Guidelines for Developing New Projects

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1   Introduction

On 28th July 2010 Gemini Observatory held the GPC 2011 Planning Kickoff Meeting. During the meeting the titles of ~35 proposed 'projects' for 2011+ were presented.

A schedule of events was also presented, leading to the Gemini Planning Retreat in Santiago on 7th & 8th October 2010. It was announced that Project Managers would be selected and informed approximately 2 weeks after the kickoff meeting.

During the Q&A session a number of questions were raised and a number of concerns aired, these included:
- What level of planning will be sufficient between now and the retreat?
- What should be including in the planning activity (e.g., Risk Management)?
- How much time should be spent on planning and to what resolution?
- How can we resolve resource conflicts?
- How will a Project Manager know what is expected of them and what support they will receive?
- How can Gemini avoid arriving at the retreat and finding that Gemini resources are overcommitted?

It was suggested that the Directorate should give clear guidance to the selected Project Managers which should include the Directorate's expectations and define the Project Manager's role.

This document was created to help provide a roadmap to the planning retreat and to provide Project Managers with some guidance during this pre-project planning phase. It should be used in conjunction with the "Annual observatory Planning Guide", which is updated and issued annually and describes the top-level mechanics of the planning system. In contrast, this document focuses on the details associated with generating new projects.

Between the Kickoff meeting and the Retreat, four stages were identified. These being:
- Program Definition Stage
- Requirements Definition Stage
- Task Definition Stage
- Resource Allocation Stage

The key events and dates are listed in Table 1. The Program Definition stage was led by the Directorate and resulted in a set of high priority projects across the Observatory, the selection of the most appropriate Project Manager for each project and the creation of this document.

This and related documents, future training, and the use of Project Insight are all part of incrementally introducing an observatory-wide Project Management standard and increasing the level of Project Management support for Gemini staff taking on Project Management roles.   The expectation is that further material and training will be available to Gemini staff through the lifecycle of their projects.

Stage	Date	Event
Program Definition	July 28, 2010	Kickoff Meeting
	August 13, 2010	Project Management
Requirement and Task Definition	August 16, 2010	Stage Begins
	September 16, 2010	Directorate Stage Review
Resource Allocation	September 20, 2010	Stage Begins
	October 1, 2010	Directorate Stage Review
Project Approval	October 7, 2010	Planning Retreat Begins

Table 1 – The various stages of project development are listed, as well as the review points leading to the annual planning retreat.

The guidelines contained within the document have been adapted from the PRINCE2 Project Management Methodology[1]. Material has been taken from the 'Managing Successful Projects with PRINCE2' reference manual and has been tailored to meet Gemini's immediate needs.

It is based on the assumption that a successful project should observe the following principles:
- A project is a finite process with a defined start and end
- All parties must be clear on what the project is intended to achieve, why it is needed, how the outcome is to be achieved and what their responsibilities are, so that there can be genuine commitment to the project
- Well-managed projects have an increased chance of success

The Project Sponsor and Project Manager should digest the content of this document and before commencing with the 'Requirement Definition' stage they should accept their stated roles (modifying if required) and commit to carry them out. When starting each stage they should refresh themselves of the guidelines as some steps within a stage are closely coupled and can be performed at the same time.

Following the steps in this document will result in the creation of documented project information. This represents the *minimum* required for the retreat. This shouldn't restrict the Project Manager and Project Sponsor from providing further information for the retreat, especially if it will help understand the project's descope options.

This methodology is product-based. In general final products can be seen as deliverables and intermediate products could be seen as project milestones.

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[1] Additional details about the Prince2 method of project management can be found at www.prince2.com

2 Roles, Responsibilities & Communication

Essential for a well-run project is that every individual involved in the management of the project understands and agrees:

- who is accountable to whom for what
- who is responsible for what
- what the reporting and communication lines are

There must be agreement and acceptance by all involved of their roles and responsibilities. There should be no gaps in responsibilities once the roles have been tailored; someone should be clearly responsible for each given management aspect.

