



Office of the Government Chief Information Officer
The Government of the Hong Kong Special Administrative Region

**PRACTICE GUIDE
FOR
SCOPING & PLANNING OF LARGE-SCALE
IT SYSTEM DEVELOPMENT PROJECTS
[G63]**

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Amendment History				
Change Number	Revision Description	Section Affected	Rev. Number	Date
1	As detailed in 1.01 to 1.06		1.1	December 2016
1.01	Add “List of Figures and Tables”	After “Table of Contents” (<i>New</i>)		
1.02	Revise the description of the related 3 best practices and guides developed by OGCIO	Preface - (e)		
1.03	Revise the description of appendices	Preface - Structure of the Guide (iv)		
1.04	Move the section 5 “Tools and Templates” to Appendix A	Remove section 5		
1.05	Move the section 6 “Sample Story and Practices Sample” to Appendix B	Remove section 6		
1.06	Add the “Reference” section	Reference (<i>New</i>)		

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CONVENTIONS

Table 1 - List of Acronyms used throughout the Practice Guide For Scoping and Planning of Large-scale IT System Development Projects

Abbreviations	Full Name
BA	Business Analyst
B/D(s)	Bureau(x)/Department(s)
URD	User Requirements Document
DITP	Departmental Information Technology Plan
DoJ	Department of Justice
EA	Enterprise Architecture
ECM	Enterprise Content Management
FAF	Funding Application Form
FS	Feasibility Study
FTE	Full-time Equivalent
GLD	Government Logistics Department
ISSS	Information Systems Strategy Study
IPD	Intellectual Property Department
IT	Information Technology
ITMU	Information Technology Management Unit
NGO	Non-Government Organisation
OGCIO	Office of the Government Chief Information Officer
PAT	Project Assurance Team
PCPD	Office of the Privacy Commissioner for Personal Data
PERT	Program Evaluation and Review Technique
PM	Project Manager
PMP	Project Management Plan
RFI	Request For Information
SA&D	Systems Analysis and Design
SIT	System Integration Test
UAT	User Acceptance Test

EXECUTIVE SUMMARY

I INTRODUCTION

Background and Objective

- (a) The implementation of large-scale and complex IT projects has been facing high risk of project failure due to several common issues. In some cases, the large-scale and complex IT projects may be undertaken by one single party where there may be a high risk of jeopardising the project with a single point of failure. Other issues include the unfamiliarity of external contractors with the Government's business and technical environments, frequent changes of key members of the project teams, gaps between business and IT sides, and prolonged procurement exercises.
- (b) OGCIO has sought to develop this Practice Guide to lay down the best practices for scoping and planning of large-scale and complex IT system development projects (**'the Guide'**), with a focus on the Initiate and Plan Phases of the project management lifecycle. The Guide is not intended to be stand-alone, but complements the "[*Practice Guide to Project Management for IT Projects under an Outsourced Environment \(PGPM\)*](#)¹". For effective use of the Guide, B/Ds should be familiar with [*PGPM*](#)¹.
- (c) The Guide will help to identify areas of complexity for IT system development projects of large-scale and high complexity, and to suggest practices to mitigate the identified risks. The Guide consists of:
 - i) **Project Scoping** – To determine and document a list of specific project goals, project boundaries, deliverables, tasks and deadlines.
 - ii) **Project Planning** – To estimate project budget, and devise schedule to come up with a project management plan according to the defined project scope.
- (d) The following diagram illustrates some of the key activities and practices introduced or refined in the Guide, including project complexity assessment, identification of key stakeholders, decomposition of the project into sub-projects if applicable, refining preliminary estimates and findings, and devising the project management plan.

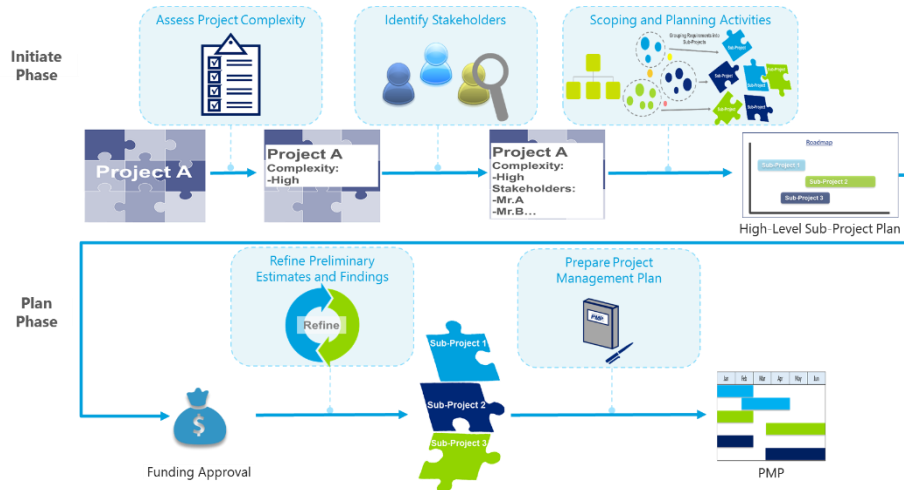


Figure 1 - Overview of the Processes

II INITIATE PHASE

Leverage Previous Project Information

- (a) Project Planner, a collective term for the person(s) responsible for scoping and planning the project since initiation, may leverage the information and experience of any previous projects within the B/D, within the Government, as well as external projects in the industry. Historical project library, if established, may benefit B/Ds on collecting and leveraging previous project information and experience.

Assess Project complexity

- (a) Project Planner should evaluate project complexity as early as possible, identify whether the project is large-scale and complex, and eventually, formulate strategies to mitigate project risks. The complexity assessment areas include:
- i) **Multiple stakeholders** – The joined-up efforts or involvement that would be required for multiple stakeholders in achieving the business outcome of the project.
 - ii) **Major business transformation** – The presence of major transformation of the existing mode of business in the proposed project in overcoming the identified problems or improving the current performance.
 - iii) **Technology risk** – The use of new, cutting edge, and/or custom-made technology with no/little market presence, proven experience or reference user groups as part of the technical solution for the proposed project.
 - iv) **Political, public and media impact** – The public and media attention to the new business process, project outcome and performance measurement.

- v) **Policy and legislative changes** – The project’s dependency on the timing of the passing of new legislations.
 - vi) **Delivery timeframe** – The impact of very tight deadlines or very long project duration on, for example, resources allocation or turnover of key members respectively.
 - vii) **User population** – The presence of a large number of users or huge user base within the Government and/or the community which would affect the complexity of requirement collection and the project size.
- (b) The scoping and planning processes depicted in this Guide have been developed around the key concept of complexity areas. The Project Planner should walk through these complexity areas and identify areas of concerns, which will be addressed in the scoping and planning processes. Considerations based on the assessment are recommended for requirements elicitation, project decomposition, project scheduling, deployment approach determination and effort estimation to facilitate the scoping and planning to mitigate the corresponding risks. Hence the complexity areas will be referred to from various perspectives throughout the Guide.
- (c) Since each project and situation is different, the Project Planner should assess the level of complexity based on previous project experience and current situation. The Project Planner should bear in mind the complexity areas and its considerations throughout the project management lifecycle.

Identify and document stakeholders’ involvement

- (a) One crucial factor for project success is to identify stakeholders and gain their support early. By identifying the relevant group of stakeholders, the Project Planner can efficiently gather the appropriate requirements to set up the business case.
- (b) The Project Planner should conduct stakeholder analysis early to identify all the stakeholder groups, determine their level of involvement and establish a communication plan. The roles and responsibilities should also be clearly defined for the relevant stakeholders. Another critical success factor is to determine the involvement of business stakeholders, dedicated participation of business users in projects, ideally internally at working group level, to help identify business processes that need to be changed and address business users’ concerns.
- (c) The Project Planner should start early in identifying ‘external stakeholders’ – parties within and outside of the Government who are impacted or have influence over the project. External stakeholders such as other B/Ds may engage in business

requirements elicitation, alignment with Government initiatives and other supporting activities, but they are not part of the formal project organisation.

Define Project Scope and Elicit High-level Requirements

- (a) Project Planner should define the project scope based on project objectives to set boundaries of the project. A feasibility study may be conducted to elicit the requirements in detail to come up with a well-defined scope to support further planning activities. The scope statement includes project outcomes and deliverables as well as any constraints identified and assumptions made.
- (b) Project Planner should elicit requirements in order to understand stakeholders' needs and priorities, to align IT and business objectives, to support estimation and decomposition, and eventually to build a business case and seek funding.
- (c) Requirements may be elicited from business, data, application, technology, and security perspectives to acquire a holistic business and IT view of the current state and identify any technical and integration requirements. Attributes of the requirements should also be captured to facilitate subsequent processes. Requirement attributes include business functions and processes, mission criticality, benefits, impacted users, effort, urgency, dependencies, constraints and other considerations. A high-level effort estimation of each requirement is required to help determine whether there is a need to decompose the large-scale project.

Project Decomposition

- (a) A large-scale and complex IT system development project should be decomposed into multiple sub-projects, where necessary and possible, to ease implementation and mitigate risk, as well as to bring earlier results and benefits to stakeholders.
- (b) The following guiding principles should be applied:
 - i) Minimise the number of sub-projects in manageable size.
 - ii) Keep complexity of individual complexity areas below acceptable level.
 - iii) Minimise impact to users such as repeated data entry, manual workaround, etc.
 - iv) Consider grouping requirements with similar attributes to improve synergies.
 - v) Avoid introducing more risks from breaking dependencies.
 - vi) Target to have manageable sub-projects to improve delivery timelines and deliver business benefit earlier and reduce the risk of project failure.
- (c) There are two major steps for the decomposition process. Step 1 aims to decompose a large-scale project by business processes and functions. It starts by grouping related

requirements by business function and process in manageable duration and effort, while keeping technical inter-dependencies.

- (d) Project Planner should perform groupings of requirements based on their attributes. Requirements with a common business function or process, as well as those with similar user types should be grouped together correspondingly. Project Planner should also distribute the requirements to lower the amount of effort required to implement each sub-project. Mission critical requirements may be grouped together to minimise the disruption of core business operations. Requirements with higher benefits or higher urgency may be grouped and prioritised into earlier sub-projects, while avoiding breaking technical or operational dependencies and constraints throughout the decomposition process.
- (e) In Step 2, the Project Planner should refine the requirements grouping to address any outstanding complexities. With the groupings of requirements, Project Planner should revisit the complexity areas identified in the Complexity Assessment and isolate complexity arising from mission critical requirements, technology risk, or policy and legislation changes. For complexity arising from major business transformation, multiple stakeholders or large user population, the Project Planner should mitigate the complexity by distributing the processes, functions or stakeholders diversely to multiple sub-projects. For complexity arising from political, public and media impact, the Project Planner should attempt to phase the project by addressing the first priority items first to ease any tense situation, and take adoption activities to align expectations. The Project Planner should revisit the existing complexity areas as appropriate and refine the groupings by referring to the relevant requirement attributes, to ensure all complexities are below the threshold. Appropriate sub-project model should be selected at this point.
- (f) There are three sub-projects models applicable to most decomposition cases:
 - i) **Typical Sub-Projects Model** – To break a large-scale and complex project into multiple sub-projects where each is below a certain duration or effort threshold. This model is suitable for projects involving multiple stakeholders and major business transformation.
 - ii) **Pilot Sub-Projects Model** – The first sub-project is conducted to establish a foundation followed by one or more sub-projects to complete the remaining requirements. This model is suitable to address technical risk, as well as major business transformation with mission critical requirements to be done first.
 - iii) **Milestone Sub-Projects Model** - First conduct the sub-project that completes the minimum requirements needed to meet a key external milestone, followed by one or more sub-projects to complete the remaining requirements. This model is suitable

to address tight delivery timeframe, to meet legislation requirements coming into effect soon, and to align with other Government initiatives with a fixed schedule.

- (g) Project Planner may combine the above three models into a hybrid model to better suit project needs.
- (h) With the formation of multiple sub-projects, alignment mechanism should be set up to cater for the needs of managing multiple sub-project teams. It may be worthwhile to conduct a study or a separate sub-project to elicit all requirements for multiple sub-projects, to avoid duplicated rounds of consultation with the same set of users and stakeholders.
- (i) The two-step decomposition process can help to lower the complexity and improve the manageability of the project, and provide the basis for project scheduling and prioritisation. However, it is not aimed to ease funding acquisition.

Scheduling of Sub-Projects

- (a) Upon the formation of sub-projects, the sub-projects should be prioritised with considerations based on project complexity and decomposition. The Project Planner can initiate the schedule with baseline durations of sub-projects and adjust resources accordingly. Project prioritisation and scheduling is a process involving multiple iterations of refinement.
- (b) Sub-projects should be prioritised based on the consideration of benefit versus complexity, dependencies and organisational readiness.
- (c) When scheduling sub-projects, the Project Planner should ensure sufficient time is allocated for any required mitigation of project risks. The Project Planner should give lead time for procurement and consultations, evaluate pilot effectiveness, and conduct feasibility/technical study, if necessary.
- (d) The deployment strategy should be formulated while taking into account the amount of resources available within B/D, external dependencies and pace out the sub-projects accordingly. A pilot should be conducted if high technology risks exists, whereas, sub-projects involving multiple stakeholders, major business transformation and large user population should be deployed by phase. Other deployment approach includes soft launch and 'big bang', depending on different project needs.

Sourcing Strategy, budget and Resource Estimation

- (a) As the sub-projects are formed, each sub-project may require a different sourcing model. Some sub-projects may be internal, outsourced or hybrid. The sourcing approach is dependent on the availability of resources, complexity of project, the need for specific

skill set and the importance to core business. The sourcing strategy shall support the formation of business case and funding bid.

- (b) Internal sourcing is preferred when the project requires in-depth knowledge in business processes. Scoping and planning an SA&D projects may be conducted with support by business analysts internally if available. External sourcing is preferred when there is a lack of readily available resource with specific skill set to support the implementation of niche projects. Hybrid approach may be considered when the project requires both internal staff with sufficient knowledge in both business and IT domains, combined with external contractors who should support the delivery of the project. Whichever sourcing strategy is adopted, it is crucial that an internal core group be formed to oversee and manage the project holistically.
- (c) Estimation considerations include allocating extra effort to manage multiple stakeholders and large user population, and allowing necessary adoption activities for major business transformation and political impact. Effort and resources should also be allocated to internal business and IT stakeholders involvement based on project nature. Other types of project effort include project management, procurement activities, other stakeholders involved activities, etc. Project budget can be calculated from quotations of vendors with assumptions. Past project experiences can also be leveraged to come up with a more accurate estimate in preparation of the funding bid.

III PLAN PHASE

- (a) Following the approval of funding and resources in the Initiate Phase, the Project Planner may need to revisit the considerations and activities in the Plan Phase, as well as to refine the deliverables with additional levels of detail. This will facilitate the activities leading to implementation including gaining internal stakeholder alignment, on-boarding project organisation members, formulating the Project Management Plan, and preparing the tender and conducting procurement, if needed.
- (b) As per the [*PGPM*¹](#), the project scope, project schedule and project budget that were formulated in the Initiate Phase should be refined, and for large-scale and complex IT system development projects, additional attention should be paid to refining the requirements, sub-project groupings, and resource estimates to ensure the latest information is taken into account and sufficient details are elicited to reduce project risks.
- (c) Similarly, the recommendations in the [*PGPM*¹](#) on preparing the Project Management Plan should still be applied, but additional consideration should be given on the

implications of large-scale and complex projects, such as for issue management and escalation and communications management when there are multiple sub-projects.

PREFACE

- (a) This Practice Guide complements the Practice Guide to Project Management for IT Projects under an Outsourced Environment [S19] ([PGPM¹](#)), which was first issued in March 2011. The [PGPM¹](#) provides guidelines on the management of IT projects based on international project management best practices including those promulgated by Projects IN Controlled Environments (PRINCE), which are already practised by Government B/Ds.
- (b) Over the years, the Government has made significant progress in harnessing IT to improve operational efficiency and effectiveness in the delivery of public services. Subject to the scope and business requirements of the required services, some of the IT system development projects can be very complex. Common issues (such as those related to scope, requirements, etc.) are sometimes encountered during the implementation of these large-scale and complex IT projects.
- (c) The implementation of large-scale and complex projects has been facing high risk of project delay or even failure due to several common issues. In some cases, the large-scale and complex IT projects may be entirely undertaken by one single party where there may be a higher risk of project being jeopardised by the failure of that single party. Other issues include the unfamiliarity of external contractors with the Government's business and technical environments, frequent changes of key members of the project teams, gaps between business and IT sides, and prolonged procurement exercise.
- (d) In order to mitigate such project risk and expedite project delivery, B/Ds should consider decomposing a large-scale and complex project into a number of sub-projects of manageable size and implement them in phases or in parallel and by more than one party. With a proper sourcing strategy in place, B/Ds should ensure there are sufficient business knowledge and technical IT skills in an internal core group to closely monitor the project progress and even take part in the project to ensure the quality of deliverables.
- (e) OGCIO has sought to develop this Practice Guide to lay down the suggested practices for scoping and planning of large-scale and complex IT system development projects ('**the Guide**'). In addition to the Guide, OGCIO has developed best practices and guides to set out an enhanced approach in IT projects delivery in another three major areas, namely the "[Best Practices for Business Analyst²](#)" for institutionalisation of business analyst (BA) role, the "[Effective Systems Analysis and Design Guide³](#)" for effective conduct of system analysis and design and the "[Practice Guide for Agile Software Development³](#)" for adopting Agile approach in software development.

- (f) The objective of the Guide is to identify areas of complexity for IT system development projects of large-scale and high complexity, and to suggest practices to mitigate the involved risks. The Guide covers two major areas:
 - i) **Project Scoping** – To determine and document a list of specific project goals, project boundaries, deliverables, tasks and deadlines.
 - ii) **Project Planning** – To estimate project budget, and devise schedule to come up with a project management plan according to the defined project scope.
- (g) For effective use of the Guide, B/Ds should preferably have basic knowledge of the [PGPM](#)¹.

Scope of the Guide

- (a) The purpose of the Guide is to provide recommendations and considerations to mitigate risks and enhance project success when delivering large-scale and complex IT system development projects. However, details of resource estimation and recommendations on getting funding approval shall not be covered in the Guide.



Figure 2 - Applicability of the Guide

- (b) **Large-scale IT System Development Projects** – The Guide is applicable to the scoping and planning of large-scale and complex IT system development projects for both internal and out-sourced projects. A simple indicator of whether an IT system development project is large-scale is whether it will likely fall within the Major Project^(a) category. The assessment of project complexity will be introduced later in the Guide to determine if a project is of high complexity. Together, large-scale and complex IT system development projects will be referred to as '**Projects**' in the Guide.

