necessary to prioritise risks and resource through the use of a quantitative risk assessment process described in the risk assessment code.

Effective project communication processes provide the vehicle through which SHE issues can be raised, and be brought promptly to the project team's attention, for example following a SHE incident.

For large projects, particularly those involving construction, consideration should be given to the establishment of safety tours and inspections.

6.13 Impact Potential

Activities to enhance the impacts of research should be planned as an integral part of a project from its inception (i.e. knowledge exchange, economic impact and public outreach).

Impact can be described as the demonstrable contribution that excellent research makes to society and the economy. Impacts from research can take many forms, and become manifest at different stages in the research lifecycle of a project and beyond. They can also be promoted in many different ways. The routes through which economic impact occur include the following:

- Fostering global economic performance, and national economic competitiveness through, for example:
 - Providing highly skilled people – skills development, employment
 - Creating opportunities for and improving business
 - Attracting investment
 - Commercialisation
- Increasing the effectiveness of public services and policy
- Enhancing quality of life, health and creative output - societal and other impacts

The potential for Economic Impact and routes to exploitation should be considered in the Conception and Definition phases of the project, built into the planning of the project, and included in the PMP.

6.14 Diversity Assessment

Project Managers need to consider whether their project will impact on particular groups of staff. This is particularly applicable in the case of business change projects.

An Impact assessment template is available which can be used as a checklist for all projects.

7 Forms

7.1 Standard templates

The following pro formas are available at ([web link](#)):

- Outline Business Case
- Project Management Plan
- Risk Management Plan
- Stakeholder Plan
- Project Change Request
- Project Report
- Close Out Report
- Post Implementation Report

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Risk Register

Project Number:	
Project Title:	
Project Manager:	
Date of Risk Register:	

Sub Projects:	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	

Project Number:

Project Title:

Ref No.	Description of Risk	Risk Type	Risk Source	Impact	Probability	Rating	Current Controls in place	Effectiveness of Mitigating Action	Overall Rating	Risk Owner	Additional Action to be Taken or Contingency Plan	Person(s) responsible for Action	Review Date	Previous Rating	Risk Status
1		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
2		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
3		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
4		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
5		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
6		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
7		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
8		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
9		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
10		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
11		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲

Ref No.	Description of Risk	Risk Type	Risk Source	Impact	Probability	Rating	Current Controls in place	Effectiveness of Mitigating Action	Overall Rating	Risk Owner	Additional Action to be Taken or Contingency Plan	Person(s) responsible for Action	Review Date	Previous Rating	Risk Status
12		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
13		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
14		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
15		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
16		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
17		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
18		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
19		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
20		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
21		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
22		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲

Ref No.	Description of Risk	Risk Type	Risk Source	Impact	Probability	Rating	Current Controls in place	Effectiveness of Mitigating Action	Overall Rating	Risk Owner	Additional Action to be Taken or Contingency Plan	Person(s) responsible for Action	Review Date	Previous Rating	Risk Status
23		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
24		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
25		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
26		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
27		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
28		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
29		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
30		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
31		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
32		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
33		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲

Ref No.	Description of Risk	Risk Type	Risk Source	Impact	Probability	Rating	Current Controls in place	Effectiveness of Mitigating Action	Overall Rating	Risk Owner	Additional Action to be Taken or Contingency Plan	Person(s) responsible for Action	Review Date	Previous Rating	Risk Status
34		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
35		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲
36		Financial, Operational & Reputational	Internal	Moderate	Moderate	9		Satisfactory	LOW 9					9	▲▲

ASPERA

Project Management

Framework

Project Management Templates

Based on the STFC Project Management Framework written by Steve Quinton and Tony Medland,
Science and Technology Facilities Council, UK

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Outline Business Case

Title		Version	Date
Project Manager	Sponsor	Department	

Complete each section, referencing additional documentation where appropriate

1 Project Overview

1.1 Context

[Project type/ source of funding (e.g. internal/commercial/grant/EU funding); role in any consortium or collaboration]

1.2 Project Description

[Project Summary including the objectives, scope, costs and timescales]

2 Project Definition

2.1 Objectives

[Objectives of the proposal]

2.2 Business Fit

[Alignment to the organisation’s strategy, relevance and potential impact]

2.3 Key Stakeholders

[Including potential customers and/or partners]

2.4 Scope

[Key Deliverables; what is included, and excluded]

2.5 Resources

[Estimated Costs (e.g. staff, equipment, consumables, travel) including working margin, contingency; availability of staff, infrastructure, equipment]

2.6 Schedule

[Timescales – including key milestones]

2.7 Funding/ Affordability

[expected funding sources (and level of certainty), surplus/deficit including how any deficits will be met]

2.8 Inter-dependencies

[related projects/previous investment, longer-term implications /liabilities (including key decision points for any future investment)]

2.9 Benefits

[Benefits of work proposed and how they will be measured]

2.10 Major Risks

[e.g. reputational, financial, scientific/technical, subcontractors, SHE]

2.11 Knowledge Exchange/Economic Impact Opportunities

[exploitation potential, confidentiality and/or IPR issues]

3 Project Management

3.1 Project Strategy

[Project strategy including management structure etc - this section becomes the separate Project Management Plan as the project progresses from the concept to definition phase]

