E-BOOK
PROJECT
MANAGEMENT

by :
Gaurav Dakshini
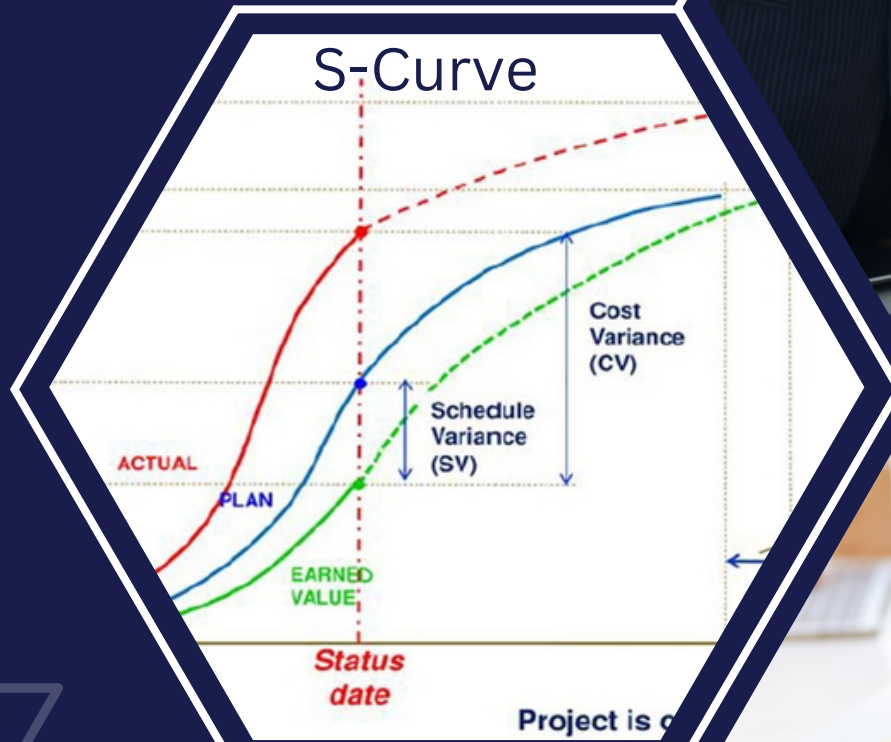
S-Curve

Cost
Variance
(CV)

Schedule
Variance
(SV)

ACTUAL

PLAN

EARNED
VALUE

Status
date

Project is

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Gaurav Dakshini

PMP® Certified
20 Years of Experience
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Initiating

1.1 Develop Project Charter
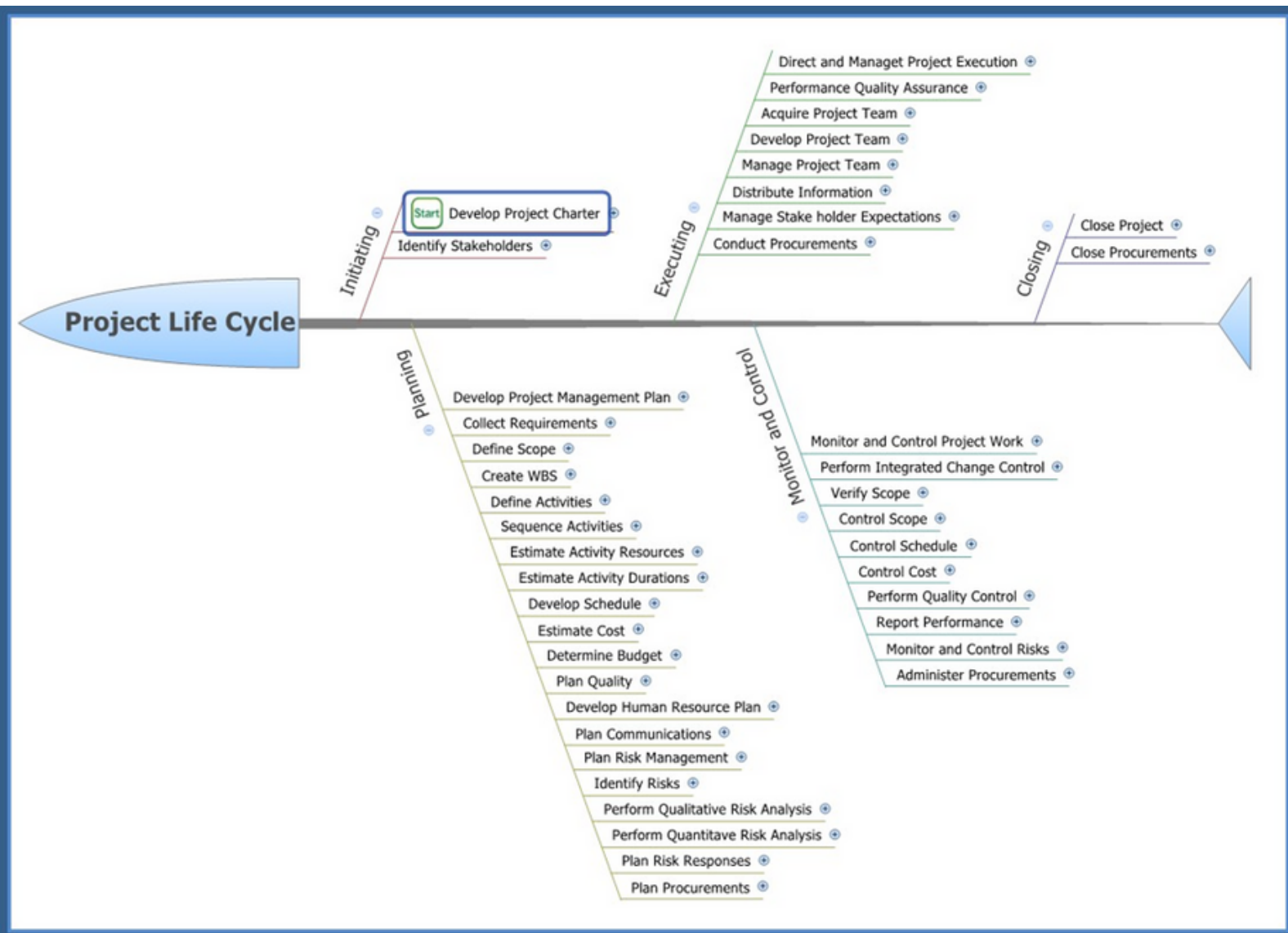
Initiating

1.1 Develop Project Charter

1.1.1 Summary

A. The project charter is a document that formally authorizes the project or a project phase. It also documents the initial requirements to satisfy the stakeholders' needs and expectations. The project charter can be generated by the client, often with the assistance of SSOE.

B. If possible, the project manager should be involved in the development of the project charter. If this is not feasible, the project manager needs to be assigned prior to the project entering the Planning phase.

C. The project must be authorized by someone external to the project. Examples are the client (for an external project) or a sponsor (internal project).

1.1.2 Input

A. <u>Project Statement of Work (SOW)</u> – A narrative description of the services to be provided by the project. It provides the business need, scope description, and strategic plan. Be aware that an external client may chose not to share all of the above with SSOE, specifically their strategic plan and/or the business need.

B. For an internal project, the project sponsor can provide the SOW. However, this is generally created together with the PM.

C. For an external project, the SOW may be received from the client as part of the bid documents. Alternatively, SSOE could develop the SOW based on a project walk–through, existing client–supplied drawings, etc. It is important to have a specific SOW to clearly identify what SSOE's fee entails in correspondence to what the client is expecting.

D. <u>Contract</u> – If the project is being executed for an external client, a contract should be signed *prior* to the start of the project. For internal (overhead) projects, no contract is required.

E. <u>Organization Process Assets</u> – SSOE's standard processes, as identified on the PM Guidelines SharePoint site, the templates referenced therein, and ISO standards help to comprise our Organization Process Assets.

F. Historical information should be used in evaluating new projects. Deltek can be used as a resource to obtain historical information regarding a particular client or project type. Most of SSOE's past

Initiating

projects have been archived; they are still accessible. Using Deltek and/or the <u>Intranet archive search</u>, a project number or disk number can be obtained. Contact C&IS to receive a copy of a past project. All projects have been saved with the intent of being reviewed and used again.

G.   <u>Lessons Learned</u> from previous projects should be reviewed, and where applicable, applied to the new project.

H.   <u>Enterprise Environmental Factors</u> – Internal factors including our manpower organization structure, various office locations, ISO standards adhered to, company work authorization system, and Deltek. It is not only SSOE's environmental factors that need to be considered, but more importantly the client's. Be aware that any contractors or subconsultants brought onto a project will have their own set of environmental factors that will need consideration.

I.   Other external factors can influence the Project Charter, such as government and industry standards and marketplace conditions.

J.   <u>Business Case</u> – Some clients may want to document whether or not the project is worth the required investment. For internal projects, a committee should determine whether or not the overhead project will be a value–added expense to SSOE. Internal projects can only be created with SBU manager approval.

K.   For external projects, the client may request SSOE's assistance in developing a cost–benefit analysis (CBA). The external client may not choose to disclose information to SSOE if they have executed the CBA internally.

1.1.3   Procedures

A.   N/A.

1.1.4   Tools and Techniques

A.   Expert judgment should be used to analyze the Project Charter, and more specifically, whether a project should be undertaken. For information regarding whether SSOE should undertake a project, see Section 2.15 – Plan Risk Management for the Go/No–Go Decision process. The template can be found on the PM Guidelines SharePoint site.

1.1.5   Output

A.   The Project Charter, at a minimum, should contain the following information:

1.   Project Justification and Purpose

Initiating

      2.   Project Objectives

      3.   Approval requirements

      4.   Product Description and Deliverables

      5.   High–level Risks

      6.   High–Level Milestone Schedule

      7.   High–Level Budget (± 50%)

      8.   Project Manager Assigned and Authority Level

      9.   Stakeholders and their Requirements

      10.   Constraints and Assumptions

B.   A project cannot exist without the project charter. It gives the project manager the authority to both spend money and commit corporate resources, and it links the project to the ongoing work of the organization.
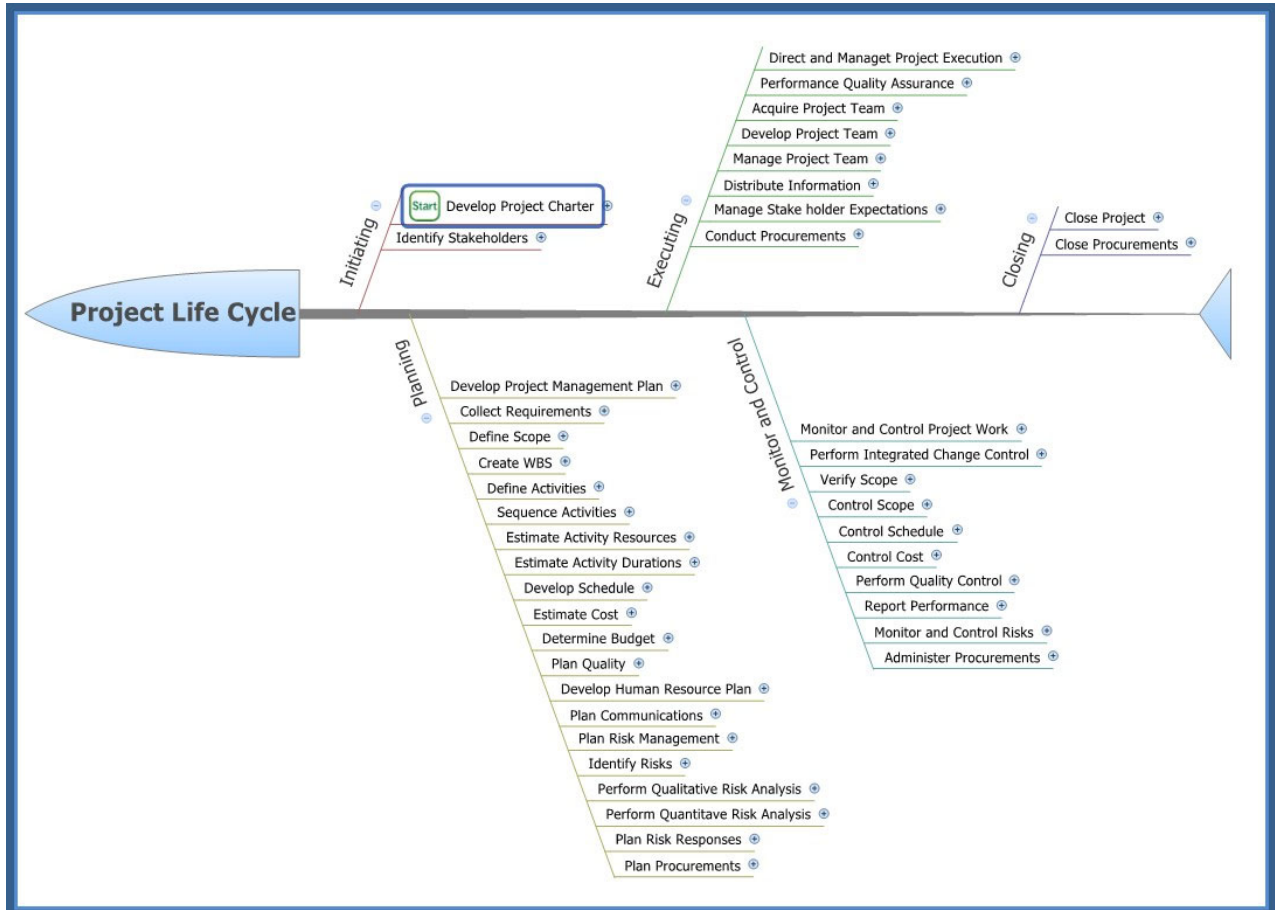
1.1.6 References

A.   Project Management Body of Knowledge Section 4.1 – Develop Project Charter

Initiating

1.1.7   Flow Chart

Project Life Cycle

Initiating
- Start Develop Project Charter
- Identify Stakeholders

Executing
- Direct and Managet Project Execution
- Performance Quality Assurance
- Acquire Project Team
- Develop Project Team
- Manage Project Team
- Distribute Information
- Manage Stake holder Expectations
- Conduct Procurements

Closing
- Close Project
- Close Procurements

Planning
- Develop Project Management Plan
- Collect Requirements
- Define Scope
- Create WBS
- Define Activities
- Sequence Activities
- Estimate Activity Resources
- Estimate Activity Durations
- Develop Schedule
- Estimate Cost
- Determine Budget
- Plan Quality
- Develop Human Resource Plan
- Plan Communications
- Plan Risk Management
- Identify Risks
- Perform Qualitative Risk Analysis
- Perform Quantitave Risk Analysis
- Plan Risk Responses
- Plan Procurements

Monitor and Control
- Monitor and Control Project Work
- Perform Integrated Change Control
- Verify Scope
- Control Scope
- Control Schedule
- Control Cost
- Perform Quality Control
- Report Performance
- Monitor and Control Risks
- Administer Procurements

1.1 Develop Project Charter (4.1).doc

Executing

1.2 Identify Stakeholders

1.2.1 Summary

A. Identification of all the stakeholders at the beginning of the project is critical for the success of the project. Project stakeholders are anyone who will have impact or influence on the project in either a positive or negative way. They can be internal people in the organization, Clients and people in their organization, the public, and sponsors.

1.2.2 Input

A. Project Charter

B. Procurement Documents

1.2.3 Procedures

A. List all stakeholders involved (also known as a Stakeholder Register). The project charter and request for proposal are the best places to start identifying people, both internal and external.

B. Review Procurement Contract for additional stakeholders involved. SSOE has alliance partners with established contracts in which key people are identified up front.

C. Consider any other relevant parties, such as suppliers and subconsultants that could have an impact.

D. Determine each stakeholder's involvement, interests, and influence on the project and how much impact they will have. Formal identification of this step is also known as the Stakeholder Management Strategy.

E. Projects tend to have several stakeholders. Time is limited as a Project manager, so it is important to review the list of stakeholders and focus on the relationships the can be leveraged to build partnerships that will have the largest impact on the project to ensure success.

1.2.4 Tools and Techniques

A. Stakeholder Analysis – a systematic approach to identifying the stakeholders and analyzing information about them to determine whose interests will be considered throughout the project. A Stakeholder register can be created to document this process.

Executing

      B.   Expert Judgment – seek information from senior management, PMs who worked on similar projects or with the same client, and subject matter experts in regard to additional stakeholders that may need to be considered.

1.2.5   Output

      A.   Stakeholder Management Strategy

      B.   Stakeholder Register

1.2.6   References

      A.   Project Management Body of Knowledge Section 10.1

1.2.7   Flow Chart

1.2 Identify Stakeholders (10.1).doc
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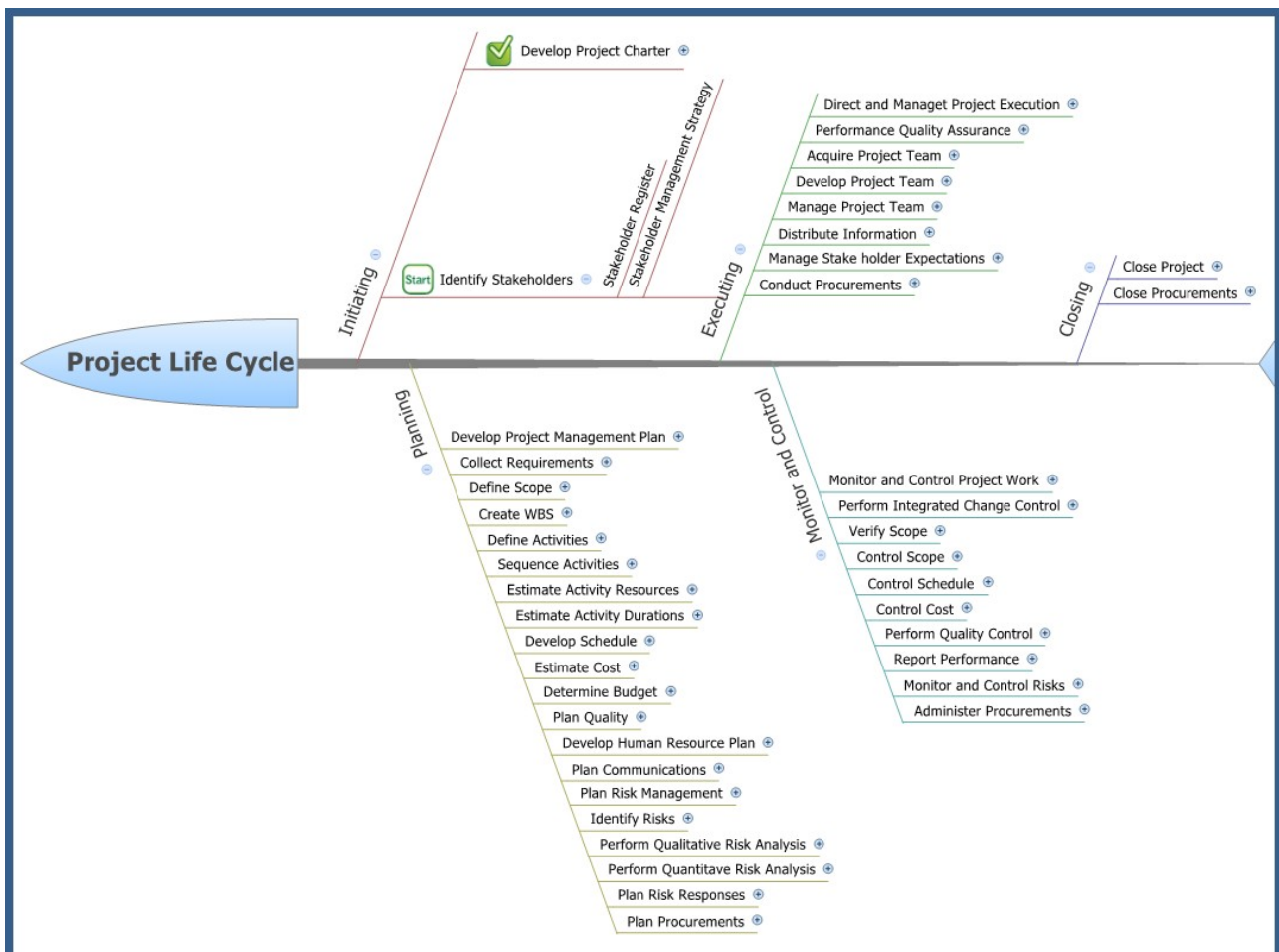
Planning

2.1 Develop Project Management Plan

2.1.1 Summary

A. The Project Management Plan (PMP) consolidates a series of subsidiary plans defining how the project will move through the process groups (from planning to executing, monitoring and controlling, and finally closing the project). The PMP is a living document that is developed and revised as the project progresses, using the Integrated Change Control process as defined in Section 4.2, Perform Integrated Change Control.

2.1.2 Input

A. Project Charter (See Section 1.1 – Develop Project Charter)

B. Requirements Documentation and Management Plan (See Section 2.2 – Collect Requirements)

C. Project Scope Statement (See Section 2.3 – Define Scope)

D. Scope Baseline (See Section 2.4 – Create WBS)

E. Schedule Baseline (See Section 2.9 – Develop Schedule)

F. Cost Performance Baseline (See Section 2.11 – Determine Budget)

G. Quality Management Plan (See Section 2.12 – Plan Quality)

H. Process Improvement Plan (See Section 2.12 – Plan Quality)

I. Human Resource Management Plan (See Section 2.13 – Develop Human Resource Plan)

J. Communications Management Plan (See Section 2.14 – Plan Communications)

K. Risk Management Plan (See Section 2.15 – Plan Risk Management)

L. Procurement Management Plan (See Section 2.20 – Plan Procurements)

M. Scope Management Plan

N. Schedule Management Plan

O. Cost Management Plan

P. Change Management Plan

Planning

2.1.3 Procedures

A. Each of the plans listed in the inputs are comprised into a single Project Management Plan. Any revision to one of these documents should go through the Integrated Change Control process, and constitutes a change to the PMP.

B. The scope, schedule, and cost baselines are often combined as one and referred to as the performance baseline which is used in the earned value process.

1. The Scope Management Plan should explain how the scope will be monitored and controlled, changes to the scope statement, WBS, and WBS dictionary and how they will be approved and reissued to reflect the changes.

2. The Schedule Management Plan should explain how the schedule will be monitored and controlled, what the update process will be, and the reporting expectations.

3. The Cost Management Plan should explain how the cost will be monitored and controlled and the reporting expectations.

4. The Change Management Plan should explain the change process for cost, identification of which project documents will require the formal change control process, and should also be included in the PMP formal change management process, including who can approve and what documents are required.

C. For information on each subsidiary plan not already explained in this section, see the referenced section from the input above.

D. The detail level of each subsidiary plan may vary, depending upon project emphasis and complexity. Some subsidiary plans may be no more than a summary, while others will be highly detailed.

E. The PMP should include both technical and management details tailored to meet the project needs.

2.1.4 Tools and Techniques

A. SSOE Project Management Plan Template

B. Project Management Plan from past related projects

         C.   Expert Judgment

              1.   The PM must be intimately familiar with the project in order to assemble a cohesive and applicable PMP. This document will govern how the project is managed and should be well thought out and thorough. The PMP can determine the successfulness of the project.

              2.   Where necessary, the PM should seek advice from discipline leads, other project manager's, the customer, and any other stakeholders as required.