^a Major Project: As of 2014, according to OGCIO Circular 2/2011, a major project is any computerisation project with funding provision over HK\$10 million.

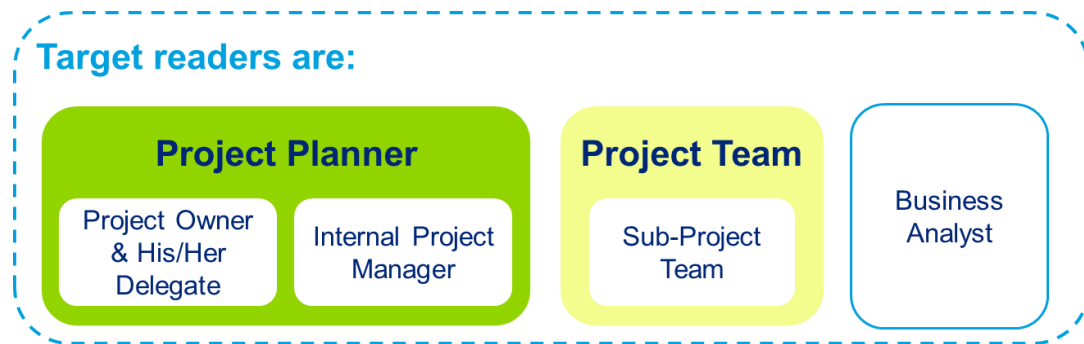


Figure 3 - Target Readers

- (c) **Target Readers** – The target readers of the Guide are:
- i) **Project owner or their delegates**, who are the ultimate decision maker for the project and supported/ advised by the PSC to ensure that the business benefits can be realised;
 - ii) **Internal project managers ('Internal PM')**, who are responsible for managing the scoping and planning activities of the project;
 - iii) **Business Analysts (BA)**, who are responsible for performing the business analysis functions for IT system development projects ; and
 - iv) **Project team members**, who design and implement the project or sub-projects. They can be internal or external resources.

Table 2 - Topics that are included and not included in the Guide

IS	IS NOT
<ul style="list-style-type: none"> ✓ Includes the Initiate Phase and Plan Phase of the project management lifecycle with regard to scoping and planning topic areas. ✓ B/Ds should make reference to PGPM¹ while taking recommendations from the Guide, where applicable. ✓ Recommendations on how to determine the baseline and how to define a scope statement. ✓ Recommendations on how to elicit high-level requirements. ✓ Recommendations on how to decompose a large-scale and complex IT system development project into sub-projects by grouping requirements based on attributes. ✓ Considerations on effort and resource estimation and deployment approach to ensure sufficient resources are allocated under project estimations. 	<ul style="list-style-type: none"> ✗ The Guide is not a stand-alone guide, instead Project Planner should adopt relevant practices in the PGPM¹ during the project management lifecycle. ✗ The following areas are not included in the Guide as these areas are already covered in other relevant guides: : <ul style="list-style-type: none"> ✗ Practices on SDLC and detailed project implementation; ✗ Detailed project effort and resource estimation calculation methods and actual estimation figures; and ✗ Practices on how to ease funding application and procurement processes.

Structure of the Guide

The Guide is divided into four sections:

i) **INTRODUCTION**

Provides an overview of the guidelines and recommendations applicable to scoping and planning of Projects, and how the activities grouped under relevant processes are mapped against the phases defined in the project management lifecycle of the [PGPM¹](#).

ii) **INITIATE PHASE**

Explains in detail the recommended considerations and activities of both existing and new processes under the Initiate Phase that can aid scoping and planning of Projects.

iii) **PLAN PHASE**

Explains in detail the recommended considerations and activities of both existing and new processes under the Plan Phase that can aid scoping and planning of Projects.

iv) APPENDICES

Tools, templates, checklists and sample story documents are provided in the following appendices for reference -

- Appendix A – Tools, templates and checklist
 - Provides a list of tools, checklists and templates to assist the processes of planning and scoping.
- Appendix B – Sample story and practice sample
 - Provides a sample story to illustrate the practices recommended in the Guide.

How to Use the Guide

- (a) The Guide is structured in such a way that enables B/Ds to identify “what to do”, “how to do” and “why it needs to be done” during scoping and planning of Projects.
- (b) The Guide assumes a familiarity with the [PGPM¹](#), and supplements the [PGPM¹](#) in order to focus on recommendations on how to mitigate project risks to improve the delivery of large-scale and complex IT system development projects.
- (c) In order to align with the [PGPM¹](#), as well as to provide ease of use, the Guide will be structured by the same project management phases (**‘Phases’**) and mapped to corresponding processes in the [PGPM¹](#).
- (d) The Project Owner, his/her delegate, and the Internal PM shall all participate in the scoping and planning of the project. Collectively, they will be referred to as the **‘Project Planner’** throughout the Guide.
- (e) The Guide provides recommended practices along with tools and samples for effective project scoping and planning. However, these practices, tools and samples cannot replace good management and sound judgment. Project Planner may use these practices and tools as aides to help them make good decisions on scoping and planning of Projects.
- (f) The Guide is also recommended to be referenced while conducting ISSS/DITP, as large-scale and complex projects are often the outcome from those studies. B/Ds may use the Guide to ensure sufficient scoping and planning considerations are taken into account when formulating the strategic plan and business case.

(g) For each process, the following information is provided to aid B/Ds, where applicable:

i) Tools & Samples

Provide a list of tools, techniques, templates and checklists which would assist in and speed up the use of the practices. Relevant samples will also be provided. The tools and samples as the supporting materials to the Guide are detailed in the Appendices of the Guide. These tools and samples may also be applicable to sub-projects. The tools and samples provided aims to facilitate scoping and planning of large-scale and complex IT system development projects. However, the tools and samples are not mandatory; Project Planner may choose to apply where applicable.

ii) Hints & Tips

Provide a list of useful hints and tips that could enhance the project efficiency or quality of the deliverables based upon past project experiences and industry practices.

iii) Process Summary

Summarises a list of stakeholders who are responsible for conducting the processes and activities and preparing the deliverables, and recommends a checklist for Internal PM to ensure that all the appropriate activities are performed during the preparation of scoping and planning of large-scale and complex IT system development projects. Please note that the checklist is not mandatory; however, it will be beneficial to use it for assuring the quality of the scoping and planning processes.

1 INTRODUCTION

1.1 LARGE-SCALE AND COMPLEX IT SYSTEM DEVELOPMENT PROJECTS

Major Projects^(b) are considered large-scale while the complexity of the projects should be assessed based on the criteria suggested in the Guide. It is recommended that the Project Planner who is initiating an IT system development project that is potentially complex should make reference to the Guide, and conduct the activities under *Chapter –2.2 Assess Project Complexity*.

1.2 PROJECT ORGANISATION STRUCTURE FOR LARGE-SCALE AND COMPLEX IT SYSTEM DEVELOPMENT PROJECTS

- (a) As different roles may be required at different stages of the project management lifecycle, the project organisation structure may be initially developed in the Initiate Phase, allowing core members to join the project in the preparation of funding application. BA should be assigned at project initiation to help define the scope and elaborate on the requirements. It is important to note that the composition of the project organisation may be different under different project nature or B/D environments.
- (b) The following are possible project organisation structure under different project scenarios or for different B/Ds.
 - i) The project structure should have dedicated resources in the roles outlined in the [PGPM](#)¹, i.e., Project Owner, PSC, PAT, Internal PM, BA, project team members, etc.
 - ii) In cases where the large and complex project is decomposed into sub-projects, some roles may be shared across the sub-projects, such as PSC, PAT, Internal PM, BA, depending on the size of the sub-projects, their degree of relevance, or other factors.
 - iii) If the project will be broken down into sub-projects, the Internal PM shall need to align the sub-projects in respect of standards, interfaces, etc.
 - iv) Some sub-projects may be independent or self-contained enough to be run as completely separate projects, project organisation and planning of such sub-projects may follow typical practices as recommended in the [PGPM](#)¹.

^b See p.11 above.

- (c) The composition of the organisation structure shall be further discussed in *Chapter – 2.4.3.5 Align Multiple Sub-Projects.*

Project Organisation Structure

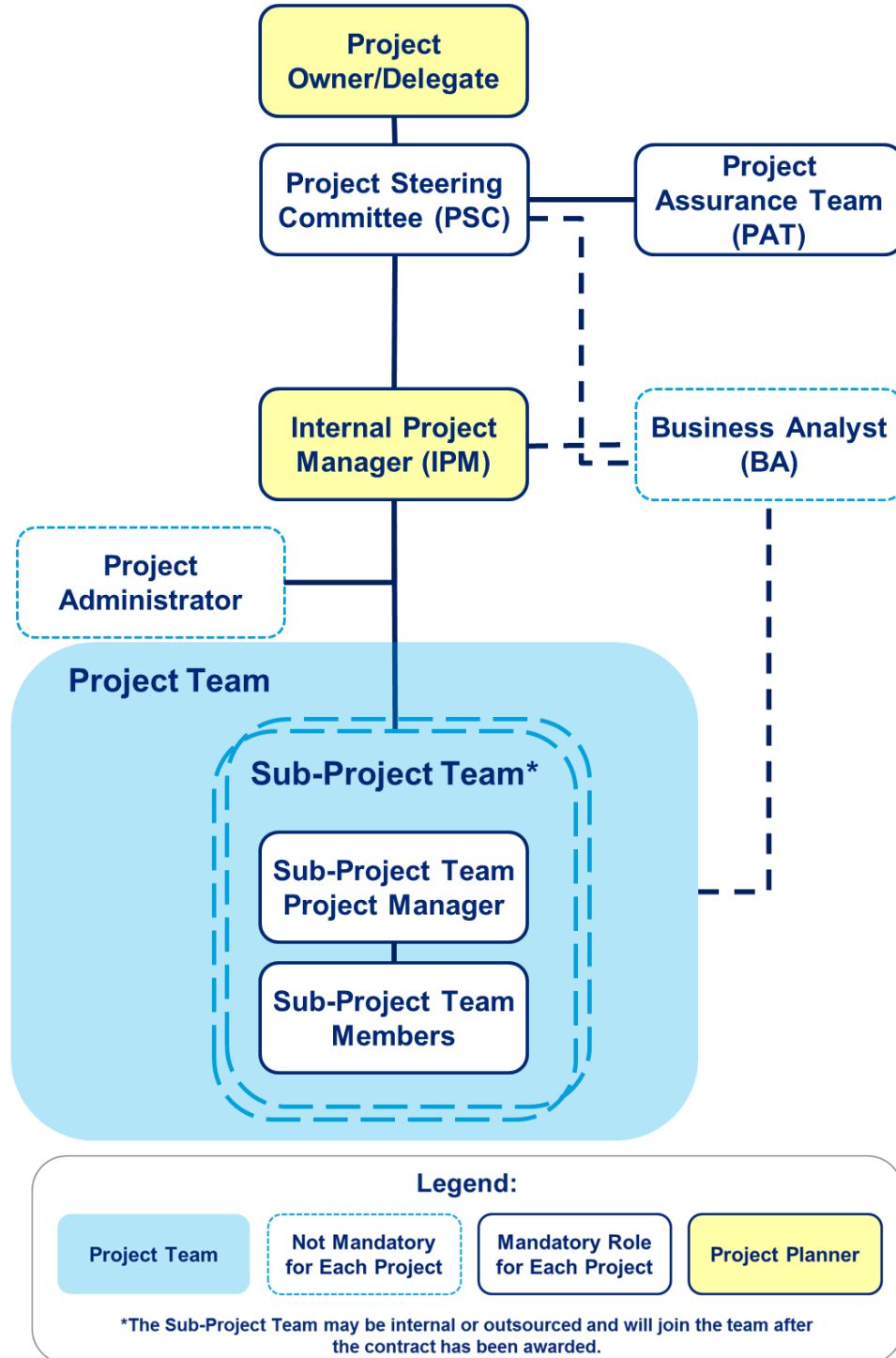


Figure 4 - Project Organisation Structure

1.3 MAPPING OF THE GUIDE TO PGPM

The following diagram illustrates the relationship between the Guide and the [PGPM](#)¹. Based on the [PGPM](#)¹'s Project Management Lifecycle Process Map, new recommended activities and processes are added on top of the existing processes for the purpose of scoping and planning of Projects. The affected processes and activities are indicated with corresponding chapter indices (shown in green), while newly introduced processes and activities will be indicated as 'new' with corresponding chapter indices.

Project Management Lifecycle Process Map

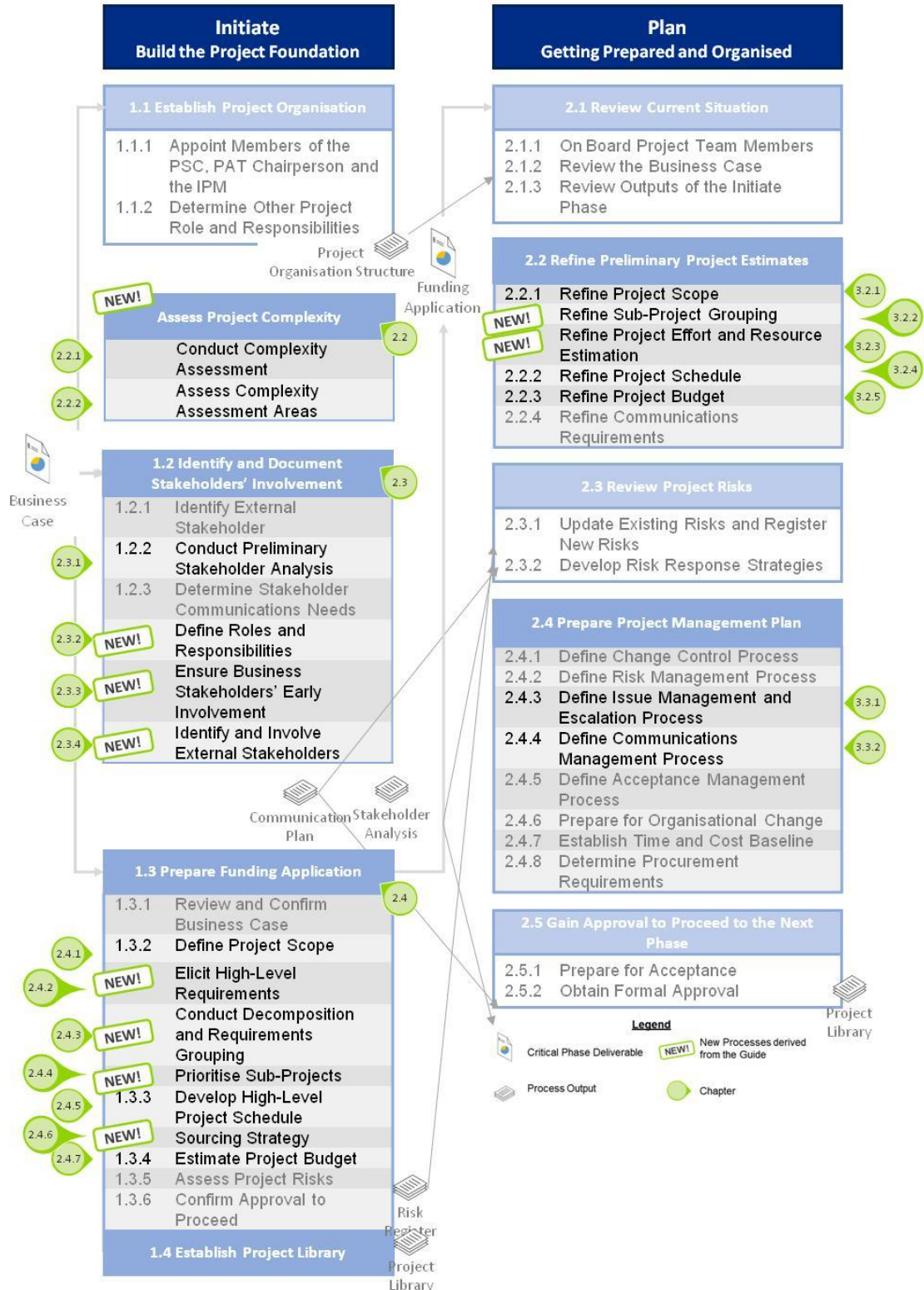


Figure 5 - Project Management Lifecycle Process Map

1.4 PROCESSES OVERVIEW

The following diagram illustrates some of the key activities and practices introduced or refined in this guide, including project complexity assessment, identification of key stakeholders, decomposing the project into sub-projects if applicable, refining preliminary estimates and findings, and coming up with the project management plan.

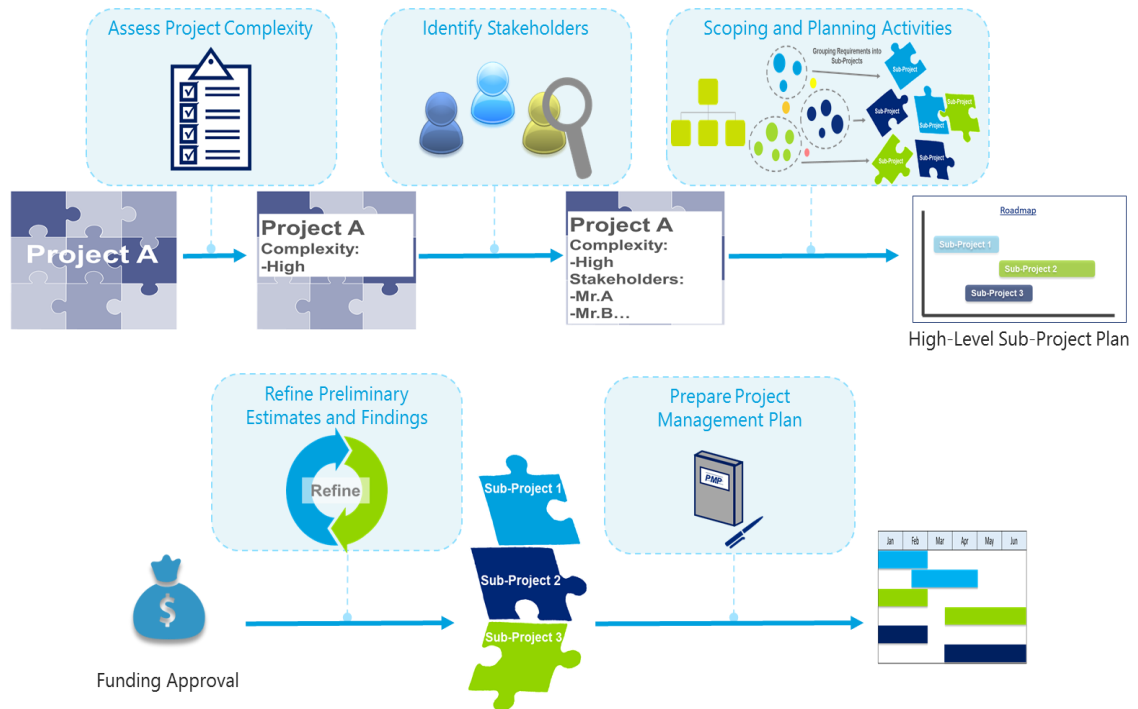


Figure 6 - Overview of the Processes

1.4.1 Tools and Samples



The project roles and key processes are illustrated in the RACI model:

i) *Appendix A –1 RACI Model*

2 INITIATE PHASE

2.1 OVERVIEW

In addition to typical project management processes already outlined in the [PGPM](#)¹, the Guide highlights new processes and activities recommended for Project Planner to properly scope and plan Projects to minimise risks during delivery. This section is developed on top of the existing project management processes for the Initiate Phase as defined in the [PGPM](#)¹, which encompasses the activities leading up to funding application. Depending on how a Project arises, these activities may be conducted as part of an ISSS/DITP project, or undertaken by a B/D during early stages of project scoping and planning.

