



We Need A PEP Talk

*RIG Section 3.5 - Project Execution Plans: A Review
of the New PEP Format & Content*

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NEW RIG 3.5: Project Execution Plan (PEP) Guidance

Who?

The PO (Ellis) and PM (Warner and Wilkinson) perspectives

What?

Evolution of RIG content from 3.4 to new format and content

Why?

So many reasons!





Who is the RIG for?

- **YOU...**
 - The RIG is guidance to help you develop, execute and deliver science more effectively and efficiently, and to effectively convey your plans to NSF.
 - Experts need to see and review your plans.
 - Cost analysts need to review your budgets.
 - Non-Experts need to be able to compete effectively too.
 - Engaging new communities is an explicit goal of the Mid-Scale program.
- **Me...**
 - The RIG helps me provide guidance to proposers and awardees, have “substantial involvement” on behalf of the USG and ensure proper stewardship of taxpayer funds.
 - Help you follow your own plans!



What PEP guidance is in the current RIG?

- Chapter 3.4.1: “Components of the Project execution Plan “
 - One table for 16 sections, with 53 rows, over 5 pages (Divestment is in section 1!)
- Chapter 3.4.2: “Detailed Guidelines for Project Execution Plans”:
 - 8 sections just say “[Reserved]”! (Only “Commissioning” has substantive content)
 - Several parts point to multiple other RIG sections
 - Mixture of historical detail, section guidance, and NSF internal process detail scattered throughout the sections
 - Some sections say to ask a PO...Your mileage will vary **WIDELY** and **WILDLY** doing that!
- Chapter 5: “Guidance for Mid-scale research infrastructure projects”
 - Lists 9 specific PEP components as a minimum, but doesn’t say why to skip others



Why is PEP guidance so important?

- Competitive merit review establishes both the priority and the feasibility of projects
- NSF Merit review uses two criteria and 5 questions for **EVERY** project we support
 - The questions are always the same....it's the answers that vary!
 - Tailoring, scaling and progressive elaboration according to the needs of the project
- Infrastructure proposals/projects/activities have a heavy emphasis on feasibility, coordination and resource requirements.
 - Really can't fit all the necessary detail on the Project Description
 - The Project description describes rationale in a persuasive format
 - The PEP explains the “How” for project implementation/execution
 - Reviewers need the fine detail to assess feasibility



NSF Merit Review Criteria

- **Intellectual Merit:** The Intellectual Merit criterion encompasses the potential to advance knowledge; and
- **Broader Impacts:** The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.
- The following elements should be considered in the review for both criteria:
 1. What is the potential for the proposed activity to
 1. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
 2. Benefit society or advance desired societal outcomes (Broader Impacts)?
 2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
 3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
 4. How well qualified is the individual, team, or organization to conduct the proposed activities?
 5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?



What have we changed?

3.4 PROJECT EXECUTION PLAN

3.4.1 Components of a Project Execution Plan

Typical components of a construction-ready Project Execution Plan (PEP), common to most plans for construction of major facilities, are listed in Table 3.4.1-1 below, as an example of the extensive nature of the pre-construction planning that should be conducted prior to expending construction funds to execute the project. While many of the listed topics cannot be substantively addressed at the earliest stage of project planning, it is important that project advocates are aware, at the outset, of the full scope of pre-construction planning activities that should be undertaken, and the consequent pre-resources required. As the project matures through the Conceptual, Preliminary and Final Design Phases, these topics become correspondingly better defined. Some topics will continue to be refined during the Construction Stage, for example, Commissioning Plans and related sub-plans.

The PEP should ideally contain or reference all project related documents and be the standalone source explaining how and why the project meets all requirements and should proceed as planned. Various components of the PEP may often be detailed in separate documents, especially, living documents for future operations such as cybersecurity and data management plans. The PEP should reference these separate documents to summarize the complete scope of the pre-construction planning. In addition to referencing these separate plans, the PEP should provide a high-level summary, outline the associated goals, and/or identified responsibility for the specific plan.

It is important for PEP to document all assumptions and boundary conditions driving project design and implementation. Additions or alterations to the typical PEP components listed below are likely, due to the unique nature of each specific project. Any special construction elements should be identified and addressed in the PEP or a separate document such as the work breakdown structure dictionary or design requirements, drawings, and specification documents.

The PEP at the end of the Final Design Phase is incorporated as part of the construction award through reference to define the award scope, schedule, configuration and contingency control, and project governance.

Table 3.4.1-1 List of the Typical Components of a Project Execution Plan, with Sub-Topics and Descriptions

Component	Sub-Topics	Description of Sub-Section Requirements
1. Introduction	1.1 Scientific Objectives	Description of the research objectives motivating the facility proposal.
	1.2 Scientific Requirements	Comprehensive statement of the Requirements Matrix/ Key Science Requirements to be fulfilled by the proposed facility (to the extent possible identifying minimum essential as well as desirable quantitative requirements), which provide a basis for determining the scope of the associated infrastructure requirements.
	1.3 Facility / Infrastructure	Description of the infrastructure necessary to obtain the research and education objectives.
	1.4 Scientific & Broader Societal Impacts	Description of the Broader Societal Impacts associated with the purpose of the facility, including the scope of work, budget and schedule related to science community or society related actions or interactions.
	1.5 Facility Divestment Plan	Description of plans and estimate of divestment liabilities at the end of facility life for transfer, demolition, site remediation, decontamination, etc., where appropriate.
2. Organization	2.1 Internal Governance & Organization and Communication	Internal Project Governance and Organization Structure with clear lines of authority, responsibility, and communication between Internal and institutional governance and oversight and advisory committees.
	2.2 External Organization and Communication	External Project Organizational Structure and Governance, showing clear lines of authority, responsibility, and communication between NSF, any partners, and the Recipient.
	2.3 Partnerships	Role of interagency or international partners in future planning and development and/or construction. Plans, agreements, and commitments for interagency and international partnerships. Description of the project's stakeholders and their roles, responsibilities and meeting schedules.
	2.4 Roles and Responsibilities	Roles and Responsibilities of key project personnel and governance groups.
	2.5 Community Relations and Outreach	Community Relations and Outreach plans for building and maintaining effective relationships with the broader research community that will eventually utilize the facility to conduct research and with the public. Description of scientific and educational outreach programs.
3. Design and Development	3.1 Project Development Plan	Description of activities that will be undertaken in order to achieve readiness for construction, such as design, prototyping, manufacturing process validation, vendor qualification, modeling and simulation, creation of required project management plans, forming partnerships, etc.

3.4.2 Detailed Guidelines for Project Execution Plans

This section elaborates on the various components outlined in the previous section, Components of a Project Execution Plan, and offers additional information that should be helpful to individuals newly involved in planning for construction and future operations. Each of the sub-sections below are aligned to the PEP Components identified in Section 3.4.1 and provides some cross-reference to other sections of this Guide.

3.4.2.1 [Introduction \[Reserved\]](#)

3.4.2.2 [Organization \[Reserved\]](#)

3.4.2.3 [Design and Development \[Reserved\]](#)

3.4.2.4 [Construction Project Definition](#)

Refer to Section 4.2.2.1 for guidance on the cost estimating plan (CEP). The cost estimate should include an executive summary of the estimate, including narrative, figures, and tables per Section 4.2.3.2.

Refer to Section 4.2.6 for guidance on development of construction schedules including the schedule basis document and NSF expectations associated with the GAO scheduling best practices.

3.4.2.5 [Staffing \[Reserved\]](#)

3.4.2.6 [Risk and Opportunity Management](#)

Refer to Section 6.2 for Risk Management Guidelines.

3.4.2.7 [Systems Engineering \[Reserved\]](#)

3.4.2.8 [Configuration Control](#)

Refer to Sections 2.4.1, 4.2.5.5, and 4.6.5 regarding changes to the performance measurement baselines (PMB) and the use of budget and schedule contingency.

3.4.2.9 [Acquisitions \[Reserved\]](#)

3.4.2.10 [Project Management Controls](#)

Refer to Sections 4.6.3.6 and 6.8 for more information and guidelines on earned value management systems (EVMS).