2.1.5 Output

         A.   Project Management Plan, including a Change Management Plan, to document how changes will be monitored and controlled.
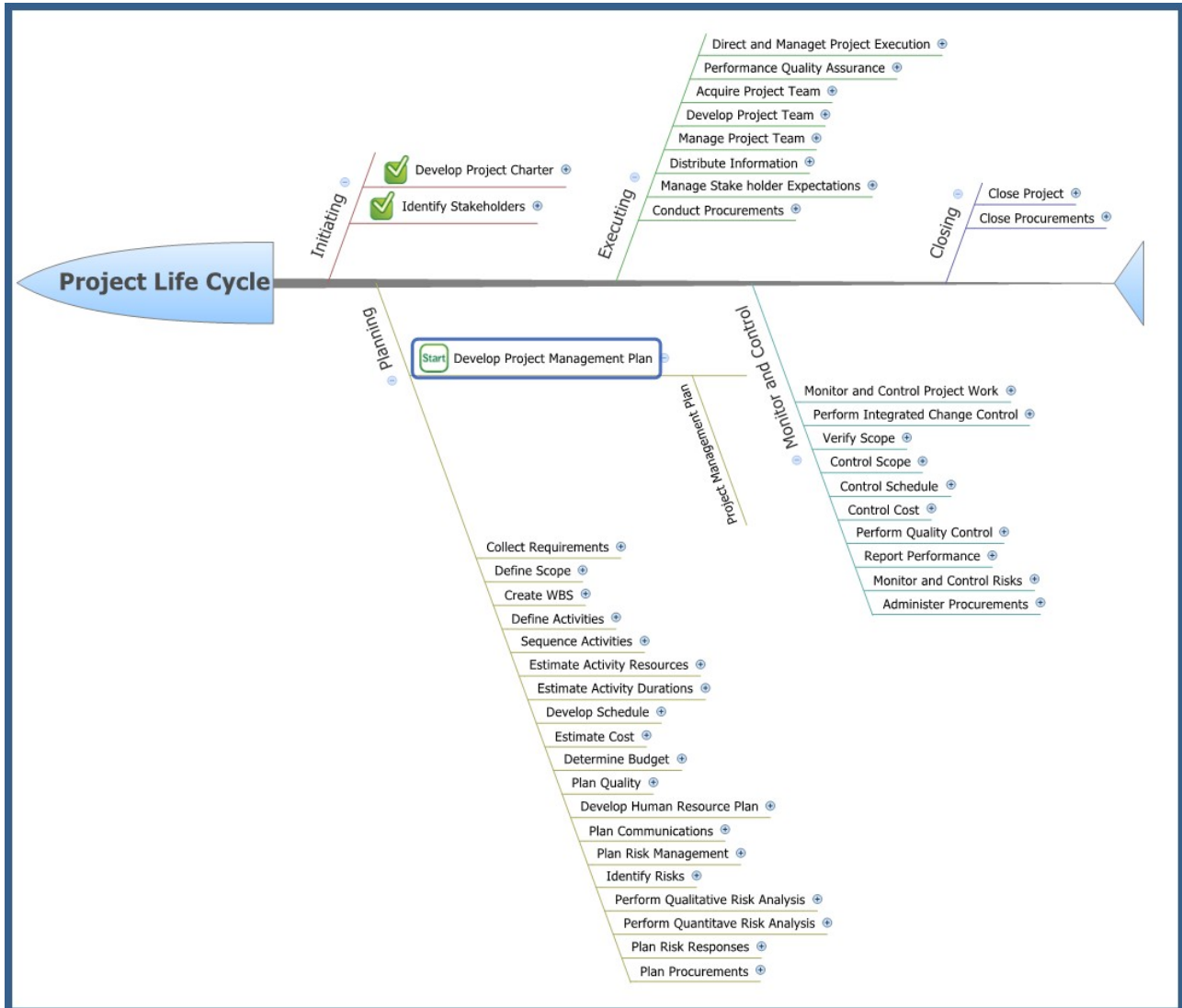
2.1.6 References

         A.   Project Management Body of Knowledge Section 4.2 – Develop Project Management Plan

Planning

2.1.7   Flow Chart

The flow chart is structured as a fishbone (Ishikawa) diagram titled "Project Life Cycle" with branches for each project phase:

Initiating
- ✅ Develop Project Charter ⊕
- ✅ Identify Stakeholders ⊕

Executing
- Direct and Managet Project Execution ⊕
- Performance Quality Assurance ⊕
- Acquire Project Team ⊕
- Develop Project Team ⊕
- Manage Project Team ⊕
- Distribute Information ⊕
- Manage Stake holder Expectations ⊕
- Conduct Procurements ⊕

Closing
- Close Project ⊕
- Close Procurements ⊕

Planning
- Start — Develop Project Management Plan (Project Management Plan)
- Collect Requirements ⊕
- Define Scope ⊕
- Create WBS ⊕
- Define Activities ⊕
- Sequence Activities ⊕
- Estimate Activity Resources ⊕
- Estimate Activity Durations ⊕
- Develop Schedule ⊕
- Estimate Cost ⊕
- Determine Budget ⊕
- Plan Quality ⊕
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- Perform Qualitative Risk Analysis ⊕
- Perform Quantitave Risk Analysis ⊕
- Plan Risk Responses ⊕
- Plan Procurements ⊕

Monitor and Control
- Monitor and Control Project Work ⊕
- Perform Integrated Change Control ⊕
- Verify Scope ⊕
- Control Scope ⊕
- Control Schedule ⊕
- Control Cost ⊕
- Perform Quality Control ⊕
- Report Performance ⊕
- Monitor and Control Risks ⊕
- Administer Procurements ⊕

2.1 Develop Project Management Plan (4.2).doc
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Planning

2.2 Collect Requirements

2.2.1 Summary

A. Collecting requirements is the gathering of information from all stakeholders to define and document the requirements of the project, as well as managing the client's needs. The requirements identified are considered part of the scope of work for SSOE and become the basis of the work breakdown structure (WBS) and project deliverables. These requirements need to be analyzed and recorded in enough detail to be measured once the project begins, but not so much detail that it is time consuming to measure and analyze progress.

2.2.2 Input

A. Project Charter (See Section 1.1 – Develop Project Charter)

B. Proposed Scope of Services or work, often included in the Request for Proposal (RFP)

C. Discussions with client and stakeholders

D. Stakeholder Register (See Section 1.2 – Identify Stakeholders)

2.2.3 Procedures

A. Meeting with the clients (and other stakeholders) to review the projects needs and requirements is often the most direct way to get a thorough definition from a client who may not have an engineering background.

B. Collecting requirements can be done in a group with all applicable stakeholders or as a workshop. This will expedite the exploration process and define the needs and expectations in a timely manner, as well as bring a team environment to the project. Consider breaking the requirements into categories, such as Project requirements (deliverable requirements, management requirements, business requirements) and Product requirements (technical requirements, performance requirements, safety and security requirements).

C. If stakeholders are not available or not willing to meet to discuss the project needs, written clarification can be requested. To get the specific responses needed, the PM can have each team member provide their own questions, which the PM then compiles into one cohesive document and gives to the owner for response. This is often the preferred way for scope definition during a competitive bid situation, so that the owner can provide all competitors with the same questions and responses.

      D.   Conducting site walk–throughs with the engineering team will help identify areas that need to be addressed, if the owner does not have a background that allows them to put together a thorough scope.

      E.   The I/O Matrix template is a good way to document the require-ments and establish who needs the information and who will be providing it. See example below.

2.2.4 Tools and Techniques

      A.   Clarification questions

      B.   I/O Matrix

      C.   Stakeholder Needs an Expectation Template

2.2.5 Output

      A.   Documented project requirements/scope

      B.   Requirements Management Plan

          1.   How required activities will be analyzed, tracked, and reported.

      C.   I/O Matrix – Many requirements are based on a relationship; the relationship approach should be documented in the plan. The use of the I/O Matrix template would be one way to document these relationships.

2.2.6 References

      A.   Project Management Body of Knowledge Section 5.1 – Collect Requirements

Planning

2.2.7   Flow Chart
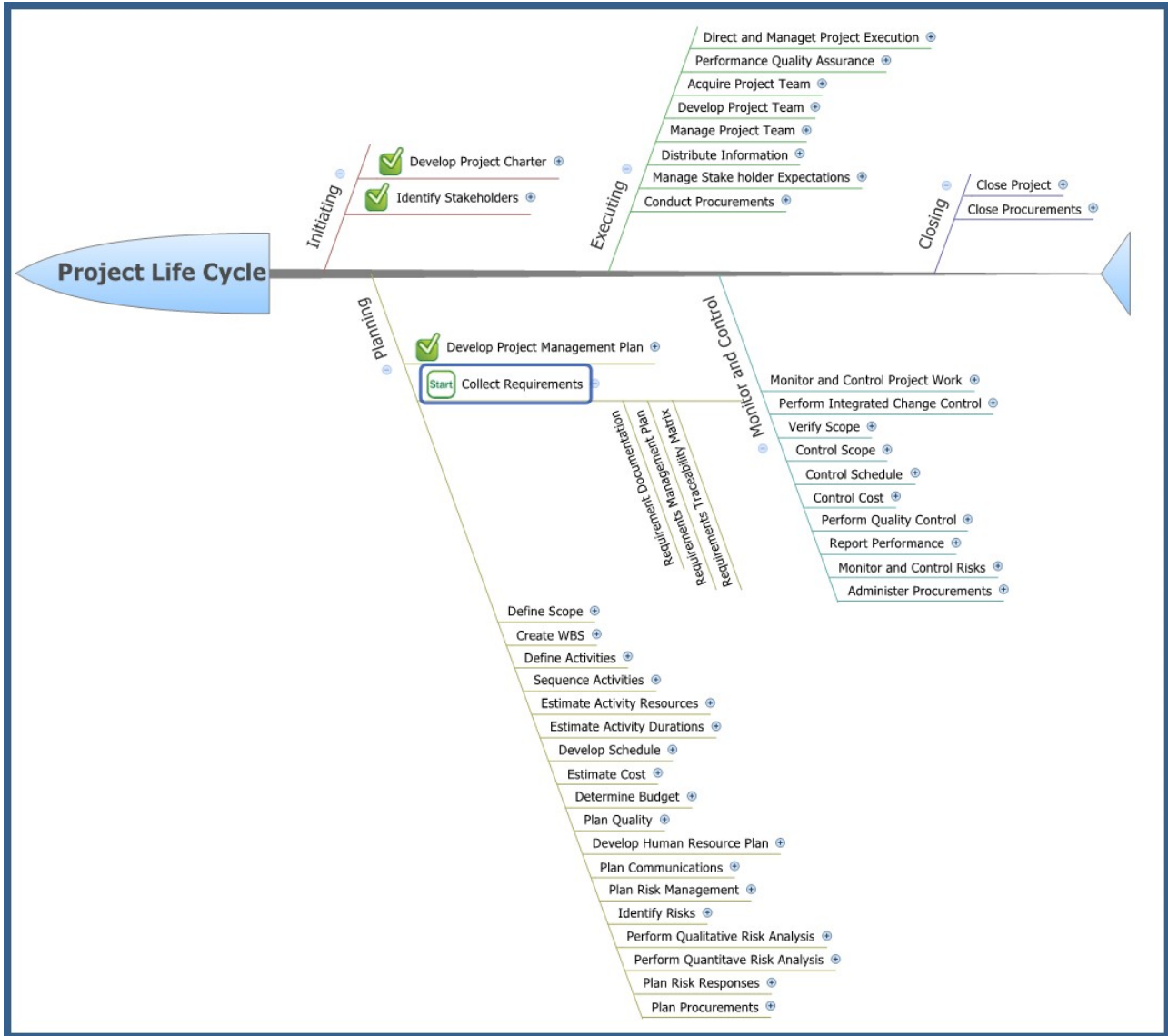
Planning

2.3 Define Scope

2.3.1 Summary

A. Creating a detailed description of the project and product. The assumptions, constraints, and deliverables defined before this point are expanded upon and used to develop the project scope statement. This is a critical element to the success of a project.

2.3.2 Input

A. Project Charter (See Section 1.1 – Develop Project Charter)

    1. Project charter provides a high level project description. It also contains project approval requirements.

B. Requirements Documentation (See Section 2.2 – Collect Requirements)

    1. This expands upon the information provided in the Project Charter and is the main input for defining the Project Scope Statement.

C. Organization Process Assets

    1. Policies and procedures.

    2. Project documents and lessons learned from previous similar projects.

2.3.3 Procedures

A. There are varying degrees to which SSOE is involved in developing the project scope statement.

    1. Many clients will provide the initial scope with the request for proposal (RFP), and SSOE is only required to make clarifications.

    2. Some clients will request SSOE to help define the scope of a project through a request for proposal of Front End Engineering as preliminary study or a development project. We may be asked to assist with product analyses, look at alternative options, or help with prototype analyses for a Front End Engineering project in order to be able to determine what the specific scope should be for the project.

3. Other clients will simply call SSOE, say they have a project, give a brief description, and ask us to price the project. It is extremely important to have a thorough documented project scope statement, regardless of what the client provides. This will be used to control quality, cost and schedule, as well as perform integrated change control.

2.3.4 Tools and Techniques

A. Expert Judgment

1. Consult the departments who will be performing the work

2. Consultants

3. Stakeholders, including client

4. Professional and technical associations

2.3.5 Output

A. Project scope statement (generally included in the Scope of Services within the proposal) information included or referenced:

1. Scope description, including exclusions, assumptions, and constraints

2. Acceptance criteria

3. Project deliverables

B. Project document updates

2.3.6 References

A. Project Management Body of Knowledge Section 5.2 – Define Scope

Planning

2.3.7   Flow Chart
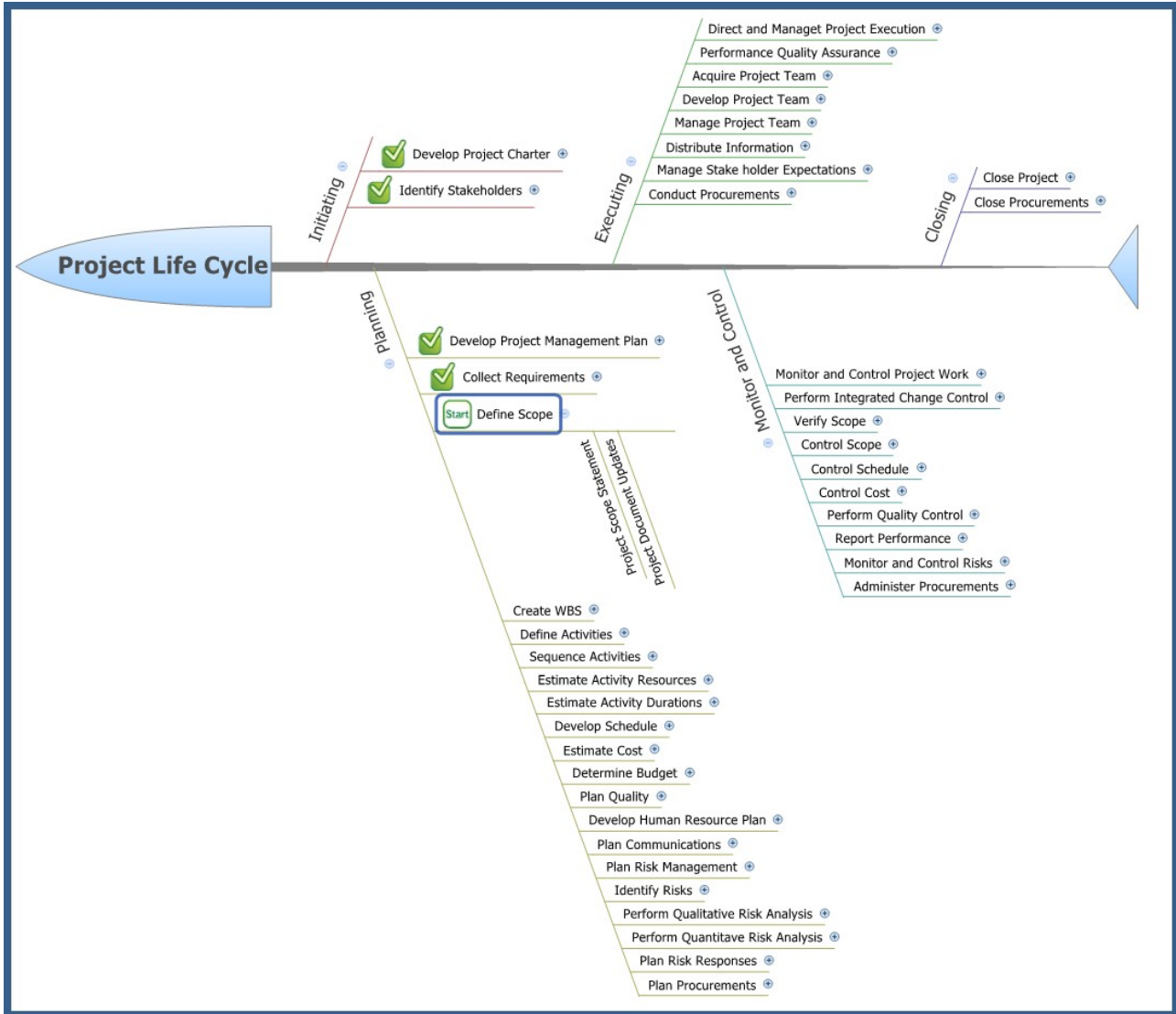
Planning

2.4 Create WBS

2.4.1 Summary

A. Development of a Work Breakdown Structure (WBS) is a method of subdividing work into smaller more manageable work packages. This allows accurate estimates of durations, resource requirements, and costs to be _____ at work package level. The WBS breaks the work into well defined and organized deliverables at lower levels within the project.

2.4.2 Input

A. Project scope statement (See Section 2.3 – Define Scope)

B. Requirements documentation (See Section 2.2 – Collect Requirements)

C. Project documentation and lessons learned from previous projects

2.4.3 Procedures

A. Projects requiring a WBS will need to consider how the work will be performed, what will be in the work packages, and how cost will be tracked. A WBS will be created and used to track the schedule and a code of accounts will be created to track cost in Deltek and/or client–required Project Management Software (such as Contract Manager or Prolog). Refer to Section 2.11 – Determine Budget for more detail on code of accounts.

B. The Project Manager should discuss with the client any specific requirements they have for how work should be broken down.

C. The WBS can be created in many forms; however, the most common are:

1. Phases

2. Deliverables

3. Organizational/Departments

D. A Level 3 WBS should be established, at a minimum, defining the project scope statement in this phase. Level 1 being the project, Level 2 Major deliverables such as area, building, or process line, and Level 3 work package. A WBS template has been developed as a starting point. Included in the template is a sample WBS, risk breakdown structure tab to identify any risks arranged by category, and a tab to develop the WBS dictionary. The dictionary establishes the code of accounts, scope of work, responsible

party, and list of milestones for each WBS item. The WBS continues to develop as the project scope develops and changes.

E.   The scope baseline is established at this point from the project scope statement, WBS, and WBS dictionary.

F.   If a project schedule is required, the WBS can be submitted to project controls to develop, or the PM can choose to develop it.

G.   For EPC/M projects: Primavera Contract Manager is often used to track the project and the WBS is also set up there. The WBS information needs to be given to the Project Controls Representative for input.

H.   An example of a Level 4 WBS for "Detailed Engineering" is shown below.
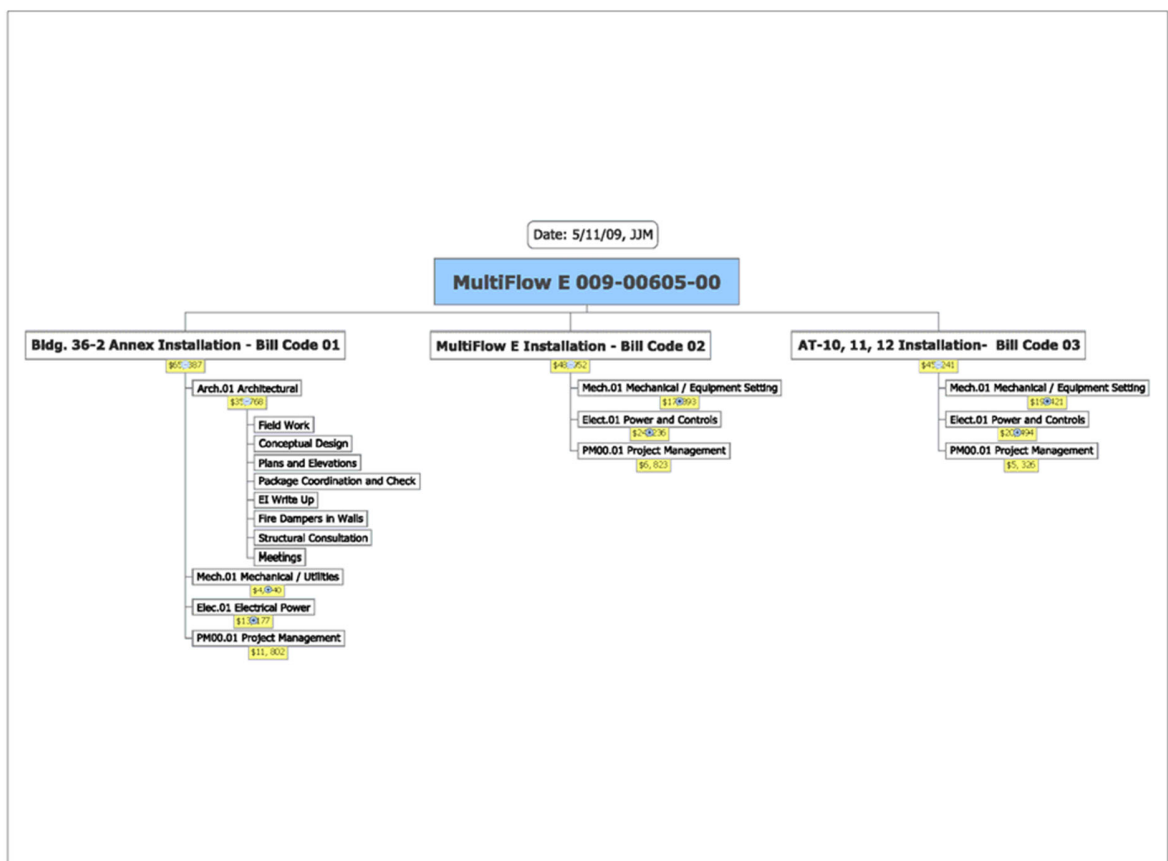
I.   For this example the levels are explained as follows:

1.   Level 1 – Project (009–00605–00)

2.   Level 2 – Deliverable (01, 02, 03 – Bill codes for Deltek)

3.   Level 3 – Work package (Arch.01, Mech.01, etc. – Dept/ Sub for Deltek)

     a.   Cost and performance are typically monitored and controlled at this level.

4.   Level 4 – Activities (Field Work, Conceptual Design, etc): Estimates are created and work is generally performed at this level.

2.4.4   Tools and Techniques

A.   Work Breakdown Structure Template with risk breakdown structure.

B.   XMind Software – can be used to developed work breakdown structures and other flow charts. This is a free software at www.xmind.net.