2.1.1 Leverage Previous Project Information

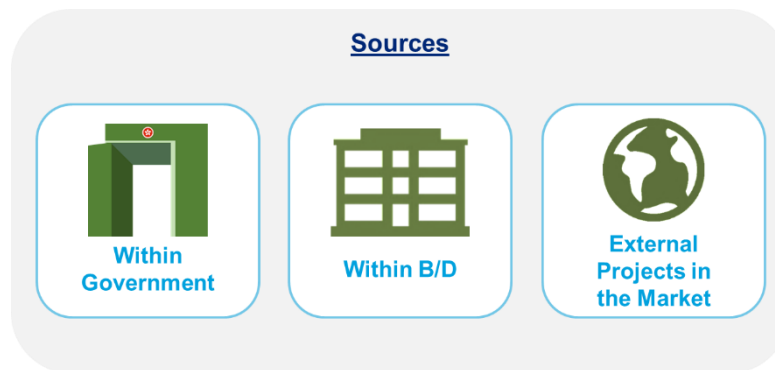


Figure 7 - Sources of Previous Project Information

- (a) Prior to determining the project scope, Project Planner may refer to previous projects of a similar nature and take note of the scope of previous projects, as well as the estimated effort, time and cost.
- (b) Project Planner may gather information, if available, on project changes and reasons for these changes. Major obstacles faced by the previous projects as well as the extra resources and lead time required to accommodate the obstacles should be examined. This information will allow the Project Planner to anticipate potential obstacles and project changes, and to scope and plan their project accordingly.
- (c) Project Planner may leverage on the information and experience of any previous projects within the B/D, within the Government, as well as external projects outside the Government.

2.2 ASSESS PROJECT COMPLEXITY

This chapter recommends complexity assessment considerations for Project Planner to mitigate project risks.

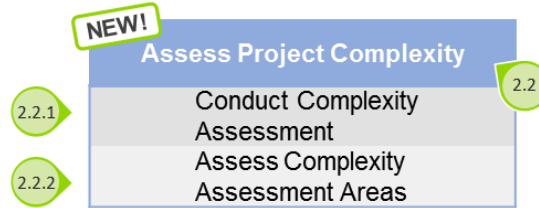


Figure 8 - Overview of Assess Project Complexity

2.2.1 Conduct Complexity Assessment

- (a) Project Planner should evaluate project complexity as early as possible, identify whether the project is large-scale and complex, and eventually, formulate strategies to mitigate project risks.
- (b) The complexity of the project will be assessed throughout the scoping and planning practices. Complexity assessment helps pinpointing how to mitigate risk when decomposing the Project, and to determine the level of complexity in the sub-projects, scoping, and scheduling considerations.

2.2.2 Assess Complexity Assessment Areas

- (a) The complexity assessment areas have evolved from the consideration items in the Supplementary Information on Project Profile Assessment section of the Funding Application Form (FAF) to evaluate project complexity. Although the items for consideration are similar, the purpose here is to identify the causes of complexity early to ensure proper scoping and planning, and this complexity assessment may be made reference to when conducting the risk assessment in FAF.
- (b) The assessment areas of complexity of projects are listed below:

Table 3 - Complexity Assessment Areas

Assessment Area	High-Level Considerations
<p>Multiple Stakeholders</p> <p>It relates to the joined-up efforts or involvement that would be required for multiple stakeholders (e.g., internal and</p>	<ol style="list-style-type: none"> (a) The number of stakeholders involved, who may each perceive the projects scope, objective and priorities differently; (b) The number of inter-related or cross departmental business processes and

<p>external stakeholders, other B/Ds, Non-Government Organisation (NGOs) and/or large population of inter-departmental business units) in achieving the business outcome of the project. These stakeholders may benefit from or be affected by the future project.</p>	<p>extent of system integration;</p> <ul style="list-style-type: none"> (c) The degree of impact and effect generated by the project on the users and stakeholders; (d) The difficulty in compromising the operational work involvement and project benefits for different stakeholders; (e) No or little experience of the stakeholder(s) in respect of working relationship or senior management support, and in delivering IT projects; and (f) The availability and maturity of BAs in undertaking the BA roles and responsibilities may also impact on resource planning.
<p>Major Business Transformation It relates to the presence of major transformation of the existing mode of business in the proposed project in overcoming the identified problems or improving the current situation.</p>	<ul style="list-style-type: none"> (a) The number of business processes and extent of system integration; and (b) The breadth and depth of changes and the time and effort required for the users and stakeholders to adapt to the changes.
<p>Technology Risk It relates to the use of new, cutting edge, and/or custom-made technology with no/little market presence, proven experience or reference user groups as part of the technical solution for the proposed project.</p>	<ul style="list-style-type: none"> (a) The availability of market supply, user groups and ready support expertise; (b) The compatibility and/or compliance with the existing IT architecture, central infrastructural facilities and government guidelines; (c) Number of proven successful cases; and (d) Availability and cost of alternatives or substitutes in case the maintenance and support services are discontinued.
<p>Political, Public and Media Impact It relates to the public and media attention to the new business process, project outcome and performance measurement. The attention may also include the project progress, responsiveness to changes in public and politicians' expectations, and comments from staff associations on the project.</p>	<ul style="list-style-type: none"> (a) The political and public sensitivity of the subject area, based on previous project experience or political environment; (b) Current controversial opinions in the society and the level of media attention; (c) Any policy commitments made by Government officials to the public; and (d) The level of impact of commitment on people's livelihood.
<p>Policy and Legislation Changes</p>	<ul style="list-style-type: none"> (a) The complexity of the new ordinance and

<p>Identify whether the project would depend on the timing of the making of new policies or passing of new legislations.</p>	<p>its sub-ordinances and how it will affect the project progress and outcome;</p> <p>(b) Internal Government regulation changes such as changes in Store and Procurement Regulations;</p> <p>(c) Any controversial views of the policy in the society; and</p> <p>(d) The scheduled duration on steps of the legislation process, possible delays, and how they will impact the project.</p>
<p>Delivery Timeframe</p> <p>Identify whether project has very tight deadlines or requires very long duration.</p>	<p>(a) Length of the project timeline, in particular when it will span over multiple years, during which situation may change, e.g., turnover of key staff or key members of external contractors;</p> <p>(b) Adequacy of project timeline for the expected scope, based on previous project experience or benchmarking similar projects; and</p> <p>(c) Adequacy of considerations and time allocation for activities on the critical path, including funding application, procurement, user acceptance, and adoption activities.</p>
<p>User Population</p> <p>Identify whether the project would serve a large number of users or huge user base within the Government and/or the community which would affect the complexity of requirement collection and the project size.</p>	<p>(a) The number of users impacted by the project;</p> <p>(b) The diversity in user groups being impacted by the project;</p> <p>(c) The impact on general public, external and internal users, and their expectation of the project; and</p> <p>(d) The users being in different geographical locations.</p>

- (c) Project Planner should walkthrough this list and identify areas of concerns, which will be addressed in the subsequent scoping and planning processes.
- (d) Since each project and situation is different, the Project Planner should assess the level of complexity based on previous project experience and current situation, with regard to the political and legislative environment, the concerns of the stakeholders including, as applicable, sentiments of the general public.
- (e) The following are examples of the activities and considerations which may help to mitigate specific risks after complexities are identified:

- i) For large-scale and complex projects with tight delivery timeframe, Project Planner may prioritise the requirements based on criticality and a phased approach may be adopted.
- ii) For projects with high technology risks, FS may be conducted to flesh out the requirements in detail to obtain a detailed scope to further support planning activities.

2.2.3 Tools and Samples



The list below includes the recommended tools, techniques and samples applicable to project complexity assessment:

- (a) **Complexity Assessment:**
 - i) *Appendix A – 2 Complexity Assessment Checklist*
- (b) **Samples:**
 - i) *Appendix B – 2 Story Background*
 - ii) *Appendix B – 3 Assessing Project Complexity*

2.2.4 Process Summary



Who will be involved?	
Role involved	Key Involvement
Project Owner	(a) On board the project upon project initiation; (b) Assign delegate as Project Planner; and (c) Assign BA roles.
Delegate of Project Owner/Internal PM, if available	(a) Assess project complexity.

Table 4 - Quality Assurance Checklist for Assessing Project Complexity

Key Tasks	Tools & Templates	<input checked="" type="checkbox"/>
1. Conduct Complexity Assessment (a) Have you considered all the complexity assessment areas?	Complexity Assessment Checklist	<input type="checkbox"/>
2. Review and Acknowledge (a) The following deliverables need to be reviewed by PAT and acknowledged by PSC/Project Owner to confirm correctness and completeness: i) Complexity Assessment Checklist.		<input type="checkbox"/>

Please refer to *Appendix A –I RACI Model* for the responsible parties.

2.3 IDENTIFY AND DOCUMENT STAKEHOLDERS' INVOLVEMENT

This chapter builds on top of the [PGPM](#)¹ to provide recommendations specific to large-scale and complex IT system development projects, in the area of identifying and documenting stakeholders' involvement.

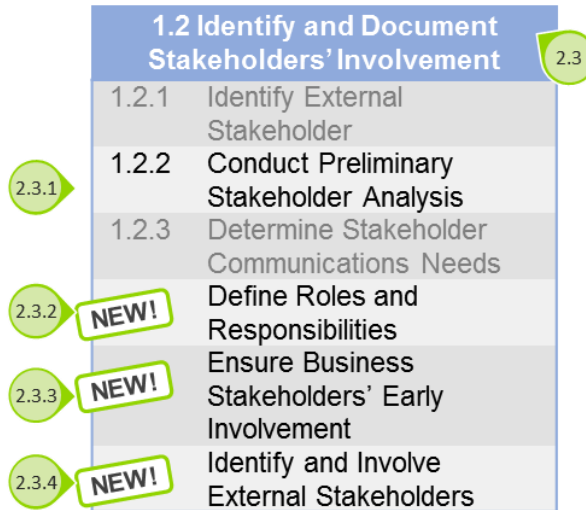


Figure 9 - Mapping of “Identify and Document Stakeholders’ Involvement” to PGPM

2.3.1 Conduct Preliminary Stakeholder Analysis

Successfully identifying stakeholders and gaining their support early is essential to project success. In order to set up well-established engagement with stakeholders, Project Planner should go through a stakeholder analysis early in the project to identify all the stakeholder groups, determine the required involvement for each of them, and establish communication plan based on their communication needs.

2.3.2 Define Roles and Responsibilities

The roles and responsibilities should be clearly defined for relevant stakeholders.

2.3.3 Ensure Business Stakeholders’ Early Involvement

- (a) Involvement of business stakeholders has proven critical to the success of IT projects.
- (b) The Guide encourages the dedicated participation of business users in project initiatives, ideally at the working group level. Their tasks include requirements elicitation, requirements prioritisation, engagement with other stakeholders, and assisting the Internal PM in project management tasks.

- (c) The benefit of such involvement is to ensure that the required capabilities from business and technical perspectives can be provided from a correct mix of expertise in the team.
- (d) The establishment of the Business Analyst (BA) role can facilitate the adoption of such concept and achieve the expected benefits. Some B/Ds already have BA equivalent units, and has proven success in helping Projects. For further information on instituting the role of BA, please refer to the "[Best Practices for BA²](#)".
- (e) The business users are familiar with the practices of the B/D. They can help identify business processes that need to be changed and address business users' concerns on the Project.

2.3.4 Identify and Involve External Stakeholders

Other than the stakeholders identified in the project organisation and within the B/D that owns the project, it is also important to identify anyone who is impacted by or has influence over the project, including parties within and outside the Government. These parties are referred to as 'External Stakeholders'. External stakeholders may be involved throughout the project management lifecycle, but they are not part of the formal project organisation.

- i) Before the Initiate Phase, Project Planner should start identifying external stakeholders based on the high-level project concept.
- ii) Briefing and proper communications with other related B/Ds may start for initial alignment, with a view to establishing a mutual understanding of the potential benefits to be achieved through cooperation.
- iii) In general, external stakeholders with higher influence and higher impact should be involved earlier in the project, i.e., Initiate Phase. Project Planner needs to make a decision on necessary external stakeholders to involve, as well as the adequate amount of stakeholder involvement at each stage of the project.

Table 5 - Activities and External Stakeholder Involvement

Activities	Suggested Parties
1. Align project objective with management vision	Management of other B/Ds, for consultations.
2. Gather business requirements involving other B/Ds	Business users from other B/Ds, for consultations.
3. Integrate/Interface with Other B/Ds	ITMUs and System Owners from other B/Ds, for consultations and follow ups.

Activities	Suggested Parties
4. Prepare for public roll out	Public relationship team or function, alignment with project organisation.
5. Align with Government Initiatives	Corresponding B/D representatives for consultations.
6. Engage other authorities in procurement process and/or related to privacy matters	E.g., Engaging GLD, DoJ, IPD and/or PCPD, as appropriate, for advice.
7. Seek advice on IT project delivery	Relevant OGCIIO representatives, if applicable, for consultations.

2.3.5 Hints and Tips



Table 6 - General Tips – Identify And Document Stakeholders' Involvement

There may be presence of conflicting interests or opinions in the project. The project objectives may be subject to scrutiny from the conflicting parties. The Project Owner should be aware of the potential influence of these stakeholders and take proactive measures to manage the corresponding risks.

2.3.6 Process Summary



Who will be involved?	
Role involved	Key Involvement
Project Planner/Internal PM	(a) Conduct preliminary stakeholder analysis; (b) Define roles and responsibilities; (c) Ensure business stakeholders' early involvement; and (d) Identify and involve external stakeholders.

Table 7 - Quality Assurance Checklist for Identify and Document Stakeholders' Involvement

Key Tasks	Tools & Templates	<input checked="" type="checkbox"/>
1. Conduct Preliminary Stakeholder Analysis (a) Have you identified all necessary stakeholders?	Please refer to PGPM ¹	<input type="checkbox"/>

Key Tasks	Tools & Templates	<input checked="" type="checkbox"/>
2. Define Roles and Responsibilities (a) Have you defined the roles and responsibilities for all the necessary stakeholders?	RACI Model	<input type="checkbox"/>
3. Ensure Business Stakeholders' Early Involvement (a) Have you considered assigning a BA role to the project organisation? (b) Have you involved relevant stakeholders early?	N/A	<input type="checkbox"/> <input type="checkbox"/>
4. Identify and Involve External Stakeholders (a) Have you considered external stakeholders and their involvement activities?	N/A	<input type="checkbox"/>

Please refer to *Appendix A – 1 RACI Model* for the responsible parties.

2.4 PREPARE FUNDING APPLICATION

This chapter builds on top of the [PGPM](#)¹ to provide recommendations specific to large-scale and complex IT system development projects, covering processes and activities supporting the preparation of the funding application.



Figure 10 - Mapping of Prepare Funding Application to PGPM

2.4.1 Define Project Scope

2.4.1.1 Conduct Project Scoping Activities

- (a) The scoping activities following a scope management lifecycle include scope confirmation, validation and control. First of all, a baseline should be set to frame the scope, followed by high-level requirements elicitation and then confirmation of scope. Further details are illustrated in *Appendix A –3 Scope Management Lifecycle*.
- (b) **Define Project Scope** – Project Planner defines the project scope based on project objectives to set boundaries of the project.
- (c) High-level requirements will be gathered during the Initiate Phase, and refined with further details in Plan Phase. For more information on gathering high-level requirements, please refer to *Chapter – 2.4.2 Elicit High-Level Requirements*. Moreover, as mentioned under complexity assessment areas, an FS may be conducted to flesh out the requirements in detail to obtain detailed scope to support further planning activities.

- (d) **Document Scope Statement** – The scope statement defines the direction for planning project activities. The scope statement includes project outcomes and deliverables, out-of-scope items/deliverables (where applicable) as well as any constraints identified and assumptions made.
- (e) **Deliverables** – a **scope statement** shall be defined upon completion of the activities.

2.4.1.2 Tools and Samples



The list below includes the recommended tools, techniques, templates and samples applicable to defining project scope. The details are provided below:

- (a) **Project Scoping:**
 - i) *Appendix A – 3 Scope Management Lifecycle*
 - ii) *Appendix A – 4 Scope Statement Template*
- (b) **Samples:**
 - i) *Appendix B – 8 Sample Scope Statement*

2.4.1.3 Hints and Tips



Table 8 - General Tips – Define Project Scope

- | |
|--|
| <ul style="list-style-type: none">(a) The scope statement should be described using language and terminologies that can be understood by all stakeholders.(b) Any changes to the project scope are managed via the change management procedures.(c) Once the scope has been confirmed with funding approval, it is finalised. Any changes to the scope will require a formal change request with strong justifications and endorsement of the Project Owner/PSC, subject to the IT project governance procedure. |
|--|

2.4.2 Elicit High-Level Requirements

Requirements elicitation is an essential part of project scoping and planning. With the scope boundaries defined, the Project Planner and BA should elicit high-level requirements throughout the Initiate and Plan Phases, to determine whether the requirements fall within the scope and to fine-tune the scope statement as more detailed information is available. Sometimes high-level requirements are elicited prior to funding application in the Initiate Phase, such as during ISSS/DITP for budget estimation, whereas more detailed requirements are elicited after the funding approval. Besides eliciting requirements from consultations/workshops, Project Planner should

also make reference to government IT standards and guidelines, departmental instructions and existing IT infrastructure documentation, where appropriate.