3.4.2.11 [Site and Environment \[Reserved\]](#)

3.4.2.12 [Cyber-Infrastructure](#)

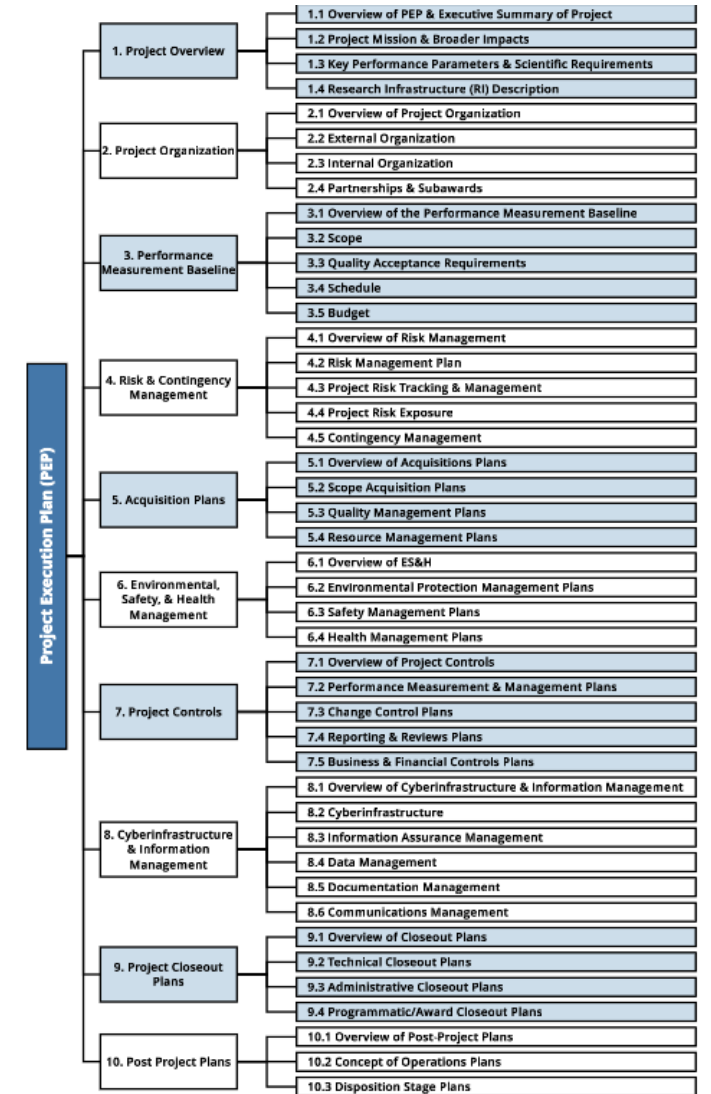
Refer to Section 6.3 for guidelines on cybersecurity.

3.4.2.13 [Environmental, Safety and Health \[Reserved\]](#)



What have we changed?

- Award-type and scale-neutral language
 - Removed language about individual solicitations
- New 10-section format for all projects
 - Same basic information requested
 - More linear and logical sequence
 - All components required
 - Not all subcomponents required
- Detailed guidance for EVERY section
 - Best practices and practical considerations included throughout
- New and enhanced figures and illustrations

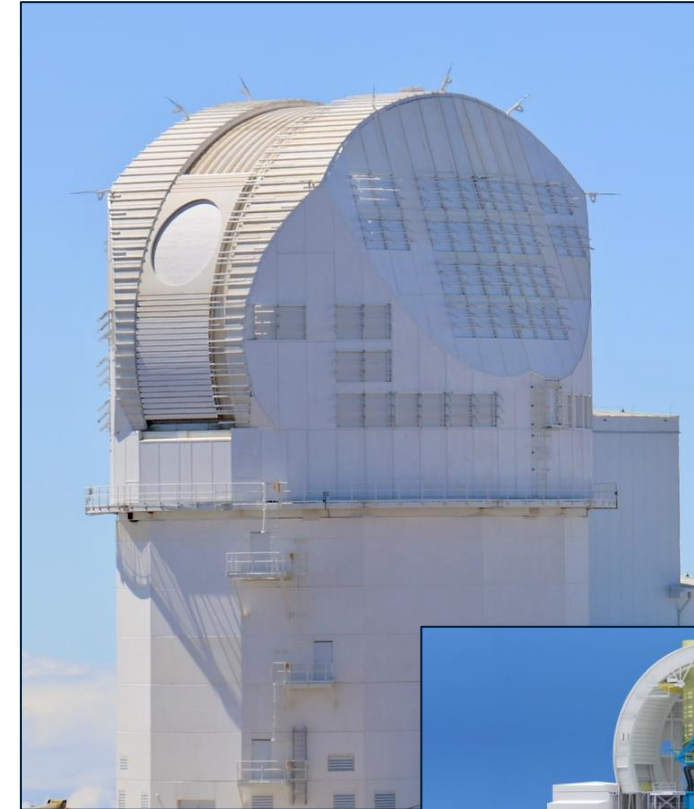
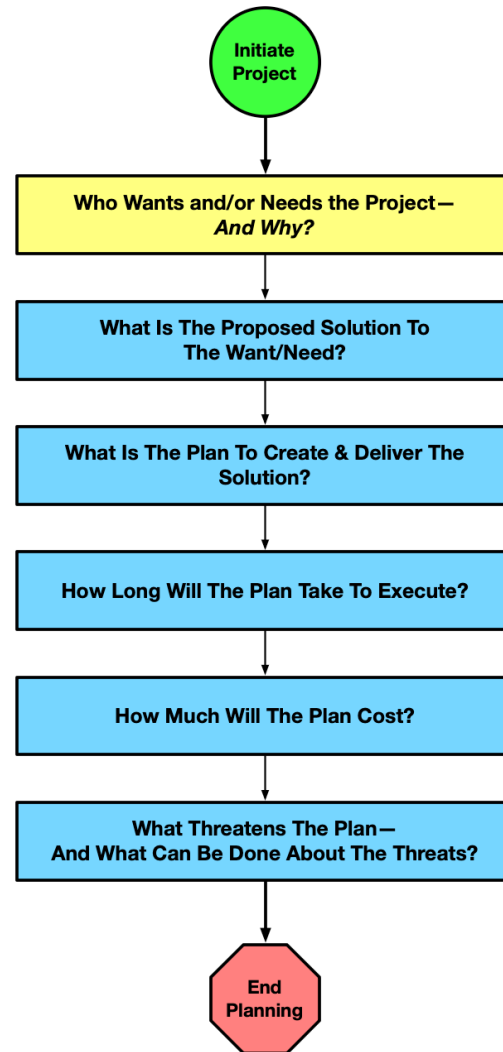