2.4.5   Output

A.   Work Breakdown Structure and Dictionary

1.   The WBS Dictionary is a detailed description of what is included in the WBS, should it be needed for reference. It identifies not only the work included, but the cost estimate, acceptance criteria, and other detailed information.

B.   Scope Baseline

C.   Project document updates

2.4.6   References

A.   Project Management Body of Knowledge Section 5.3 – Create WBS

B.   Detailed information on WBS and the relationship to cost accounts in Deltek can be obtained from Project Reporting (see Section 4.8 – Report Performance) or the Project Control Departments, if they are involved in the project.

Planning

2.4.7 Flow Chart
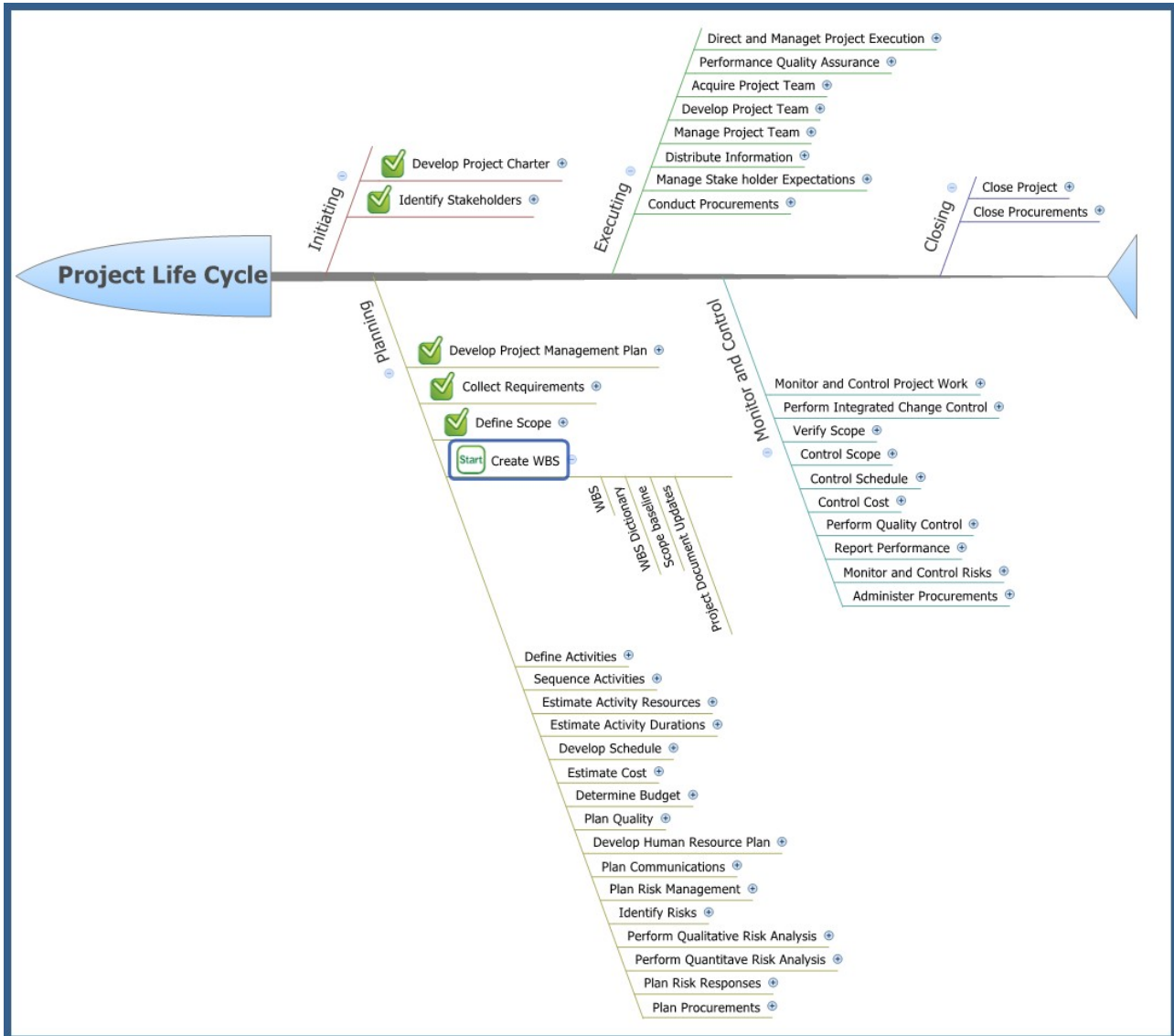
Planning

2.5 Define Activities

2.5.1 Summary

A. Once the project scope has been developed, definition of the scheduled activities at the lowest level of the WBS can begin.

    1. Activity definition is the process of identifying all of the specific actions that are required in order to complete a project. This process is dependent on the development of the project scope (Section 2.3) and Work Breakdown Structure (WBS Section 2.4). These two activities are essential in establishing an organized structure of all of the project actions and deliverables, to enable definition of scheduled activities for a given project.

    2. Defining the activities should provide the basis for estimating, scheduling, executing, monitoring, and controlling the project work. If executed well, this will ensure all the scope is _____ and planned for.

    3. The level of detail and planning varies across all projects depending on numerous factors such as size, client requirements, and risk. The PM typically plans, estimates, monitors, and controls the project at the work package level. An acceptable level of detail needs to be established by the Project Manager at the beginning of the project.

2.5.2 Input

A. Project Scope Statement (defined in Section 2.3)

B. Work Breakdown Structure (defined in Section 2.4)

C. WBS Dictionary (defined in Section 2.4)

D. Project Management Plan (defined in Section 2.1)

E. Lessons Learned (if applicable)

2.5.3 Procedures

A. Defining activities involves reviewing the WBS and subdividing the work into a list of activities necessary to complete the work package. The list of activities should then have a definition of specific work to be performed. The activity should be a small measurable piece of work for the WBS or work package.

    1. Example: Foundation W.P. for Building A

        a. Activities

            1) Structural Drawings

2)   Electrical Drawings

3)   Field Work

2.   Decomposition or rolling wave techniques can be used to plan and define the activities for the projects.

3.   Decomposition is the process of breaking the scope into smaller and smaller components. Rolling wave is similar to decomposition, but the scope is decomposed throughout the project as it becomes more defined, such as defining phase one in great detail, while leaving phase two with high–level activities until the project gets closer to phase two and further details can be established.

4.   For projects that require extremely detailed planning and/or extend over several months, the rolling wave planning technique is recommended. This will allow the PM to plan the first few months in detail and develop future work in more detail as they become near term.

B.   The WBS component will have instances where the work is not well defined in the scope of work when the schedule is developed. Listing an activity as a place holder so that item is not forgotten is recommended practice. This activity can be developed later and an updated activity definition list can be issued.

C.   This list of activities can be entered directly into the scheduling software to save time and duplication of effort.

2.5.4   Tools and Techniques

A.   Templates

1.   Standard activity lists from past projects

2.   List of resources with skill sets

3.   Schedule Templates

2.5.5   Output

A.   Activity List – A list of all the activities that have been defined in the schedule. It should be organized by WBS structure and each activity description should be detailed enough for all project team members to understand the work being described.

B.   Activity Attributes – Extra details that are associated with a given activity. They include activity ID's, activity codes, predecessors, successors, constraints, leads/lags, and resources. These attributes can be used for filtering and/or sorting activities in different ways. Examples are by discipline, trade, resource, or constrained project completion date.

C. Milestone List – A list of significant points or events within the project. These intermediate goals should occur throughout the life of a project and help project manager know if the project is on schedule. Many of the milestone points are mandatory, such as items dictated by the contract, specific client requirements, or governmental bodies.

D. Requested Changes – When defining activities in the project schedule, there is the possibility that changes to the project can be generated due to undefined scope or other factors. When this occurs, the integrated change control process in (Section 4.2) is used to manage the change.

2.5.6 References

A. Project Management Body of Knowledge Section 6.1 – Define Activities

Planning

2.5.7   Flow Chart

Project Life Cycle

Initiating
- ✅ Develop Project Charter ⊕
- ✅ Identify Stakeholders ⊕

Executing
- Direct and Managet Project Execution ⊕
- Performance Quality Assurance ⊕
- Acquire Project Team ⊕
- Develop Project Team ⊕
- Manage Project Team ⊕
- Distribute Information ⊕
- Manage Stake holder Expectations ⊕
- Conduct Procurements ⊕

Closing
- Close Project ⊕
- Close Procurements ⊕

Planning
- ✅ Develop Project Management Plan ⊕
- ✅ Collect Requirements ⊕
- ✅ Define Scope ⊕
- ✅ Create WBS ⊕
- [Start] Define Activities

Activity List
Activity Attribute list
Milletone List

- Sequence Activities ⊕
- Estimate Activity Resources ⊕
- Estimate Activity Durations ⊕
- Develop Schedule ⊕
- Estimate Cost ⊕
- Determine Budget ⊕
- Plan Quality ⊕
- Develop Human Resource Plan ⊕
- Plan Communications ⊕
- Plan Risk Management ⊕
- Identify Risks ⊕
- Perform Qualitative Risk Analysis ⊕
- Perform Quantitave Risk Analysis ⊕
- Plan Risk Responses ⊕
- Plan Procurements ⊕

Monitor and Control
- Monitor and Control Project Work ⊕
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- Verify Scope ⊕
- Control Scope ⊕
- Control Schedule ⊕
- Control Cost ⊕
- Perform Quality Control ⊕
- Report Performance ⊕
- Monitor and Control Risks ⊕
- Administer Procurements ⊕

2.5 Define Activities (6.1).doc

Planning

2.6 Sequence Activities

2.6.1 Summary

A. Activity Sequencing develops logical relationships between activities on the activity list. Activities will typically have at least one predecessor and one successor, with the exception of the first and last activity. Types of links include Finish–to–Start, Finish–to–Finish, Start–to–Start, and Start–to–Finish. Activity Sequencing also involves inputting lead and lag time into a schedule. Lead and Lag allows you to more accurately portray what may actually occur in a realistic scenario.

2.6.2 Input

A. Activity List (see Section 2.5)

B. Activity Attributes (see Section 2.5)

C. Milestone List (see Section 2.5)

D. Approved Change Requests (see Section 2.5)

E. Project Scope Statement (see Section 2.3)

2.6.3 Procedures

A. The Precedence Diagramming Method (PDM) is the preferred method. PDM is a network diagramming method in which activities are represented as boxes or rectangles called nodes, and the relationships between them are illustrated using arrows. This method is used by scheduling software such as Primavera and MS Project. Below is a simplistic example that could be created by hand, as well as one generated utilizing Primavera P6. Note that although the precedence diagram shows activities and their relationships, it is not representative of the timescale, or duration, in which they occur.

Precedence Diagram created by hand in Microsoft Word
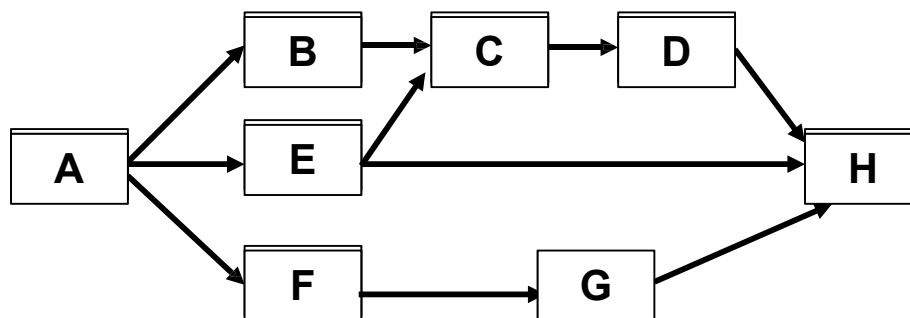
Precedence Diagram created in Primavera P6
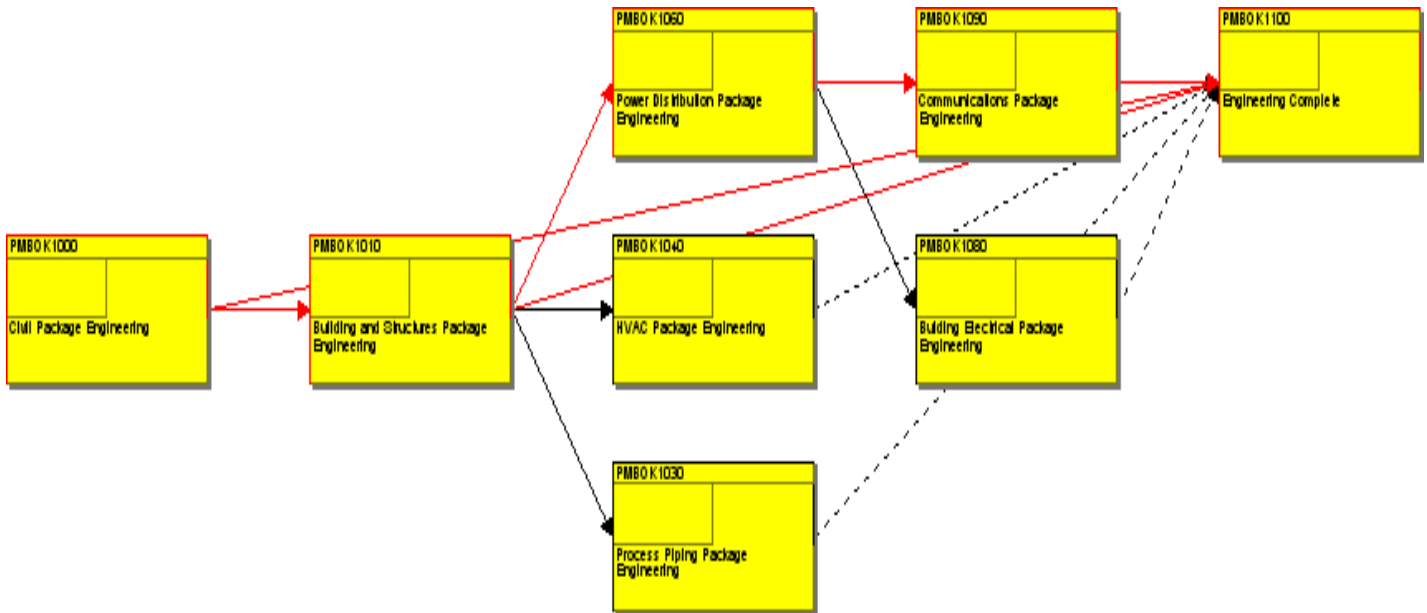
B.   There are 3 steps in developing a network diagram:

1.   Determine Dependency Relationships

2.   Dependency Determination

3.   Applying Leads and Lags

Step 1 – Determine Dependency Relationships

The four relationship types used in the Precedence Diagramming Method are:

■   **Finish–to–Start**. The start of the successor activity depends upon the completion of the predecessor activity. (Most common and Primavera's /MS Project default relationship type.)
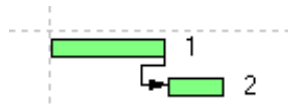
- **Finish–to–Finish**. The completion of the successor activity depends upon the completion of the predecessor activity.
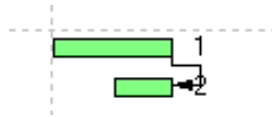
- **Start–to–Start**. The start of the successor activity depends upon the start of the predecessor activity.
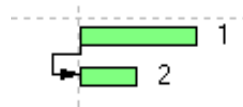
- **Start–to Finish**. The completion of the successor activity depends upon the start of the predecessor activity.

This process is also done very effectively in a planning meeting using a wall or large sheet of paper and post–it notes. This allows for team involvement in the sequencing process and is easily transferred into the scheduling software.

Step 2 – Dependency Determination

There are three types of dependencies used when determining activity sequencing.

- **Mandatory Dependencies** – Those dependencies decided upon by the project team that yield limitations in the work to be accomplished. For example, it may be impossible to design in entirety the electrical systems until the mechanical systems have been completed. These types of dependencies may sometimes be referred to as hard logic, since there are no alternative courses of action.

- **Discretionary Dependencies** – Those dependencies decided upon by the project team that establish the preferred sequencing of events in a schedule. For example, design of both mechanical and electrical aspects of a system could occur in parallel. However, if the electrical group waited to begin until the mechanical portion was complete, a significant amount of re–work could be avoided. This would be the ideal sequence of events, also referred to as "preferred logic." "preferential logic," or "soft logic." It's important to note that those types of dependencies can skew total float values and can also potentially alter the critical path. For these reasons, it's important to keep written documentation of all discretionary dependencies used and the alternatives that could be implemented.

- **External Dependencies** – Dependencies decided upon by the project management team involving the relationship between project and non–project activities. The delivery dates of a particular piece of equipment from an outside vendor or an approved milestone from the client are examples of external dependencies.

Step 3 – Applying Leads and Lags

The project stakeholders determine which activities require a lead or lag and document this accordingly. "Lead" allows you to accelerate successor activities while "Lag" allows you to delay successor activities. For example, the second phase design of a mechanical package can begin 10 days before the completion of the first phase. In this case, the activities are linked finish–to–start relationship with 10 days of positive lag is used.

2.6.4   Tools and Techniques

    A.   Below is a list of commonly used templates at SSOE:

        1.   Schedule/Network Diagram Templates

            a.   General Facilities

            b.   Automotive Facility

            c.   Bio–Fuel Facility

            d.   Process and Packaging Lines

    B.   These templates can be provided from past projects by the project control department as a starting point to a schedule and network diagram.

    C.   Step templates used in Primavera allow for quick assignment of numerous steps to a task with ease. For more information on step template samples and their use, see the Project Control Departments.

2.6.5   Output

    A.   Project schedule network diagram

    B.   Updated activity list from approved changes

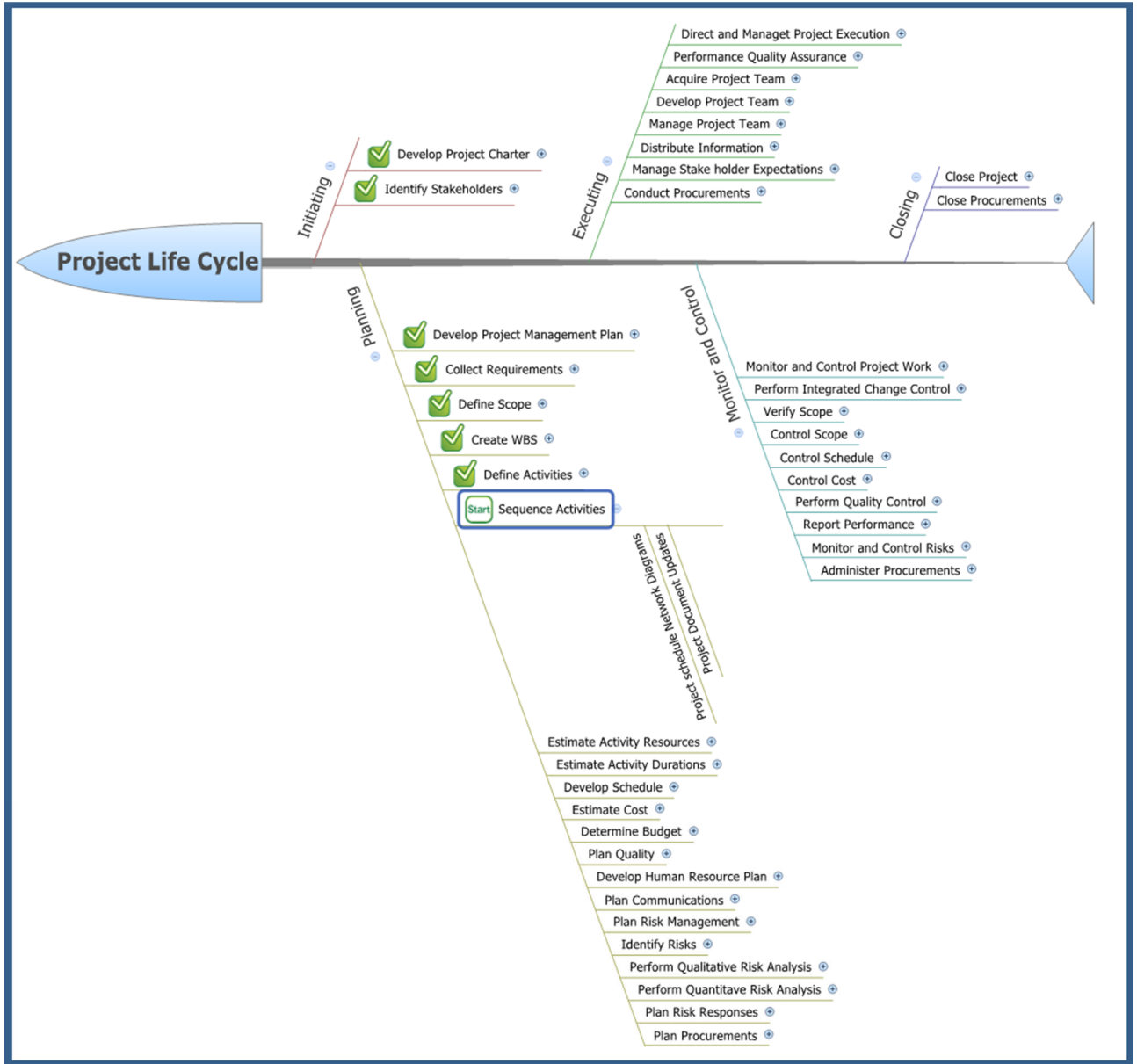   C.   Updated activity attributes

    D.   Requested changes

2.6.6   References

    A.   Project Management Body of Knowledge Section 6.2 – Sequence Activities

Planning

2.6.7 Flow Chart

Planning

2.7 Estimate Activity Resources

2.7.1 Summary

A. Identifying resources and level of effort needed to complete the project activities is done via activity resource estimating. Resources can include labor, equipment, and/or materials and is an integral part of the cost estimating process. Cost estimates should define how many hours a given discipline or trade needs to complete their assigned activities. The estimator will also determine how many pieces of equipment and what materials are needed for project completion. This can be completed in the scheduling software or on the cost estimate worksheet depending on the size complexity and type of project. The Deltek resource management module can also be used to plan and estimate internal resources.

2.7.2 Input

A. Organization charts

B. Activity lists (2.5)

C. Activity attributes (2.5)

D. Resource availability

E. Project Management Plan (2.1)

F. Deltek

G. MS Project and Primavera Project Management Scheduling Software

2.7.3 Procedures

A. The PM issues the Project Management Plan, deliverables, and the project schedule with sequenced activities to Resource Managers and Discipline Captains for review. It is the responsibility of the Resource Manager and Discipline Captains to allocate and to determine the availability of resources.

B. Each discipline estimates the level of effort required for successful completion of their activities. (Refer to the Tools and Techniques section on suggestions for estimating projects.) The PM may choose to do the estimating themselves, solicit input from the necessary Discipline Captains, or request the assistance of the Project Control Departments, depending on the size and complexity of the project. It is strongly recommended that all stakeholders are involved in the estimating process to ensure ownership.

C.   Resource Managers review and assign the appropriate staff. If Resource Managers do not have staff available, the Resource Manager investigates staff availability within the Corporation. The Resource Manager/Project Manager may have to acquire external staff. See Section 2.20 – Procurement Planning.