2.4.2.1 Requirements Elicitation Considerations and Activities based on Project Complexity

Based on the complexity assessment, Project Planner should have identified areas of complexity he/she should address throughout scoping and planning of the project. Certain considerations are recommended for the high-level requirements elicitation, together with in-scope activities that can mitigate project risks. The following list demonstrates the considerations and activities:

Table 9 - Requirements Elicitation Considerations and Activities Based on Project Complexity

Complexity Assessment Area	Recommended Considerations and Activities
<p>1. Multiple Stakeholders</p>	<ul style="list-style-type: none"> (a) Involve stakeholders early, particularly those that are highly influential, highly impacted, and those without prior business relationship; (e) Include multiple workshops and socialisation sessions to ensure alignment among the stakeholders and their objectives and concerns are addressed; (f) Document requirements from different stakeholders to document the requirements and the types of stakeholder affected; (g) Address the different levels of requirements priority from different parties to ensure the level of priority can be aligned; and (h) Identify all the cross departmental or integrated business processes and system integration to ensure completeness in subsequent planning.
<p>2. Major Business Transformation</p>	<ul style="list-style-type: none"> (a) Identify the degree of change to the current business operations; (b) Assess the time required for the users adoption and alignment with stakeholders; and (c) Consider including adoption activities in the scope to ease user adoption.

Complexity Assessment Area	Recommended Considerations and Activities
3. Technology Risk	(a) Identify the level of technology risk; and (b) Consider including Feasibility/Technical Study in the scope to assess if the identified technology is practical for the proposed project.
4. Political, Public and Media Impact	(a) Identify the political and public sensitivity of the subject area, and any policy commitments made by Government officials during requirements elicitation; and (b) Consider including adoption and promotional activities in the scope to ease user and public adoption.
5. Policy and Legislation Changes	(a) Consider how the complexity arising from the existing or new ordinance and its sub-ordinances will affect the project requirements; (b) Allow flexibility in requirements to adapt to the new policy and legislation changes; and
6. Delivery Timeframe	(a) Identify requirements that are of lower priorities; and (b) After project schedule has been formulated, decide whether requirements outside of delivery timeframe should be excluded from scope, considered as a separate project, or swapped with other requirements in order to fit in the timeline.
7. User Population	(a) Estimate the number of users and identify diversity in user groups impacted by the project; (b) Identify any complexity arising from the users being in different geographical locations; and (c) Consider whether adoption and promotional activities should be included to ease user and public adoption.

2.4.2.2 Capture High-Level Requirements

- (a) The scope statement defines the direction for planning project activities, and it is made up of high-level requirements. Project Planner should gather all the necessary requirements to define the project scope, the project outcomes and deliverables, as well as any constraints identified and assumptions made. Requirements that are deemed out-of-scope need to be identified.
- (b) **Consultations and workshops:** Project Planner may use Stakeholder Analysis to identify relevant parties and may arrange consultations/workshops with representatives from various stakeholder groups in order to gather a holistic view of the requirements.

- (c) **Other means of requirement capturing:** Besides capturing requirements through consultations/workshops, Project Planner may also capture requirements from existing documentation, market research, research from overseas practices, and also leverage the project experience from other B/Ds.
- (d) **Leveraging Enterprise Architecture^(c) (EA) Domains as appropriate:** The EA Domains of business, data, application, technology and security can help assess the current state of the B/D's environment. Project Planner may leverage these domains in identifying requirements to ensure different perspectives are covered.
- (e) **Requirement attributes:** Attributes of the requirements should also be captured, to facilitate subsequent processes. Requirement attributes include business functions/processes, mission criticality, benefits, impacted users, effort, urgency, dependencies, constraints and other considerations of the requirements.
- (f) **Scope Assessment:** This activity is to determine if the requirements are affecting related business processes and application, system, data and infrastructure, and to determine whether such affected areas should be included in the project scope. Project Planner may leverage Business Capability Mapping, System and IT Infrastructure landscape, if available, to better visualise the current environment.
 - i) **Business capability mapping:** Project Planner should identify business functions and capabilities affected by the project, as well as new capabilities required to support the business changes.
 - ii) **Data, application and system landscape:** Project Planner should identify all systems affected by the requirements and the integration/interface between the affected systems. Changes in one system may affect other systems that are integrated or have interface with that system. The mapping should also show the types of data that need to be migrated due to the new requirements.
 - iii) **Infrastructure landscape:** Project Planner should identify all the infrastructure and network supporting the affected systems and any shared infrastructure which may require adjustment.

2.4.2.3 Document Requirements

^c EA provides a structured approach for analysing and maintaining the current and future state of B/Ds' business and the technology architecture and strategy, processes, organisation and technology applications, in order to enable business process re-engineering through B/Ds' business and technology transformation

- (a) The requirements captured in consultation sessions or workshops should be clearly documented in the requirements catalogue.
- (b) Requirements and their attributes should be logged for other processes to use, as well as for refinement in subsequent phases. Besides, Project Planner may assess the requirement attributes to facilitate project decomposition and sub-project prioritisation in later Phases.
- (c) Requirements may be prioritised with MoSCow Prioritisation Method.

2.4.2.4 Tools and Samples

The list below includes the recommended tools, techniques, templates and samples suitable for high-level requirements elicitation and requirements documentation:

- (a) **Elicit high-level requirements:**
 - i) *Appendix A –5 Stakeholder Question Set*
 - ii) *Appendix A –6 Usage of Enterprise Architecture Domains to Elicit Requirements*
- (b) **Document requirements:**
 - i) *Appendix A –7 Requirements Catalogue Template*
 - ii) *Appendix A – 8 Requirements Attribute List Template*
 - iii) *Appendix A –9 MoSCoW Prioritisation*
- (c) **Samples:**
 - i) *Appendix B – 4 Using Enterprise Architecture Domains To Elicit And Assess Requirements*
 - ii) *Appendix B – 5 Sample Business Capability Mapping*
 - iii) *Appendix B – 6 Requirements Catalogue Sample*
 - iv) *Appendix B – 7 Sample Requirement Attributes List*
 - v) *Appendix B – 8 Sample Scope Statement*

2.4.2.5 Hints and Tips

Table 10 - General Tips – Elicit High-Level Requirements

- (a) Eliciting high-level requirements is one of the key processes detailed in the Guide. As more information is discovered throughout the project, the deliverables generated by other processes may need to be refined.
- (b) Not all stakeholders can be involved in the initial consultation meetings. In order to ensure other stakeholders remain engaged, it may be beneficial to introduce the project to them and let them know that their help and involvement may be needed in the future.

- (c) It is important to ensure goals are aligned across the stakeholder groups. Projects trying to satisfy unaligned goals often run into difficulties. One way is to line up the representatives from all stakeholder groups in meetings or workshops to agree upon the project goals.
- (d) Other than consultation, Internal PM should also gather information related to the project through other means to facilitate the planning process. For example, system landscape and system specifications should be gathered for a system replacement/modification project to understand existing settings and any integration needs.

2.4.3 Conduct Project Decomposition and Requirements Grouping

- (a) In order to address complexity concerns for large-scale and complex projects, one of the techniques is to decompose the project into multiple sub-projects of manageable size to ease implementation and mitigate risks.
- (b) Project Planner should keep in mind that decomposition of project aims to lower the complexity and improve the manageability of the project, rather than to ease funding acquisition. Sub-projects serving to meet the same project objective should be included in a single funding bid.

2.4.3.1 Guiding Principles on Project Decomposition

- (a) Project decomposition methods may vary under different circumstances, so there is no a single standard way for decomposition. Project Planner should bear in mind that decomposing a Project into sub-projects will inevitably create overhead in project management and in aligning the deliverables. Too many sub-projects may even cause difficulties in these respects. Therefore Project Planner should note the guiding principles to ensure that the Project is decomposed into sub-projects of reasonable sizes with sufficient benefits to justify the increased overheads and other project risks. The guiding principles include:
 - i) Rationalise the number of sub-projects as more sub-projects may create more management overhead.
 - ii) Lower the complexity of individual complexity areas through project decomposition.
 - iii) Minimise impact on users such as repeated data entry, manual workaround, etc.
 - iv) Consider grouping requirements with similar attributes to improve synergies.
 - v) Avoid introducing more risks from breaking dependencies.
 - vi) Target to have manageable sub-projects to improve delivery timelines and deliver business benefit earlier and reduce the risk of project failure.

2.4.3.2 Overview of Project Decomposition

- (a) **Requirement attributes** – based on the requirements elicited earlier, Project Planner should form groupings of these requirements by holistically looking at all of their attributes, i.e., business function/process, mission criticality, benefit, impacted users, effort, urgency, dependency and constraint. The requirement groupings will become the basis for forming sub-projects.

Table 11 - Considerations based on Requirement Attributes

Requirement Attributes	Considerations
1. Business Function and Process	(a) Requirements that are related and work in conjunction to achieve a common business function or process should be grouped together.
2. Benefit	(a) Groups of requirements with higher benefits may be prioritised into earlier sub-projects to maximise realisation of benefits.
3. Mission Criticality	(a) Requirements that are mission critical should be carefully assessed to determine how to minimise the disruption to core business operations. For example, large, complex requirements that need to be done together may require a dedicated sub-project, while incremental changes may be distributed to minimise risk.
4. Urgency	(a) Requirements that users have determined to be of higher urgency may be prioritised and grouped into earlier sub-projects to meet certain business objectives or milestones, while the less urgent requirements may be left to other sub-projects. (b) These may be based on management decisions or priorities, with the objective of addressing some pressing issues.
5. Effort	(a) Distribute the requirements to lower the amount of effort required to implement each sub-project and reduce the risk.
6. Impacted Users	(a) Group requirements with similar user types. (b) May consider deployment to different user types in different phases.
7. Dependency	(a) Bear in mind to avoid breaking technical or operational inter-linkages with other requirements throughout the project decomposition process. (b) Requirements with dependencies on them, for example, from other requirements or external milestones, need to be implemented earlier.

Requirement Attributes	Considerations
8. Constraint	<p>(a) Requirement grouping should not violate the constraints.</p> <p>(b) These constraints may alter during the project. Adjustment may need to be made to the schedule of individual sub-projects subject to a holistic review of the requirement attributes.</p> <p>(c) For example, if certain requirements have a hard deadline or needs to be completed before an external milestone, group these requirements to be implemented before the deadline.</p>

- (b) **Project complexity** – based on the complexity areas identified in the Complexity Assessment, the Project Planner may pinpoint how to restructure the sub-projects so that the corresponding project risk can be mitigated.

Table 12 - Decomposition and Grouping Considerations and Activities Based on Project Complexity

Complexity Assessment Area	Recommended Considerations and Activities
1. Delivery Timeframe	<p>(a) Delivery timeframe may be constrained by external milestones or dependent on the level of urgency determined by users</p> <p>(b) Decompose the project to ensure all the mission critical requirements are delivered within delivery timeframe (leverage requirement attributes);</p> <p>(c) Decompose by different levels of urgency for ease of prioritisation (leverage requirement attributes);</p> <p>(d) Identify any external dependency, and isolate the portion of scope being affected by such dependencies into individual sub-projects, where possible; and</p> <p>(e) If project timeline is too long such as spanning over several years, it is advisable to break it down into phases, for example, of duration within 15 months, for ease of management, to react on changes, and to review the performance of the sub-projects concerned.</p>
2. Technology Risk	<p>(a) Isolate the component with technology risk identified, where practical and appropriate;</p> <p>(b) Conduct an FS, if required, to confirm the technical feasibility;</p> <p>(c) A separate sub-project for testing all integrations thoroughly, may be required; and</p> <p>(d) Consider if a pilot sub-project is worthwhile to minimise</p>

Complexity Assessment Area	Recommended Considerations and Activities
	the risk.
3. Policy and Legislation Changes	(a) Assess the potential areas of impact due to the policy and legislation changes; and (b) Attempt to separate the sub-projects dependent on the policy and legislation changes for separate roll-out so the change factors can be isolated.
4. Major Business Transformation	(a) For project that will impact on core business operations or multiple business functions, form sub-projects with requirements of similar business function and process; and (b) Carefully plan sub-projects with mission critical requirements to avoid interrupting core business operations.
5. Multiple Stakeholders	(a) For project that will impact on multiple stakeholders, minimise the number of stakeholders in each sub-project
6. User Population	(a) Consider forming sub-projects by user groups with similar business requirements, business functions, positions, geographic locations, internal vs. public, so the user population of each sub-project is of manageable size; (b) If the Project Planner has identified significant benefits from conducting pilot under circumstances where the project timeline allows, the Project Planner may conduct a pilot to a small portion of the user population for proof of concept; and (c) Adoption and promotional activities may be planned as a separate sub-project.
7. Political, Public and Media Impact	(a) Identify if any Government commitment has been made, or if there are any public and media sensitive impacts, and accord first priority to those relevant requirements; (b) Attempt to phase the project by addressing the first priority items first to ease any tense situation; and (c) Adoption activities , such as marketing and campaign activities to align expectations and obtain consensus, where necessary, may be handled in a separate sub-project.

(c) **Sub-projects model** – During the decomposition of a large-scale and complex project, the formation of sub-projects may be arranged in various ways in respect of mainly the order and timing of execution. Project Planner should first determine the sub-projects model for use based on the complexity areas being targeted as it may affect how the requirements should be distributed into sub-projects. In general, there are three

sub-projects models which are applicable to most cases based on project experience in the industry. Project Planner may suitably apply any of the three sub-projects models, allowing room for flexibilities or even combine the models based on specific project needs.

- i) **Typical sub-projects model** is breaking a large-scale and complex project into multiple sub-projects where each is below a duration or effort threshold, for example, implementation period of each sub-project is under 15 months and effort under 150 man-months, B/Ds should base on their project situation to define their thresholds. Upon proper requirements elicitation, the amount of effort for each requirement can be aggregated together to estimate the effort needed for the sub-projects. This model is most applicable to projects which involve multiple stakeholders and major business transformation, where stakeholders or business functions/processes can be split between the sub-projects. The order and timing of execution of those sub-projects are subject to the inter-dependency among them.

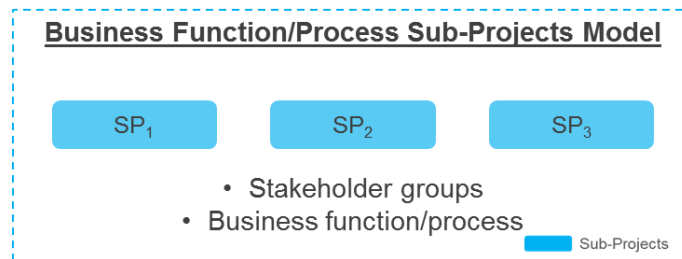


Figure 11 - Typical Sub-Projects Model

- ii) Another sub-projects model is pilot or foundation based, where the first sub-project is conducted to establish a foundation followed by one or more sub-projects to complete the remaining requirements. This model is applicable to addressing technical risk with a pilot and/or implementing the pre-requisite components first. It is also applicable to major business transformation where the mission critical requirements are better to be done first while minimising the impact by non-critical requirements which may introduce more risks.

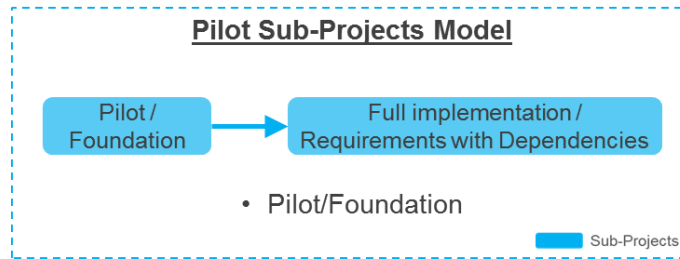


Figure 12 - Pilot Sub-Projects Model

iii) A variation of the above model is to first conduct the sub-project that completes the minimum requirements needed to meet a key external milestone, followed by one or more sub-projects to complete the remaining requirements. This model is applicable to addressing tight delivery timeframe, where certain requirements may need to be completed to meet legislation requirements which are coming into effect, or to align with other Government initiatives with a fixed schedule.

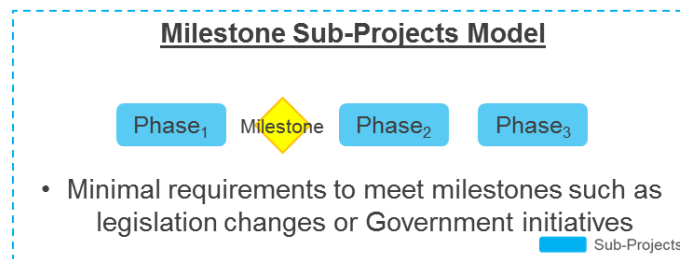


Figure 13 - Milestone Sub-Projects Model

iv) Project Planner may combine the above models (i) – (iii) into a hybrid model to better suit project needs. For example, a pilot may be conducted for a proof of concept, then the project can be implemented in separate chunks based on end-to-end business functions and processes.

2.4.3.3 Project Decomposition Method

(a) The decomposition process consists of two major steps, namely the basic decomposition of large-scale project and decomposition by complexity. The first step aims to decompose a large-scale project by business processes and functions, while step two targets to address the existing complexity issues after the large-scale project is decomposed by business functions and processes.