Every Project Is Different—And The Same

Turning the six fundamental project planning questions into a 10-component PEP

Birthday
Cake



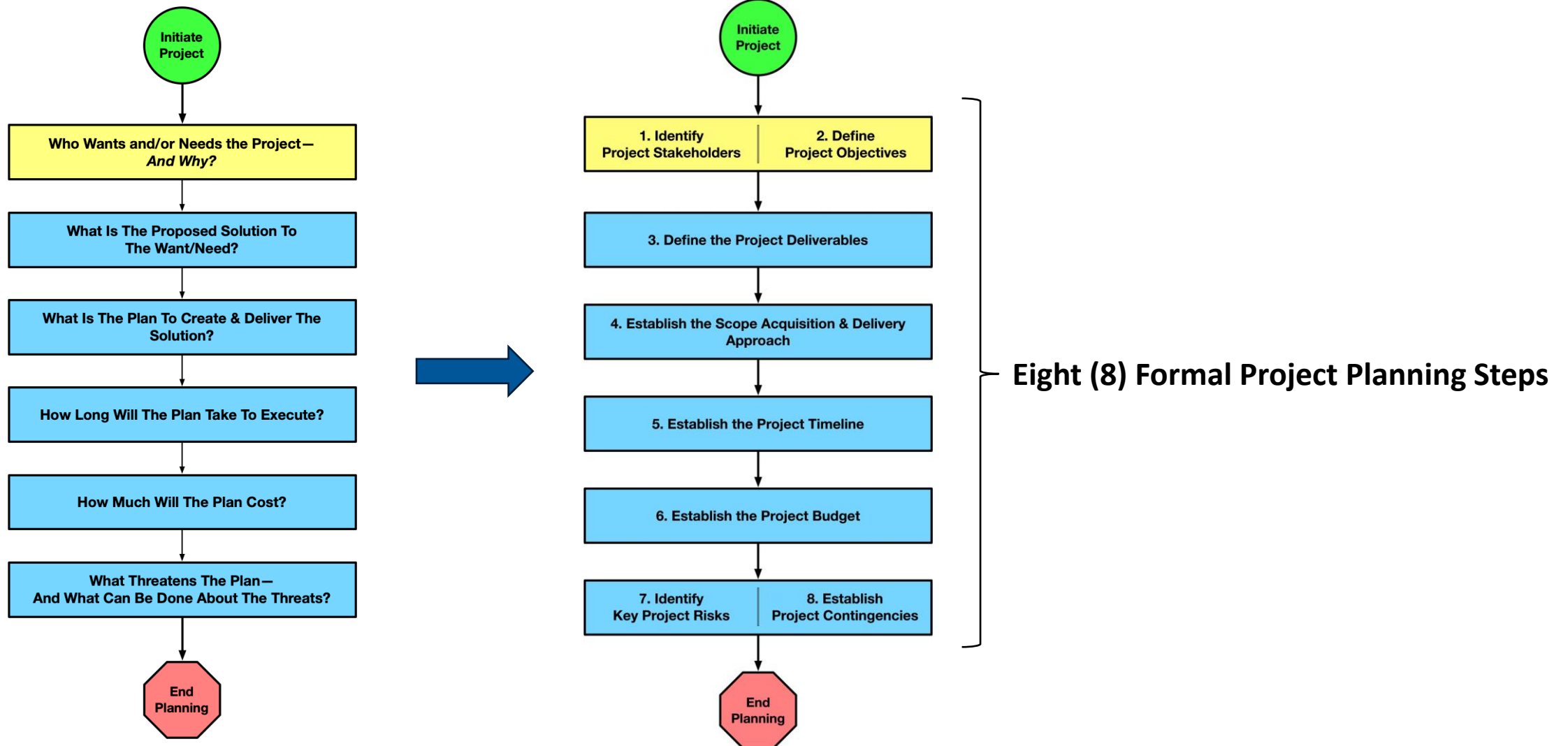
Daniel K. Inouye Solar
Telescope (DKIST)





Every Project Is Different—And The Same

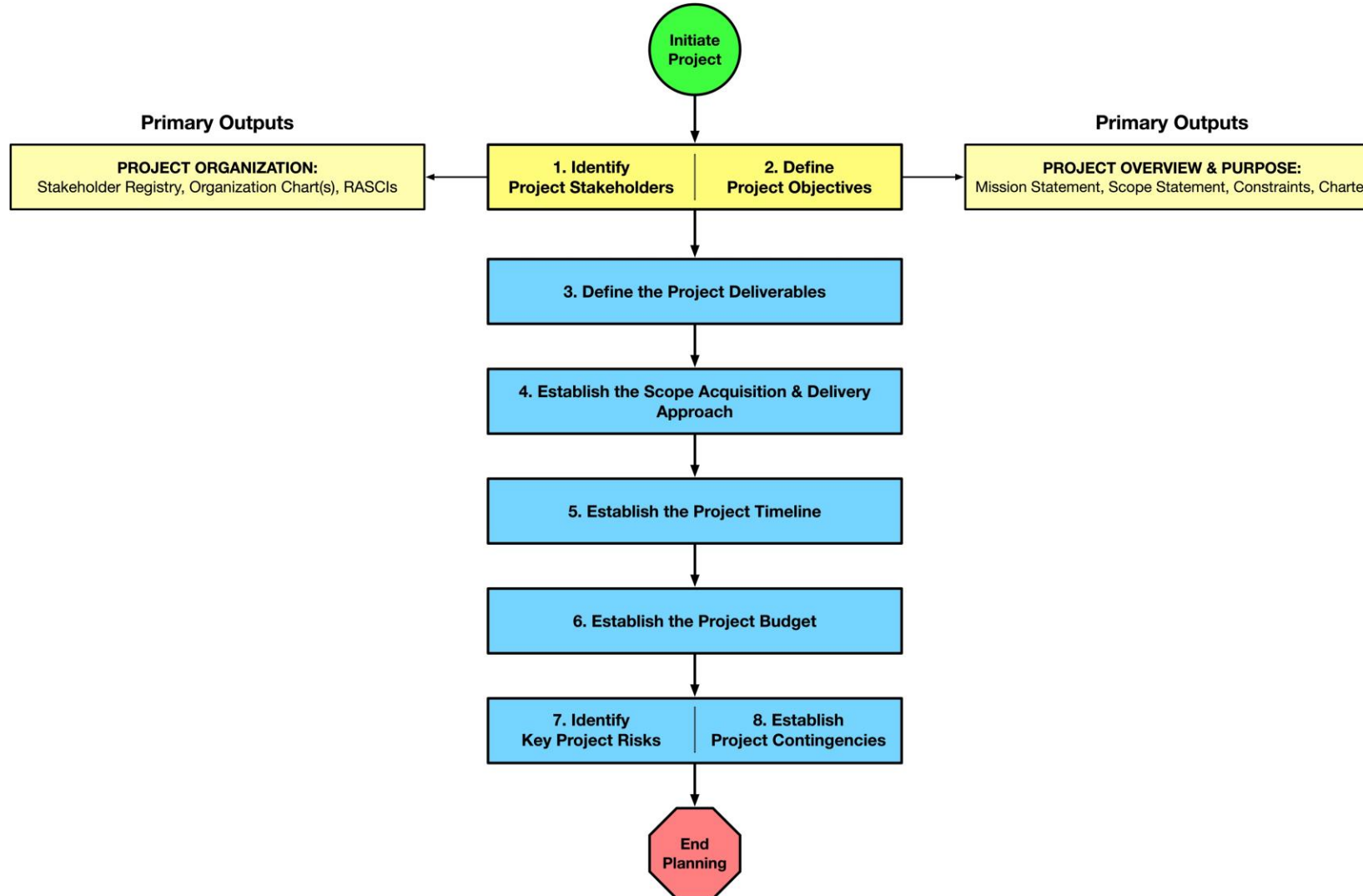
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Every Project Is Different—And The Same