D.   A Discipline Work Plan (DWP) may be used to plan and estimate resources. The DWP can be done in the Excel Template, Master Project Schedule, and/or Deltek Planning Module. The DWP is required to have the deliverables and/or planned activities list with its budget, resources, and planned start and finish dates. Creating budgets by department numbers is not enough information and does not meet ISO requirements if a DWP is required.

    1.   DWP's are reviewed by the Project Manager and Resource Manager.

    2.   Adjustments are made to the DWP with the approval and input of the stakeholder.

E.   All stakeholders must review the deliverables and estimates to ensure compliance with the scope of work. If additional scope is identified or changes to the scope are needed. This needs to be addressed.

F.   The PM initiates the integrated Change Management process.

G.   Resource Manager should reassign staff accordingly and communicate changes with the PM.

2.7.4   Tools and Techniques

A.   Alternatives Analysis – This analysis includes assigning resources with different skill levels and productivity factors to determine the most efficient means of completing a task. For example, we may assign Engineers with a higher level of experience to accelerate a task with the drawback of increased hourly costs.

B.   Published Estimating Data – We utilize published materials, such as R.S. Means and Richardsons, to establish unit costs and productivity factors that aid in estimating resource quantities and costs.

C.   Deltek SBU Rate Tables.

D.   Project Management Software – Currently, Timberline Estimating and Primavera P6 software are used internally to aid in activity resource estimating. Both programs utilize databases with historical information that assist in future resource planning.

E.   Bottom–Up Estimating – When activities are too broad to be estimated accurately, they are broken down (decomposed) into a greater level of detail and estimated piece by piece. Once all pieces are estimated, they are combined to form the overall estimate. Be careful not to build contingency into each and every level of the estimate as this accumulates quickly.

2.7.5   Output

A.   Activity Resource Requirements

1.   Graphs from scheduling software

2.   SBU efficiency plan

3.   Project schedule

4.   Deltek project plan

5.   Project revision report

B.   Activity Attributes Updates – Once required resources for a given activity are identified, the activity attributes are updated to reflect the types and quantities of resources needed.

C.   Resource Breakdown Structure – This is a grouping of all resources required for a given project in a hierarchical structure.

D.   Resource Calendar Updates – This is the calendar for a given project that identifies working and non–working days.

E.   Requested Changes – When a project change order is requested, resource requirements must be reviewed in order to determine schedule and cost impact.
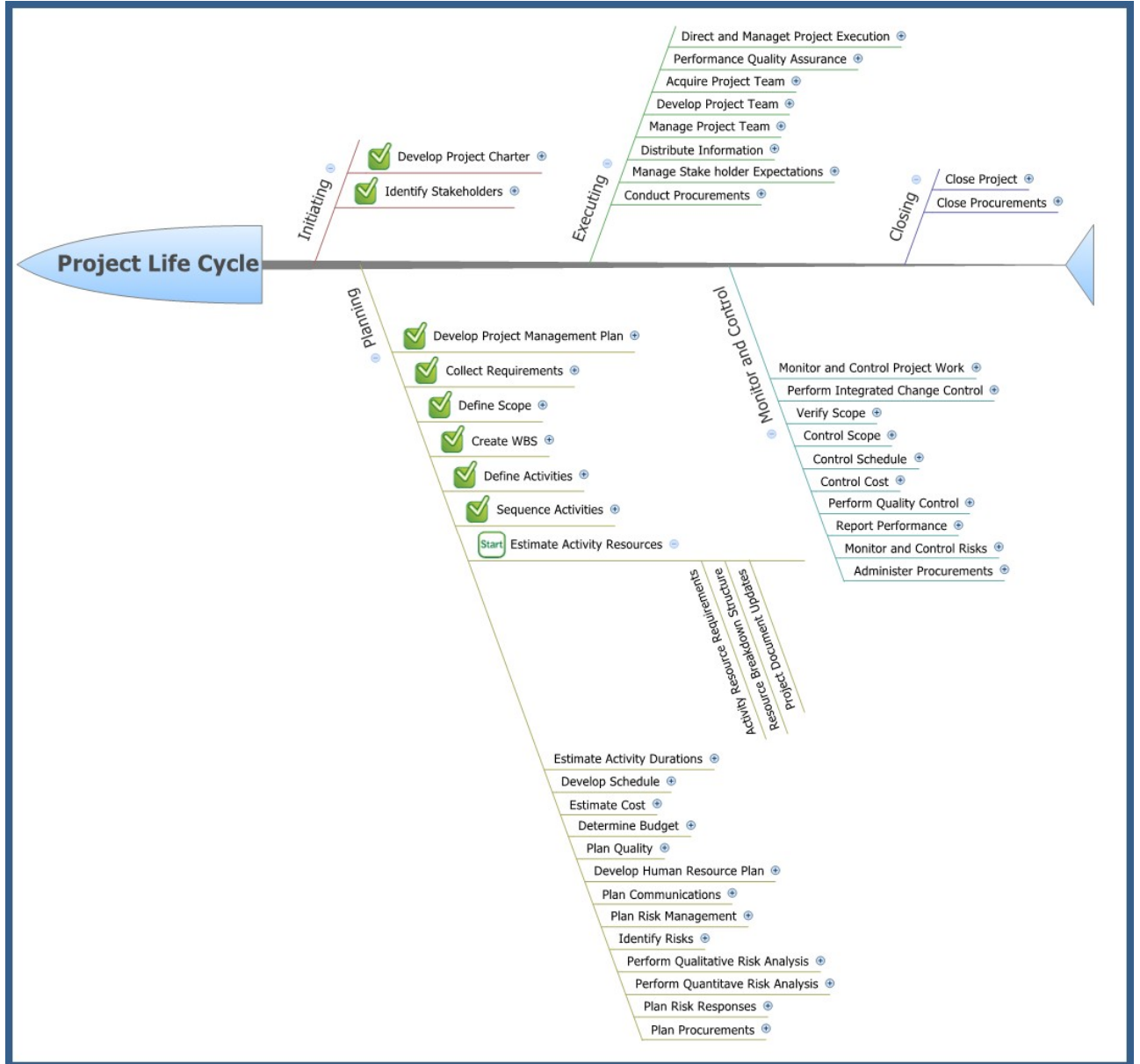
2.7.6   References

A.   Project Management Body of Knowledge Section 6.3 – Activity Resource Estimating

Planning

2.7.7   Flow Chart

Planning

2.8   Estimate Activity Durations

2.8.1   Summary

A.   Activity Duration Estimating is estimating to the best of one's ability an activities duration while taking into account as much duration influencing information as possible. Durations can be impacted by the activity scope of work and required resource types, quantities, and availability. Estimating resource durations requires that the amount of work effort be quantified, the number of available resources determined, and the number of work periods required taking into consideration project and resource calendars, all be determined. An example would be: a package's duration may be estimated by developing a budget based on past history and assigning a specific number of available engineers who work a standard 40 hour/5 day a week calendar.

2.8.2   Input

A.   Organizational Process Assets

1.   Historical information maintained of past projects can be used to aid in activity duration estimating of similar work. This may be as simple as consulting a team member who worked on a previous comparable project. Other organizational process assets could involve the utilization of the company calendar and yearly vacations, as well as typical 5 day, 40–hour week schedule.

B.   Project Scope Statement (See Section 2.2 – Define Scope)

1.   Constraints and Assumptions detailed in the project scope statement must be taken into consideration when establishing activity durations. For example, Certain information from outside sources may not come available until a set date, such as receiving a geotechnical report. In this example, the foundation design cannot be done until the geotechnical report is received and reviewed.

C.   Activity List and Attributes (See Section 2.5 – Define Activities)

D.   Activity Resource Requirements (See Section 2.7 – Estimate Activity Resources)

1.   Availability, as well as skill level of required resources, can significantly influence an activity's duration. If an engineering package takes two engineers working full time a set amount of time to complete, yet only one is available, you'd expect the package to take at least twice as long to complete. Another factor to consider is the resource's

experience level. A senior engineer may need only a day to complete a task, whereas an entry level engineer may need a week to work through the same task.

E. Resource Calendar (See Section – 2.7 Estimate Activity Resources and Section 3.3 Acquire Project Team)

2.8.3 Procedures

A. Review the WBS, Activity List, and Attributes for the project.

B. Understand the scope and description of each of the work packages and gather enough information needed to estimate the activity.

C. Review the resource availability (2.7).

D. Estimate the activities. Tools and Techniques below list suggested estimating techniques.

E. Perform a sanity check after the estimate is complete.

F. Include a reserve (or contingency) in the estimate.

G. Record all assumptions made for future use.

2.8.4 Tools and Techniques

A. Analogous Estimating – This is the process of using the actual duration of a past project or activity as the basis for estimating. This tends to be the easiest of the estimating techniques, but it is not one of the more accurate techniques.

B. Parametric Estimating – This is the mathematical process of multiplying productivity factors by units required to complete the schedule activity. For example, if a cubic yard of concrete can be poured in 10 man hours, then it will take 100 man hours to pour 10 cubic yards.

C. Three Point Estimates – Also known as Project Evaluation and Review Technique (PERT), this is the process of evaluating the most likely duration, optimistic duration, and pessimistic duration and using a weighted average as the basis for activity duration using the formula below. For example, if the most likely duration (t_M) to complete an engineering package is 10 days, the optimistic duration (t_O) is 8 days, and the pessimistic duration (t_P) is 15, your estimated duration would be 10.5 days.

$$t_E = (t_O + 4t_M + t_P)/6 \quad => \quad (8 + 4*10 + 15)/6 = 10.5$$

Planning

D.   Reserve Analysis – This is the same as putting a contingency on a cost estimate. This reserves time for schedule risk and acts as a buffer period for potential delays. This can be established by using a percentage of the overall duration, a fixed number or work periods, or through risk analysis.

2.8.5   Output

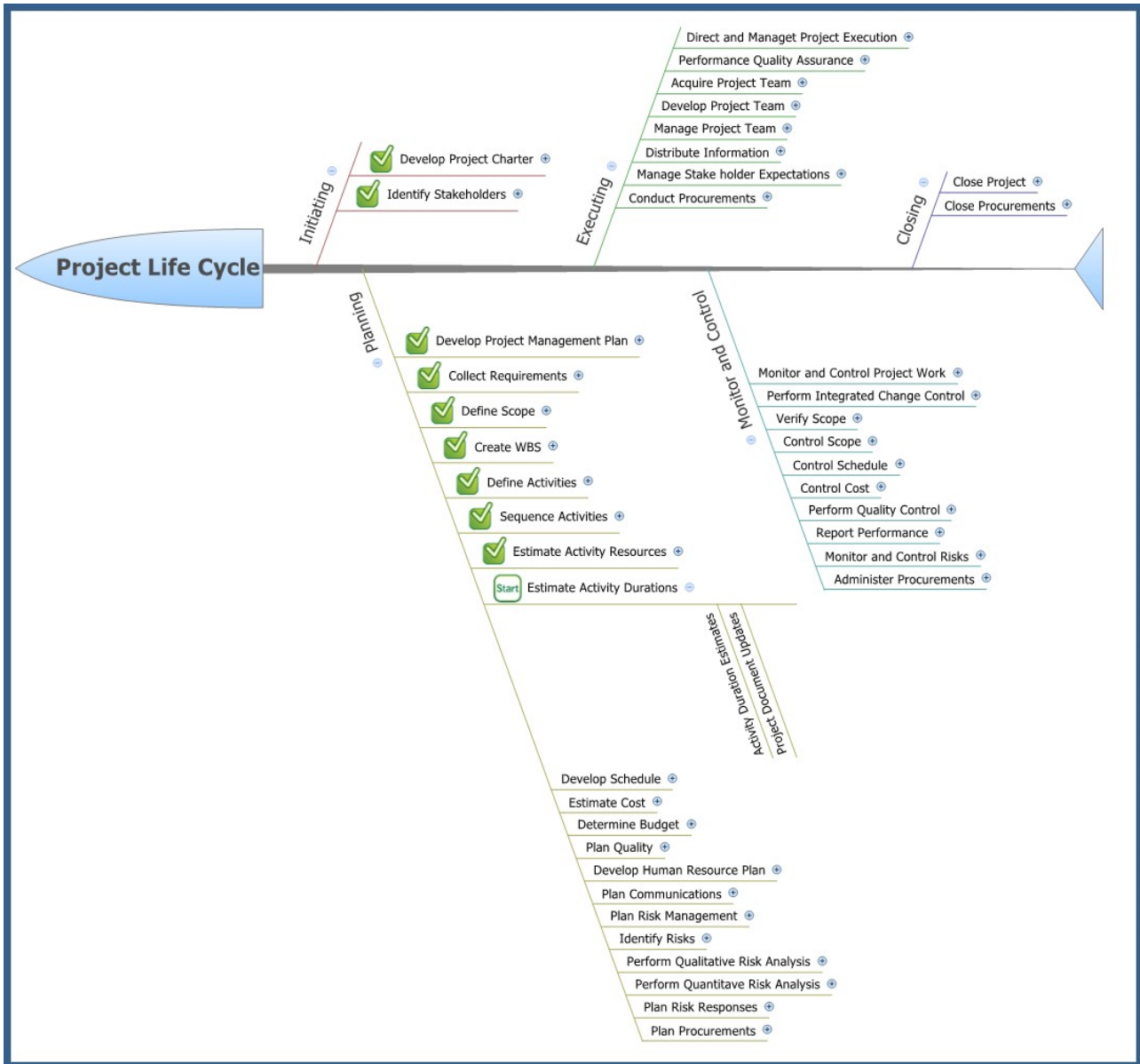A.   Activity Duration Estimates

B.   Activity Attributes Updates

2.8.6   References

A.   Project Management Body of Knowledge Section 6.4 – Activity Duration Estimating

Planning

2.8.7   Flow Chart

Planning

2.9 Develop Schedule

2.9.1 Summary

A. Schedule development requires taking all the activities, constraints, resources, and durations, and sequencing them into a project schedule. The typical method of scheduling SSOE uses is critical path method scheduling. This is an iterative process where the critical path is determined, float is reviewed, and any fast tracking or schedule crashing is done.

2.9.2 Input

A. Activity List (Section 2.5)

B. Activity Attributes (Section 2.5)

C. Project Schedule Network Diagrams (Section 2.6)

D. Activity Resources Requirements (Section 2.7)

E. Resource Calendars (Section 3.3)

F. Activity Duration Estimating (Section 2.8)

G. Project Scope Statement (Section 2.3)

2.9.3 Procedures

A. Schedule development begins with the WBS, the activity list, and duration estimates. The level of detail for a schedule will depend on several factors, including phase, size, duration, and complexity. When developing a schedule, think in terms of how the work is going to be executed and the ability to measure progress of the activities. The schedule should have enough detail in the planning and proposal phase to identify the critical activities, key milestone dates, project baseline, resource requirements, and dates for the project to provide analytical capability for assessing the probable completion date. This could be considered a milestone schedule. The schedule will continue to develop in more detail and change throughout the life cycle of the project as the scope becomes more defined and the project is being executed. The PM typically reviews a summary schedule to track progress and looks at a detail schedule when changes or issues are occurring on the project.

2.9.4   Tools and Techniques

A.   Critical Path and Critical Chain Methods – This method calculates the early and late start and finish dates for all schedule activities by performing a forward and backward pass through the project schedule. This method does not take into account resource limitations. When the schedule is updated to account for limited resources, it's known as the Critical Chain Method. Buffers can also be added to pad the project dates against slippage.

B.   Resource Leveling – This is the process of leveling over–allocated resources by changing activity durations or logic within the project schedule. This can reduce the total number of resources required within a given time period and helps to create a more manageable workflow. It is important to note that resource leveling can have an effect on the critical path and can extend the overall project duration. It can also lead to the project schedule becoming resource dependant. To keep the project from being delayed while evaluating feasible resource allocations, first determine how many resources are required in what time frame. Then allocate the critical path activities first and distribute the rest amongst activities that have float.

C.   Schedule Compression – Shortening the project schedule without changing project scope. This can be achieved by using one of two techniques, crashing or fast tracking.

1.   Crashing involves analyzing cost and schedule tradeoffs to determine the most cost effective means of compressing the schedule. Examples of crashing include approved overtime or using more resources on crashed tasks.

2.   Fast tracking involves changing activity relationships to occur in parallel, rather than in sequence in order to shorten overall duration. An example would be issuing a foundation package before completing the mechanical or electrical design. The project–risk is typically increased with schedule compression.

D.   What–If Scenario Analysis – The method of entering possible scenarios into the project schedule to determine the outcome. The feasibility of potential changes can be assessed. Risk response or contingency plans can be assessed using "What If."

E.   MS Project

F.   Primavera P6

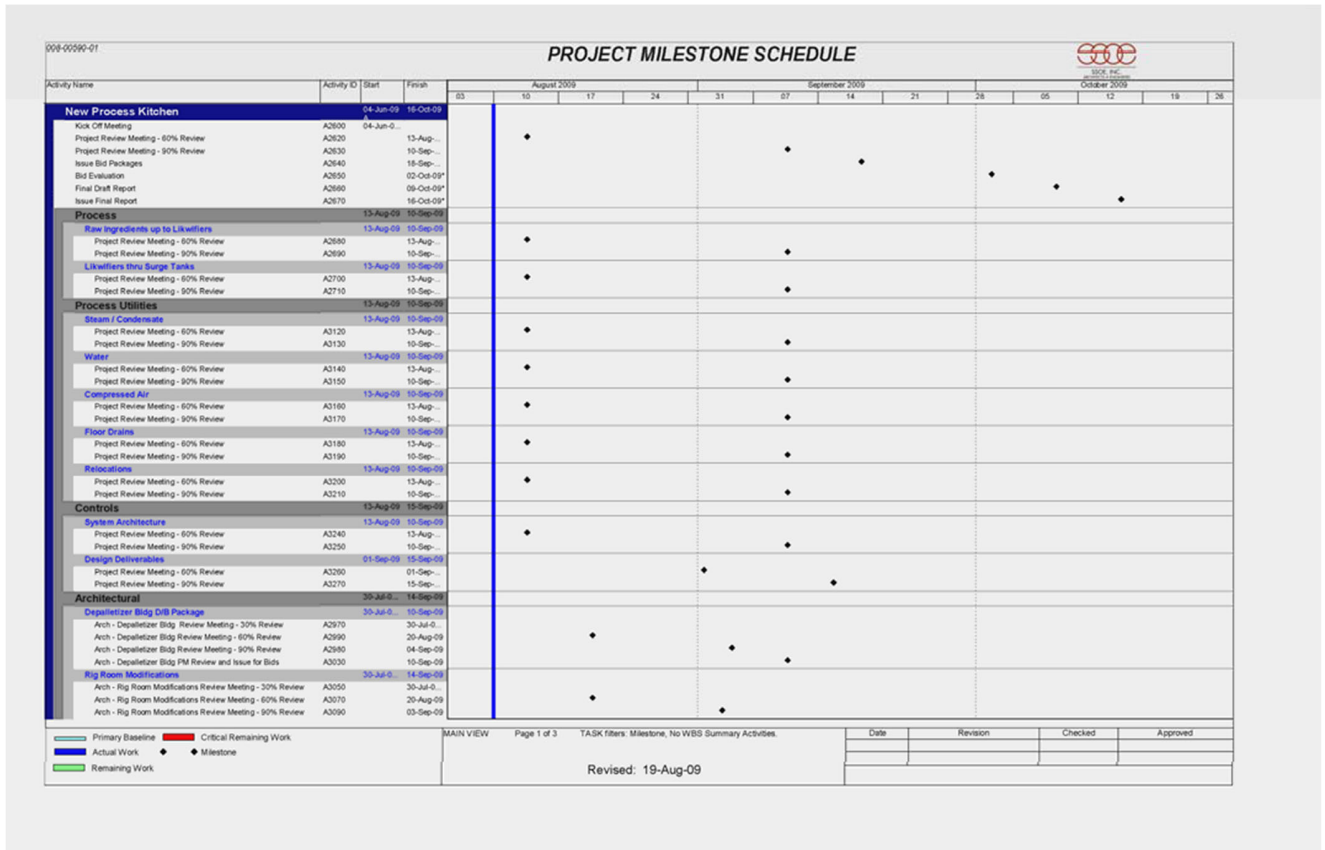# Planning

2.9.5　　Outputs

A.　　　Project Schedule　– See examples

Milestone Report

Activity Name	A/E Firm	Project Manager	Construction Manager	30% Review	60% Review	90% Review	IFC	Comments
Phase 1								
North Addition								
100.C01 FOUNDATION ENGINEERING	SSOE	Kusnier	Baker	N/A	30-Aug-07 A	N/A	14-Sep-07 A	
100.C02 STEEL ENGINEERING	SSOE	Kusnier	Thomas	N/A	N/A	18-Sep-07 A	20-Sep-07 A	
100.C02A STEEL BULLETIN #1	SSOE	Kusnier	Thomas	N/A	23-Oct-07 A	N/A	05-Nov-07 A	
100.C02B STEEL BULLETIN #2	SSOE	Kusnier	Thomas	N/A	N/A	N/A	12-Dec-07 A	
100.M01 M/I ENGINEERING	SSOE	Kusnier	Smith	N/A	27-Nov-07 A	15-Jan-08 A	30-Jan-08 A	
100.M02 FIRE PROTECTION ENGINEERING	SSOE	Kusnier	Smith	N/A	04-Oct-07 A	09-Nov-07 A	30-Nov-07 A	
100.Q01 EQUIPMENT SETTING ENGINEERING	SSOE	Kusnier	Smith	N/A	N/A	26-Mar-08 A	28-Mar-08 A	
100.E01 E/I ENGINEERING	SSOE	Kusnier	Hitt	N/A	14-Jan-08 A	14-Feb-08 A	22-Feb-08 A	
South Addition								
101.C01 FOUNDATION ENGINEERING	SSOE	Kusnier	Baker	N/A	30-Aug-07 A	N/A	14-Sep-07 A	

Planning

Milestone Schedule

Planning

Summary Schedule

Planning

Detail Schedule

PROJECT SCHEDULE

008-00590-01

Activity Name	Activity ID	Remaining Duration	Start	Finish	Activity % Complete
New Process Kitchen		54d	04-Jun-09	23-Oct-09	
Kick Off Meeting	A2600	0d	04-Jun-0...		100%
Project Review Meeting - 60% Review	A2620	0d		13-Aug-...	0%
Project Review Meeting - 90% Review	A2630	0d		10-Sep-...	0%
Issue Bid Packages	A2640	0d		18-Sep-...	0%
Bid Evaluation	A2650	0d		02-Oct-09*	0%
Final Draft Report	A2660	0d		09-Oct-09*	0%
Issue Final Report	A2670	0d		16-Oct-09*	0%
Project Management		49d	04-Jun-0...	16-Oct-09	
Project Project Management		49d	04-Jun-0...	16-Oct-09	
PM	A1800	49d	04-Jun-0...	16-Oct-09	48.42%
PMA / Coordinator	A1810	49d	04-Jun-0...	16-Oct-09	48.42%
Facilities Project Management		26d	06-Jul-0...	15-Sep-09	
Rig Room	A1820	22d	06-Jul-0...	09-Sep-09	53.19%
Depalletizer D/B Package	A1830	26d	13-Jul-0...	15-Sep-09	43.48%
PM Process Support	A1860	1d	10-Aug-09	10-Aug-09	0%
Process		54d	04-Jun-09	23-Oct-09	
PFD's / P&ID's / Mass Balance		27d	08-Jun-0...	16-Sep-09	
PFDs - Raw to Likwifiers	A1420	27d	08-Jun-0...	16-Sep-09	0%
PFDs - Likwifiers to Surge Tanks	A1430	27d	08-Jun-0...	16-Sep-09	0%
P&IDS - Likwifiers to Surge Tanks	A2470	15d	29-Jun-09	26-Aug-09	60%
Mass Balance	A2490	0d	20-Jul-0...	03-Aug-...	100%
P&IDS - Raw to Likwifiers	A2480	10d	10-Aug-09	21-Aug-09	70%
Raw Ingredients up to Likwifiers		31d	09-Jul-0...	22-Sep-09	
Size and Spec Equipment	A1520	5d	09-Jul-0...	14-Aug-09	58.33%
3D - Equipment Layout	A2500	10d	09-Jul-0...	21-Aug-09	64.29%
Project Review Meeting - 60% Review	A2680	0d		13-Aug-...	0%
3D - Specialty Trains Piping	A2510	11d	27-Aug-09	11-Sep-09	0%
3D - Base Ingredients Piping	A2520	11d	27-Aug-09	11-Sep-09	20%
Project Review Meeting - 90% Review	A2690	0d		10-Sep-...	0%
Drawings and Specs	A2530	7d	14-Sep-09	22-Sep-09	0%
Likwifiers thru Surge Tanks		39d	09-Jul-0...	02-Oct-09	
Size and Spec Equipment	A2340	5d	09-Jul-0...	14-Aug-09	58.33%
3D - Equipment Layout	A2560	6d	20-Jul-0...	17-Aug-09	50%
Project Review Meeting - 60% Review	A2700	0d		13-Aug-...	0%
3D - Piping - Process Trains	A2540	16d	21-Aug-09	14-Sep-09	0%
3D - Piping - CIP	A2570	16d	21-Aug-09	14-Sep-09	0%
3D - Piping - Spice Mix Room	A2580	16d	21-Aug-09	14-Sep-09	0%
3D - Piping E-Oil Room	A2590	16d	21-Aug-09	14-Sep-09	0%
Project Review Meeting - 90% Review	A2710	0d		10-Sep-...	0%
Drawing Extractions and BOM	A2550	14d	15-Sep-09	02-Oct-09	0%
Equipment Modeling (China)		6d	08-Jun-09	17-Aug-09	
Raw to Likwifiers	A1340	6d	08-Jun-0...	17-Aug-09	95.3%
Likwifiers to Surge Tank	A1350	6d	08-Jun-0...	17-Aug-09	77.78%
Pricing (Vendor Quoting)		29d	03-Sep-09	14-Oct-09	
Equipment	A2260	29d	03-Sep-...	14-Oct-09	0%
Installation	A2300	29d	03-Sep-09	14-Oct-09	0%
Cost Estimate		5d	15-Oct-09	21-Oct-09	
Cost Estimate Summary 0002.60	A1070	5d	15-Oct-09	21-Oct-09	0%

Legend: Primary Baseline — Critical Remaining Work — Actual Work — Milestone — Remaining Work

MAIN VIEW | Page 1 of 6 | TASK filter: No WBS Summary Activities

Revised: 19-Aug-09

Date	Revision	Checked	Approved

B.   I would also include an example of a schedule with the logic/ dependencies shown. My Campbell's schedule is a one–pager if you wanted to use that.