Step 1 – Basic Decomposition of Large-Scale Project

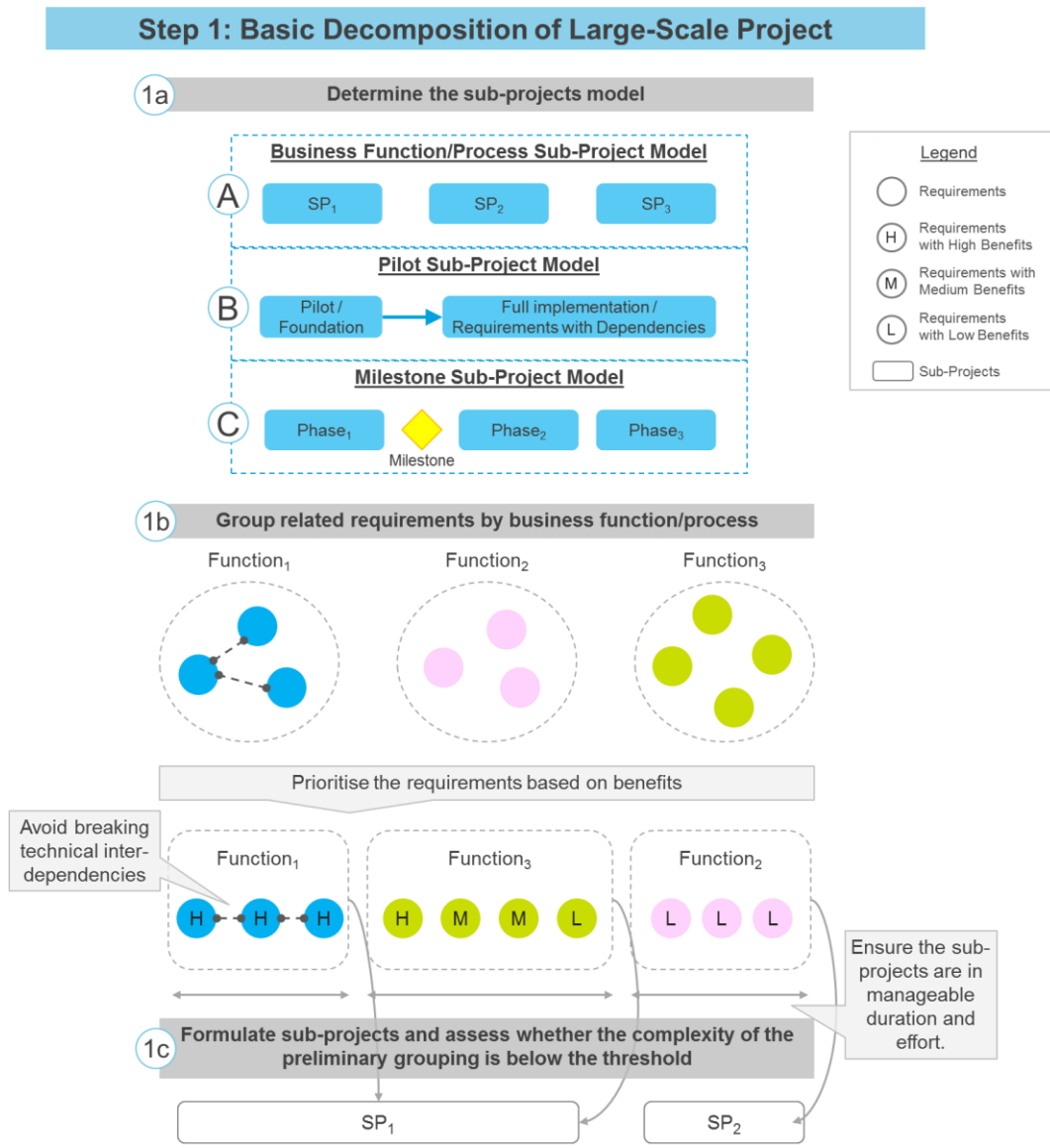


Figure 14 - Overall Decomposition Process Step 1

(a) **Determine the sub-projects model**

- i) Besides the abovementioned sub-projects models, Project Planner may apply a hybrid sub-projects model which may be a combination of model A, B or C to cater for specific project needs.
- ii) The following example aims to visualise the decomposition process for easier understanding:

Example

A pilot may be needed to address complexity of high technology risk, and the requirements are spread out in various business functions while a milestone, such as a computerised licencing system to support the commencement of a licencing scheme, has to be met.

Step 1(a): Determine the sub-projects model

The sub-projects model may be as follows:

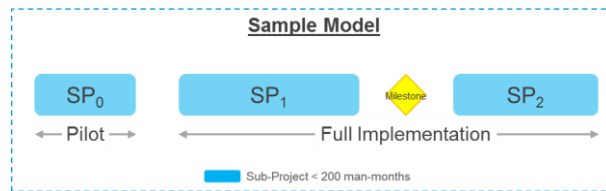


Figure 15 - Example of a Sub-Projects Model

- (b) **Group requirements by business function/process** – Project Planner may first break down a large project into sub-projects in association with groups of requirements. The Project Planner should group the requirements such that:
 - i) Requirements of the same business function are grouped together;
 - ii) Related groupings such as inter-related business functions or requirements with technical inter-dependencies are in the same sub-project;
 - iii) Requirements with highest benefits or highest priority are in the same sub-project so they can be implemented first to deliver highest business benefits earlier; and
 - iv) Sub-projects are of a manageable duration and effort, for example, under 15 months and 150 man-months respectively.
- (c) **Formulate sub-projects and assess whether the complexity of the preliminary grouping is below the threshold** – after decomposition by business function/process to reduce size, effort and duration of the Projects to sub-projects, Project Planner should examine each sub-project with an aim to identify the complexity areas with high risk

which can be mitigated through further decomposition. If any of the sub-projects exceeds the threshold, e.g., 150 man-months of implementation effort, or complexities still exist, or new complexities have arisen from the formation of sub-projects, the Project Planner should further refine the requirements based on the complexity areas (Step 2).

Example (Continued):

Based on the requirement elicitation stage, 10 requirements, R1 to R10, were captured. The requirements were mainly supporting 4 main business functions, i.e., A-D, with R3 dependent on R6.

Step 1(b): Group requirements based on business function/process

Requirements	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
Requirement Attributes										
Business Function	A	B	A	C	A	D	B	C	B	D
Dependency			R6							
Benefits	H	M	H	L	M	H	L	L	L	M
Effort	H	M	H	M	L	M	M	H	L	H

(High=H, Medium=M, Low=L)

- i) Since R4 and R8 offer low benefits and require medium to high effort to implement, these requirements may not be justified to implement.
- ii) The combination of R1, R3 and R5 has a fairly high benefit and effort, so these requirements should be grouped together with priority to implement.
- iii) R3 is dependent on R6, so R6 must be implemented first to enable R3.
- iv) Therefore, in consideration of the benefits and effort as well as dependency, the grouping by business function should be fine-tuned as follows:

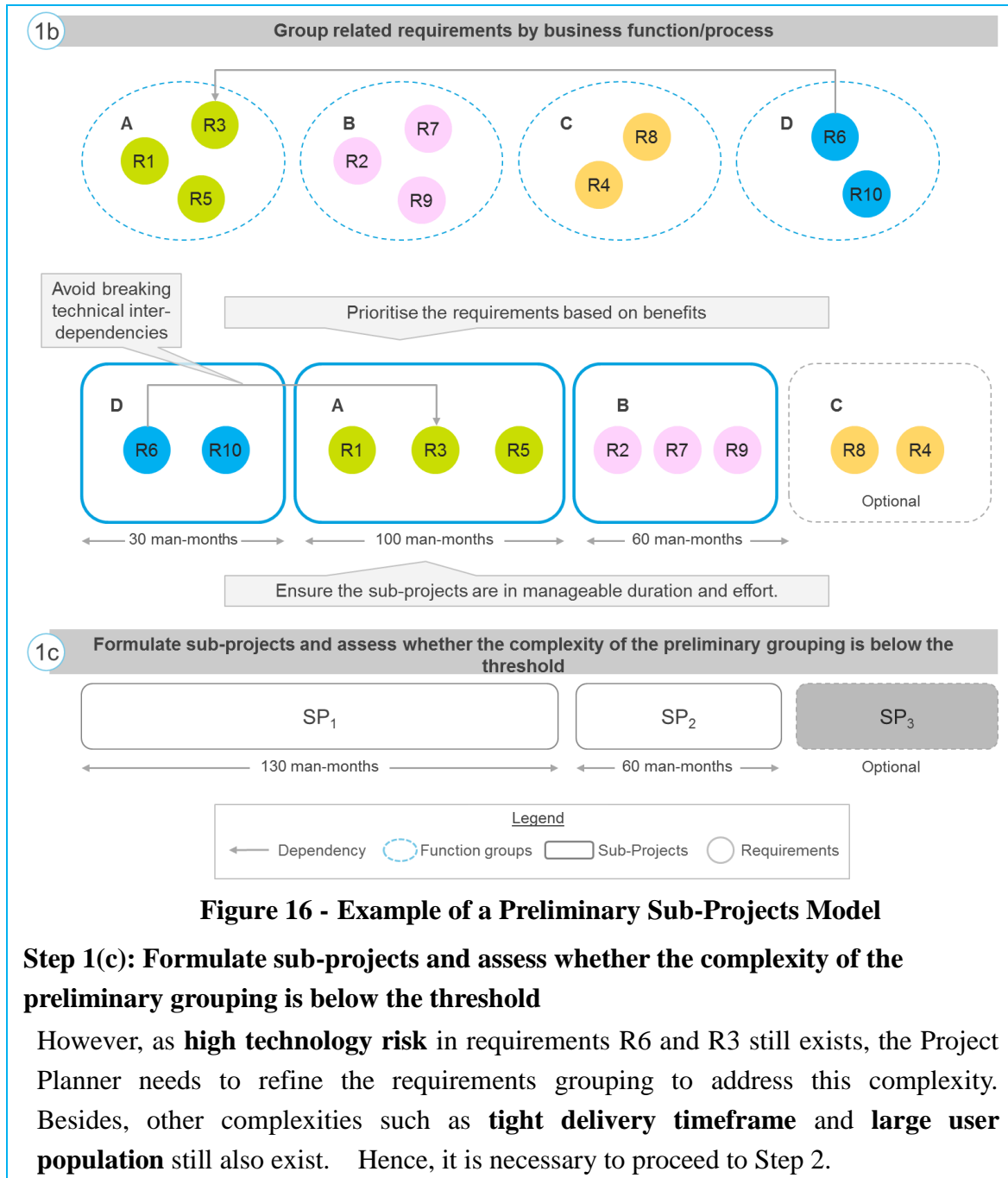


Figure 16 - Example of a Preliminary Sub-Projects Model

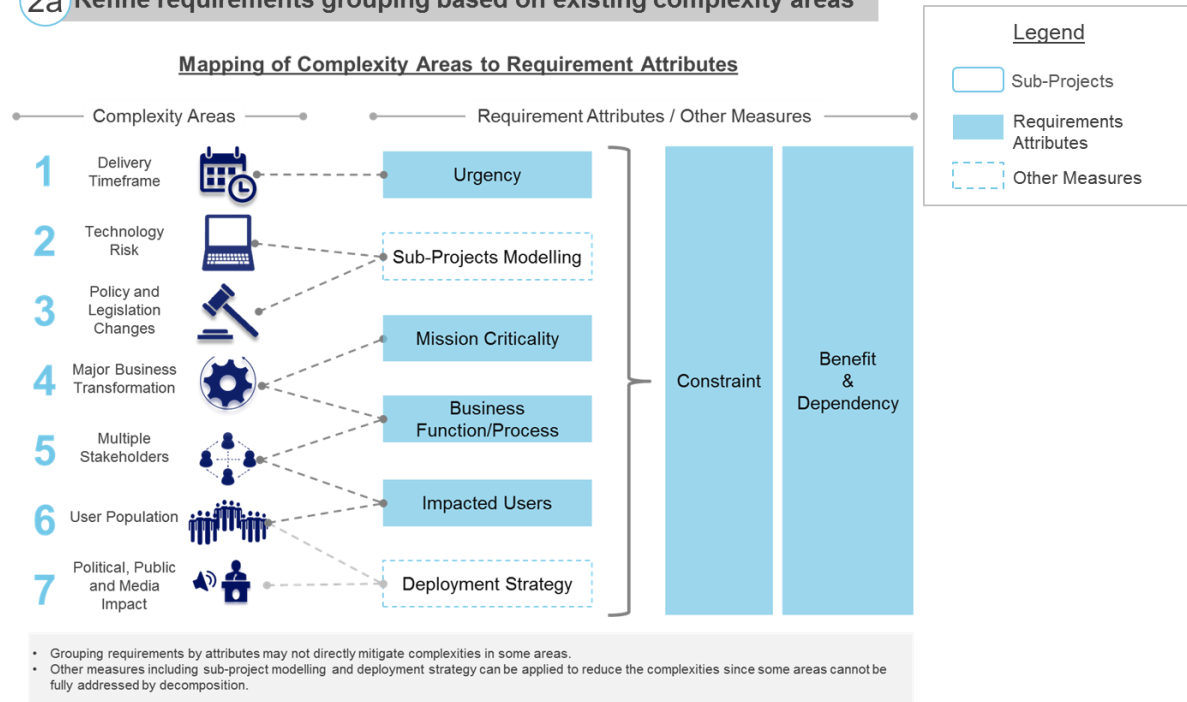
Step 1(c): Formulate sub-projects and assess whether the complexity of the preliminary grouping is below the threshold

However, as **high technology risk** in requirements R6 and R3 still exists, the Project Planner needs to refine the requirements grouping to address this complexity. Besides, other complexities such as **tight delivery timeframe** and **large user population** still also exist. Hence, it is necessary to proceed to Step 2.

Step 2 – Refine Sub-Projects based on Complexity

Step 2: Refine Sub-Projects based on Complexity

2a Refine requirements grouping based on existing complexity areas



2b Ensure that the sub-projects are in manageable sizes and under an acceptable threshold

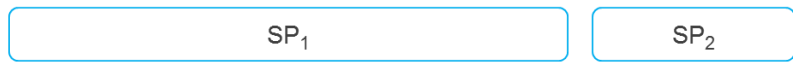


Figure 17 - Overall Decomposition Process Step 2

- (a) **Refine the requirements grouping based on the existing complexity areas** – Even after grouping the requirements by business function and process, complexities may still exist within sub-projects or new complexities may be created due to the formation of sub-projects. Project Planner should revisit the existing complexity areas as appropriate and refine the groupings by referring to the relevant requirement attributes. The Project Planner should also avoid violating the constraints and breaking dependencies between requirements while refining the groupings.
- i) Some requirement attributes are more relevant to the complexity area being addressed. As some of the requirements attributes, i.e., business function/process, benefit, effort, and dependency, have already been assessed in Step 1, the groupings should be refined by focusing on the remaining requirement attributes.

- ii) The complexity areas should be addressed one by one so that all the complexities that exist in the sub-projects are reduced to an acceptable threshold. Given that grouping requirements by attributes may not directly mitigate complexities in some areas such as high technology risk, policy and legislation changes, large user population and political, public and media impact, these areas may be taken care of by sub-projects modelling and deployment strategy, which will be discussed in later chapters. The following table illustrates how Project Planner may group requirements to reduce the relevant complexity.

Table 13 - Recommendations on how to group requirements pinpointing to the complexity areas

Complexity Area	Requirements Grouping Recommendations
1. Tight Delivery Timeframe	<ul style="list-style-type: none"> (a) The urgent requirements can be done in the first sub-project to ensure external key milestones can be met. (b) Include all mission critical requirements to ensure an end-to-end process.
2. Technology Risk	<ul style="list-style-type: none"> (a) Group the core and mission critical requirements to form an end-to-end function for conducting a pilot. (b) Technical requirements with higher risk or dependency requirements can be grouped together to perform a pilot.
3. Policy and Legislation Changes	<ul style="list-style-type: none"> (a) Requirements dependent on such changes can be grouped into later sub-projects if needed to allow time for the change process.
4. Major Business Transformation	<ul style="list-style-type: none"> (a) Requirements may be grouped by similar stakeholders/users or business function/process, and dissimilar or unrelated stakeholders and functions can be grouped under a different sub-project. (b) For major business transformation with mission critical requirements, these can be grouped together while minimising other requirements in the same sub-project to minimise risk.
5. Multiple Stakeholders	<ul style="list-style-type: none"> (a) Requirements should have already been grouped by similar stakeholders/users or business function/process.
6. User Population	<ul style="list-style-type: none"> (a) May choose to apply phased deployment approach to ease user adoption. Deployment approach will be discussed in later chapter.
7. Political, Public and Media Impact	

- (b) **Ensure that the sub-projects are in manageable sizes and under an acceptable threshold** – Some other considerations that should be borne in mind when grouping requirements:
- i) Keep duration and effort of each sub-project manageable;
 - ii) Maximize benefit by delivering higher benefits earlier where feasible;
 - iii) Keep "hard" dependencies in the same sub-project to avoid introducing additional risk;
 - iv) Avoid splitting same users or business functions/processes into different sub-projects if it would cause disruption to operations during the transition period (between the go-live dates of different sub-projects); and
 - v) Ensure the requirements grouping do not violate any constraints. (Please refer *Chapter 2.4.3.4 - Access Constraints* to identify and assess constraints.)

Example (Continued):

Step 2a: Refine the requirements grouping based on the existing complexity areas

Requirements	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
Requirement Attributes	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10
Business Function	A	B	A	C	A	D	B	C	B	D
Dependency			R6							
Benefits	H	M	H	L	M	H	L	L	L	M
Effort	H	M	H	M	L	M	M	H	L	H
Mission Criticality	Must Have	Should Have	Must Have	Could Have	Should Have	Should Have	Should Have	Could Have	Should Have	Should Have
Urgency	H	M	H	L	M	H	L	L	L	M

(High=H, Medium=M, Low=L)

- i) Since requirements R1, 3, 5, 6 and 10 has high urgency and are mission critical, these requirements should be implemented first.
- ii) **Technology risk** – group requirements R1, 3, 5, 6 and 10 together to deliver an end-to-end function as R1 and R3 are mission critical while not breaking the inter-linkages between R3 and R6.
- iii) **Tight delivery timeframe** – implement the urgent requirements first, i.e., R1,

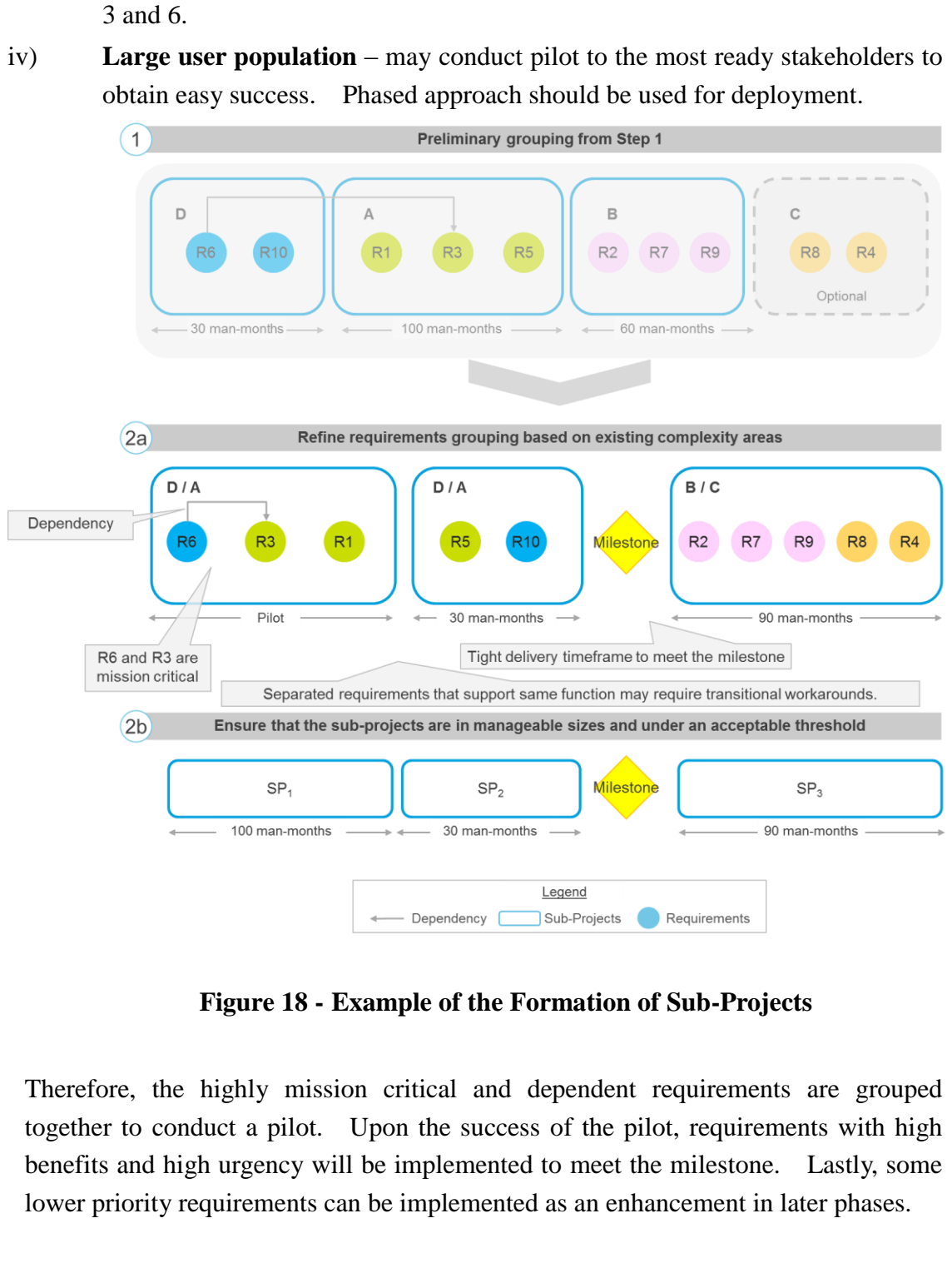


Figure 18 - Example of the Formation of Sub-Projects

Therefore, the highly mission critical and dependent requirements are grouped together to conduct a pilot. Upon the success of the pilot, requirements with high benefits and high urgency will be implemented to meet the milestone. Lastly, some lower priority requirements can be implemented as an enhancement in later phases.