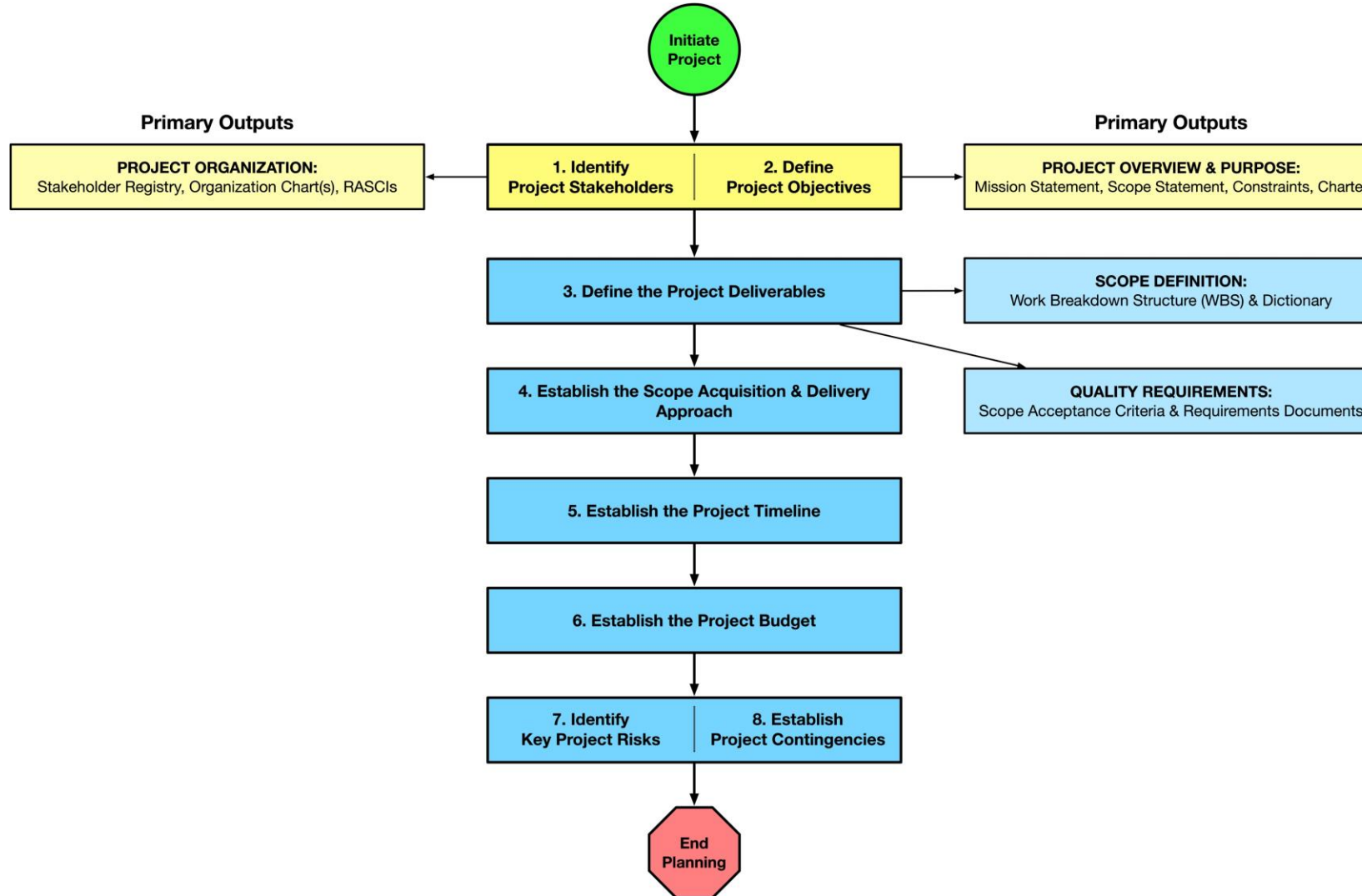
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Every Project Is Different—And The Same

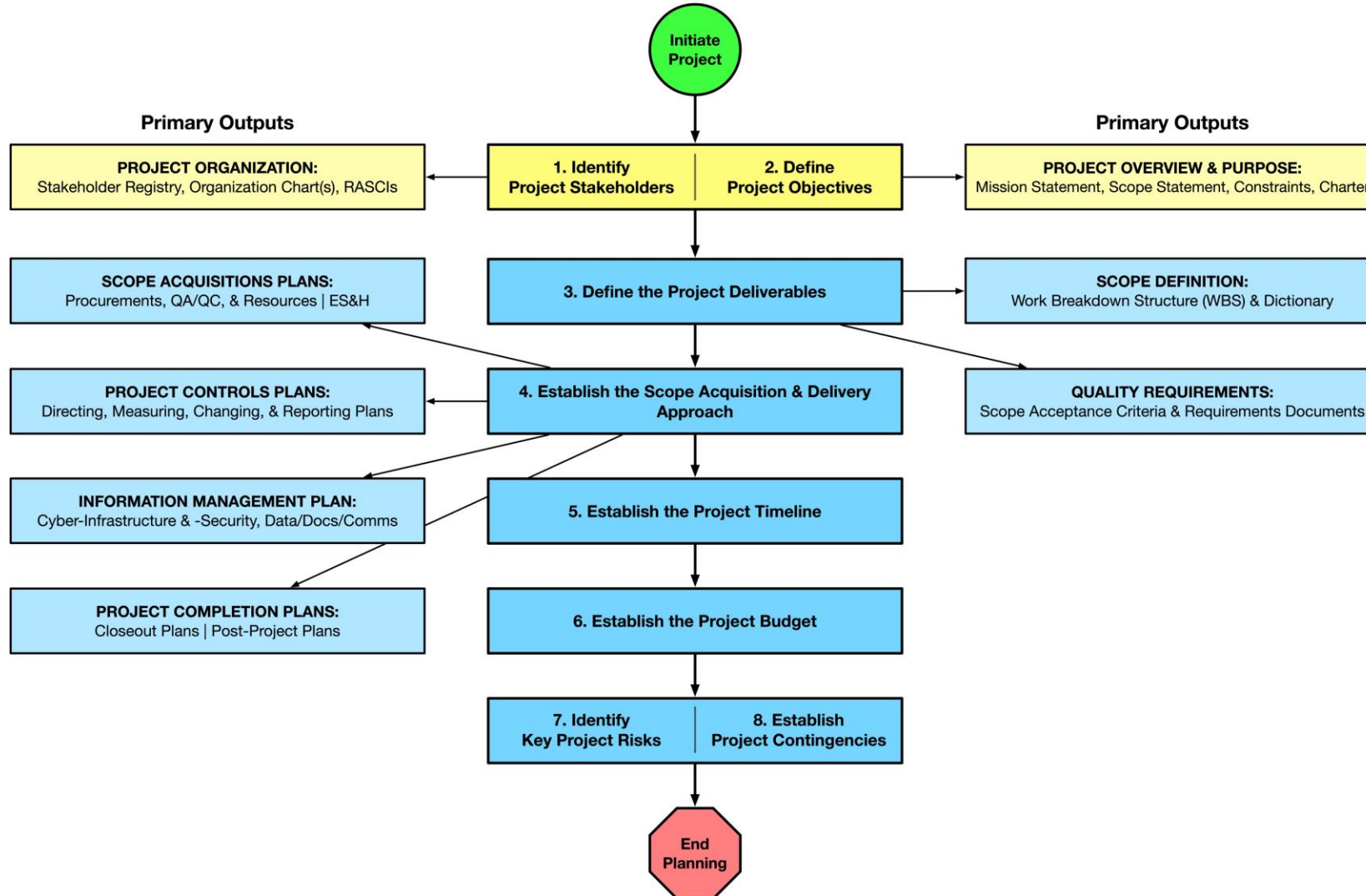
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Every Project Is Different—And The Same