Project Management Plan

Title		Version	Date
Duration	Approved Budget	Project Type	
[from/to]	[including contingency]	[internal, grant, EU, commercial etc]	
Project Manager	Sponsor	Department	

Complete each section, referencing additional documentation where appropriate

1 Project Description

[Brief project description including the scope]

2 Project Organisation

[fit with other projects or programmes, role in a collaboration, reporting: project board etc, work breakdown structure]

3 Objectives and Deliverables

[outputs of the project, reference a technical specification or other documentation as appropriate]

4 Project Schedule

[milestones, reviews/gateways, reference a Gantt chart if appropriate]

5 Finance

[costs and profile, the management of contingency, income and profile]

6 Resources

[including staff, accommodation, equipment – requirement and availability]

7 Procurement Plan

[any special requirements for procurement particularly where EU tender will be required]

8 Risk Management

[usually references a separate Risk Management Plan]

9 Stakeholder Communication

[usually references a separate Stakeholder Communication Plan]

10 Monitoring and Reporting

[monitoring process – what, how often, to whom etc]

11 Quality Plan

[including documentation control, change control, project and technical reviews]

12 Benefits Realisation and Impact Plan

[what are the benefits and how will they be realised, in particular relating to Economic Impact]

13 SHE Plan

[any particular Health, Safety and Environmental issues; for construction projects will CDM regulations apply]

14 Diversity Issues

[any impact on particular groups of staff]

Stakeholder Plan

Title	Project Manager	Project Sponsor	Department	Version	Date

Stakeholder	Influence	Interest/Expectations	Actions and Due Dates	Progress
	H/M/L			

Project Report

Title		Version	Date
Duration	Approved Budget	Project Type	
[from/to]	[including contingency]	[internal, grant, EU, commercial etc]	
Project Manager	Sponsor	Department	

Project Description
[short project description]

Progress
<p>Narrative summary of progress to date (i.e. since last report)</p> <ul style="list-style-type: none"> - Overall opinion on whether project is on track and Red, Amber or Green - Key successes (e.g. milestones and/or deliverables met). - Problems (e.g. milestones missed, changes to specification, cost to completion issues/ contingency requests) - Future developments / next steps (and any constraints)

Milestones		Dates		
Description		Planned	Expected	Complete

Financial Summary				
	Staff (SY)	Staff (£k)	Recurrent (£k)	Total (£k)
Planned Cost to Date				
Actual Cost to Date				
Planned Total Cost				

Project Management Templates

Current Estimate of Total Cost				
Approved Budget				

Project Issues/Active Risks		
	Issues/Risks identified	Proposed mitigation taken (or planned)

Key Milestones/Deliverables over the next Period		
	Milestone/Deliverable	Potential Issues/Concerns

Project Change Request

Title		Number	Date
Project Manager	Sponsor	Department	

Description of Change Requested			
[text]			
Anticipated Benefits/Reason for Change			
[text]			
Impact of the proposed Change			
Cost	[in each case state none, or detail the change]		
Schedule			
Performance			
Resources			
Risk			
Originator	[name]	Date	[date raised]

Recommendation	Project Manager	Date
Implement / Reject	[name]	[date approved]
Approval for Implementation	Customer/Sponsor	Date
Implement / Reject	[name]	[date approved]
Action Required/Comments		
[text]		

Close Out Report

Title		Version	Date
Duration	Approved Budget	Project Type	
[from/to]	[including contingency]	[internal, grant, EU, commercial etc]	
Project Manager	Sponsor	Department	

Project Description
[short project description]

Status
[Confirm that the deliverables have been completed and note any variations against the latest specification; note any requirement for ongoing support and how this will be managed]

Action	Date
Description	
[Note any outstanding actions with completion dates]	
Hold the Post Implementation Review	

Milestones - Final Summary		Dates		
Description		Planned	Expected	Complete

Financial - Final Summary				
	Staff (SY)	Staff (£k)	Recurrent (£k)	Total (£k)

Project Management Templates

Planned Cost to Date				
Actual Cost to Date				
Planned Total Cost				
Current Estimate of Total Cost				
Approved Budget				

Performance
[General comments on the performance of the project. Any customer feedback available at this stage]

Post Implementation Review

Title		Version	Date
Duration	Approved Budget	Project Type	
[from/to]	[including contingency]	[internal, grant, EU, commercial etc]	
Project Manager	Sponsor	Department	

To be read in conjunction with the Close Out Report

Status
[Narrative on how the deliverables and any ongoing support is performing]

Action		Dates		
Description		Planned	Expected	Complete
[Actions from the Close Out Report]				

See the Close Out Report for the final Milestone and Financial Summaries

Benefits
[Are the benefits identified in the original Business case being realised? Any corrective action required]

Feedback and Lessons Learned
<p>[Feedback from the Project manager, Sponsor and Customer on the performance of the Project. Should include:</p> <ul style="list-style-type: none"> - Deliverables planning and outcomes (objectives met/not met, lessons learned) - Financial planning and control (under/over budget, factors that helped/hindered) - Schedule planning and outcomes (within / over schedule, factors that helped / hindered) - Change management and control (key changes, initial assessment, comments most significant changes from Change Log) - Any lessons learned for future projects - ideas for improvement (i.e. both for project management and /or oversight) <p>[disseminate within the Department and through the Project Review Committee as appropriate]</p>