Figure 2.1**Error! Reference source not found.** is designed to show the relationship between the Project Sponsor (a member of the Directorate) and the Project Manager. For large projects the Project Manager will be part of a Project Management Team which may include a dedicated System Engineer and Project Scientist. A large project may have multiple teams working on different components of the overall project. Note that a Project Manager may be requested to manage multiple projects and each project may have a different Project Sponsor. The roles and responsibilities of the Directorate, Project Sponsor and Project Manager were identified during the Program Definition Stage, as were the need for a Project Management Team. In addition, the communication guidelines were produced.

2.1 *Directorate Role and Responsibilities*

The Directorate is responsible for the overall direction and management of the program (collection of projects). The Directorate is ultimately responsible for assurance that each project (once started) remains on course to deliver the desired outcome of the required quality.
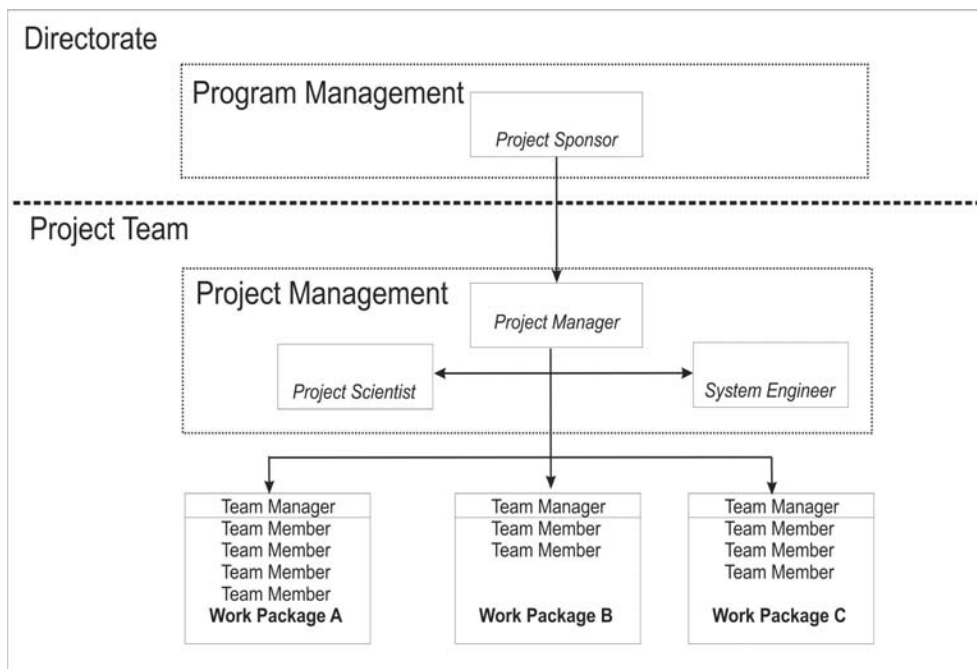

Figure 2.1 – Project management chart.

The Directorate's responsibilities pertaining to the pre-project stage include:
- Selection of projects to conduct in 2011 and beyond
- Selection of project managers
- Providing an adequate roadmap and guidance
- Review each completed stage and approve progression to the next
- Commit resources required for the project
- Program-level change control

During the pre-project phase the Directorate is collectively responsible for oversight of the activities. The Directorate will meet regularly (nominally once a week) between kickoff and the planning retreat to review the status of the program.

2.2   Project Sponsor Role and Responsibilities

The Project Sponsor is a member of the Directorate who has ultimate responsibility for the project. The Project Sponsor's role is to ensure that the project is focused throughout its lifecycle on achieving its objectives and delivering a product that will achieve its forecast benefits.