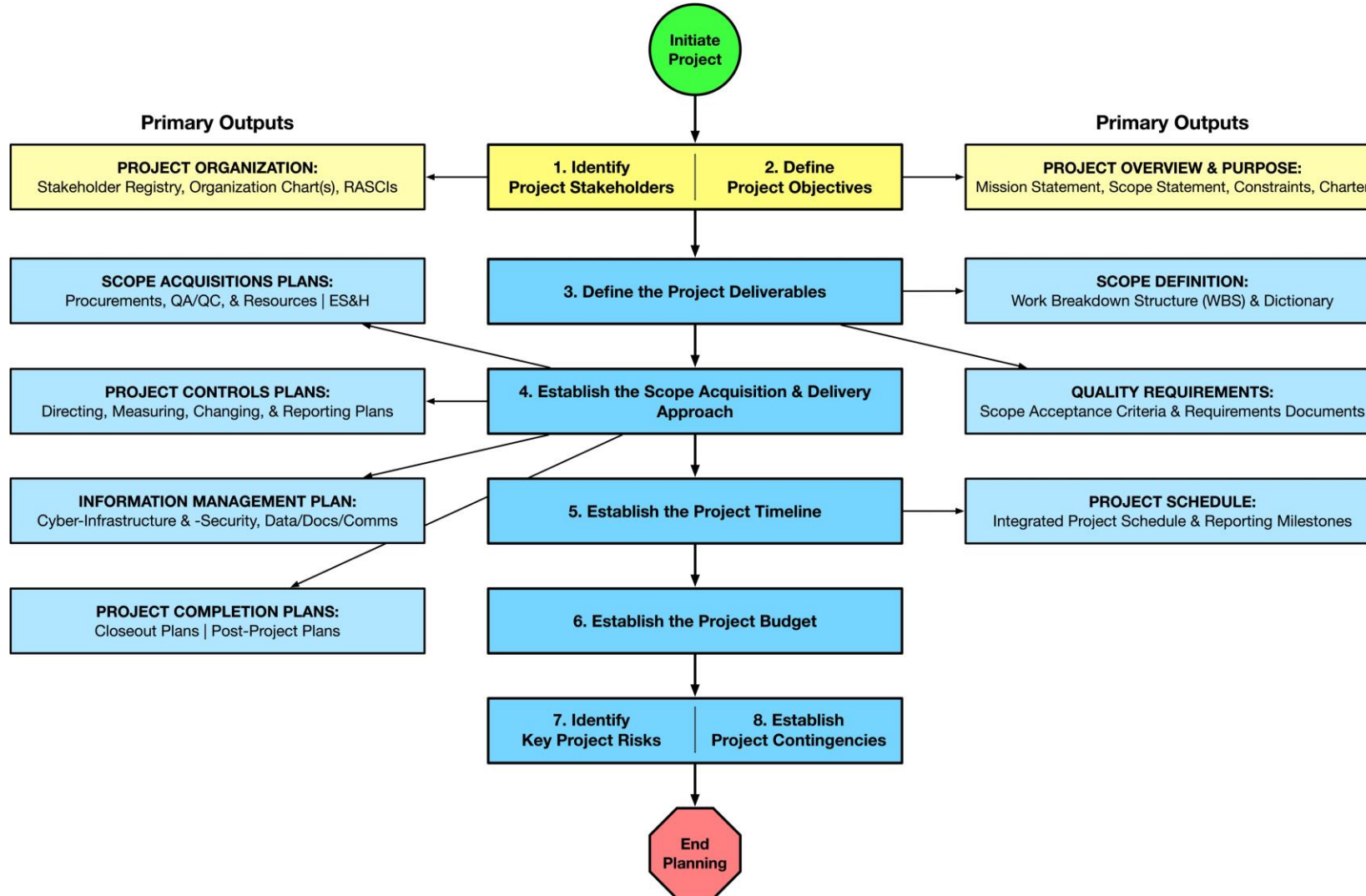
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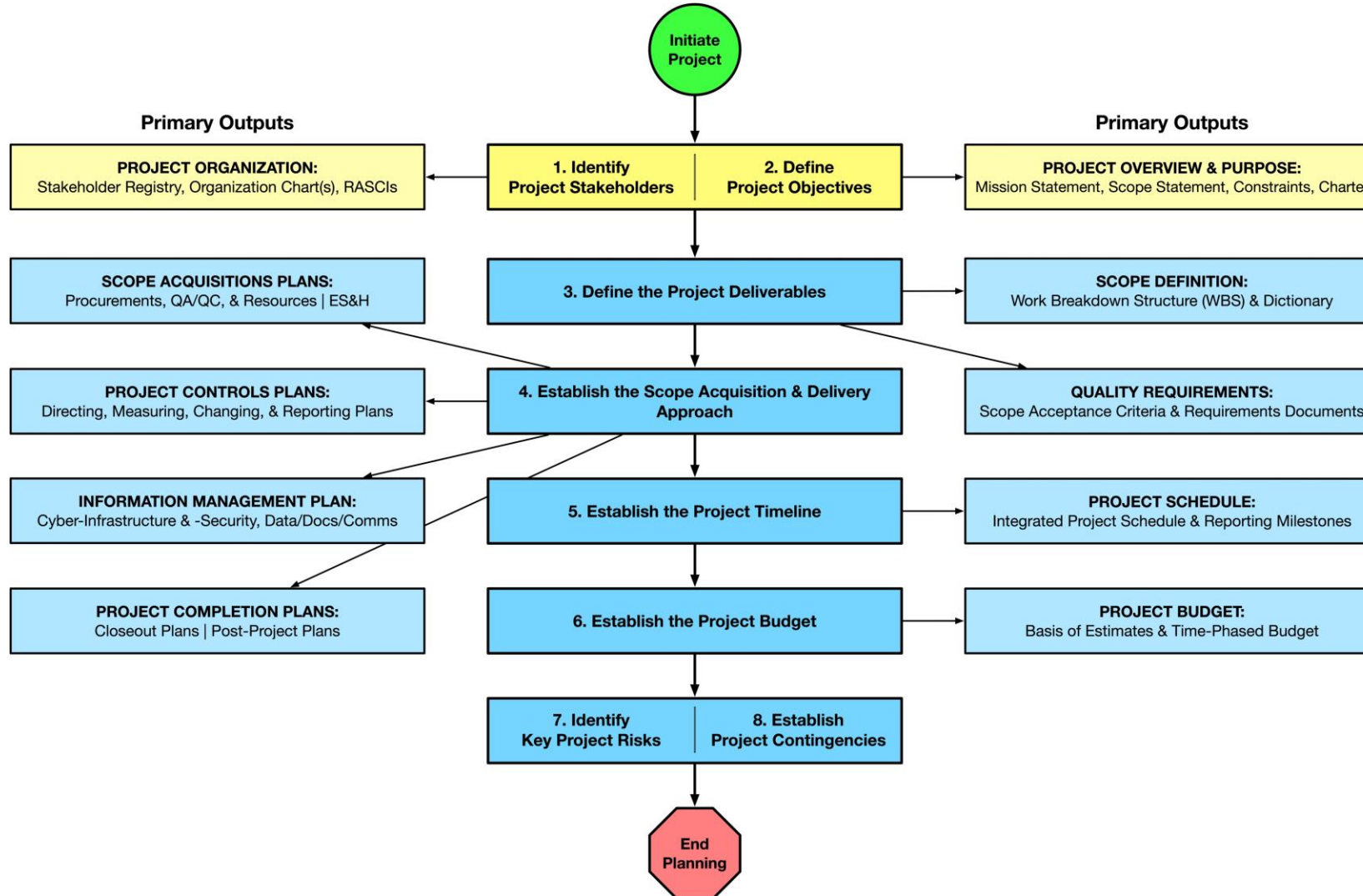
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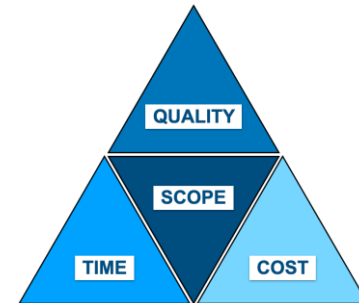
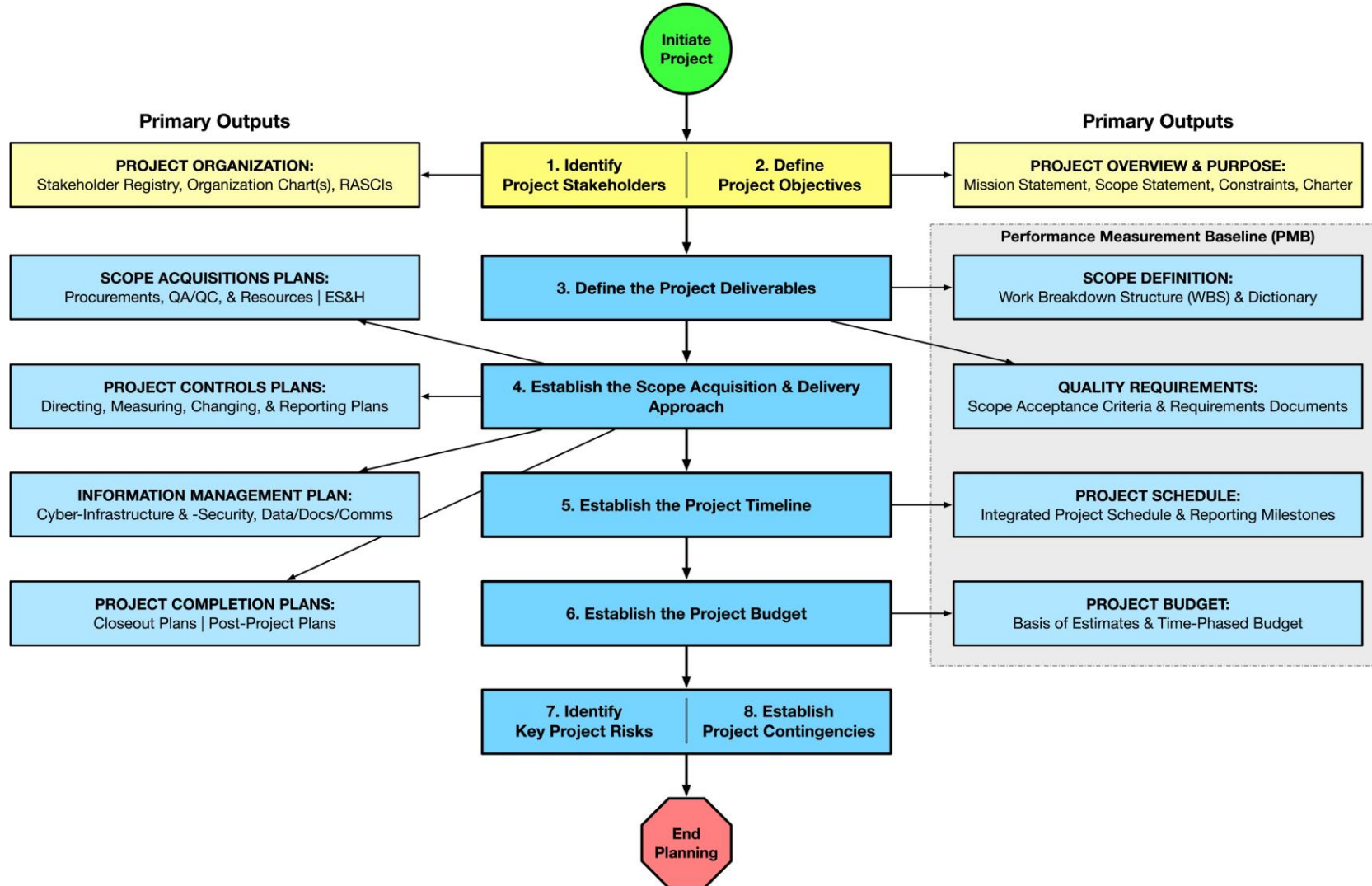
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Every Project Is Different—And The Same