1.   Schedule Baseline is accepted and approved start and finish dates for the project which will be incorporated into the project management plan.

2.   Scheduling data including resource requirements updates, activity attributes updates, and project calendar updates.

3.   Changes in risk identified from developing the schedule should be updated in the risk register. (See Section 2.16)

4.   Project Management Plan and other project document updates (Section 2.1) – The project management plan needs updated to reflect any changes in the schedule management plan.
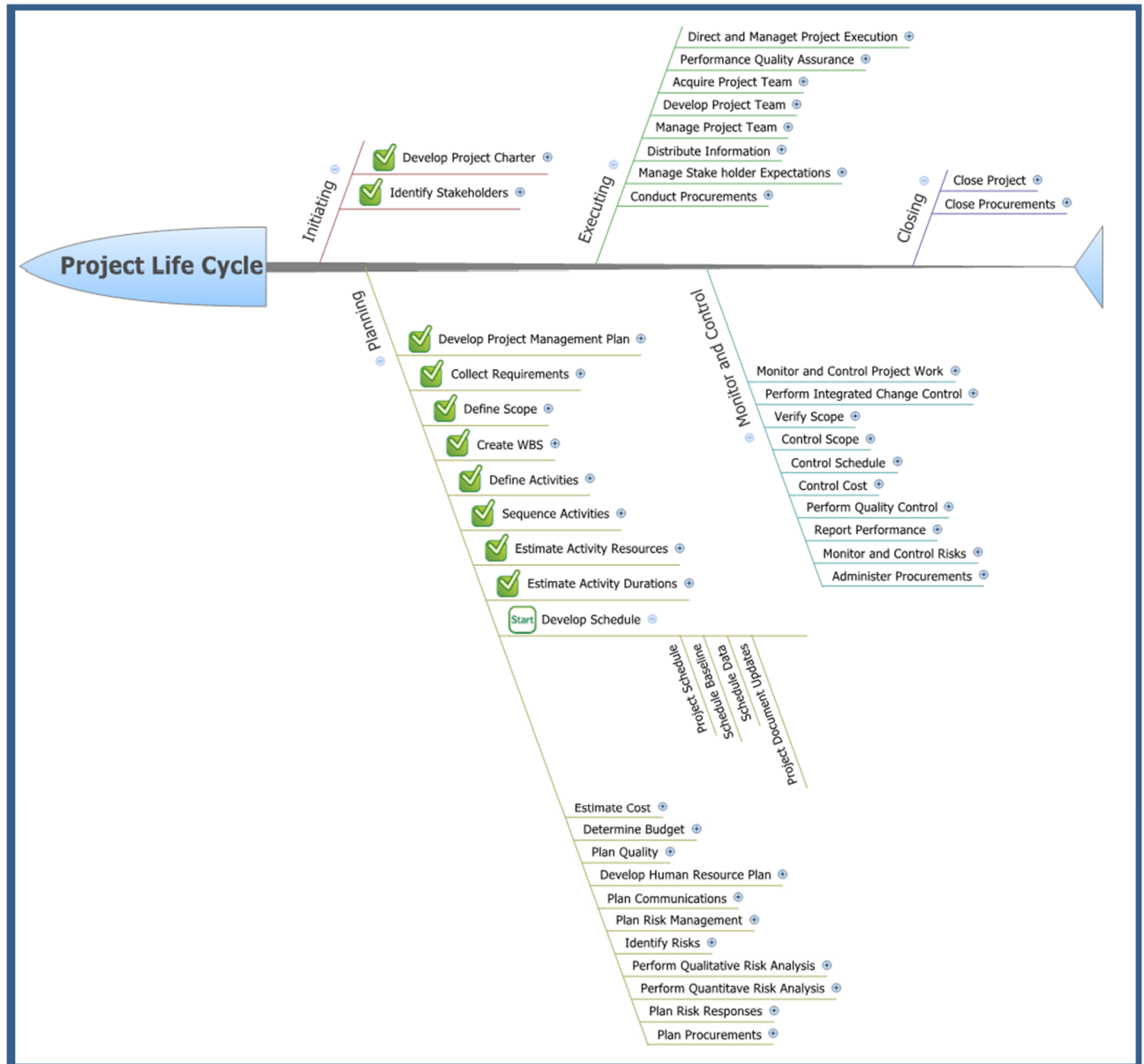
Planning

2.9.6   References

A.   Project Management Body of Knowledge – Section 6.5

2.9.7   Flow Chart

Planning

2.10   Estimate Costs

2.10.1. Summary

A.   Estimating can be defined as the process of calculating the costs of any and all elements of the project. These elements can include labor, expenses, subconsultants, or material fabrication, or construction costs. The cost estimate can be used for determining the economic feasibility of a project, evaluating project alternative methods, establishing a project budget, providing a baseline for project cost control and schedule control, and providing a construction check estimate. These estimates have varying degrees of cost to prepare. Level of accuracy depends on the use of the estimate. SSOE typically provides a design estimate for all design projects; however, we may be requested to assemble varying degrees of construction estimates. Construction cost estimates should be updated as additional information is made available to refine the accuracy of the estimate, if included in the project's scope of work.

2.10.2. Input

A.   Scope Baseline and Scope statement (See Sections 2.3 and 2.4)

B.   Project Schedule (See Sections 2.7 and 2.8)

   1.   Specifically the Activity Resource Estimates and Activity Duration Estimates

C.   Resource Plan (See Section 2.13)

D.   Risk Register (See Section 2.16)

E.   For Construction Cost Estimates:

   1.   Market conditions

   2.   Means books

2.10.3. Procedures

A.   Cost estimates may be used to develop pricing for items, such as design services for an office building, processing plant, automotive facility, hospital renovation, etc. Regardless of the subject the basic steps are the same:

   1.   Review and thoroughly understand the scope of the project.

   2.   Quantify the resources required.

Planning

3.   Apply appropriate pricing to the required resources.

4.   The project schedule and resource plan should have been developed.

5.   Any and all known risks should also have been identified.

6.   Organize the estimate output in a structured way that supports the decision making process, preferably by the WBS that was established for ease of establishing a cost baseline to monitor and control against.
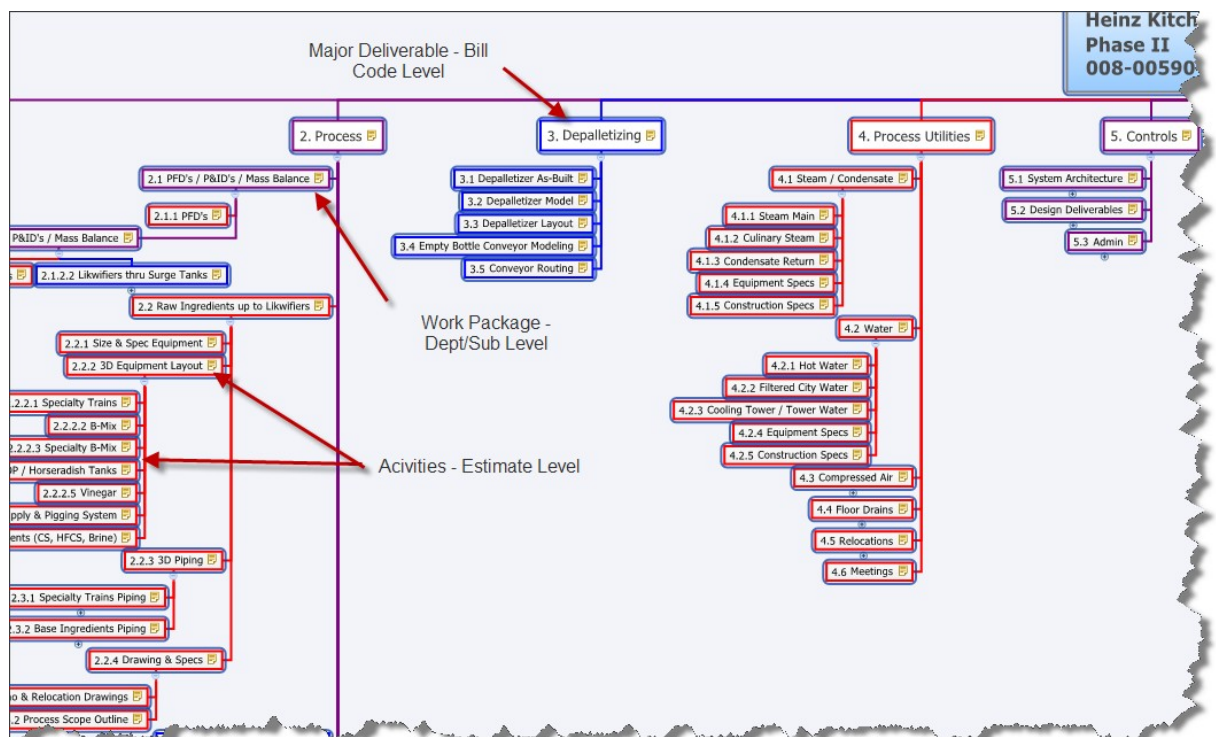
B.   Items to consider when assembling a cost estimate are (but not limited to):

1.   Location

2.   In–sourcing/Out–Sourcing

3.   Resources

4.   Risks

5.   Purpose of estimate and level of accuracy

6.   Assumptions and constraints

       C.   Always have a second person review the estimate as a sanity check.

2.10.4.   Tools and Techniques

    A.   Excel design and construction estimating templates

    B.   Estimate Review Checklist

    C.   Sage Timberline Software (or other Estimating Software)

    D.   RS Means data

    E.   Analogous Estimating Technique

       1.   This method allows the quick estimation of a project using previous similar projects and past experience to develop an approximate cost. The level of accuracy is low but the cost to develop is also minimal. This may be the best method when little information is known.

    F.   Parametric Estimating Technique

       1.   This method uses a mathematical process of cost per square foot (or other parameter) to determine the cost budget. This is more helpful in Construction Cost estimating, where a Means book may be consulted, than in determining a design budget.

    G.   Bottom–Up Estimating Technique

       1.   This method provides a very detailed and accurate estimate but may be time consuming and costly to perform. It involves quantifying and summing up each of the individual work packages or items.

    H.   Three–Point Estimating Technique

       1.   Also known as PERT, this is the process of evaluating the most likely duration, optimistic duration, and pessimistic duration (taking into account various risk factors) and using a weighted average as the basis for the activity's cost using the formula below.

$$c_E = (c_O + 4c_M + c_P)/6$$

Example: Optimistic duration   =   3 days
               Pessimistic   =   7 days
               Most likely   =   5 days

$$c_E = (3 + 4[5] + 7)/6$$

Planning

       I.   Reserve Analysis

           1.   It is not uncommon to include a contingency in the estimate to allow a buffer for certain risks or unknown factors in the project.

2.10.5.   Output

       A.   Cost Estimate and supporting details

       B.   List of Exclusions and Assumptions

       C.   Summary of the basis of the estimate (how it was estimated)

2.10.6.   References

       A.   Project Management Body of Knowledge Section 7.1 - Cost Estimating

Planning

2.10.7.   Flow Chart
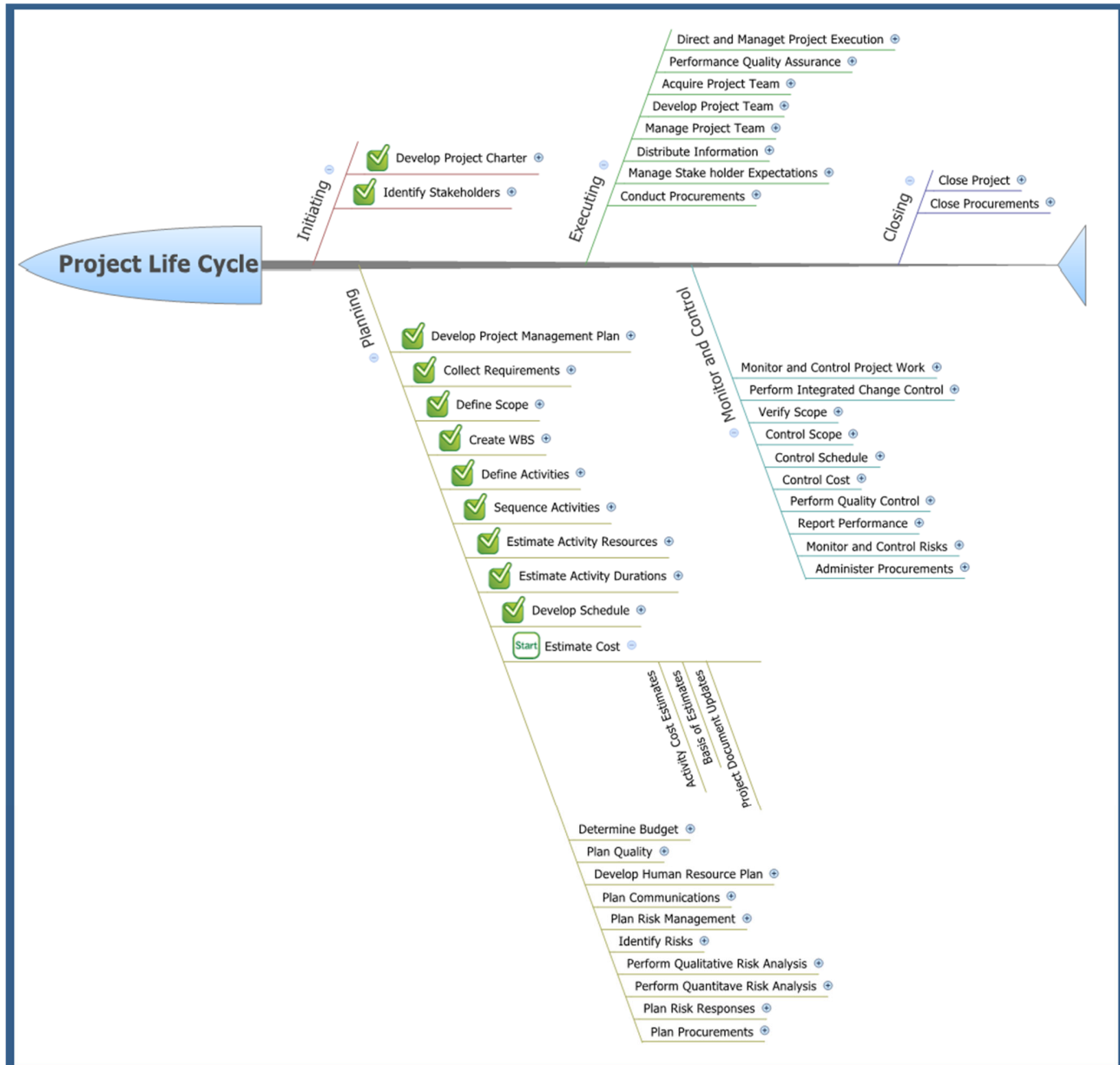
Planning

2.11 Determine Budget

2.11.1 Summary

A. Determining budget starts with the cost estimate and breaks this down to the work package level. It excludes contingency funds. This process establishes the budget for the work packages, the cost baseline, and control accounts for the project. Any contingency reserves should be held in a separate control account to be used at the PM's discretion. Cost performance is measured from the cost baseline, not the cost estimate. Again, contingency funds are not part of the cost baseline.

2.11.2 Input

A. Activity Cost estimate (See Section 2.10)

B. Scope Baseline and Scope Statement (See Sections 2.3 and 2.4)

C. Project Schedule (See Section 2.9)

D. Resource Calendars (See Section 2.13)

E. Contracts that may affect the budgets

2.11.3 Procedures

A. Cost estimates are typically comprised of more detail than the WBS levels at which the project will be controlled. Estimates are rolled up to a higher level to form the control accounts. The control accounts are then rolled up to form the budget and establish the cost baseline.

B. The Management and/or contingency reserve funds should be kept in a separate control account as they are not part of the performance measurements and baseline.

C. The Control accounts will be used to set up the budgets in Deltek.

D. The WBS3 Dept/Sub code is the level at which the project will be controlled and performance measured for design projects. The Cost accounts for EPC/M projects may be set up differently since they will include costs that will not be tracked in SSOE accounting systems. Primavera Contract Manager can be used to Control Budgets for projects that will be managing additional project costs for the client that will not be passed though the accounting systems.

Planning

Example – XMind WBS Tool
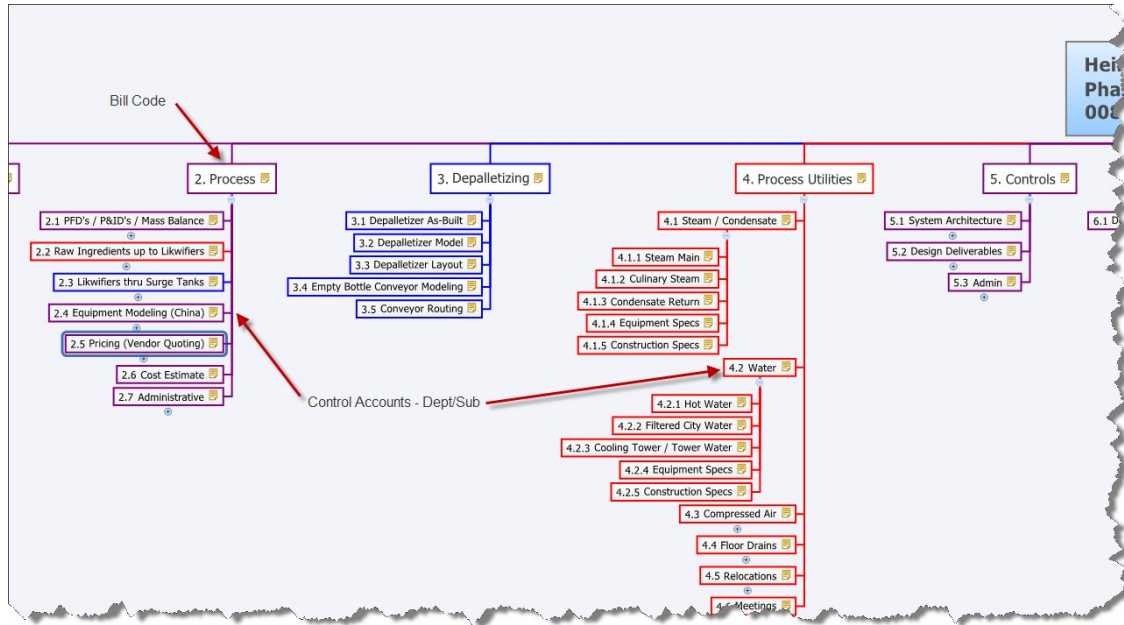
Example – Deltek Project Planning

					EV Pct			
⊟ **Process**	Bill Code	008-00590-01	02		**Planned Hrs**	2,211.12	662.15	94
					EV Pct			
⊞ **PFD's/PID's/Mass Balance**	Dept/Sub	008-00590-01	02	0002.10	**Planned Hrs**	761.69	228.11	32
					EV Pct			
⊞ **Raw Ingredients up to Likwifiers**	Dept/Sub	008-00590-01	02	0002.20	**Planned Hrs**	452.09	135.38	1
					EV Pct			
⊞ **Likwifiers thru Surge Tanks**	Dept/Sub	008-00590-01	02	0002.30	**Planned Hrs**	515.11	154.26	22.0
					EV Pct			
⊞ **Equipment Modeling (China)**	Dept/Sub	008-00590-01	02	0002.40	**Planned Hrs**	272.62	81.64	11
					EV Pct			
⊞ **Pricing (Vendor Quoting)**	Dept/Sub	008-00590-01	02	0002.50	**Planned Hrs**	54.80	16.41	2.3
					EV Pct			
⊞ **Cost Estimate**	Dept/Sub	008-00590-01	02	0002.60	**Planned Hrs**	27.40	8.20	1.1
					EV Pct			
⊞ **Administrative**	Dept/Sub	008-00590-01	02	0002.70	**Planned Hrs**	127.41	38.15	5
					EV Pct			
⊞ **Depalletizing**	Bill Code	008-00590-01	03		**Planned Hrs**	33.57	10.04	1
					EV Pct			
⊟ **Process Utilites**	Bill Code	008-00590-01	04		**Planned Hrs**	708.97	212.30	30
					EV Pct			
⊞ **Steam / Condensate**	Dept/Sub	008-00590-01	04	0004.10	**Planned Hrs**	184.95	55.38	7
					EV Pct			
⊞ **Water**	Dept/Sub	008-00590-01	04	0004.20	**Planned Hrs**	239.75	71.79	10
					EV Pct			
⊞ **Compressed Air**	Dept/Sub	008-00590-01	04	0004.30	**Planned Hrs**	102.75	30.77	4
					EV Pct			
⊞ **Floor Drains**	Dept/Sub	008-00590-01	04	0004.40	**Planned Hrs**	75.35	22.56	3
					EV Pct			
⊞ **Relocations**	Dept/Sub	008-00590-01	04	0004.50	**Planned Hrs**	61.65	18.46	
					EV Pct			
					Planned Hrs	44.52	34	