Project Sponsor's responsibilities pertaining to the pre-project stage include:
- The Project Sponsor will be the Project Manager's first point of contact
- Brief Directorate about project progress
- Ensure that there is a coherent project organization structure and logical set of plans
- Monitor and control the progress of the project at a strategic level

The Project Sponsor is responsible for the overall assurance of the project – that is, that it remains on target to deliver products that will achieve the expected benefits, and that the project will be completed within its agreed tolerances for budget and schedule.

2.3   Project Management Team

The project needs the right people in place, with the authority, responsibility and knowledge to make decisions in a timely manner. The project management team needs to reflect the interests of all parties who will be involved, including the user's interests. Project management requires resources and calls for a range of skills, which must be available within the project management team. It is important that consideration is given to all the activities that are involved in managing the project so that no important aspects are overlooked. It is also important that all the skills needed by the project are made available. Specific roles and responsibilities vary from Project to Project.

2.4   Project Manager Role and Responsibilities

The Project Manager has the authority to run the project on a day-to-day basis on behalf of the Directorate within the constraints laid down.

The Project Manager's prime responsibility is to ensure that the project produces the required products to the required standard of quality and within the specified constraints of time and cost. The Project Manager is also responsible for the project producing a result capable of achieving the benefits defined during the pre-process phase.

Project Manager specific responsibilities for the project include:
- Manage the production of the required products
- Direct and motivate the project team
- Plan and monitor the project
- Produce project documentation
- Manage the risks, including the development of contingency plans
- Take responsibility for overall progress and use of agreed resources and initiate corrective action where necessary.
- Be responsible for project change control and any required configuration management
- Prepare and report to the Project Sponsor through weekly 'Highlight' Reports and 'End Stage' Reports
- Liaise with the Project Sponsor to assure the overall direction and integrity of the project
- Agree technical and quality strategy with appropriate members of the Directorate
- Prepare the End Project Report and Lessons Learned Report (end of project)
- Identify and obtain any support and advice required for the management, planning and control of the project
- Liaise with any supplier or account managers
- May also perform Team Manager and project support roles

2.5   Project Scientist

The Project Scientist has the overarching role of ensuring that projects meet the needs of the Gemini scientific community, through their involvement in the planning and execution of projects requiring scientific involvement. The Project Scientist is actively involved in the definition of requirements, early in the development of a project plan. The Project Scientist iterates with the other members of the Project Management Team as trades become evident (e.g., between functionality, performance, cost, risk, etc.), and advises the project throughout its duration to help ensure that the end-product is consistent the requirements agreed at the project's inception. Furthermore, the Project Scientist often takes the lead in testing or validating that the product of the project meets all of the requirements.

The Project Scientist works directly with the Project Manager and Systems Engineer while performing their role within the Project Management Team. In some cases the Project Scientist may take on some of the responsibilities of the Systems Engineer, particularly where complex trade studies are necessary that might involve performance modeling to understand the impact of various design options.

2.6   System Engineer

The involvement of system engineering in a project's Management Team is generally a function of its complexity and scope. Relatively small (essentially standalone) projects which are

conducted by a small Project Team may not involve System Engineering, while those involving a range of disciplines across the entire Observatory often do. The decision to include System Engineering in the Project Management Team is made by the Project Sponsor and Project Manager, at the outset of the project's definition phase. When included, the System Engineer plays a number of important roles, including but not limited to –

- Requirements analysis, to verify they are complete and perhaps use them to derive additional (secondary or child) requirements for the project, as necessary
- Create a project requirements baseline and its database
- Control the project requirements database and manage the requirements traceability
- Participate in trades of cost, risk, and performance
- Helping the Project Manager ensure that adequate contingency is applied to yield realistic plans
- Identify interfaces and seeing that they are properly documented and understood by parties on all sides of the interface, then approve them
- Assist in various risk analyses involving resources, key technologies, functional performance, and schedule
- Helping maintain robust cross-discipline communications throughout the duration of the project, from conception to completion
- Working closely with the rest of the project team, lead the integration and testing stage of the project

2.7 Communication

It is expected that the Project Manager will have regular communication with the Project Sponsor. The Project Manager will prepare a 'Highlight' Report on a weekly basis which will include progress made over the last week, plans for the next week and a list of known/outstanding issues. Details of the report are to be agreed by the Project Sponsor and the Project Manager.