2.4.3.4 Assess Constraints

- (a) Activities in this section are to ensure that the decomposition of the project based on complexity assessment and requirement attributes are not violating any constraints.
- (b) If certain constraints are violated, the formation of sub-projects needs to be adjusted to accommodate the constraints.
- (c) Constraints will be assessed from three perspectives: business, technical, and external.
- (d) **Assess Business Constraints** – Consider how current business will be impacted, and identify any business constraints, preventing separations, for example:
 - i) Closely inter-related operations;
 - ii) Closely inter-related business processes; and
 - iii) Management decision and strategic direction.
- (e) **Assess Technical Constraints** – Consider how current applications and systems will be impacted, and identify any technical constraints preventing separations, for example:
 - i) Making changes to the same system at the same time;
 - ii) Systems with operations depending on output of each other;
 - iii) Change in behaviour of one system will also affect the behaviour of another one; and
 - iv) Other coupling constraints.
- (f) Group the sub-projects bounded by similar business or technical constraints, and address any complexity identified.
- (g) **Assess External Constraints** – Identify if there are any constraints due to external factors, such as legislation/policy changes, systems end-of-life, service contract ending, impact from the business changes of another B/D. Ensure the forming of sub-projects is not violating any of these factors.

2.4.3.5 Align Multiple Sub-Projects

- (a) The decomposition of Projects may result in the formation of multiple sub-projects. Once the Project Planner has identified the possibility of decomposing the Project into multiple sub-projects, alignment mechanism should be set up to cater for the needs of managing multiple sub-project teams.
- (b) The project organisation structure may vary according to the results of project decomposition. The decomposition results may lead to **Multiple sub-projects being formed** – The sub-project teams may be internal or out-sourced, depending on whether there are sufficient skills and resources to deliver the sub-projects. Each sub-project may consist of a sub-project manager, and sub-projects alignment responsibilities may be taken up by the Internal PM or a delegate to ensure proper alignment across

sub-projects is maintained to mitigate the risk caused by inter-dependencies of sub-projects. In rare and exceptional circumstances, a sub-project may run as an independent project with its own project organisation.

2.4.3.6 Consider Extra Activities to Cater for Multiple Sub-Projects



Figure 19 - Other Considerations to Manage Multiple Sub-Projects

- (a) New project risks may be induced by the grouping of multiple sub-projects and their management vs. managing one single project.
- (b) Examples include a need for overall project management and coordination, ensuring solution works as a whole, and duplication in requirements elicitation effort.
- (c) Possible measures include the conduct of initial requirements elicitation study, final SIT and UAT.

Table 14 - Proposed Activities to Cater for Multiple Sub-Projects

Area to Address	Description and Mitigation
1. Project Management	<ul style="list-style-type: none"> (a) There is a possibility that different sub-project teams will take up the individual sub-projects, and outsourced services may be acquired. (b) Project management and coordination amongst different sub-project teams to ensure project coherence requires extra

Area to Address	Description and Mitigation
	<p>effort and possible extra resource.</p> <p>(c) It is recommended to establish a set of sub-projects alignment activities to govern the project at a holistic level and the respective sub-project teams.</p>
<p>2. Requirements Elicitation</p>	<p>(a) With multiple sub-projects, multiple rounds of consultation may take place with the same set of users and stakeholders.</p> <p>(b) It is recommended to conduct a study or even sub-project to elicit requirements as far as possible, so the users and stakeholders can focus on providing requirements during the study and to minimise the number of consultation sessions.</p> <p>(c) Scope, high-level estimation, and project schedule need to be refined.</p>
<p>3. Testing the Overall Solution</p>	<p>(a) Although sub-projects should be self-contained, their deliverables should work together towards one solution at a holistic level.</p> <p>(b) SIT and UAT within individual sub-projects cannot guarantee that the sub-projects are compatible with each other.</p> <p>(c) For 'Big Bang' deployment, besides early joint testing of the inter-related sub-projects, a final round of SIT and UAT should take place prior to roll-out to ensure the solution works as a whole.</p> <p>(d) For phased deployment, the later sub-projects are responsible for testing all integration and interaction of their deliverables with those of the other sub-projects that are completed prior to them.</p>

2.4.3.7 Tools and Samples

The list below includes the recommended samples applicable to project decomposition and requirements grouping:

Samples:

- i) *Appendix B – 9 Decomposing The Sample Project*
- ii) *Appendix B – 10 Assessing Constraints for the Sample Project*

2.4.3.8 Hints and Tips



Table 15 - General Tips – Conduct Decomposition and Requirements Grouping

Overall Decomposition and Grouping Tips

- (a) The objective is not to decompose everything to the atomic level, but to form sub-projects that are manageable, i.e. within implementation cost threshold and fulfilling areas of complexity assessment.
- (b) Maintain a manageable number of sub-projects, for ease of overall project management.
- (c) Multiple iterations of decomposition and grouping may be required before the final sub-projects can be formed.

Utilise EA artifacts or other kinds of visual aids to identify the logical groupings

- (a) EA artifacts or other kinds of visual aids, if available, can be used to help identify logical groupings of requirements. The following are some recommended aids.

Table 16 - Recommended Artifacts and Visualisation Aid

Aid	Description
1. Mapping of Business Functions and Logical Applications	Illustrate how logical and business functions are related
2. Mapping of Logical and Physical Applications	Illustrate how logical and physical applications are related
3. Application Interface Catalogue	Identify existing interfaces between systems

2.4.4 Prioritise Sub-Projects

- (a) With a project being decomposed into manageable sub-projects, these sub-projects should be prioritised to formulate the project scheduling. Project prioritisation is a process involving multiple iterations of refinement.
- (b) In order to bring out most benefits for a project, the prioritisation criteria should be considered thoroughly from different perspectives.
- (c) The prioritisation information should be captured along with the requirements as attributes, so Project Planner can utilise these attributes to assist in project prioritisation.
- (d) Sub-projects are to be prioritised based on three main prioritisation criteria, namely:
 - i) Benefit vs. complexity;
 - ii) Dependencies; and

iii) Organisational readiness.

2.4.4.1 Assess Benefit vs. Complexity

- (a) In general, sub-projects with higher benefits and low complexities should be prioritised to go first, and those with low benefits and high complexities should be placed towards the end of the project. Such approach can allow greater value to be realised earlier where applicable.
- (b) **Benefits** – Requirements serving the same business function/process and with higher benefits should be grouped into the same sub-project. The sub-projects that bring higher benefits should have a higher priority to be implemented first.
- (c) **Complexity** – Evaluate sub-project complexity using Complexity Assessment Areas. Please refer to *Chapter 2.2 - Assess Project Complexity*.
- (d) The following diagram illustrates how the level of benefit and complexity determine the level of priority:

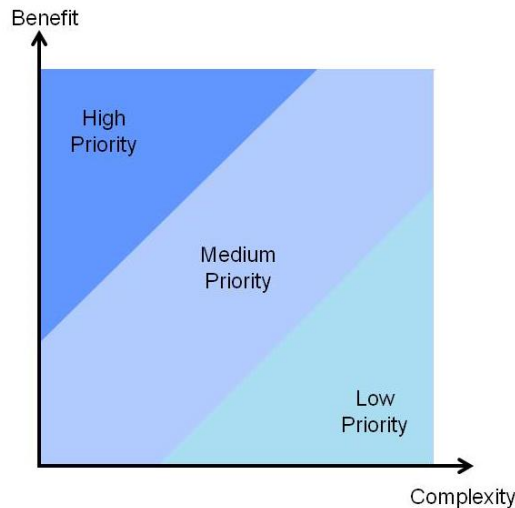


Figure 20 - Benefit vs. Complexity Illustration

2.4.4.2 Identify Dependencies

- (a) Dependencies among sub-projects will affect their sequencing. A sub-project cannot be started or completed unless all the sub-projects which it depends on are completed.
- (b) All dependencies between sub-projects need to be identified. Any unidentified dependencies may cause conflicts and issues in the project schedule, and fail the overall project.

Table 17 - Types of Sub-Projects Dependencies

Dependencies	Description
1. Business Process Dependencies	Dependencies due to business operations (a) Examples: i) Certain business operation cannot take place unless another business operation is functioning.
2. Technical Dependencies	Dependencies due to technical reasons (a) Examples: i) Core systems or the infrastructure must be built prior to system enhancements. ii) Data modelling must complete before data conversion.
3. Other Dependencies	In general, a sub-project cannot be started or completed if another sub-project or its deliverables are not completed. (a) Examples: i) A sub-project depending on the change to the regulation or legislation caused by another sub-project. ii) Subsequent sub-projects are pending on the information gathered from a study project. iii) Sub-projects cannot move forward if relevant standards, including data, security, protocol, and interface, have not been established.

- (c) Project Planner needs to identify all such dependencies to ensure the sequencing is accurate and determine which sub-project comes first. Project Planner may use Program Evaluation and Review Technique (PERT) (*Appendix A – 12 Program Evaluation and Review Technique*) and Critical Path Methodology to help capture the dependencies between sub-projects, and identify the critical path.

2.4.4.3 Assess Organisational Readiness

- (a) Project Planner should assess the general readiness of the users, taking into consideration the population, learning curve for the new technology, diversification in business functions and requirements, departmental and geographical differences.
- (b) Project Planner should also assess the current environment of the B/D and determine whether there are sufficient resources to support the project, technology maturity, and staff readiness to change.

- (c) Project Planner should minimise the concurrent conduct of multiple sub-projects to avoid exhausting resources within the same period of time.

2.4.4.4 Tools and Samples

The list below includes the recommended tools, techniques, templates and samples applicable to sub-project prioritisation.

- (a) **Sub-Project Prioritisation:**
- i) *Appendix A – 10 Requirement vs. Sub-Project Mapping Template*
 - ii) *Appendix A – 11 Sub-Project Prioritisation Attribute List Template*
- (b) **Samples:**
- i) *Appendix B – 11 Sample Sub-Project Prioritisation Attribute List*

2.4.5 Develop High-Level Project Schedule

With the prioritised sub-projects, Project Planner can initiate the schedule with baseline durations of sub-projects, and adjust the amount of resources involved. Project scheduling is a process involving multiple iterations of refinement.

2.4.5.1 Scheduling Considerations and Activities based on Project Complexity

Based on the identified project complexities, Project Planner should take into account scheduling considerations and activities to ensure sufficient time is allocated for any required mitigation in project risk.

Table 18 - Scheduling Considerations and Activities based on Project Complexity

Complexity Assessment Area	Recommended Considerations and Activities
<p>1. Multiple Stakeholders</p>	<ul style="list-style-type: none"> (a) Allocate time to reach out and involve stakeholders in project activities and milestones; (b) Allocate time to allow multiple consultation and socialisation sessions to ensure alignment among the stakeholders and their objectives and concerns are addressed; (c) Allocate more time if different stakeholders need to be handled in separate sessions; and (d) Take into consideration stakeholders' availability and business relationship, to assess the time required for interaction.

Complexity Assessment Area	Recommended Considerations and Activities
<p>2. Major Business Transformation</p>	<p>(a) Identify and align with stakeholders the time required for the users to adapt to the business transformation;</p> <p>(b) Adopt a phased implementation or conduct a pilot project as appropriate. This may be beneficial for project with high complexity in business transformation. The time required to do so should be considered; and</p> <p>(c) Allocate time for any adoption activities included in-scope.</p>
<p>3. Technology Risk</p>	<p>(a) Consider the time required if a Feasibility/Technical Study will be conducted;</p> <p>(b) Conduct a pilot for project with high technology risk as appropriate. Consider the time required to do so;</p> <p>(c) Allocate more time for SIT and UAT of the solution, to ensure test script and testing itself are thorough, and multiple rounds of fixes can take place; and</p> <p>(d) Allocate extra time as contingency and buffer due to the uncertain nature of the solution being implemented.</p>
<p>4. Political, Public and Media Impact</p>	<p>(a) Take into account certain sub-projects may have higher sensitivity due to the political, public or media impact; and</p> <p>(b) Schedule time for any required adoption activities to ease user and public adoption as well as collection of public opinion.</p>
<p>5. Policy and Legislation Changes</p>	<p>(a) Formulate schedule with the assumptions if the policy and legislation goes through, if it does not go through, and if it is delayed;</p> <p>(b) Consider outcome of the policy and legislation changes and how it will impact the schedule; and</p> <p>(c) Sequence of sub-projects may need to be changed to accommodate impact of the policy and legislation changes.</p>
<p>6. Delivery Timeframe</p>	<p>(a) Consider to take projects with a long duration by phased implementation of sub-projects, and conduct re-assessment before the start of each sub-project;</p> <p>(b) For tight timelines, attempt to schedule sub-projects to overlap or run in parallel, provided that the dependencies allow such phasing and project organisation can support such overlapped delivery; and</p> <p>(c) Some sub-projects may not complete within deadline. Possible actions include:</p> <p>i) Communicate with project owner and relevant stakeholders to determine how to handle such</p>

Complexity Assessment Area	Recommended Considerations and Activities
	<p>sub-projects;</p> <p>ii) Consider swapping those sub-projects that do not require to meet the deadline or with lowest priority to the back; and</p> <p>iii) Make decision on excluding them from project scope; defer them to another project phase, or re-group it to a separate project.</p>
<p>7. User Population</p>	<p>(a) Take into account the time required to manage and support a large user population or a largely diverse population;</p> <p>(b) Cater for any scheduling consideration arising from the users at different geographical locations; and</p> <p>(c) Allocate time as appropriate for any required user and public adoption and promotional activities.</p>

2.4.5.2 Schedule Sub-Projects

- (a) After mapping out the sequence of the sub-projects, the next task is to assign duration to these sub-projects and their respective activities to formulate the project schedule. Project Planner may need to make adjustments to the project effort and resources estimation after the sub-projects are scheduled.
- (b) **Amount of resources to be managed** – represents the number of Full-time Equivalent (FTE) that can work on the project delivery at the same time. The number of FTE should be in manageable size by the Internal PM or the sub-projects team project manager. Thus, the availability of internal resources limits the number of FTE that can work on the project delivery in the same period of time, which also determines the minimum duration for the sub-projects.
- (c) **External dependencies** – may affect the schedule or even sequence of sub-projects. The affected schedule or sequence may need to be adjusted to accommodate external dependencies, such as:
 - i) Government-wide initiatives;
 - ii) New legislations;
 - iii) Management decisions;
 - iv) Cross-departmental alignment; and
 - v) Other potentially related projects, either internal or of related B/Ds.
- (d) **Pace the sub-projects** – minimise overlapping of sub-projects in the same period, where appropriate, to ease project management as well as user adoption.

(e) The following diagram illustrates high-level project schedule considerations:

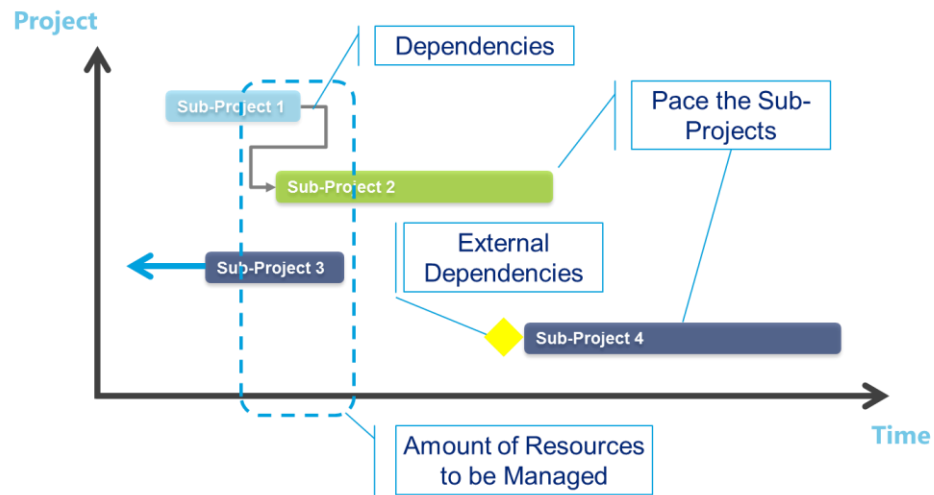


Figure 21 - Sub-Projects Scheduling Considerations

2.4.5.3 Scheduling Considerations and Activities due to Project Decomposition

The Project Planner should allocate time to cater for activities induced by multiple sub-projects, as well as activities required to align the related sub-projects and ensure cohesiveness.