2.11.4   Tools and Techniques

    A.   Scheduling Software

    B.   Primavera Contract Manager

    C.   Deltek

    D.   Excel templates

2.11.5   Output

    A.   Cost Performance Baseline – The graph below represents the cash flow for the project. This is the cost baseline indicating how much money is going to be spent when.
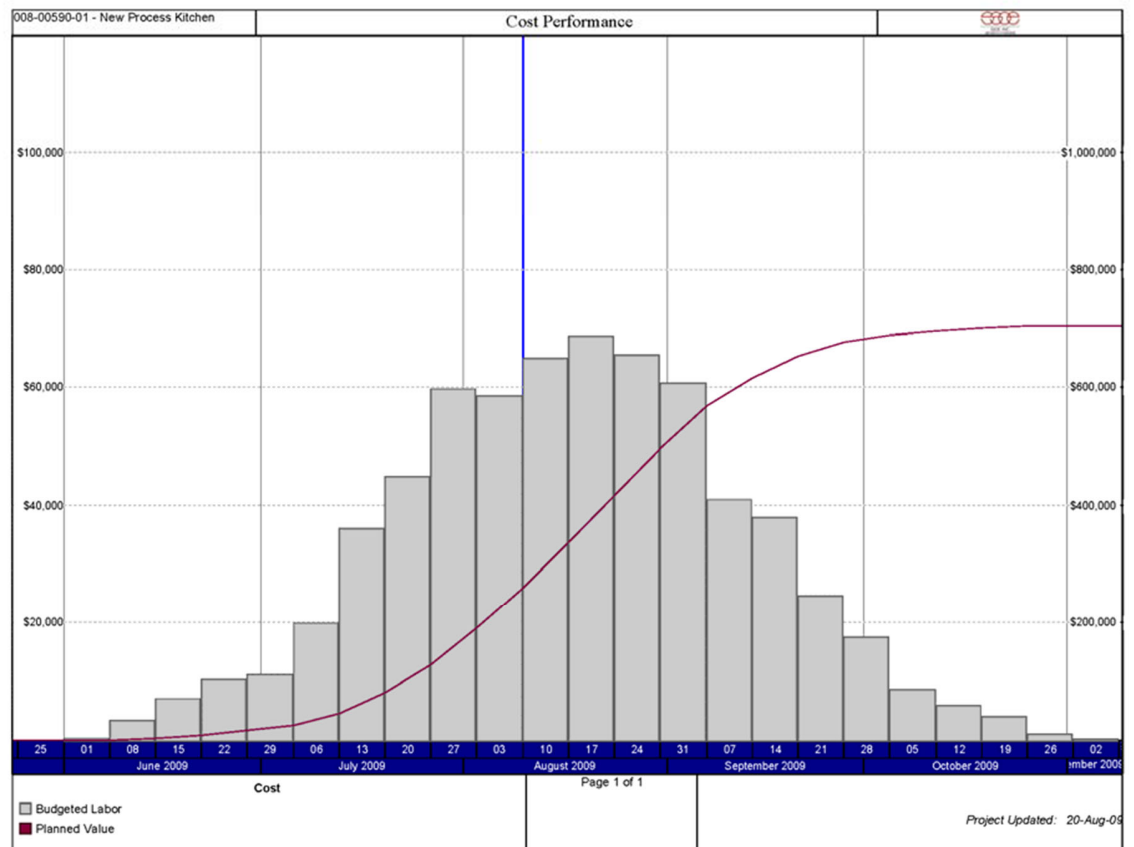
    B.   Funding Requirements (how often and how much to invoice)

    C.   Schedule Updates

    D.   Risk Register Updates

Planning

2.11.6   References

A.   Project Management Body of Knowledge – Section 7.2

B.   Deltek Training Material for planning

2.11.7   Flow Chart
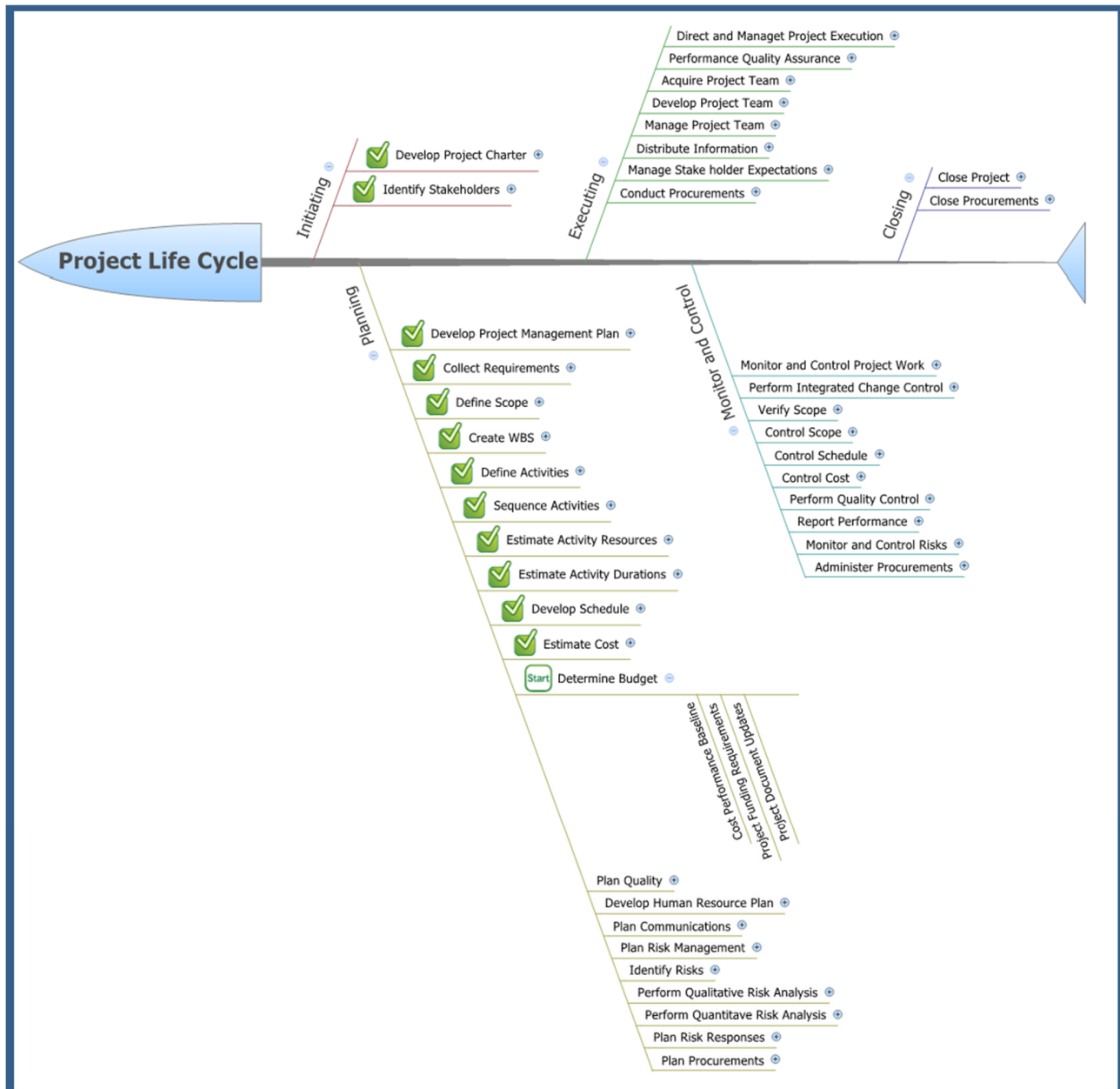
Planning

2.12 Plan Quality

2.12.1 Summary

A. Quality planning is defining the measurements and standards that the project will adhere by to ensure the project's intended needs and requirements are fulfilled.

2.12.2 Input

A. Project Management Plan (2.1)

1. Scope Statement and WBS (Section 2.3 and 2.4 – Create WBS)

2. Cost Performance Baseline (Section 2.11 – Determine Budget)

3. Schedule Baseline (Section 2.9 – Develop Schedule)

B. Stakeholder Register (1.2 – Identify Stakeholders)

C. Risk Register (2.16 – Identify Risks)

D. SSOE CAD Standards

E. ISO Procedures

F. PM Guidelines

G. Lessons Learned Website

H. Project Specific Requirements

1. Applicable Codes

2. Client Standards

2.12.3 Procedures

A. Review the SSOE ISO procedures to evaluate which ones will apply to the project. The Project Management ISO Checklist is a good reference.

B. Determine what specific project standards might be required. They can be requirements from the product or client specific requirements or tolerances, or governmental agency regulations.

C. The plan should outline how you will comply with what you will do to meet the standards and what the measurements will be used to determine if the standards are being met.

D. Determine the Cost of Quality (COQ), maintaining a balance between the needs of quality and the importance of adhering to the scope, cost, schedule, risk, and client satisfaction. Internal design reviews is an example of how the cost of quality can prevent non–conformances.

1. Plan, plan, plan before executing. The cost of non–conformance due to re–work, errors and omissions, or document corrections can be substantial.

2. Invest in prevention. Provide the appropriate training, allow the appropriate amount of time necessary to perform the task, and document the processes where necessary.

2.12.4 Tools and Techniques

A. PM ISO Checklist

B. Cost–Benefit Analysis – reviewing the benefits of meeting a particular quality standard versus the cost of meeting that standard.

2.12.5 Output

A. Quality Management Plan – how the plan will be implemented on the project. This becomes part of the Project Management Plan. The Quality Management Plan will vary in its formality and detail, depending upon the project needs, but should include a statement on how quality will be monitored and controlled.

B. Project Management ISO Checklist.

C. Quality Baseline – What are the minimum requirements or tolerances for the project.

D. Process Improvement Plan – Details the process for analyzing the set processes to identify which activities add value, and processes that need to be improved or eliminated. Lessons Learned exercises are a good way to identify areas of improvement.

E. Quality Metrics – How quality process will measure the project.

2.12.6 References

A. Project Management Body of Knowledge – Section 8.1

B. Quality System Procedures

C. Project Management ISO Checklist

D. Lessons Learned Website

Planning

2.12.7 Flow Chart
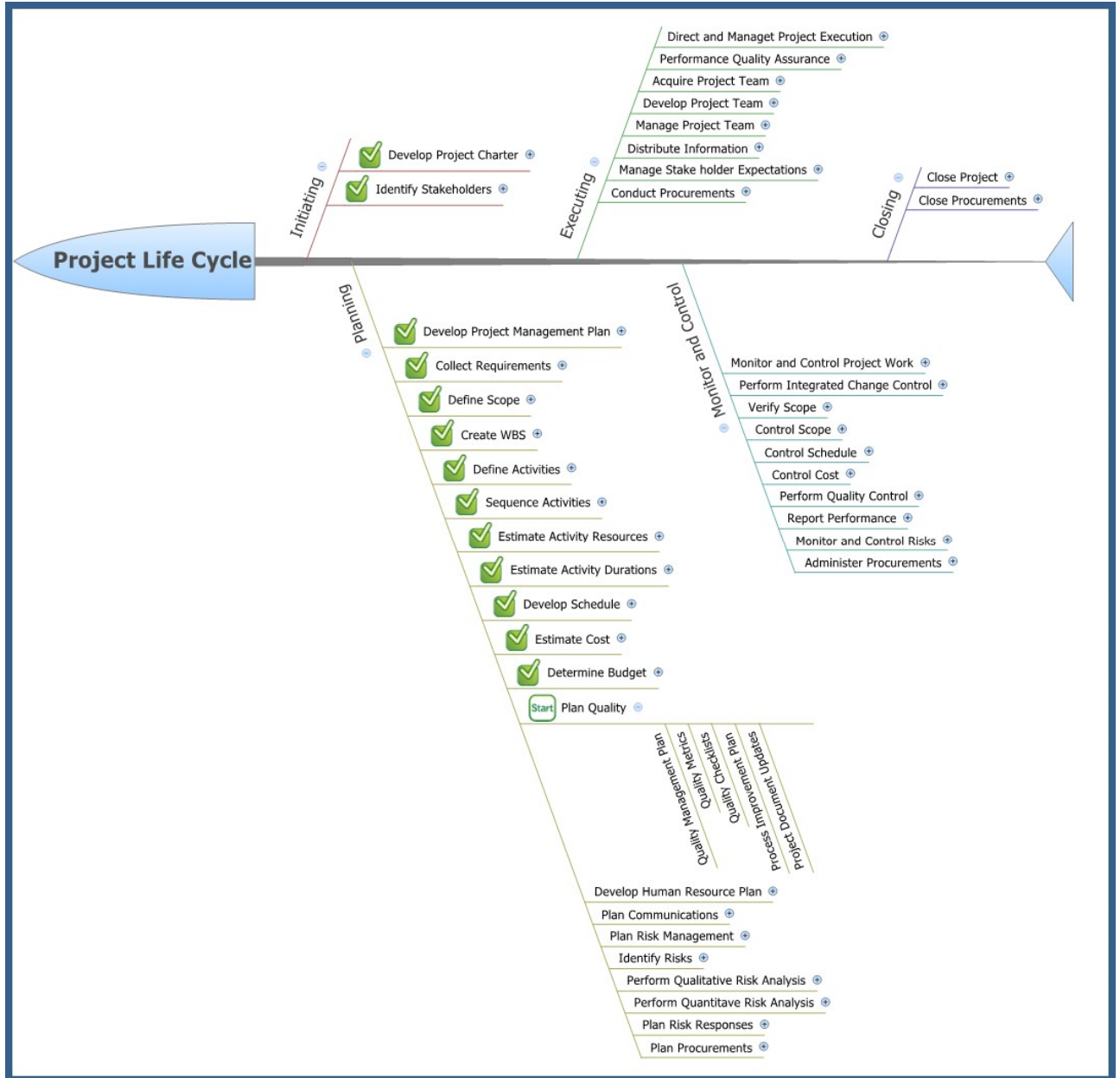
Planning

2.13 Develop Human Resource Plan

2.13.1 Summary

A. Identifying the roles and responsibilities for a project, as well as the availability and skill sets for the staff required. The creation of the Staff Management Plan is required for the Project Management Plan to identify when and how the staff will be utilized.

2.13.2 Input

A. Activity Resource Requirements (See Section 2.7 – Estimate Activity Resources)

B. Organizational Chart

2.13.3 Procedures

A. Determine which organizations/departments will be involved with the project and their interdependencies.

B. Determine the reporting relationships among the candidates for the project team. Specifically, who the candidate reports to for rewards or corrective action required later in the project.

C. Know the job descriptions of the resources.

D. Evaluate the cultural and language differences that will affect the working relationships among the team members. This is especially important if utilizing the China office or any other offshore resources. Their working hours and holidays may be different than what is expected and these dates and times need to be made known to the entire project team.

E. Logistically, people in separate buildings, time zones, and countries need to be identified so that the proper coordination can take place during standard work hours.

F. Determine the individual goals and agendas of the potential project stakeholders, as well as who has informal power in areas important to the project. It is important to determine who has power to influence the project from the client's side, early in the project, to prevent rework and control change later on.

G. See Section 2.7 for Activity Resource Requirements. This should be used to determine the HR needs for the project.

2.13.4   Tools and Techniques

A.   Organization Charts

1.   Hierarchical–type Organization Chart

2.   Matrix–based Responsibility Chart: RACI Chart

3.   MS Project or Primavera

B.   Networking

1.   Non–project activities, for example, meeting for lunch or a baseball game with clients, contractors, and internal team, promotes camaraderie at the start of the project, helping the project start on the right foot. Proactive correspondence and informational conversations throughout the project are also effective and may lead to future work opportunities.

C.   Discipline Work Plans (DWP's) (excel template or using scheduling software)

D.   Deltek Planning Module

2.13.5   Output

A.   Roles and Responsibilities

1.   Each team member should understand their role on the project, their authority within the project to make decisions and assign resources, and the work they are responsible for completing.

2.   The Project Manager needs to be familiar with the skill sets of the employees assigned to his team and identify any additional training required. An example would be ensuring all CAD members are trained in the platform required by your project.

B.   Project Organization Chart

C.   Staffing Management Plan

1.   Based on resource needs, identify additional staff required to complete the project. Additional staff may be required if there are not enough employees in house to complete the project, or if no one with the necessary skill set is currently employed. Hiring contract staff and subcontracting parts of the project are alternatives to

hiring new employees. Once resource needs are determined, create a project organization chart for internal and external distribution complete with contact information.

2. Create a Roles and Responsibilities Matrix (aka RACI Chart).

3. Create a resource schedule to determine when team members need to be brought onto the team and when they can be released from the project. Having specific start and end activities may help prevent unnecessary charges to the project when a team member is no longer needed. Resource schedules can be developed from MS Project or Primavera software, and can also be generated in the Deltek Resource Management Module.

4. Outline the additional training required for the team members.

5. Have recognition and reward processes in place to promote desired behaviors, such as completing assign-ments on time and within budget. Examples include a pizza lunch at the end of the project, spot awards, and VIP awards.

6. Outline the safety considerations required for the project, as well as any potential hazards.

    a. Are safety glasses, hard hats, and steel–toed boots required on–site?

2.13.6   References

A. Project Management Body of Knowledge Section 9.1 - Develop Human Resource Plan

Planning

2.13.7   Flow Chart

2.13 Develop Human Resource Plan (9.1).doc
https://gauravdakshini.com/pmp-certification-training/
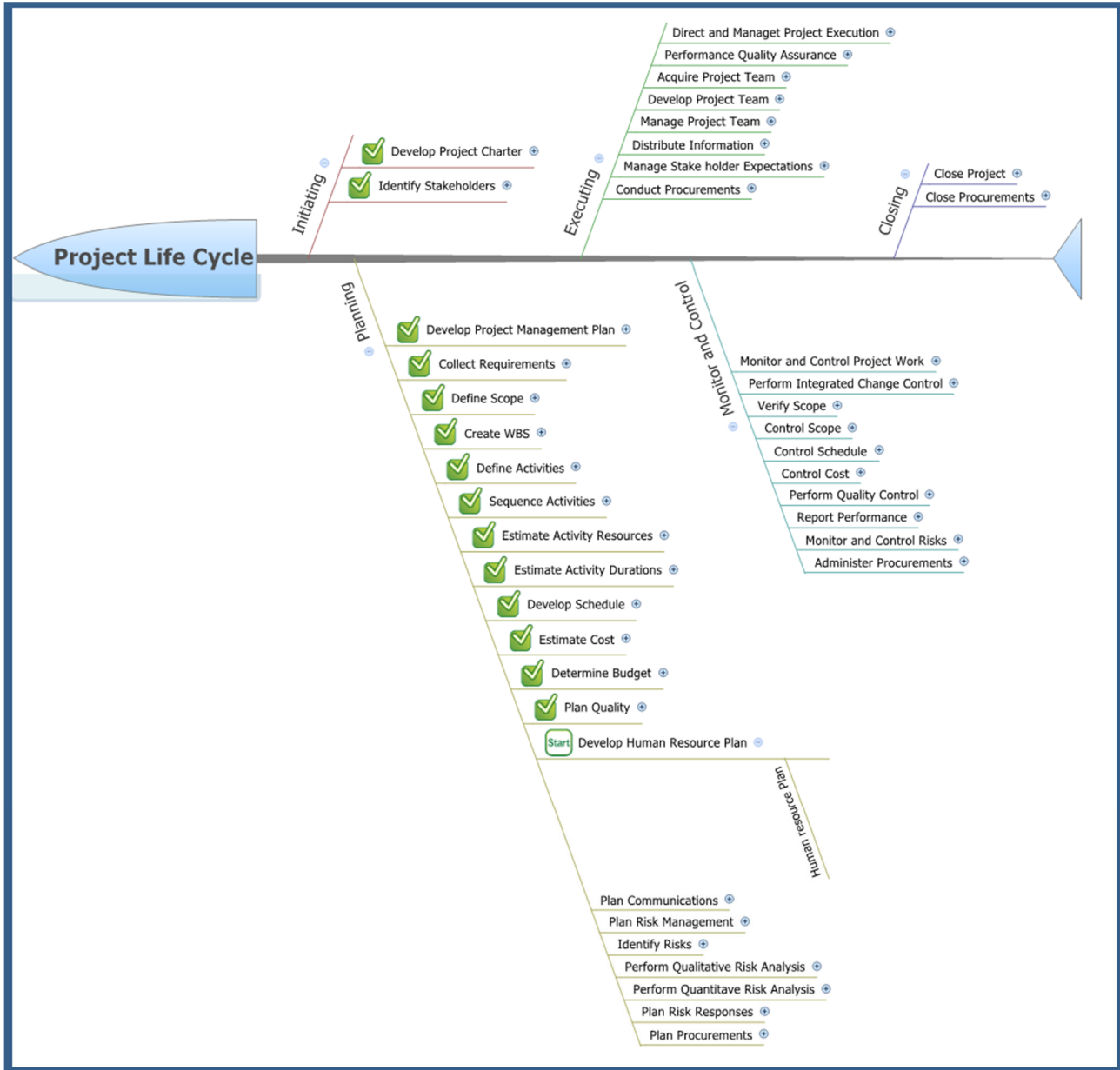
Planning

2.14. Plan Communications

2.14.1. Summary

A.   The processes required to ensure timely and appropriate generation, collection, dissemination, storage, and disposal of project information. This defines the rules of information flow during the project. Who needs what information, when is it provided to them, who sends it, and how is it sent? These are all items defined in the Communications Management Plan.

2.14.2. Input

A.   Stakeholder Register (See Section 1.2 – Identify Stakeholders)

B.   Stakeholder Management Strategy (See Section 1.2 – Identify Stakeholders)

C.   Lessons Learned and historical information

2.14.3. Procedures

A.   Determine who needs to receive what information. Setting up a distribution list of the stakeholders to receive all project information is one way to ensure consistency. Setting up an "external" distribution list for the Owner or Contractors, and an "internal" distribution list for the internal team, is an efficient way to ensure emails are sent to the right team members without relying on memory. This can be saved in the Public Folder for all internal team members' use.

B.   Determine and define ground rules for phone call protocol with external stakeholders, meeting minutes, communication channels and so on. Things to consider could include: do phone calls with a client require a report? Who receives meeting minutes and within what time frame should they be published?

C.   Defining when the PMA should distribute the information, when it is acceptable for the discipline captain to distribute information, and on what types of communication should the PM be copied (emails) or notified immediately, should all be included in the Communications Management Plan.