3   Requirement Definition Stage

The goals of the requirement definition phase are to:
- Produce the Final Product Identification and Definition
- Complete Project Requirements Identification and Prioritization
- Identify Project Constraints
- Identify the 'Project Approach'
- Identify the Project Management Team
- Identify the Resources required for Planning
- Creation of the Project Brief

3.1   Final Product Identification and Definition

The first task of the Project Sponsor and Project Manager is to digest the information pertaining to the project that is currently available. The project information available could range from a project title and brief directive/mandate to a well understood project with clear benefits, requirements and set of products.

For those projects which contain scarce information, the Project Sponsor and Project Management Team should work together to understand the benefits of the project. For example, what does the observatory want to gain at the end of the project? Once establishing the benefits the final product should be recognized. This final product should be described in as much detail as possible. Both the benefits and end product should be documented.

3.2   Project Requirements Identification and Prioritization

The next step is to document the project requirements. The Project Sponsor, Manager, and Scientist should work together to gather any requirements which already exist. If a set of comprehensive requirements exist then they should be reviewed in the context mentioned below. Once formed, requirements should be placed under configuration control at the end of this stage.

Forming clear, unambiguous requirements is essential. Requirements should be specific and measurable. When forming a requirement, ask yourself, will we be able to clearly demonstrate that this requirement has been met? Subjective requirements which require interpretation can lead to misunderstandings. Clear measurable Acceptance Criteria for each requirement should be documented. A lot of time can be wasted in producing a very good plan to achieve the wrong objectives. Hence having agreed requirements before starting project planning is crucial.

Requirements should be placed in a Requirements Document. The more work and effort that is put into defining and refining the requirements, the easier planning will be.

Once a complete requirements list has been formed, the Project Sponsor , Manager and Scientist should work together to prioritize the list of requirements. They should be ordered in terms of being essential, highly desirable and desirable. Given project constraints (budget, staff effort and time) the scope of the project may have to be reassessed at various points of the lifecycle (including Resource Allocation). Having an agreed prioritized list of requirements will help the

Directorate and Project Manager make tough decisions, should they prove necessary. From here secondary or derived/child requirements may be necessary to turn high-level requirements into more detailed engineering requirements.

3.3   Identify Project Constraints

The Project Manager should establish (and document) any known project constraints. For example, does a nominal cost cap exist? Is it a hard number or does it have some flexibility. Given the long-term 5 year plan, when is the estimated end date of the project? What are the implications of completing the project later and earlier than this date? Approximately what level of FTEs (if any) does the Directorate expect will be used on the project? What is the tolerance?

Having an understanding of the Project Constraints is essential, as it will help make decisions when planning. Ideally any constraints should be known to the Project Sponsor and Project Manager at the time of specifying the requirements, yet it shouldn't limit the requirements, just help to prioritize them and hence help the Project Manager to be realistic when planning with their management team.

3.4   Project Approach

Before beginning planning, decisions must be made regarding how the work of the project is going to be approached. For example, will the solution include:
- Commercially 'off the shelf' (COTS) procurements
- Custom designed components
- In-house development
- Single or multiple 3rd Party contracts

In addition, will the solution be:
- Based on an existing product
- 'Built from scratch'
- Based on specific technologies? Contain novel/high risk components?

There needs to be a clear understanding between the Project Sponsor and Project Manager before the planning commences. This should be documented. A short discussion including whether each is feasible should be recorded.

3.5 Project Management Team

Before proceeding any further the Project Sponsor and Project Manager should identify the Project Management Team required for this project. For smaller projects the Project Manager will be the only member of the project management team (and could also take other roles in the project such as Team Manager and even Team Member). For larger projects a Management Team will be required with input from Systems Engineering and a Project Scientist.