Table 19 - Scheduling Considerations and Activities due to Project Decomposition

Item	Recommended Considerations and Activities
<p>1. Milestones and Checkpoints</p>	<p>(a) Milestones and checkpoints for the overall project need to be planned and established to track project progress.</p> <p>(b) Milestones should be set for every major deliverable and sub-project completion.</p> <p>(c) Monthly checkpoint is recommended for the PSC to manage the overall project progress.</p> <p>(d) More checkpoints should be set if more sub-projects are overlapping and with inter-dependencies.</p>
<p>2. Procurement</p>	<p>(a) Procurement activities need to take place for each sub-project being outsourced, and sufficient time needs to be allocated for the procurement activities depending on the procurement approach, such as adoption of the IT standing offer agreements administered by OGCIO or conducting open tender exercises requiring processing by GLD or the Central Tender Board, involvement of overseas suppliers for RFI, obtaining approval of licences, etc.</p>

Item	Recommended Considerations and Activities
3. Establish standards (e.g., data, security, infrastructure)	(a) If standards need to be established prior to implementation of sub-projects, time needs to be allocated depending on the depth and breadth of the standards.
4. Testing	(a) Besides conducting early joint tests of inter-related sub-projects, it may be required to conduct a final testing of the overall project to ensure deliverables of all sub-projects are working together as required. (b) This is on top of the testing of the individual sub-projects, thus extra time needs to be allocated.
5. System Integration	(a) Time needs to be allocated for integration between systems being developed in different sub-projects; (b) More time may be required if the sub-projects are implemented by different sub-project teams rather than by one single sub-project team. (c) Standards may be required to be set up before subsequent work can take place.

2.4.5.4 Determine Deployment Approach

- (a) The deployment approach should be defined at the Initiate Phase of the project as this will have an impact on the project schedule, even if the final deployment plan may vary depending on the situation.
- (b) Project Planner should first assess the resources and time available for the project, before making a decision on the deployment approach.
- (c) The 4 major deployment strategies are:
 - i) Phased deployment;
 - ii) Pilot deployment;
 - iii) Soft launch; and
 - iv) ‘Big Bang’.
- (d) Other than the 4 major deployment strategies mentioned above, Project Planner may leverage other deployment approach or a combination of the mentioned strategies to customise the best fit strategy for the unique nature of the project and/or sub-projects. The following table may help facilitate the decision process for Project Planner in choosing the appropriate deployment approach.

Table 20 - Deployment Approach Decision Table

Considerations	Potential Deployment Approach
1. Multiple Stakeholders	(a) Deploy in phases by stakeholders or groups of stakeholders with similar business requirements to break deployment into manageable size; and (b) Conduct a pilot where the benefit vs. duration is justifiable.
2. Major Business Transformation	(a) Deploy in phases by criticality of business functions to ease adoption; (b) Conduct a pilot deployment where the benefit vs. duration is justifiable; and (c) Adoption activities should be planned.
3. Technology Risk	(a) Conduct a pilot deployment or soft launch where the benefit vs. duration is justifiable.
4. Political, Public and Media Impact	(a) Phase by criticality against public demand to reduce impact and pace adoption; (b) Public facing solutions may require big bang roll-out; (c) Conduct soft launch where the benefit vs. duration is justifiable; and (d) Adoption activities should be planned along with the deployment.
5. Policy and Legislation Changes	(a) Apply phased approach with an attempt to isolate the sub-projects dependent on policy and legislation changes for separate roll-out.
6. Delivery Timeframe	(a) Deploy in phases to ensure Must Have requirements are delivered within the delivery timeframe; and (b) Identify any external dependencies , and apply phased deployment for the portion of scope being affected by such dependencies, where possible.
7. User Population	(a) Phase by user groups with similar business requirements, considering business functions, positions, geographic locations, and internal vs. public; (b) Conduct a pilot where the benefit vs. duration is justifiable; and (c) Adoption and promotional activities should be planned.

- (e) In general, if ‘Big Bang’ is the decided deployment approach due to business or management reasons, implementation can still be phased into sub-projects, where appropriate, to reduce project complexity and the corresponding risks. Please refer to *Chapter 2.4.3 - Conduct Project Decomposition and Requirements Grouping* for further information.

2.4.5.5 Tools and Samples



The list below includes the recommended tools, techniques, templates and samples applicable to project scheduling:

- (a) **Scheduling sub-projects:**
- i) PERT can be used to analyse the activities involved to complete a Project and estimate the minimum time needed to complete the Project, (*Appendix A – 12 Program Evaluation and Review Technique*)
 - ii) *Appendix A – 13 Deployment Approaches*
 - iii) *Appendix A – 14 Pilot Projects*
- (b) **Samples:**
- i) *Appendix B – 12 Sample Sub-Projects And Scheduling*

2.4.5.6 Hints and Tips



Table 21 - General Tips – Project Scheduling

Resource Considerations

- (a) Project Planner should apply sound judgment and experience when determining duration of sub-projects, as there is a limitation on the size of the sub-project teams that can be managed (e.g., a task requiring 100 man-days does not mean it can be completed in one day with 100 FTE. An appropriate estimation is 20 man-days with a 5 people team).
- (b) In general, one unit of resources in the project organisation can manage approximately five units of resources providing the implementation service, and for consultancy studies, one unit of resources in the project organisation can manage approximately three units of resources providing the service. This limits the amount of resources that can be managed at a point in time for each project type, thus defining the shortest duration possible to be managed.

Outsourcing Considerations

- (a) One option to overcome the limitation of managing too many delivery resources is to outsource the management of the project, and allow the contractor to manage the multiple delivery resources or sub-contractors. However, consideration should be taken that such assignment may induce higher project risk given the less direct control over the delivery resources.
- (b) If the delivery of service is outsourced, an adequate level of time allocation is required for

the procurement related activities such as funding application assessment processes, tender selection process and contract preparation, RFI from overseas vendors, obtaining licence approvals, etc.

- (c) It is recommended to involve other supporting or professional B/Ds such as DOJ, GLD, IPD, etc. early, where possible and applicable, to account for the long lead times and minimise delays. B/Ds should also engage vendors through discussions or RFI early on to obtain preliminary effort and resource estimation.
- (d) Procurement activities may be performed on a per sub-project basis. The sub-projects, having lower costs and shorter project durations, may have a shorter procurement process.

Implementation approach of individual sub-projects

- (a) Actual implementation approach taken for the individual sub-project will be dependent on the requirements and decided by the project organisation and the sub-project teams.

2.4.6 Sourcing Strategy

- (a) A large-scale and complex IT system development project may require a more complicated sourcing strategy as the project may be broken down into sub-projects which can be implemented internal or outsourced. The sourcing strategy for manpower resource should be planned with thorough considerations to mitigate the risk of any human resource issues.
- (b) B/Ds should involve Business Analysts in the scoping of large-scale and complex IT system development projects, to help elicit business requirements, identify key issues from the business perspective and provide advice on scoping and planning activities to ensure the Project Management Plan is well prepared prior to implementation.
- (c) B/Ds should conduct SA&D internal as they are more familiar with the B/Ds' business and operations. Hence, B/Ds can retain knowledge of the systems and better understand the overall system architecture to ensure high quality systems delivered. B/Ds can also avoid jeopardising the delivery of systems upon frequent changes of key members of external contractors. In conclusion, B/Ds should retain most of the project planning, systems analysis and design work internal, while allowing the flexibility to outsource the implementation process.
- (d) The following illustrates the criteria that need to be considered when deciding the sourcing strategy for implementation of sub-projects, each criterion may favour towards either one of the sourcing preference such as outsource, internal or hybrid team.

Table 22 - Sourcing Strategy

Criteria	Description	Sourcing Preference
Complexity of Project	(a) High impact on major business processes or stakeholders (b) Contractors lack knowledge in business processes	Internal
	(a) High security concern (b) High data privacy issue (c) Mission confidentiality	Internal
Need for Specific Skill Set	(a) Lack of readily available resources with specific skill set to support the implementation of niche projects	Outsource
Availability of Resource	(a) Limited resources to deliver IT projects (b) Several projects are ongoing at the same time	Outsource
Mission Criticality / Importance to Core Business	(a) Turnover of external contractors may cause discontinuity of knowledge succession	Internal

- (e) Project Planner should take a holistic view across different criteria when considering the overall preference. Where neither the preferences to internal nor outsource approach dominate, Project Planner may consider taking a hybrid approach in which the team is composed of both internal staff with sufficient knowledge in both business and IT domains, as well as external contractors who shall support the delivery of the project.
- (f) For the implementation of large-scale and complex projects, an internal core group with resources in various areas such as enterprise/domain architecture, technical review, business analysis, project management, system development, should be formed to ensure sufficient internal involvement to reduce the risk of project failure due to unfamiliarity of external contractors with the B/Ds’ business and technical environments, frequent changes in key members of external contractor’s project teams and inadequacy in project planning and management.
- (g) B/Ds may form an internal core group regardless of whether the project is implemented internally or outsourced. The following table suggests the responsibilities of the key members of the in-house core group in implementation of large-scale and complex IT system development projects or sub-projects:

Table 23 - Internal Core Group and Key Responsibilities

Resource	Key Responsibilities
Enterprise/Domain Architect Technical Reviewer	(a) Ensure alignment with architecture standards, if exist and applicable, in the business, application, data, infrastructure, and security domains (b) Perform high-level review of key architecture components
Business Analyst	(a) Contribute to the development of business case (b) Facilitate the elicitation and analysis of requirements (c) Assess proposed system option and organisational readiness (d) Plan for and monitor the business analysis activities
Project Manager	(a) Manage the scope, plan and delivery activities of the project

- (h) These members will participate actively throughout the project management lifecycle as described in other relevant practice guides.

2.4.7 Estimate Project Budget

- (a) For large-scale and complex IT system development project, the process of project budget estimation should cover the high-level estimation of the effort and resources needed to implement the requirements of the project. After the Project is decomposed into sub-projects of manageable size as described in *Chapter 2.4.3 – Conduct Project Decomposition and Requirements Grouping*, the estimations should be made on the sub-project level rather than the overall Project level to allow a more accurate view of the amount of resources and effort needed.
- (b) The high-level effort estimation is expected to be rough estimates, for example, in terms of man-months or even man-years. The following paragraphs focus on the methods and necessary estimation considerations on how to address common issues for Projects.

2.4.7.1 Effort Estimation Considerations and Activities based on Project Complexity

Project complexities should have been reduced to an acceptable threshold upon decomposition and requirements grouping. However, in cases where the sub-projects may still be exposed to a certain level of complexity under the threshold, Project Planner should bear in mind the effort estimation considerations listed in the table below.

In general, further adjustment to effort estimation may be made during scheduling when the deployment approach is determined (*Chapter 2.4.5 –Develop High-Level Project Schedule*).

Table 24 - Estimation Considerations and Activities Based on Project Complexity

Complexity Assessment Area	Recommended Considerations and Activities
1. Multiple Stakeholders	<ul style="list-style-type: none"> (a) Allocate extra effort to manage multiple stakeholders for activities such as consultation and socialisation sessions; (b) Estimate required effort based on number of sessions, where each session range from 1-3 hours in general, depending on the level of involvement; and (c) Allocate effort to complete all the required cross-departmental or integrated business processes and system integration.
2. Major Business Transformation	<ul style="list-style-type: none"> (a) Estimate effort required for any necessary change management and adoption activities.
3. Technology Risk	<ul style="list-style-type: none"> (a) Estimate effort required for any Feasibility/Technical Study needed; (b) Estimate extra effort required for SIT and UAT of the solution, to ensure test script and the testing itself are thorough; and (c) Allocate extra effort as contingency and buffer due to the uncertain nature of the solution being implemented.
4. Political, Public and Media Impact	<ul style="list-style-type: none"> (a) Estimate effort required for any necessary adoption activities to ease user and public adoption and promotion activities.
5. Policy and Legislation Changes	<ul style="list-style-type: none"> (a) Work out estimates on different scenarios, for example, in case the policy and legislation is passed, not passed, or deferred; and (b) Consider the impact on estimation based on the outcome of the policy and legislation changes.
6. Delivery Timeframe	<ul style="list-style-type: none"> (a) For tight timelines, sub-projects may be scheduled to be running in parallel. Estimate potential effort required to manage and align multiple sub-projects at the same time; and (b) Revise the effort estimate after project schedule is formulated.
7. User Population	<ul style="list-style-type: none"> (a) Estimate the effort required to manage and support a large user population or a largely diverse population; (b) Base estimation on the number of users and diversity in

Complexity Assessment Area	Recommended Considerations and Activities
	user groups impacted by the project; (c) Estimate any effort arising from the users being in different geographical location; and (d) Allocate effort for any required adoption and promotional activities to ease user and public adoption.

2.4.7.2 Estimate Effort and Resources

- (a) **Implementation Effort** – Project Planner may use tools such as the implementation complexity matrix if available or other estimation methods to help with the estimation on implementation effort.
- (b) **Align Multiple Sub-Projects** – Upon the formation of sub-projects, Project Planner should consider the sub-projects alignment activities and effort to allocate sufficient effort and resources to set up:
 - i) Standards, tools and templates;
 - ii) Communication protocols;
 - iii) Metrics and reporting; and
 - iv) Escalation procedure.
- (c) The following illustrates the activities of the sub-projects alignment:



Figure 22 - Sub-Projects Alignment Activities

2.4.7.3 Involve Internal Stakeholders

- (a) The effort estimation needs to take into account the effort required by internal stakeholders who are not part of the project organisation, to support the contractors of the project team (for out-sourced projects) and sub-project teams (internal or out-sourced, if available) by attending consultation sessions, providing business requirements, conducting UAT, etc. Project Planner may make reference to the effort estimates for internal stakeholders as an indicator to determine whether the project is of manageable size.

- (b) Depending on the project nature, the level of internal stakeholders' involvement varies. A system development project may require one internal stakeholder FTE for every five FTE from contractors of the project team or sub-project team.

2.4.7.4 Estimate Other Project Efforts

In order to have a more accurate estimate of effort and budget, with considerations regarding scale and complexity of the project, the following activities, for example, may be taken into consideration of the high-level estimation:

- i) Procurement Activities;
- ii) Project Management;
- iii) Other Stakeholder Involved Activities;
- iv) Hardware Implementation Overhead;
- v) Software Installation Overhead;
- vi) Data Related Activities (e.g., data cleansing/conversion/migration);
- vii) System Integration;
- viii) Transitional interfaces with existing systems;
- ix) Testing (e.g., User Acceptance Testing, System Integration Testing);
- x) Training;
- xi) Nursing;
- xii) Continuous support and maintenance; and
- xiii) Other procedures (e.g., Security Risk Assessment and Audit, Privacy Impact Assessment, etc.).

2.4.7.5 Tools and Samples



The list below includes the recommended tools, techniques, templates and samples applicable to effort and resource estimation:

- (a) **Estimate Effort and Resource:**
- i) *Appendix A – 15 Implementation Complexity Matrix*
 - ii) *Appendix A – 16 Other Considerations in High-Level Estimation*

2.4.7.6 Hints and Tips



Table 25 - General Tips – Estimate Project Budget

<p>Estimation Considerations</p> <p>(a) When a Project is decomposed into multiple sub-projects, each may be taken up by a different team or a different contractor. Management of multiple teams / contractors will add to the workload of the Internal PM, and extra resources, such as Project Administrator, could be accounted for to support the Internal PM.</p> <p>Effort and Resource Estimation</p> <p>(a) Project estimation is developed by utilising an estimation method such as top-down or bottom-up method.</p> <p>i) Top-down Approach – historical information, market research and benchmarking to derive the estimates of projects of similar nature and size with the greatest possible accuracy, is considered.</p> <p>ii) Bottom-up Approach – the project is broken down to high-level Work Breakdown Structure in order to determine actual resources and effort per task and sum up the estimations of the component activities of the project. The decomposition of Project will be discussed in <i>Chapter 2.4.3 – Conduct Project Decomposition and Requirements Grouping</i>.</p> <p>Budget Estimation</p> <p>(a) Project Planner should allow buffer for contingency based on the complexity and amount of uncertainty of the project.</p> <p>(b) Breakdown of budget by project phases and year should be derived, particularly for Projects that are usually multi-year projects.</p> <p>Other Considerations in High-Level Estimation</p> <p>(a) Using internal staff versus contract staff will have a different impact on budget estimation.</p>

2.4.8 Process Summary



Who will be involved?	
Role involved	Key Involvement
Internal PM/ Project Owner’s delegate	<p>(a) Assist in the development of the funding application;</p> <p>(b) Set baseline and define high-level project scope;</p> <p>(c) Estimate project effort and resources;</p> <p>(d) Decompose the large-scale and complex projects and group requirements into sub-projects of manageable sizes;</p> <p>(e) Prioritise the sub-projects based on benefit vs.</p>

Who will be involved?	
Role involved	Key Involvement
	complexity, dependency and organisational readiness; (f) Develop high-level project schedule; and (g) Estimate the project budget.
BA	(a) Facilitate the formation of project scope; (b) Facilitate the elicitation and analysis of requirements; (c) Estimate project effort and resources; (d) Prioritise the sub-projects based on benefit vs. complexity, dependency and organisational readiness; and (e) Give advice on high-level project schedule.
PAT	(a) Give advice on high-level project schedule.
Users/Other Stakeholders	(a) Provide functional and non-functional requirements.