D.   Determine what, if any, FTP sites or document transfer software will be used and who will need access to them. Access to IBackup, SharePoint, and ProjectWise can be given to clients without requiring additional licenses or incurring project fees. Access can be defined down to the folder for read–only or read–write access to the documents contained.

Planning

2.14.4. Tools and Techniques

    A.   Distribution Lists

    B.   Organization Chart

    C.   Prolog, SharePoint, ProjectWise, or other document transfer software

2.14.5. Output

    A.   Communications Management Plan

    B.   Schedule updates

    C.   Stakeholder Register and Stakeholder Management Strategy updates

2.14.6. References

    A.   Project Management Body of Knowledge Section 10.2 – Identify Stakeholders

Planning

2.14.7. Flow Chart

Planning

2.15 Risk Management Planning

2.15.1 Summary

A. Deciding how risk will be managed and performed, the resources that will in be involved in managing risk, and how risk will be identified is Risk Management Planning. The plan should ensure the risks identified are proportional to the importance of the project and to the organization.

2.15.2 Input

A. Project Scope Statement

B. Project Management Plan

    1. Cost Management Plan

    2. Schedule Management Plan

    3. Communication Management Plan

C. Risk policies

D. Risk types

E. Risk definitions

F. Risk tolerances

2.15.3 Procedures

A. The Go/No Go template should be used for projects other than alliance partners to identify if SSOE is willing to take on the project from a risk perspective. The template has a series of questions the answers of which will determine a risk score that will be used to determine if SSOE should accept developing a proposal for the project.

B. If the project is a Go, a Risk Management Strategy Planning Meeting with project stakeholders is the best way to evaluate how to manage risk. Plans for conducting risk management include cost and schedule constraints, as well as who will be responsible for managing the risk. The cost of managing risk could potentially be significant, if it is a high risk project and needs to be budgeted for. Schedule can be a risk factor in and of itself; however, who and how risk is managed is a more direct impact factor on the schedule, and needs to be identified to be able to control the risks later to avoid impacting the schedule.

C.   Risk Categories such as cost, time, scope, and quality should be identified and be included in the risk register. In addition, the level of probability, and impact for each risk should be identified at this stage of the project.

D.   The Risk Threshold levels and acceptable tolerance allowances lead to classification as Red, Yellow, or Green on the risk register. The risk register has default-recommended thresholds built into the template, but can be modified at the PM's discretion.

E.   The Risk Breakdown Structure is developed as a subset of the WBS structure and populated on the risk register.

2.15.4   Tools and Techniques

A.   Risk management strategy planning meeting:

1.   Schedule of risks and costs.

2.   Responsibilities of activity (RACI)

2.15.5   Output

A.   Risk Management Plan

B.   Report – Risk register

C.   Budget to manage risk

D.   Risk breakdown structure.

Planning

2.15.6   Flow Chart
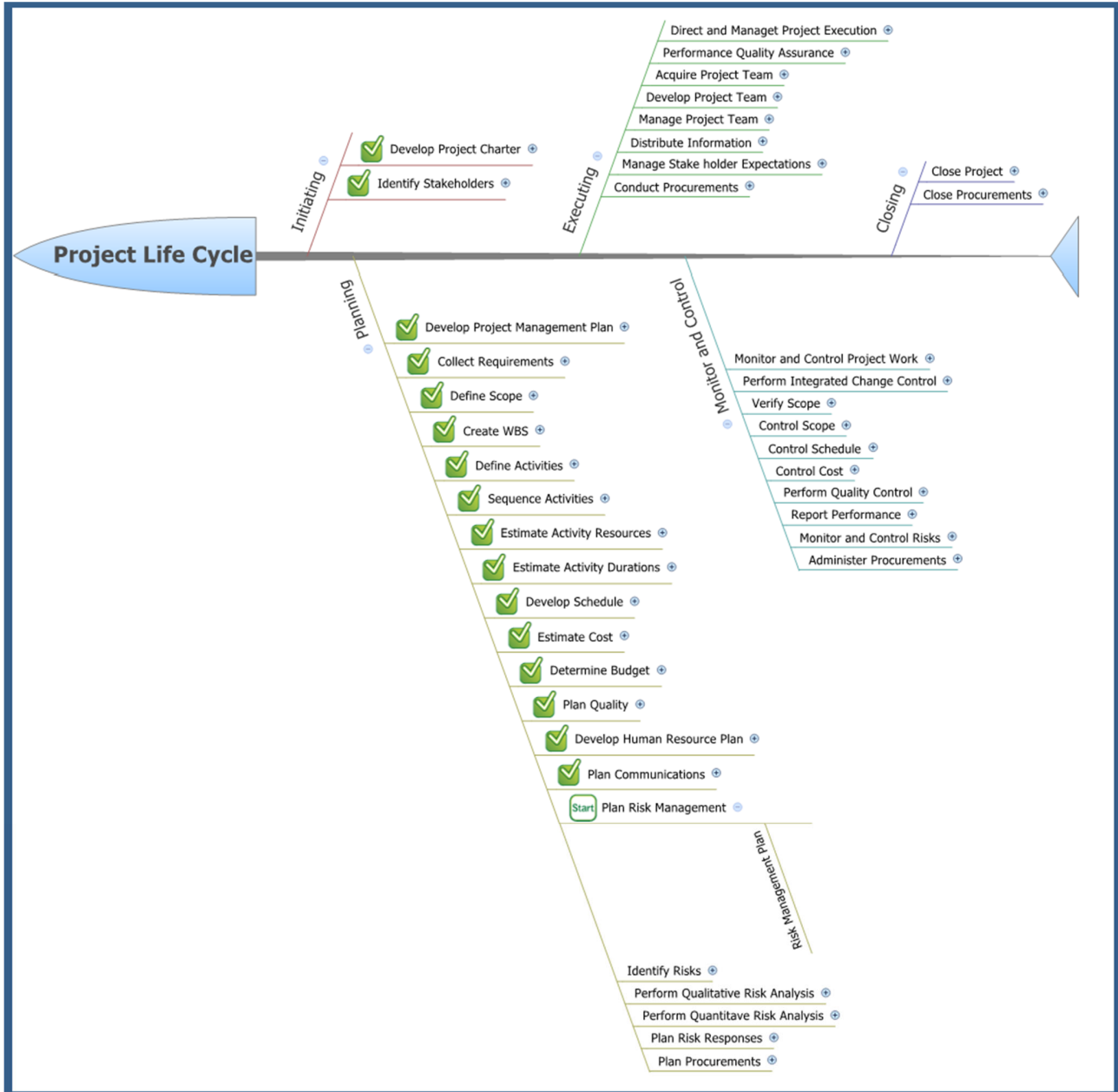
Planning

2.16   Identify Risk

2.16.1   Summary

A.   Identify all the things that are concerns or items that could go wrong on the project. Identify items on a project that give rise to concern or risk and document their characteristics. The people involved should be the responsible (R) and approvers (A) list for each WBS element on the RACI chart (Section 2.13 - Develop Human Resource Plan).

B.   Identify what keeps the R & A's up at night.

2.16.2   Input

A.   Project scope statement. Review assumptions.

B.   Project Management Plan

1.   Risk Management

2.   Cost Management

3.   Schedule Management

4.   Quality Management

C.   Lessons learned.

2.16.3   Procedures

A.   Risk can be identified in many forms; consider some of these types of risk when identifying them for the project.

1.   Legal Risk

2.   Safety and Environmental

3.   Lost of profitability

4.   Loss of Customer Satisfaction

5.   Poor Product Performance

6.   Project Delay and budget overruns

B.   The Work Breakdown structure will be a valuable component to identifying risk, consider it the risk identification checklist. Risk can be identified by stepping through the WBS structure and identifying any risk for each element by **exploring what you don't know** about the element. This will help in obtaining a comprehensive list of potential risks and potential actions or responses for

element or work package. Responses will be addressed in Section 2.19 – Risk Response Planning. The Risk will be listed in the Risk Breakdown Structure (RBS), a subset of the WBS which was set up on the risk register in the Risk Management Planning Section 2.15.

C. Risk Identification will be an iterative process. New risk will be identified as the project is being executed.

D. Review with the team to understand the root causes of the risk identified. Analyze the cause and effects of risk to determine if there are anymore risks that should be identified. List the causes on the risk register.

E. Use of the Ishikawa or fish bone diagram will help layout the cause and effects of risks.

F. Review project plans, assess quality requirements, and evaluate schedule deadlines and cost constraints for any additional potential risks.

2.16.4 Tools and Techniques

A. Internet and Risk Manual: look for risk list.

B. Brainstorming with the risk management team is a good way to look at all the possible risks that could occur on the project.

C. Interview stakeholders formally or informally.

D. SWOT analysis: strengths, weaknesses, opportunities, threats. Evaluate what strengths and do they outweigh our weaknesses. Determine if there are any opportunities that can help achieve an objective or overcome the risk. Assess the threats that might prevent achieving objective.

E. Risk Register.

2.16.5 Output

A. Risk Register: Should include all initial entries and has identified risky, potential responses, causes of risk, updated risk categories.

2.16.6 References

A. Project Management Body of Knowledge Section 12.1 – Identify Risk

Planning

2.16.7   Flow Chart
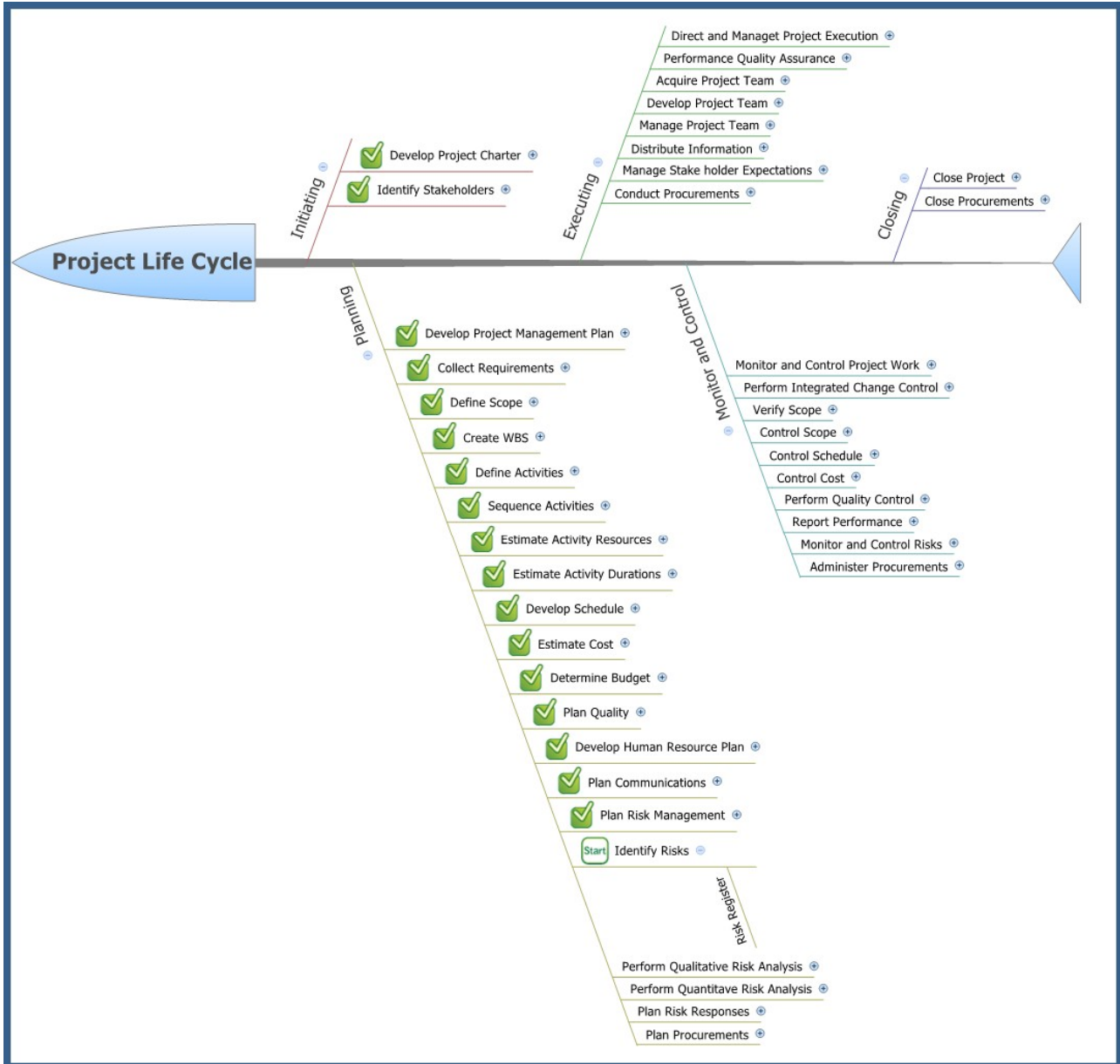
Planning

2.17 Qualitative Risk Analysis

2.17.1 Summary

A. This is the initial interest of the risk. Assessing the probability of if the risk will happen and what the impact on the project would be. Identification of when in time this threat or opportunity may happen is also an important aspect. This is a subjective, but quick process, to analyze the risk which sets up the foundation for performing quantitative risk analysis.

2.17.2 Input

A. Risk register

B. Risk management plan

C. Project scope statement

2.17.3 Procedures

A. The data collected needs to be unbiased and accurate in order to obtain a meaningful assessment. An R.A.I.D. (Risks, Assumptions, Issues, Dependencies) list can be put together to categorize the risks to determine if they are really risks or just assumptions, issues, or dependencies.

    1. Risk – Events with probability and consequences.

    2. Assumptions – If an identified risk is just a factor that is considered true, whether it is estimated or strategic, then it is an assumption. Always validate and document assumptions. Get the facts, and then make the decision.

    3. Issue – Something that is certain to happen that needs to be addressed or managed.

    4. Dependency – An item that is dependent on another decision or a constraint that modifies the schedule.

B. After determining the true risks on the projects, the risks can be updated on the risk register by the RBS.

C. Then next step is to categorize the risks by scope, schedule, cost, quality, other, internal or external. This can also be done on the risk register.

D. The probability or likelihood that a risk will occur, and the impact the risk will have on the project, is the next thing to be identified on the risk register. The probability can be thought of in terms of very low (VL) that the risk will occur to very high (VH) that the risk will occur. If you have a risk that is very high or likely to happen, you should consider treating it as an issue instead. Impact ranges from a very low impact (VL) to a very high (VH) impact on the project. It is recommended that it should be evaluated from a client, personal, and team perspective. This should happen prior to identifying which risk falls into what category.

E. The risk register will calculate the risk score by multiplying the probability by the impact for the risk. Based on the score, it will classify the risk as red, yellow, or green. These colored threshold levels can be adjusted by the Project Manger as needed. This will provide a ranking to prioritize the risk and determine which risks will need to have quantitative risk analysis performed. The Risk identified in the Red threshold is the most critical and is recommended to have a quantitative risk analysis performed.

F. Threats – Risks that have a negative impact on the project are considered threats. Any threats that score in the red zone should be treated with high priority, and have a more aggressive response strategy from those that score in the yellow or green zone.

G. Opportunities – Risks that have a positive impact on the project are considered opportunities. Opportunities in the red zone should be reviewed first, since they will be the easiest to achieve and have the greatest benefit for the project.

H. The last steps in qualitative analysis are assigning a Risk Owner to each of the risks, and prioritize them based on the earliest time the risk has the potential to occur.

2.17.4 Tools and Techniques

A. Probability and Impact risk matrix – built into the risk register

B. R.A.I.D. List

C. Output

D. Updated Risk Register

2.17.5 Output

A.

Planning

2.17.6 References

A. Project Management Body of Knowledge Section 11.3 – Perform Qualitative Risk Analysis

2.17.7 Flow Chart
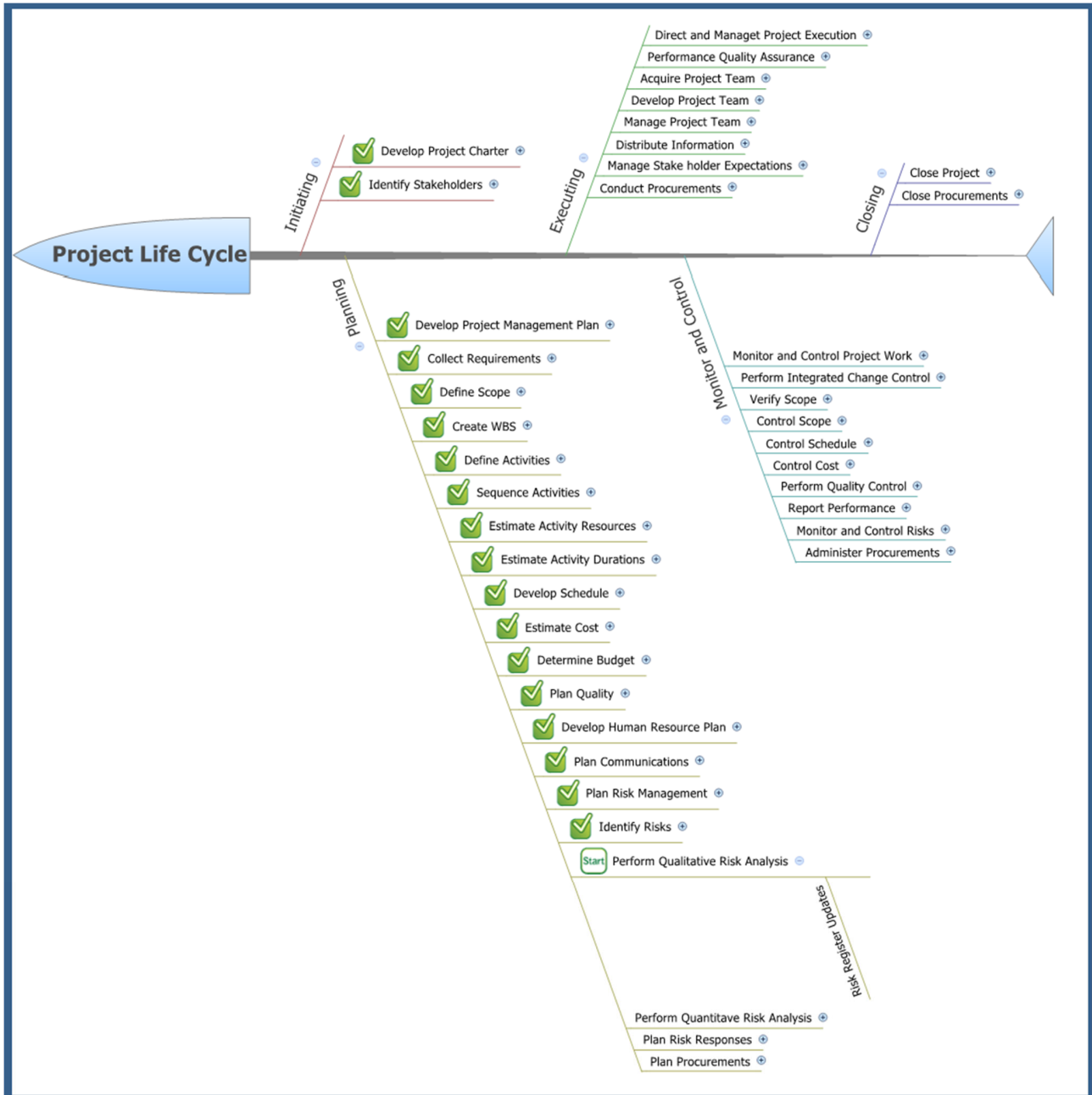
Planning

2.18　Quantitative Risk Analysis

2.18.1　Summary

A.　Quantitative Risk is the process of quantifying the risk. The scope statement should identify if this process is required. Typically, it is only performed on large projects on high priority "red zone" threats determined from the probability and impact matrix from Section 2.16.

B.　This process is analyzing the risk in a numerical fashion to determine the overall effect on the project. There are reversal methods to achieve this analysis; the processes below are SSOE's recommended practices.

2.18.2　Input

A.　Risk Management Plan

B.　Project Management Plan – review schedule and cost sections.

2.18.3　Procedures

A.　Quantitative risk analysis is not an easy task to perform. There are several approaches that can be used to perform this analysis, which include modeling software, Expected Monetary Value analysis, probability distribution, and sensitivity analysis.

B.　Decision Tree analysis is the recommended approach at SSOE.

　　1.　Decision Tree analysis is a visual hands–on approach to determining the Expected Monetary Value (EMV) of the Risk. The decision tree looks at a risk and considers the different choices or scenarios to consider for the risk. The choices are assigned a dollar value for the scenario and a probability of happening. After the possible scenarios have been determined, the next step along the decision tree path is deciding what the rewards or payoffs are for that scenario. Calculating through the decision tree string will determine the EMV. See example.

Payoff - Cost

Decision / Option 1

Ex: Internal Resources
($50,000)

70% → **Possible outcome**
Ex: Less Knowledgeable
($65,000) → $15,000 =
$65,000-$50,000

- $7,500 = (.70 * $15,000) + (.30 * -$10,000) + $50,00

30% → **Possible outcome**
Ex: Internal Coordination
($40,000) → -$10,000 =
$40,000-$50,000

Decision to be made

Ex: Use Internal resources
or Subcontract

Subcontract $2,500
(use greater of $2,500 or -
$7500 Expected Monetary
Value (EMV) or **Profit**)

$2,500 = (.70 * -$10,000) + (.30 * $15,000) + $70,000

70% → **Possible outcome**
Ex: Expert Knowledge
($60,000) → -$10,0,000 =
$60,000-$70,000

Decision / Option 2
Ex: Subcontract
($70,000)

30% → **Possible outcome**
Ex: Internal Coordination
($85,000) → $15,000 =
$85,000-$70,000

C.   Other quantitative risk analysis techniques, such as the sensitivity analysis and model simulation, can be found in the PMBOK Section 11.4.

2.18.4   Tools and Techniques

A.   Modeling Software, such as a Monte Carlo program.

B.   Probability distribution.

C.   Sensitivity analysis.

D.   Schedule Buffering – A buffer built into the project based on the confidence of the schedule and the risk tolerance. The buffer is not built into each activity, but by work package or element controlled by the Project Manager.