Turning the six fundamental project planning questions into a 10-component PEP

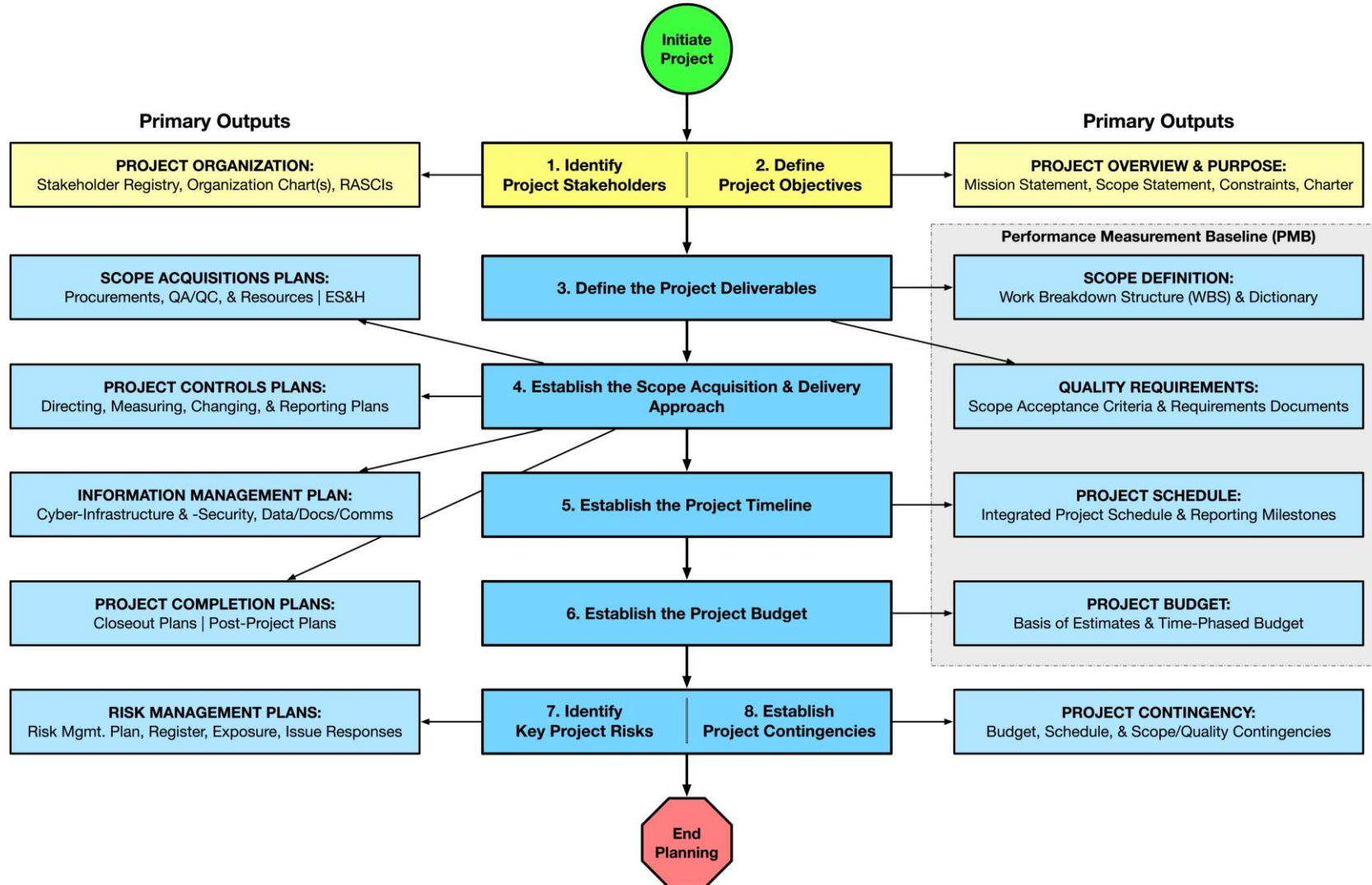


Performance Measurement Baseline



Every Project Is Different—And The Same

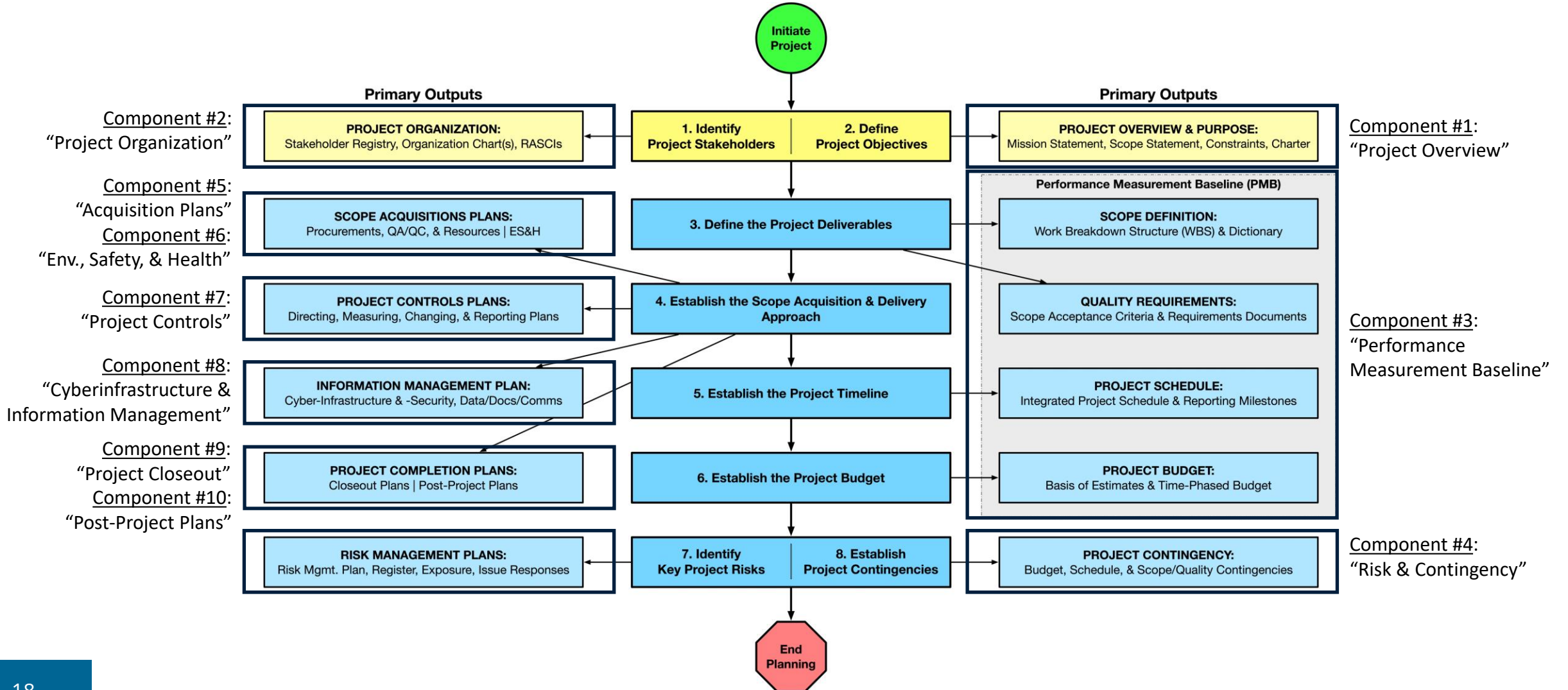
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Every Project Is Different—And The Same