Table 26 - Quality Assurance Checklist for Preparing Funding Application

Key Tasks	Tools & Templates	<input checked="" type="checkbox"/>
1. Define Project Scope (a) Have you considered the baseline items recommended for the project scope statement? (b) Have you confirmed and validated the project scope?	Project Scope Statement	<input type="checkbox"/>
2. Elicit High-Level Requirements (a) Have you considered eliciting the requirements from a Business, Application, Data, Security, Infrastructure, and Organisation perspective? (b) Have you taken into account the requirements elicitation considerations and activities that are identified during the complexity assessment? (c) Have you documented the requirements on the Requirements Catalogue? (d) Have you considered the requirement attributes?	Requirements Catalogue Requirements Attribute List	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
3. Conduct Project Decomposition and Requirements Grouping (a) Have you considered the guiding principles in decomposing the project? (b) Have you taken into account the decomposition	Requirement vs. Sub-Project Mapping	<input type="checkbox"/>

Key Tasks	Tools & Templates	<input checked="" type="checkbox"/>
<p>considerations and activities identified during complexity assessment?</p> <p>(c) Have you considered grouping the requirements with similar attributes to form sub-projects?</p> <p>(d) Have you identified the constraints for decomposition?</p>		<p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>
<p>4. Prioritise Sub-Projects</p> <p>(a) Have you conducted assessment in the following activities:</p> <p>i) Complexity vs. benefit analysis;</p> <p>ii) Dependencies; and</p> <p>iii) Organisational readiness.</p>	<p>Sub-Project Prioritisation Attribute List</p>	<p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>
<p>5. Develop High-Level Project Schedule</p> <p>(a) Have you taken into account the considerations and activities identified during complexity assessment?</p> <p>(b) Have you adopted PERT or other scheduling methods to estimate the time needed to complete the project/sub-projects?</p> <p>(c) Have you considered the following areas when scheduling the sub-projects:</p> <p>i) Amount of resources to be managed;</p> <p>ii) External dependencies; and</p> <p>iii) Pace of the sub-projects?</p> <p>(d) Have you considered to include the following activities on the high-level project schedule:</p> <p>i) Milestones and checkpoints;</p> <p>ii) Procurement activities;</p> <p>iii) Activities to establish standards;</p> <p>iv) Testing; and</p> <p>v) System integration?</p> <p>(e) Have you determined the deployment approach?</p>	<p>High-Level Project Schedule</p>	<p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>
<p>6. Sourcing Strategy</p> <p>(a) Have you determined the sourcing strategy for your project and sub-projects?</p> <p>(b) Have you formulated your core group based on your project requirements?</p>	<p>Business Case</p>	<p><input type="checkbox"/></p> <p><input type="checkbox"/></p>

Key Tasks	Tools & Templates	<input checked="" type="checkbox"/>
<p>7. Estimate Project Budget</p> <p>(a) Have you taken into account the effort and resource estimation considerations and activities identified during the complexity assessment?</p> <p>(b) Have you leveraged the Implementation Complexity Matrix and/or other effort estimation methods recommended in the Resource Estimation Guide to calculate appropriate effort estimates?</p> <p>(c) Have you taken into account the following efforts besides the implementation effort:</p> <ul style="list-style-type: none"> i) Other project effort including procurement activities, project management overhead, training, etc.; and ii) Other internal stakeholder’s effort such as business vs. IT staff. 	<p>Inputs to Funding Application</p>	<p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>
<p>8. Review and Consult</p> <p>(a) The following deliverables need to be reviewed by PAT and consulted by PSC/Project Owner to confirm correctness and completeness:</p> <ul style="list-style-type: none"> i) Scope Statement; ii) Requirements Catalogue; iii) Requirement Attributes List; and iv) High-Level Project Schedule. 		<p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p>

Please refer to *Appendix A –1 RACI Model* for the responsible parties.

3 PLAN PHASE

3.1 OVERVIEW

As more information are gathered in the Plan Phase, the project scope, sub-project grouping, effort and resource estimation, project schedule and project budget needs to be refined to ensure the Project is decomposed into sub-projects that are manageable in size. The Project Planner may need to revisit the considerations and activities in the Initiate Phase and refine the deliverables if necessary. This chapter is developed on top of the existing project management processes for the Plan Phase as defined in the [PGPM¹](#), with processes and activities recommended for Projects.

3.2 REFINE PRELIMINARY ESTIMATES AND FINDINGS

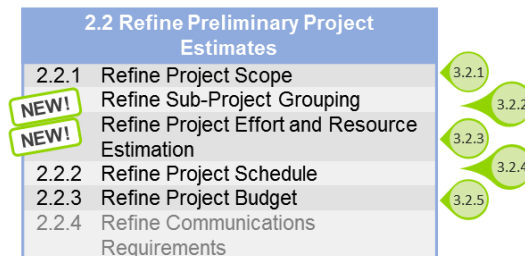


Figure 23 - Mapping of “Refine Preliminary Project Estimates” to PGPM

- (a) In the Initiate Phase, Project Planner should have developed a scope statement, high-level effort, resources and cost estimations, preliminary grouping of requirements into sub-projects based on high-level requirements and eventually, derived a high-level project schedule.
- (b) This chapter builds on top of the [PGPM¹](#) to provide recommendations specific to large-scale and complex IT system development projects, covering processes and activities supporting the refinement of the preliminary project estimates and findings gathered in the Initiate Phase.
- (c) The following diagram shows the deliverables that may need to be revised:

Processes & Activities	Deliverables to be Revised
Refine Project Scope <ul style="list-style-type: none"> • Elicit Detailed Requirements • Refine Scope Statement 	Requirements Catalogue
	Requirements Attribute List
	Scope Statement

Refine Sub-Project Grouping	Sub-Project Prioritisation Attribute List
Refine Project Effort & Resource Estimation	Project Management Plan
Refine Project Schedule	
Refine Project Budget	

Figure 24 - Mapping of Processes and Activities to Deliverables

3.2.1 Refine Project Scope

3.2.1.1 Elicit Detailed Requirements

- (a) In the Plan Phase, Project Planner may elicit more detailed requirements to support refining the project scope as well as breaking down of the deliverables into smaller and more manageable components as mentioned in the [PGPM](#)¹. The requirements should be detailed enough to define a work plan. As more information is available at this phase, Project Planner may revisit the project complexity assessment areas to ensure the considerations are still valid.
- (b) Project Planner should communicate with stakeholders, as necessary, to elicit requirements in detail.

3.2.1.2 Refine Scope Statement

- (a) The scope statement and project management plan will be developed based on the boundaries set by the scope statement delivered during Initiate Phase.
- (b) As more requirements are gathered, Project Planner may have a clearer picture of the project scope. Therefore, the scope needs to be refined with more details of the requirements to facilitate project planning in later stages. Project Planner may conduct the following activities to refine the scope statement:
 - i) Update the Requirements Catalogue (*Appendix A – 7 Requirements Catalogue Template*) and Requirements Attribute List (*Appendix A – 8 Requirements Attribute List Template*) as more detailed requirements are gathered;
 - ii) Revise the scope statement (*Appendix A – 4 Scope Statement Template*) as level of detail of the requirements being more accurately defined;
 - iii) Review, refine and update any constraints and assumptions made in the development of the project scope; and

- iv) Confirm mutual agreement among the stakeholders involved on the refined project scope, and communicate with stakeholders being affected to gain their buy-in.

3.2.2 Refine Sub-Project Grouping

As the project scope is refined and more detailed requirements are elicited, the sub-projects arising from the Initiate Phase may require reassessment to ensure the sub-projects are in manageable size. Further grouping or decomposition of requirements or sub-projects may take place if there are changes to the project situation. Project Planner may need to refine the Sub-Project Prioritisation Attribute List (*Appendix A – 11 Sub-Project Prioritisation Attribute List Template*) to ensure all considerations have been taken into account.

3.2.3 Refine Project Effort and Resource Estimation

Project Planner is recommended to further refine the estimations on effort and resources to a more detailed level and provide estimation sufficient to formulate the Project Management Plan for internal and outsourced projects, and subsequent procurement activities for services that are being outsourced.

- i) Estimate effort and resources down to the range of man-weeks or even man-days;
- ii) Refine estimation according to new details given to the requirements;
- iii) Allocate sufficient resources to oversee the multiple sub-projects after decomposition, as necessary; and
- iv) Estimate effort required for potential procurement activities as soon as possible once more information is available.

3.2.4 Refine Project Schedule

With a clearer picture of the project scope, decomposition of the Project, and effort and resource estimation of the sub-projects, the project schedule may need to be further refined. Project Planner is recommended to:

- i) Refine project schedule, based on the detailed requirements and estimation;
- ii) Revisit benefit vs. complexity of the sub-projects based on the recommendations in *Chapter 2.4.4.1 – Assess Benefit vs. Complexity*;
- iii) Refine project schedule at level of detail to weeks, if possible; and
- iv) Re-prioritisation of sub-projects may be required if there is a change to the project situation.

3.2.5 Refine Project Budget

Estimation for each required resource is preferred, so the overall budget can be calculated in detail, and a more detailed project management plan can be developed.

3.2.6 Process Summary



Who will be involved?	
Role involved	Key Involvement
Project Owner	(a) Have authority on project scope and refine sub-project grouping.
Internal PM	(a) Refine project scope; (b) Refine sub-project grouping; (c) Refine project schedule; and (d) Refine project budget.
BA	(a) Refine scope statement.
PSC/PAT	(a) Have authority on project scope and refine sub-project grouping; and (b) Give advice on effort and resources estimation, project schedule and budget.
Users/Other Stakeholders	(a) Give advice/comments on refinement of project scope and schedule.

Table 27 - Quality Assurance Checklist for Refining Preliminary Estimates and Findings

Key Tasks	Tools & Templates	<input checked="" type="checkbox"/>
1. Refine Project Scope (a) Have you elicited more detailed requirements to formulate a work plan? (b) Have you validated the scope statement derived from Initiate Phase?	Refine Project Scope Statement	<input type="checkbox"/> <input type="checkbox"/>
2. Refine Sub-Project Grouping (a) Have you revisited the sub-projects grouping to ensure that they are in manageable sizes? (b) Have you reconsidered whether the complexity areas have changed throughout the Plan Phase?	Complexity Assessment Checklist	<input type="checkbox"/> <input type="checkbox"/>

Key Tasks	Tools & Templates	<input checked="" type="checkbox"/>
3. Refine Project Effort and Resource Estimation (a) Have you refined the effort estimation based on potential new activities derived in the Plan Phase?	Project Management Plan	<input type="checkbox"/>
4. Refine Project Schedule (a) Have you refined the project schedule down to a more detailed level based on more detailed requirements elicited?		<input type="checkbox"/>
5. Refine Project Budget (a) Have you refined the project budget based on the change in effort and resource estimation?		<input type="checkbox"/>
6. Review and Approve (a) The following deliverables need to be reviewed by PAT and approved by PSC/Project Owner to confirm correctness and completeness: i) Project Management Plan.		<input type="checkbox"/>

Please refer to *Appendix A – 1 RACI Model* for the responsible parties.

3.3 PREPARE PROJECT MANAGEMENT PLAN

This chapter builds on top of the [PGPM](#)¹ to provide recommendations specific to large-scale and complex IT system development projects, covering processes and activities supporting the preparation of the Project Management Plan.

2.4 Prepare Project Management Plan	
2.4.1	Define Change Control Process
2.4.2	Define Risk Management Process
2.4.3	Define Issue Management and Escalation Process
2.4.4	Define Communications Management Process
2.4.5	Define Acceptance Management Process
2.4.6	Prepare for Organisational Change
2.4.7	Establish Time and Cost Baseline
2.4.8	Determine Procurement Requirements

3.3.1

3.3.2

Figure 25 - Mapping of “Prepare Project Management Plan” to PGPM

3.3.1 Define Issue Management and Escalation Process

When there are multiple sub-projects to be managed, the sub-project team project manager(s), if applicable, should report to the Project Planner in case of any issues identified at the sub-project level.

3.3.2 Define Communications Management Process

When there are multiple sub-projects, Project Planner should include the sub-project team project manager(s) in the Communications Management Plan.

3.3.3 Process Summary

Who will be involved?	
Role involved	Key Involvement
Internal PM	(a) Define issue management and escalation process (b) Define communications management process
Sub-Project Team	(a) Report and escalate issues to Internal PM
Users/Other Stakeholders	(a) Give advice/comments on defining communications management process

Table 28 - Quality Assurance Checklist for Preparing Project Management Plan

Key Tasks	Tools & Templates	<input checked="" type="checkbox"/>
1. Define Issue Management and Escalation Process (a) If sub-project teams are formed, have you defined issue management and escalation process guidelines which are standardised across all sub-projects?	Project Management Plan	<input type="checkbox"/>
2. Define Communications Management Process (a) If sub-project teams are formed, have you defined the Communications Management Plan?		<input type="checkbox"/>
3. Review and Approve (a) The following deliverables need to be reviewed by PAT and approved by PSC/Project Owner to confirm correctness and completeness: i) Project Management Plan.		<input type="checkbox"/>

Please refer to *Appendix A – 1 RACI Model* for the responsible parties.

4 SUMMARY

The following summarises the processes and activities covered in the Guide:

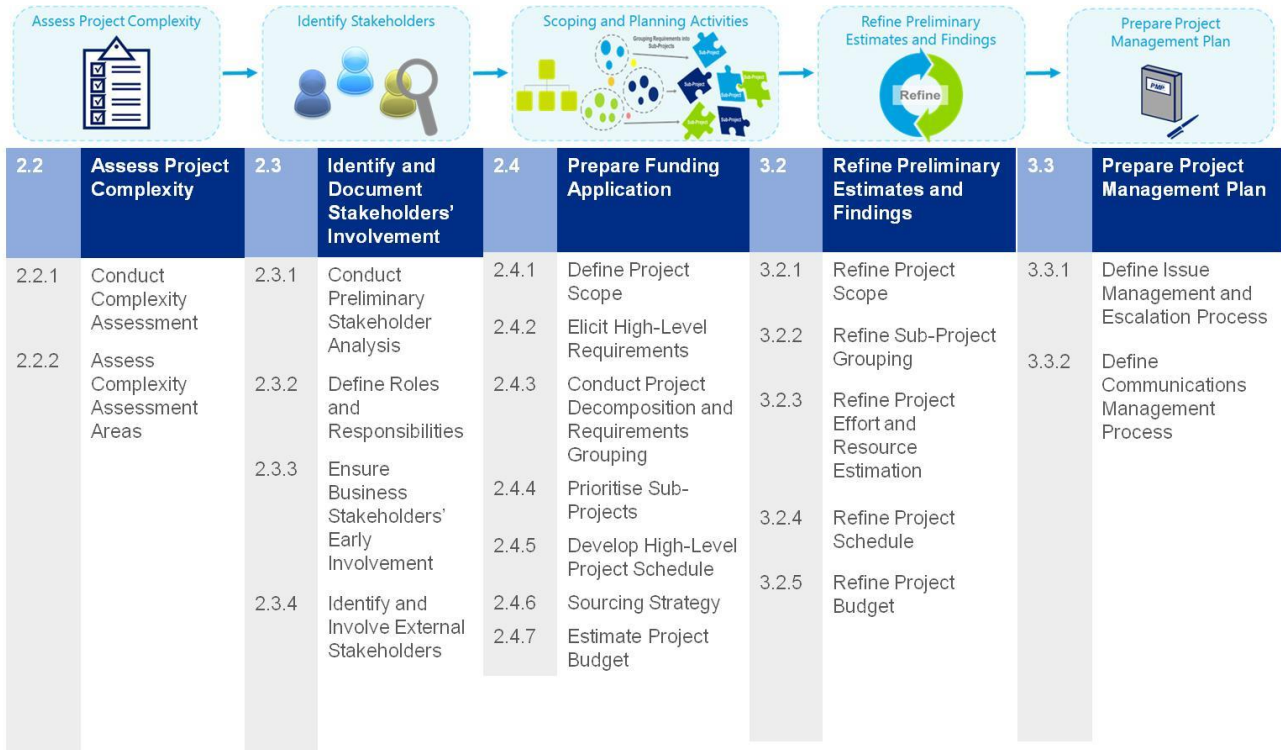


Figure 26 - Summary Table

REFERENCE

- 1 “Practice Guide to Project Management for IT Projects under an Outsourced Environment” can be found at
http://www.ogcio.gov.hk/en/infrastructure/methodology/proj_mgmt/pm_practice_guide_outsourced.htm
- 2 “Best Practices for Business Analyst” can be found at
http://www.ogcio.gov.hk/en/infrastructure/methodology/system_development/best_practices_for_ba.htm
- 3 “Effective Systems Analysis and Design Guide” can be found at
http://www.ogcio.gov.hk/en/infrastructure/methodology/system_development/effective_guide.htm
- 4 “Practice Guide for Agile Software Development” can be found at
http://www.ogcio.gov.hk/en/infrastructure/methodology/system_development/agile_software_development.htm

GLOSSARY

Table 29 - Glossary to facilitate the consistency of terms

Term	Definition
Business Analyst (BA)	BA refers to any person(s) who is (are) responsible for performing the business analysis functions for IT system development projects.
Change Request	A formal request to change the scope, design, method, or other planned aspects of a project, usually including estimates of the effect to the project cost and schedule. It may arise through changes in the business or issues in the project. The document should be logged, assessed, and approved before a change to the project is made.
Contractor Team Members	People who are developers, system analyst or project manager of an outsourced project team.
Sub-Project Team	The team who design and implement the project or sub-projects. They can be internal or external resources
Deliverables	Any tangible, verifiable outcome or item produced by the project.
Departmental IT Plan (DITP)	A DITP is a medium-term IT Plan, covering a period of normally one to three years depending on the business planning horizon of the B/D. It should take stock of the progress of IT development of the B/D; identify areas where IT can be exploited to improve the overall efficiency, effectiveness and resources utilisation of the B/D; and set out IT requirements of the B/D in stages in the planned period.
Enterprise Architecture (EA) Framework	Provides a structured approach for analysing and maintaining the current and future state of B/Ds' business and the technology architecture and strategy, processes, organisation and technology applications, in order to enable business process re-engineering through B/Ds' business and technology transformation.
Feasibility Study (FS)	A research on the economic viability of proposed projects and provides a thorough analysis of the business opportunity, including a look at all the possible roadblocks that may stand in

Term	Definition
	the way of the cooperative's success.
Functional Requirements	Define the capabilities and functionality of a proposed system from a business perspective.
Information Systems Strategy Study (ISSS)	A departmental ISSS is conducted to (i) assess the current ICT requirements of the department, and identify its long-term IT potential with regard to its business and operational strategies; and (ii) recommend a departmental IT strategic plan covering development and implementation over the next five years.
Internal Project Manager (Internal PM)	The person who is responsible for managing the scoping and planning activities of the project.
Lessons Learnt	A summary of what the project team learnt, resulting from both successful and unsuccessful project outcomes. It should be documented at the end of each project.
Non-Functional Requirements	Specify criteria of how the proposed system can perform and maintain these functions and features (i.e. how the proposed system should work) from a business perspective. The non-functional requirements can be grouped into different categories such as audit, control and security, data requirements, service level targets, usability, etc.
Phase	A group of related project activities that come with the completion of a specific deliverables tollgate within a project management lifecycle.
Project Management Lifecycle	The project management lifecycle consists of four phases, namely Initiate, Plan, Execute and Close.
Project Management Plan (PMP)	A formal, approved document that defines how the project is executed monitored and controlled. It is used as a live document during the course of the project and is composed of subsidiary management plans from other project dimensions and other planning documents.
Project Organisation	May include business analysts, project management staff, members of project team and sub-project teams
Project Owner	The Project Owner is the person who often stands to win or lose the most in terms of the outcome of the project; accepts

Term	Definition
	full authority for the project, accepts accountability for the performance of the project (and who wants to do the project) and provides resources.
Project Planner	A collective term to represent the Project Owner, his/her delegate, and the Internal PM.
Project Team	The team who design and implement the project or sub-projects. They can be internal or external resources.
Project Steering Committee (PSC)	A team of people consisting of Executive, Senior User and Senior Technical. The PSC should support the Project Owner and keep the project aligned with its business goals and objectives. They decide on all actions needed in order to complete the project.
Stakeholder Analysis	A preliminary analysis on all the identified stakeholders to understand their involvement in the project as well as their communication requirements.