Again, it is important that individuals understand their roles and responsibilities in the management and support of the project. Each individual should be actively committed to carrying out their roles and responsibilities.

The roles and responsibilities of the Project Team should be agreed with the Project Sponsor and should be sent for approval at the next stage boundary, i.e., when the Project Directorate meet to approve the project at the end of the stage.

It is expected that the majority of the project planning will be conducted by the management team although it is understood that interacting with other members of the observatory may be required. The Project Sponsor and Project Manager should assess the skills and knowledge required to undertake planning and should identify any short-term and long-term training requirements, including their own.

3.6 Resources Required for Planning

The Project Sponsor and Project Manager should calculate the amount of time required by the project management team to spend on planning the project between the beginning of the next (Task Definition Phase) and the end of the pre-project phase (the retreat). For example this might require 20% of available effort for 6 weeks.

3.7 Creation of the Project Brief

Each project requires a centrally located configuration management documentation repository. The information gathered during this stage should either be placed into the relevant tabs in PI or in the project dedicated document repository within PI. The documents created during this stage are collectively known as the Project Brief and should be accessible by the Directorate for the stage review on the 27th August. The Project Brief consists of

- Project Summary
- List of Project Team Members
- Requirements
- Task Definitions
- Resource Allocations
    - o Labor Estimate
    - o Non-labor Cost Estimate
    - o New infrastructure
- Risk Ledger

4 Task Definition Stage

By this pre-project stage the proposed project should be defined such that it has a clear list of prioritized requirements, project constraints have been identified and a project approach defined. The Project Sponsor, Project Manager and Project Management Team have been identified, and clearly understand their roles and responsibilities for this pre-project stage. All of this should have been documented and approved by the Directorate.

The goals of the task definition stage are to:
- Define and Analyze the project's products
- Identify the project's tasks and dependencies
- Estimate the effort required for the project

4.1 Introduction to Planning

A plan is documentation, framed in accordance with a predefined scheme or method, describing how, when and by whom specific targets or sets of targets will be achieved. A plan is a design of how identified targets for products, timescales, costs and quality can be met. Plans are the backbone of the management information system required for any project. It is important that plans are kept in line with the identified benefits of the project at all times.

Effective planning identifies:
- Whether the targets are achievable
- The resources needed to achieve the targets within a time frame
- The activities needed to ensure that quality can be built into the products
- The problems and risks associated with trying to achieve the targets and stay within the constraints

Planning is not a trivial exercise. It is vital to the success of the project. A plan must contain sufficient information and detail to confirm that the targets of the plan are achievable. Poorly planned projects cause frustration, waste and rework.

In general, plans should be presented via summary information that the audience can easily understand, interpret and question. A plan should make the use of charts, tables and diagrams for clarity.

The project should be divided into a number of stages with the next stage being planned in detail.

4.2 Introduction to the Planning Methodology

The product-based planning technique provides a start to the planning activity and a planning framework. It involves:
- Establishing what products the plan is intended to generate
- Describing those products and their quality criteria
- Determining the sequence in which each of the products should be produced and any internal and external dependencies.

After these initial steps, the normal steps of planning are:
- Identifying the tasks needed to produce and validate the quality of the products
- Deciding when the tasks should be done and by whom
- Estimating how long the task will take
- Producing a time-based schedule of tasks
- Calculating the overall effort
- Estimating the cost of any materials and equipment that must be obtained
- Assessing the risks contained in the plan
- Identifying the management control points needed

Before planning begins, method(s) of estimation must be chosen. Each facet of the project may need its own estimation method. Estimating may be done by:
- Using computer tools
- A group of experienced planners
- Top-down or bottom-up methods
- Discussion with those who will do the work

The aim of the 'Task Definition' stage is to start work on the project plan.