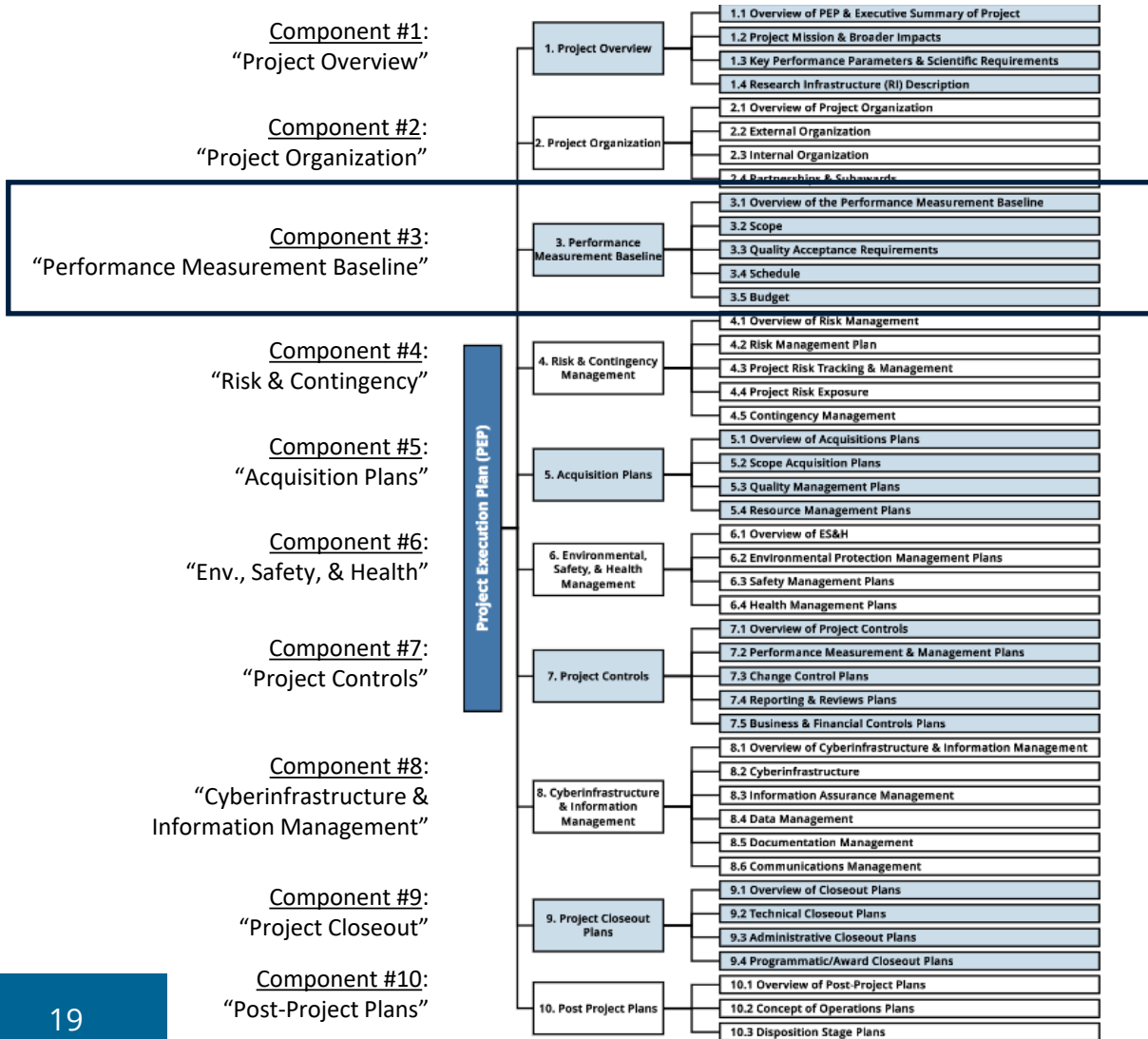
Turning the six fundamental project planning questions into a 10-component PEP





Every Project Is Different—And The Same

Turning the six fundamental project planning questions into a 10-component PEP



Every Component Description Includes:

- **Introduction**
 - What Does This Component Describe?
 - Why Is This Component Important?
 - How to Develop and Write This Component?
 - Component Overview Table
- **Subcomponent X.1**
 - Detailed Description Of What's To Be Included
 - Good Practices & Practical Considerations
 - *[Examples]*
- **Subcomponent X.2**
 - Detailed Description Of What's To Be Included
 - Good Practices & Practical Considerations
 - *[Examples]*
- **Subcomponent X.n...**

Link to Detailed RIG Chapter If Applicable



Every Project Is Different—And The Same

Turning the six fundamental project planning questions into a 10-component PEP

3.4.4 Performance Measurement Baseline (PEP Component 3)

What Does This Component Describe?

This component describes the Performance Measurement Baseline (PMB) that defines and documents the four objective measures of project success: Scope, Quality, Schedule, and Budget. These four elements are captured in a suite of documents, including a Work Breakdown Structure (WBS), WBS Dictionary, Quality Acceptance Requirements, Integrated Project Schedule (IPS), and a Time-Phased Budget. Additionally, this component provides a summary view of the Total Project Definition, which includes Contingency associated with each of the four PMB elements, and a yearly funding profile.

Why Is This Component Important?

The PMB is the pre-defined and documented definition of project success. It is the agreed-upon objective “target” upon which all project activities should be planned and directed. A successful Project should result in the delivery of 100% of the scope as defined in the PMB, meeting all of its quality acceptance criteria, and doing so on schedule and within budget. One cannot fully plan, execute, or close a project successfully without a well-defined and stable PMB.

How To Develop & Write This Component:

There are five subcomponents to be included in the Baseline component of a PEP, as listed in the table below. All five are required, regardless of project type, size, or complexity. Each sub-component has several identified documents or products that should be created during the development of this component.

The Baseline should be structured in a manner that matches the project characteristics and is agreed upon by the participants and stakeholders. This entire component should be tailored and scaled to the individual type, size, complexity, and characteristics of the Project. Further, the subcomponents are typically developed in a progressively elaborated approach, as described in X.X.X.X.

Component	Sub-Component	Documents/Products	References
3 Performance Measurement Baseline	3.1 Overview of the Project Baseline and Project Definition (required)	TPC and Total Duration, Summary Milestones, Summary Budget & Funding Profiles	NSF EVM Gold Card (https://www.nsf.gov/bfa/lfo/docs/NSF_EVMS_Gold_Card_July%202019-1.pdf)
	3.2 Scope (required)	Work Breakdown Structure (WBS), WBS Dictionary	Section 4.2. Project Scope and Work Breakdown Structure (WBS)
	3.3 Quality (required)	<ul style="list-style-type: none"> Requirements Documents Specifications Test plans Acceptance Criteria 	Section 4.3. System Integration, Requirements, and Quality Assurance
	3.4 Schedule (required)	Schedule Basis and Estimating Plan, Integrated Project Schedule (IPS), Reporting Milestone Table	Section 4.4- Schedule Development, Estimating, and Analysis, GAO Schedule Estimating Guide
	3.5 Budget (required)	Cost Estimating Plan, Cost Book and Basis of Estimate (BOE), Time-Phased Budget	Section 4.5 - Cost Estimating and Analysis, GAO Cost Estimating Guide

3.4.4.2 Scope (PEP Subcomponent 3.2)

This subcomponent identifies and describes the baseline scope of the project via two key documents: a Work Breakdown Structure (WBS) and a WBS dictionary. Both of these documents are required on every project. The WBS integrates and relates all project work (cost, schedule and scope) and is used throughout the project management to identify and monitor project progress. See RIG Section 4.2 Project Scope and Work Breakdown Structure (WBS) for detailed guidelines on developing a WBS. Every project, regardless of type, size, or complexity, is required to have a WBS that includes at least specific

Level-2 deliverables. Below that level, the details will be dependent on the project specifics. Summaries of these two documents are included in this PEP subcomponent, as described below:

- **Work Breakdown Structure:** The full scope of the project is identified and listed in a deliverables-based Work Breakdown Structure (WBS), where the deliverables are comprised of the products, results and services of the project. The project WBS is an organized hierarchical listing by name or title of all scope in the project. If the complete WBS for the Project extends to levels below L3, it will generally be too large for inclusion in its entirety within the PEP. In that case, the full WBS should be maintained in a separate document or appendix and only the first few WBS levels should be displayed in the PEP. A statement should be made enumerating the number of levels and providing a reference to the full WBS as a supplementary document.
- **WBS Dictionary:** A corresponding high-level WBS Dictionary summary is also included in this subcomponent. The WBS Dictionary defines and describes each element of the WBS. Like the WBS itself, the full WBS Dictionary is typically created as a supplementary document and referenced within the PEP. The WBS Dictionary that is included in this subcomponent is limited to the level-2 or level-3 WBS determined above.

A summary table that includes all high-level scope elements through WBS level 3, along with corresponding dictionary descriptions, should be included in this subcomponent.

WBS #	WBS Element Name	Element Description (Simplified WBS Dictionary Entry)
1	Project Name	
1.1	L2 Element Name	High-level deliverable description, including key subcomponents, significant exclusions, and other relevant high-level information necessary to clearly and unambiguously understand and describe the element.
1.1.1	L3 Element Name	High-level deliverable description, including key subcomponents, significant exclusions, and other relevant high-level information necessary to clearly and unambiguously understand and describe the element.
1.2	L2 Element Name	High-level deliverable description, including key subcomponents, significant exclusions, and other relevant high-level information necessary to clearly and unambiguously understand and describe the element.
1.2.1	L3 Element Name	High-level deliverable description, including key subcomponents, significant exclusions, and other relevant high-level information necessary to clearly and unambiguously understand and describe the element.

Note that the WBS structure should be tailored and scaled to the project and organization characteristics. Most, but not all, NSF projects are usually well matched to a traditional waterfall framework, with a hierarchy of elements that sum up to higher levels. Traditional frameworks are most common, but NSF allows other frameworks, depending upon the project characteristics. Software developers and other organizations accustomed to cyclical planning and management methods, for example, may be accustomed to an agile framework.

Good Practices and Practical Considerations:

- While task-based WBSs are acceptable in some industries, a “product-oriented” WBS is preferred for NSF RI projects. That is, the WBS should capture only deliverables: products, services, and results. Associated tasks and activities are captured in the Project’s Integrated Project Schedule (IPS), not the WBS. One simplistic way to think of this is that the WBS includes “nouns” while the schedule includes “action verbs.”
- The level of detail in the WBS should match the stage, size, and complexity of the project. The lowest level elements of the WBS on any “branch” are called work packages. Work packages serve as the focus on corresponding activities in the IPS, i.e., the activities in the IPS should be developed and organized around provision and delivery of the work package scope. Similarly, work packages are used as the lowest level budgeting elements in the time-phased budget, i.e., the cost basis of estimates (BOEs) described below in subcomponent 3.5 are established at the work package level.
- In a hierarchical WBS, lower level WBS elements roll up to the higher levels such that each high level WBS is the sum of the lower-level elements and work packages.
- Acceptance of any non-traditional framework will need to be negotiated with NSF.
- When naming lower level WBS elements, add identifiers that link to the higher level WBS, i.e., “Procurement” may occur many times in the WBS, but “Periscope Optics Procurement” will distinguish between the various other procurements and avoid confusion when viewing elements out of context.
- While constructing a WBS, control accounts and control account managers (CAMs) should also be identified. An accountable person should be identified for each high-level WBS element of scope to ensure proper management and oversight is provided.

3.4.4.3 Quality Acceptance Requirements (PEP Subcomponent 3.3)

This subcomponent describes the processes for determining and documenting the requirements and quality acceptance criteria and plans for the deliverables identified and included in the WBS. It describes how the key parameters and high-level science requirements summarized above in PEP subcomponent 3.2 flow down to detailed science requirements, engineering requirements, and quality/acceptance requirements and plans. If all requirements or plans are not fully mature, it describes the process the project will follow to progressively elaborate documentation and planning.

Typically, requirements are captured in tabular format. One example of this type of table is shown below in Table 4.4-x; note however that the format of the table will depend strongly on the characteristics of the project. For complex projects with many cross-linked requirements, a data base or multiple spreadsheets or tables with links to higher level requirements may be needed. If the actual requirements documents are too large to include in the PEP itself, then this subcomponent should describe the processes and references them as provided supplementary requirements documents.

Table 4.4-x. Simple Table showing the traceable flowdown links from key parameters to science and engineering requirements to quality plan and requirements. Complex projects may require separate but linked documents tracing the relationship between high-level requirements and lower, detailed requirements and quality plans.

Key Performance Parameters	Science Requirements Documents	Detailed Science and Engineering Requirements Documents	Quality Acceptance Plans
• Key Parameter A	<ul style="list-style-type: none"> High-Level Science Requirement A High-Level Science Requirement B 	• Detailed Science Requirements Document XY	<ul style="list-style-type: none"> Quality Control and Acceptance Plan for Component X Quality Control and Acceptance Plan for Subsystem Y
• Key Parameter B	<ul style="list-style-type: none"> High-Level Science Requirement C High-Level Science Requirement D 	• Engineering Requirements for Subcomponent Y	• Quality Control Plan for Subcomponent Y



Conclusions

- RIG revisions on PEP guidance are expected to:
 - Provide more comprehensive, consistent and effective guidance to proposers and awardees (i.e., Help us help you!)
 - Ensure opportunities for non-experts beginning to work with formal project management approaches
- Improve project planning and outcomes
 - Full consideration and documentation of relevant details
- Improve PEP development efficiency and effectiveness
 - **The same information is requested**, but more clearly communicated
 - Better to develop once and tweak than go through major rework cycles



Check out the Working Draft of Section 3.5!

- We are very interested in your feedback!
 - Draft version of the new PEP section (§ 3.5) is in Whova app
 - The PDF you see is still **VERY** Drafty (e.g. figures aren't all finalized)
- Please send your individual comments and feedback on what is not clear, missing or causes concerns
 - No group or consensus reports.
 - No wordsmithing (yet!), please focus on higher-level comments about content, approach and any perceived strengths, gaps or limitations.
- E-mail me: stellis@nsf.gov
 - Designated NSF program lead on this section...
 - Coordinating w/ RIO and other parts of the effort
 - Or.....



Other ways to give feedback

Still in **DRAFT** form! NSF would like to hear from the RI community offering their perspective on the RIG Changes.

A few ways to communicate

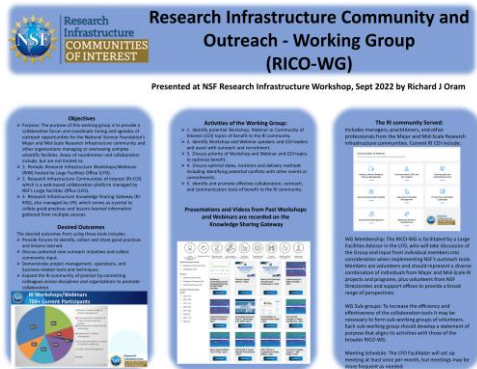
In-Person RIG Table top

In Person- Poster Session X2

Message Presenters on the Whova app

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**Send comments*
to: stellis@nsf.gov**

**This is not a FACA activity, so no individual responses but public comment in Federal Register planned for later this year.*



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