4.3   Defining and Analyzing Products

By defining a plan in terms of products to be delivered (deliverables), the creation, quality and suitability of those products can be managed and controlled more easily. In addition, by defining the required products, everyone involved can see and understand the required outcome.

This is divided into three steps:
- Identify the products (including management products and documentation) to be produced
- Ensure that they are fully understood and agreed by everyone involved
- Sequence them in their logical order of creation.

4.4   Identifying Tasks and Dependencies

Simply identifying products for large projects is insufficient for control purposes. The tasks implied in the delivery of each of the products need to be identified to give a fuller picture of the plan's workload.

This is divided into three steps:
- Identify all tasks necessary to deliver the products
- Establish the interdependencies between tasks
- Ensure that dependencies both internal and external to the project are covered.

4.5   Estimating Effort

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.

This is an iterative process. The objective is to identify the resources and time required to complete each task. This will include not only people but also other resource that will be required, such as facilities.

The two major steps in a typical estimating process are:
- *Identify resource types required*. Specific skills may be required depending on the type and complexity of the project. Requirements may include project infrastructure (for example alterations to buildings, labs, seating/access for new people), equipment, computer hardware (additions or changes), software, specialized supplies, travel or money. *It is important to agree about a* definition of resource type. For staff this should include:
  - the skills and experience level(s) required
  - where these skills can be found so that the commitment required of different divisions/groups can be identified
- *Estimate effort required for each task by resource type*. At this point the estimates will be approximate and therefore provisional.
  The reliability of estimates depends on:
  - how detailed the understanding of the task is
  - the assumptions made
  - understanding the products

From this information one can estimate the elapsed time (duration) for each task for use in scheduling. The assumptions that underpin the estimate, the margin of error and the degree of confidence in the estimate should also be recorded in the plan. This information will enable the Directorate to set appropriate tolerances.

A distinction should be made between near-term and long-term planning when considering resource estimation for multi-year projects. In general, projects with a duration of <1 year that are proposed to be executed soon (within a year) should be defined with enough detail that there is a high degree of confidence that it can be completed within the proposed plan. Uncertainties and associated contingency in resource demands will vary from project to project, and the Project Sponsor should be consulted in setting a reasonable degree of contingency while planning. Naturally projects which extend longer in time are less likely to be executed according to the original plans. Accordingly, additional contingency should generally be applied in the out-years for multi-year projects. As an example, the resource estimates needed to conduct the various tasks associated with a three year project might have an uncertainty of 20% in the first 12 months of the project, 30% in the second year, and 50% in the final year. As the project is executed and risks retired, the out-year steps in the plan are brought forward and better defined, reducing the associated contingency. In this manner the Directorate, which oversees the allocation of resources across many projects, can ensure that near-term resources for current

projects are properly allocated each month while having a reasonable assurance that the resources required to successfully complete any multi-year projects will also fit within known future resources.

Note that one approach to consider while generating tasks is to produce an 'Optimistic' estimate, a 'Realistic' estimate and a 'Pessimistic' estimate, where:

Optimistic Estimate Definition: If all goes well, what is the least amount of effort required to complete the task.
Realistic Estimate Definition: Given the experience of the management team and any known issues, re-estimate the expected amount of effort to complete the task. Remember to be realistic.
Pessimistic Estimate Definition: What is worst case scenario? If you had to stake your monthly salary on completing the maximum amount of effort required to complete this is task, what would it be?

There are many benefits of attaching tolerance to your estimates. In doing so one can:
- Begin to understand what the high risk tasks are – see Risk Identification (section 5.2.2)
- Ultimately help manage expectation by providing a range of delivery dates as opposed to a delivery date which usually is either the optimistic date or worst still an unrealistic date.
- Use the data for project monitoring to make closed-loop decisions throughout the lifetime of the project.

5   Resource Allocation Stage

By this pre-project stage the project should have been planned such that the products and tasks have been identified and estimated. The goals of the stage are to:
- Schedule the project (assign resources and form a timeline)
- Identify and Evaluate Project Risks
- Completing the Plan, ready for the retreat

The Observatory is heavily resource limited and needs to optimize its resources as best as possible. The Directorate has this overall responsibility.

Resourcing will be an iterative process. By the end of the first week a rough estimation and timescale of the resources should be known.

5.1   Scheduling

A plan can only show the ultimate feasibility of achieving its objectives when the tasks are put together in a schedule that defines when each task will be carried out.

Scheduling follows estimates of the time for each task and is then followed by an assessment of the risks inherent in the plan. The schedule may need to be revisited during the Planning process to refine and improve the way in which the plan will be carried out.

The objectives of scheduling are to:
- Match available resources to the identified tasks
- Schedule work according to the defined sequence and dependencies
- Smooth resource usage within the bounds of the identified dependencies and any overall time constraints
- Identify surplus resource effort or additional resource effort needed and negotiate with the Directorate to resolve these
- Calculate total requirements for human and other resources and produce a cost for these.

As Gemini will be assigning resources to the complete program (2011 onwards) this process of the pre-project phase has a stage dedicated to it. It is expected that in the future Gemini will have more of a rolling program where project mandates are issued at various times throughout the year and projects start at different times. This change in governance will allow both program and project level planning to become easier, less time consuming and less disruptive.

Normally there are a number of approaches which could be suggested, but given the current constraints the Project Manager and Project Sponsor should assess resource availability at the previous stage boundary and give guidance.

The people who will be available to do the work (or the cost of buying in resources) should now be established. Any specific information should be noted – for example, names, level of experience, percentage availability, dates available from and to, external or internal resources. The project may also require non-human resources; this availability must also be assessed.

The result will be a schedule that shows the loading of work on each person and the usage of non-people resources. The duration of each task can be amended, based on knowledge of the resource effort required and the availability of the appropriate resource type. The schedule is often displayed as a Gantt Chart.

5.2   Risk Management

Risk is a major factor to be considered during the management of any project. Project management must control and contain risks if a project is to stand a chance of being successful.

Risk can be defined as uncertainty of outcome (whether a positive opportunity or negative threat). Some amount of risk taking is inevitable if the project is to achieve its objectives. The aim is to manage that exposure by taking action to keep exposure to an acceptable level in a cost-effective way.

Risk Management involves having:
- Access to reliable, up-to-date information about risks
- A decision-making process supported by a framework of risk analysis and evaluation
- A process in place to monitor risks
- The right balance of control in place to deal with those risks.

Before determining what to do about risks, the Project Sponsor and Project Manager must consider the amount of risk they are prepared to tolerate. The Project Team should be prepared to take comparatively large risks in some areas and none at all in others, e.g., Health and Safety.

An 'owner' should be identified for each risk; this should be the person best situated to track it. Allocating ownership of the risk process as a whole and the various components is fundamental from the outset. In large projects, this is likely to be the responsibility of the System Engineer.

5.2.1   Risk Management Cycle
Throughout the project the risk environment will constantly change. The project's priorities and relative importance of risks will shift and change. Assumptions about risk have to be regularly revisited and reconsidered.

Figure 5.1   *Risk Management Cycle*

5.2.2 Risk Identification
This step identifies the potential risks (or opportunities) facing the project. It is important not to judge the likelihood of a risk at this early time. Attempting to form judgments while identifying a list of potential risks may lead to hurried and incorrect decisions to exclude some risks.

Once identified, risks are all entered in the Risk Ledger. This contains details of all risks, their assessment, owners and status. The Risk Ledger becomes a control tool for the Project Manager, providing a quick reference to the key risks facing the project, what monitoring activities should be taking place and by whom. The Risk Ledger will be reviewed at the stage boundary.

5.2.3 Risk Evaluation
Risk evaluation is concerned with assessing the probability and impact of individual risks, taking into account any interdependencies or factors outside the immediate scope under investigation:
- Probability is the evaluated likelihood of a particular outcome actually happening
- Impact is the evaluated effect or result of a particular outcome actually happening
  - Should consider: time, cost, quality, scope, benefit & people/resources

5.2.4 Identify suitable responses to the risk
Suitable responses to risks break into broadly five types, as shown in the table below.

Response	Description
Prevention	Terminate the risk – by doing things differently and thus removing the risk, where it is feasible to do so. Countermeasures are put in place that either stop the threat or problem from occurring or preventing it having any impact on the project
Reduction	Treat the risk – take action to control it in some way where the actions either reduce the likelihood of the risk developing or limit the impact on the project to an acceptable level
Transference	This is a specialist form of risk reduction where the management of the risk is passed to a third party via, for instance, an insurance policy or penalty clause, such that the impact of the risk is no longer an issue for the health of the project. Not all risks can be transferred in this way.
Acceptance	Tolerate the risk – perhaps because nothing can be done at a reasonable cost to mitigate it or the likelihood and impact of the risk occurring are at an acceptable level
Contingency	These are actions planned and organized to come into force as and when the risk occurs

Any given risk could have appropriate actions in any or all of these categories. A project needs to allocate the appropriate budget, time and resources to risk management.

5.2.5 Risk Planning and Resourcing
Having made the selection, the implementation of the selected actions will need planning and resourcing and is likely to include plan changes and new or modified components:
- Planning, which, for the countermeasure actions itemized during the risk evaluation activities, consist of:
  - o identifying the quantity and type of resources required to carry out the actions
  - o developing a detailed plan of action: as additional tasks or as a contingency plan
  - o confirming the desirability of carrying out actions identified during risk evaluation in light of any additional information gained
- Resourcing, which will identify and assign the actual resources to be used to conduct the work involved in carrying through the actions
  - o note that the resource required for the prevention, reduction and transference actions will have to be funded from the project budget since they are actions that the project are committed to carry out
  - o contingency actions will normally be funded from a contingency budget.

5.3 Completing the Plan

A plan is not simply a diagram or Gantt Chart. It is incomplete without certain supporting narrative sections. Having completed the schedule and assessment of the risks satisfactorily, the plan, its costs, the required controls and its supporting text needs to be consolidated so the Project Sponsor can represent the project at the Planning Retreat.

A narrative needs to be added to explain the plan, any constraints on it, external dependencies, assumptions made, the risks identified and their required countermeasures.

A plan is not completely understandable without text to explain:
- What the plan covers (for example, a particular stage, the project, specific products)
- The planning approach taken
- The intended approach to implement the plan (for example, the number of stages and distribution of work)
- How the plan will be monitored and controlled
- What management reports will be issued
- Any included constraints
- Risks contained in the plan and any countermeasures taken
- External dependencies
- Assumptions made, including any planning assumptions
- Tolerances to be applied

The information should be contained within the project's document repository. It is expected that some additional information relating to the execution of the project will be created after the retreat but before the January 1, 2011.

6   Santiago Planning Retreat 2010

By the time of the Santiago Planning Retreat, the project should have been fully planned.

The Project Sponsor should understand the trades and the effects of reducing/increasing requirements/work and how this is related to the benefits of the project.

The project documentation repository should contain all the supporting evidence to help the Project Sponsor justify the trades if required.

At the retreat the parameters of each project are likely to be tweaked such that they fit within the overall resources available to the Observatory, hence forming the Observatory Program. A basic objective of the retreat is to make well informed decisions about the priorities assigned to various projects, taking into consideration their costs (in many forms), the advantages and risks to Gemini's stakeholders if they are pursued, and links to various strategic interests of the Observatory. The utility and effectiveness of such a prioritization process is a function of how well proposed projects have been defined, going into it.

Once the Observatory Program is approved it will come under configuration control and will be monitored on a weekly basis. Further 'Project' guidelines will be available at the retreat.