2.18.5   Output

    A.   1.   Updated risk register

2.18.6   References

    A.   Project Management Body of Knowledge Section 11.4 – Perform Quantitative Risk Analysis

Planning

2.18.7 Flow Chart
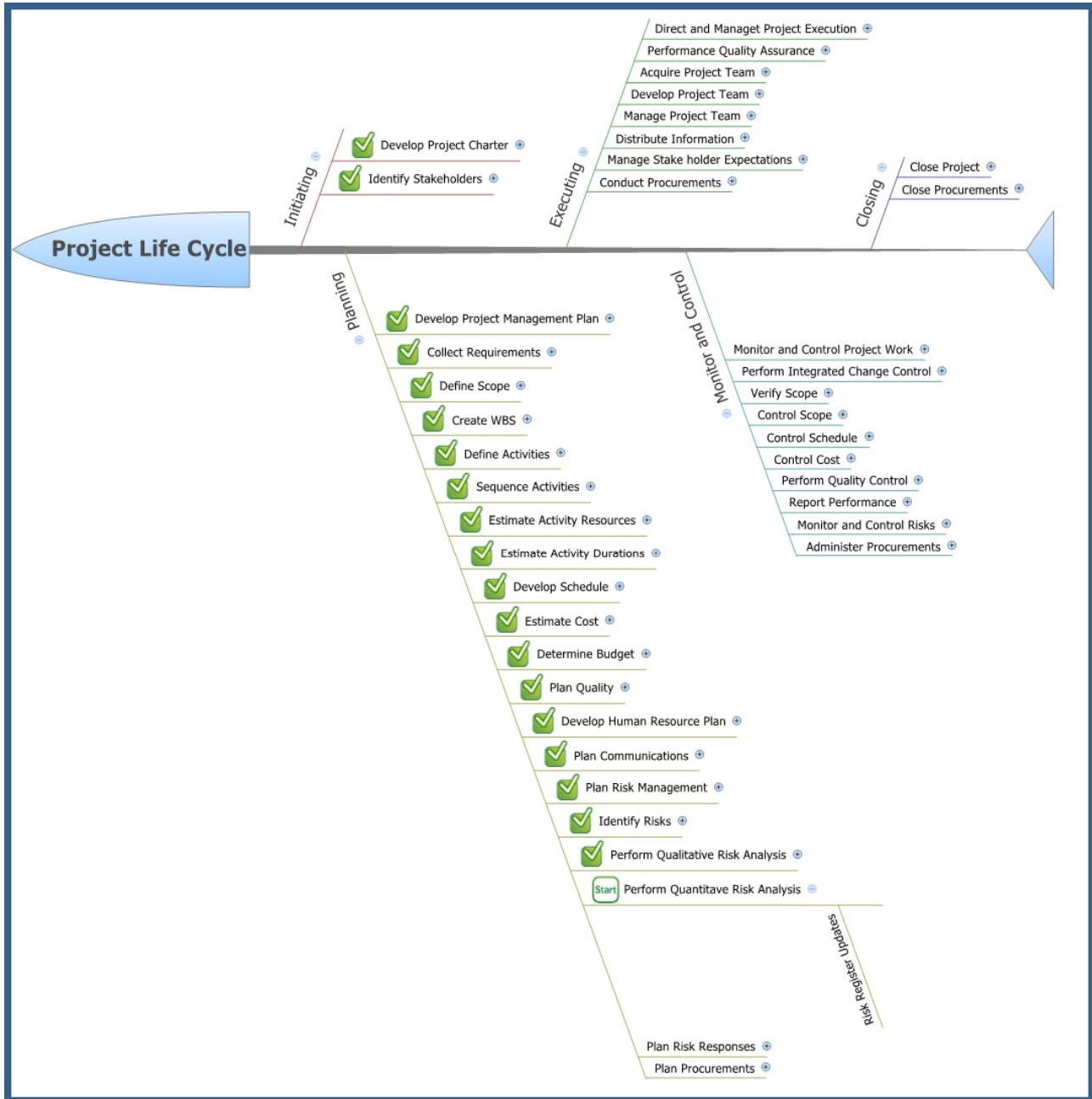
Planning

2.19 Plan Risk Response

2.19.1 Summary

A.   Risk response planning reduces the threats and opportunities that were identified earlier. The key to a successful plan is to ensure the appropriate level of response is taken. The response plan should also be completed in a timely and cost–effective manner.

2.19.2 Input

A.   Risk Management Plan

B.   Risk Register

2.19.3 Procedures

A.   The response plans will vary depending on the zone the risk fell into.

1.   Red Zone

   a.   Threats

      1)   Avoidance – Eliminating the cause of the risk by changing the project scope or plan. Choosing not to do that option. Avoidance must be a strategic decision as it can result in lost of capital or revenue, or possible cancellation of the project or phase.

      2)   Transference – Transfer the risk to a third party. It may reduce the amount of risk but will not eliminate the risk. Transference of risk can be done through insurance, bonds, warranties and contracts.

      3)   Mitigation – The attempt to reduce the impact or probability to reduce the risk associated with the item. This is typically a technical risk that can reduce threats by cause and effect.

   b.   Opportunities

      1)   Exploit – Taking action to make sure the risk happens

2)   Share – Would develop a joint venture to minimum risk.

3)   Enhancing – The opposite of mitigation to make probability or impact increase so the risk will happen.

2.   Yellow

a.   Acceptance – Maybe do nothing, just let it happen and potentially accept a lower profit, or develop a contingency plan should this occur for threats. Opportunities, the additional benefits and rewards, may just happen on their own.

B.   The responses need to be reviewed against the Red, Yellow, and Green to see if response planning is aligned for both opportunities and threats.

C.   Once, the response plan for the risk is determined, it should be recorded on the risk register. A detailed plan should be identified by the risk owner on how to achieve the selected response and manage it with in the time and cost constraints. Items to consider for the response plan, especially the Red Zone, are as follows:

1.   Triggers, symptoms, and earning signs or the risk occurring

2.   Fall–back plans for risks that have occurred

3.   Residual risks

4.   Contingency reserve

2.19.4   Tools and Techniques

A.   Contingent Response Strategies – Responses that only occur as certain events happen, such as missing a milestone or needing to make something a higher priority.

2.19.5   Output

A.   Update Risk Register

1.   Prioritize list of risks with responses. For Red, determine what type of response; for Yellow, develop some sort of contingency plan; for Green, verify acceptance and passive responses.

B.   Update the project management plan with the response.

C.	Contract decisions – Decisions to transfer the risk to a third party such as insurance, or subcontracts.

D.	Project Documents – Technical documents and assumption log.

2.19.6	References

A.	Project Management Body of Knowledge Section 11.5 – Plan Risk Responses

Planning

2.19.7   Flow Chart

Project Life Cycle

Initiating
- Develop Project Charter
- Identify Stakeholders

Executing
- Direct and Managet Project Execution
- Performance Quality Assurance
- Acquire Project Team
- Develop Project Team
- Manage Project Team
- Distribute Information
- Manage Stake holder Expectations
- Conduct Procurements

Closing
- Close Project
- Close Procurements

Planning
- Develop Project Management Plan
- Collect Requirements
- Define Scope
- Create WBS
- Define Activities
- Sequence Activities
- Estimate Activity Resources
- Estimate Activity Durations
- Develop Schedule
- Estimate Cost
- Determine Budget
- Plan Quality
- Develop Human Resource Plan
- Plan Communications
- Plan Risk Management
- Identify Risks
- Perform Qualitative Risk Analysis
- Perform Quantitave Risk Analysis
- Start Plan Risk Responses
- Plan Procurements

Monitor and Control
- Monitor and Control Project Work
- Perform Integrated Change Control
- Verify Scope
- Control Scope
- Control Schedule
- Control Cost
- Perform Quality Control
- Report Performance
- Monitor and Control Risks
- Administer Procurements

Risk Register Updates
Risk Related Contract Decisions
Risk Related Plan Updates
Project Management Plan updates
Project Document updates

2.19 Risk Response Planning (11.5).doc
https://gauravdakshini.com/pmp-certification-training/

Planning

2.20 Plan Procurement

2.20.1 Summary

A. This planning process involves evaluating what, when, and how you will be contracting out or purchasing. What resources does SSOE need to acquire from outside the organization. This should be performed very early on in the project. When considering how to acquire outside resources, the buyer should evaluate the project schedule, risk involved in using external resources, the type of contracts that need to be used, and the potential sellers.

2.20.2 Input

A. WBS (See Section 2.4 – Create WBS)

B. WBS Dictionary (See Section 2.4 – Create WBS)

C. Project Schedule (See Section 2.9 – Develop Schedule)

D. Cost Estimate (See Section 2.10 – Estimate Cost)

E. Scope Baseline (See Section 2.3 – Define Scope)

F. Type of market buyer's or seller's

G. Procurement procedures

H. Make/buy criteria

I. Risk Register (See Section 2.16 – Identify Risks)

J. Resource Requirements

2.20.3 Procedures

A. Develop a Procurement Management Plan for the project. The Plan will identify the number and type of various contracts and purchase orders required for the project. This is dependent on the project schedule and a logical division of work according to the layout of the project and the need for specialty skills.

B. SSOE prepares draft contract documents for contracts between the Owner and Contractor. SSOE's role is solely as the contract administrator, and SSOE does not hold contracts except in situations where SSOE is performing "at risk." The Owner then reviews the drafts, and acceptance of the final revision for project use are established.

C. Develop the qualified bidders list for the project through a pre–qualification process based on submitted information from the subcontractors, Dun & Bradstreet reports, prior experiences, and reputation.

2.20.4 Tools and Techniques

A. Determine if the resources should be internal or external. It is up to the Project Manager to determine the best method to complete the project on time and budget.

1. A make–or–buy analysis should be performed to determine which option provides the greatest opportunity for profit AND revenue.

2. Resource and budget constraints may either point to one solution, or may be in competition with each other.

B. Consult purchasing or contracts department for expert judgment.

C. The type of contract directly relates to the risk level. For example, SSOE has more risk if a cost plus percentage of cost is used to as a buyer. Risk can be minimized if a fixed price or lump–sum contract is used.

D. Identify a list of pre–qualified sellers from purchasing.

2.20.5 Output

A. Procurement management plan, which can describe how the procurement process is to be managed from development through closure.

B. Procurement documents, such as an RFI (request for information) or RFP (request for proposal, or quotation)

C. Contract statement of work (preliminary)

D. Make or buy decision

E. Source Selection Criteria

F. Requested changes

2.20.6 References

A. Project Management Body of Knowledge – Section 12.1

B. Procurement Procedures

Planning

2.20.7   Flow Chart
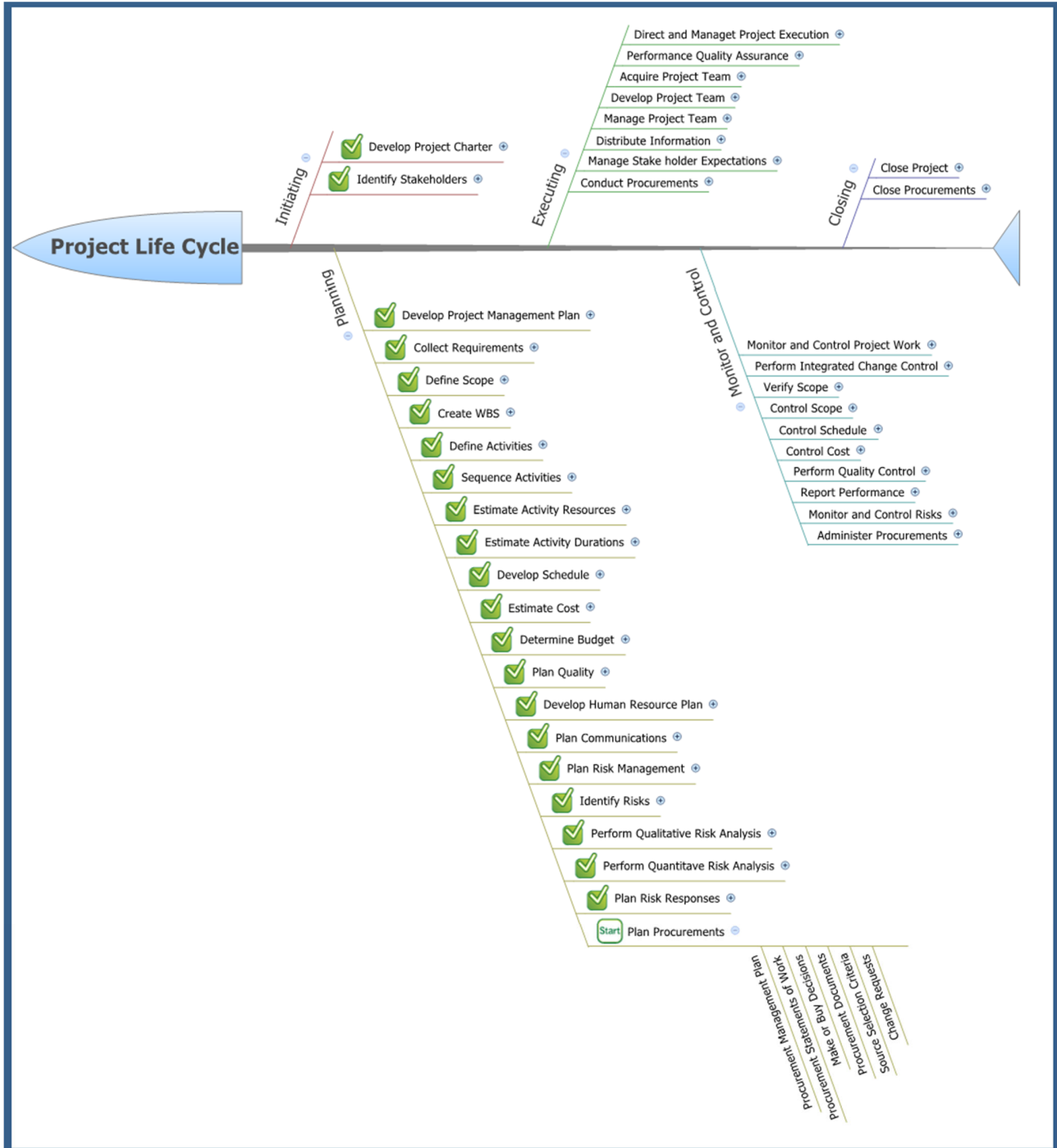
Executing

3.1 Direct and Manage Project Execution

3.1.1 Summary

A. In the execution phase of the project, the PM executes the project as described in the Project Management Plan (PMP) to meet the project objectives. Up until this point, the PM has planned the approach to be used; at this time, the approach is implemented.

3.1.2 Input

A. Project Management Plan (See Section 2.1 – Develop Project Management Plan)

B. Approved Change Requests (See Section 4.2 – Perform Integrated Change Control), including preventative or corrective actions

3.1.3 Procedures

A. Expert judgment should be exercised by the PM to direct and manage the execution of the PMP. When required, seek advice and recommendations from other PMs, the customer, or other stakeholders.

B. Utilize software to make the tasks more automated, such as scheduling software or Deltek.

C. Implement approved changes and update the following documents: PMP, Schedule, Deltek Plan, DWP's, Scope of Work.

3.1.4 Tools and Techniques

A. Scheduling software

B. Deltek

C. SharePoint

D. Other software packages to make the execution of the PMP automated

3.1.5 Output

A. Project deliverables

B. Project status (schedule and cost of deliverables)

C. Change requests, including corrective and preventative actions

D.   PMP and other project document (such as logs and registers) updates

3.1.6   References

A.   Project Management Body of Knowledge Section 4.3

Executing

3.1.7 Flow Chart
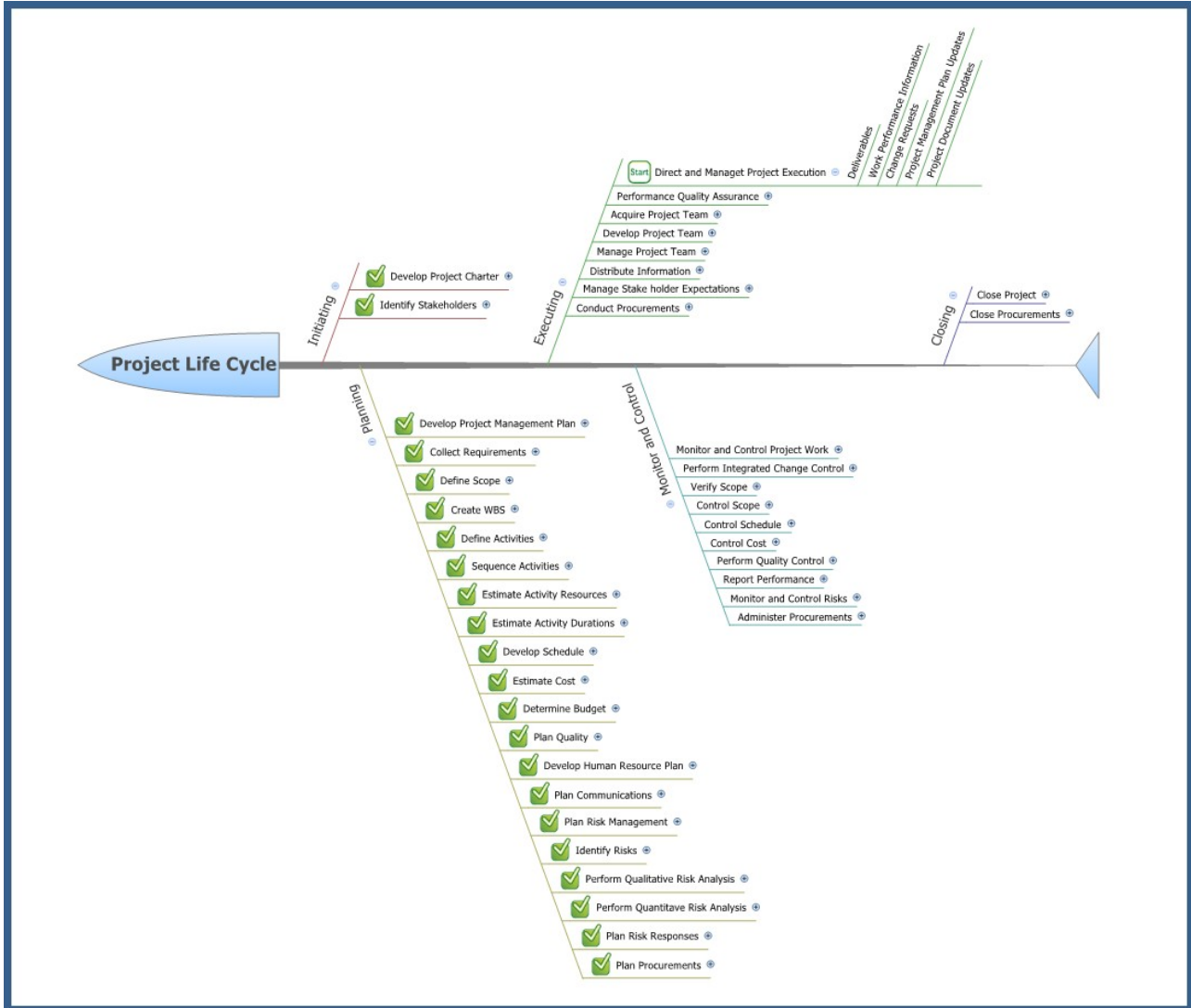
Executing

3.2 Perform Quality Assurance (QA)

3.2.1 Summary

A. Quality Assurance is ensuring the deliverables and processes meet the project requirements. This is accomplished at SSOE through quality audits. These processes and procedures are supported by the Quality Steering Committee with representatives from each business unit.

3.2.2 Input

A. Project Management Plan (See Section 2.1)

    1. Quality management plan (See Section 2.12)

    2. Process Improvement Plan (See Section 2.12)

B. Quality metrics (See Section 2.12)

C. Work performance information, including technical performance measure, deliverables and schedule status, and costs incurred.

D. Quality Control measurements

3.2.3 Procedures

A. The PM is responsible for preparing and attending any project audits for which they are the project manager.

B. Quality Audits (ISO audits) are done quarterly internally and once a year externally by the quality team. These audits help ensure quality is being met, cost is being reduced due to quality and customers are satisfied.

C. The Project Management ISO checklist can be reviewed and filled out prior to the audit.

3.2.4 Tools and Techniques

A. Project Management ISO checklist

3.2.5 Output

A. Requested change.

B. Recommended corrective actions.

C. Project management plan (updates) and other project related documents as determined by the ISO audit.

Executing

3.2.6 References

A. Quality procedures on the Intranet

B. Project Management Body of Knowledge – Section 8.2

3.2.7 Flow Chart
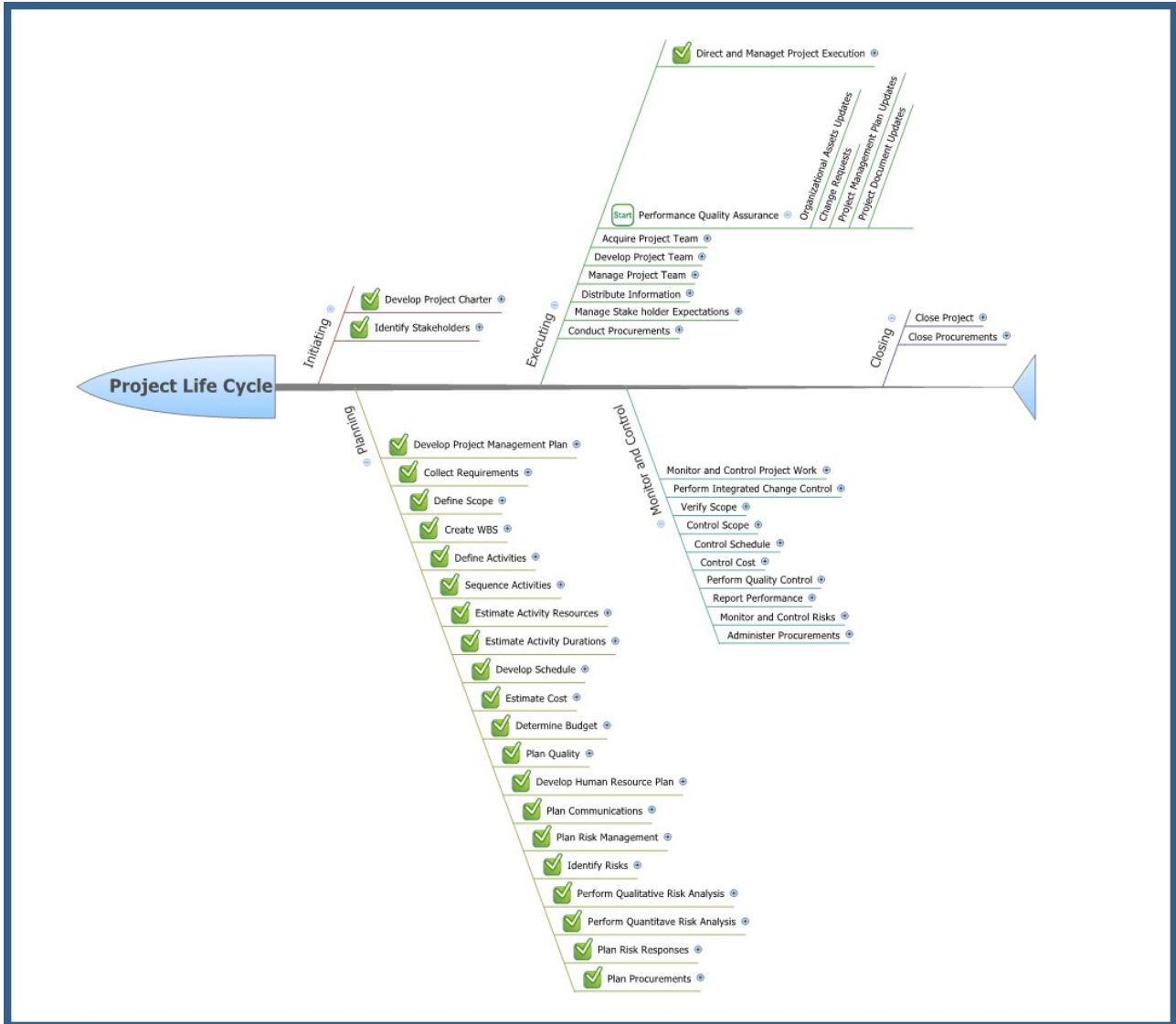
Executing

3.3 Acquire Project Team

3.3.1 Summary

A. Acquiring the Project Team consists of confirming the availability of staff to be utilized for the project. As the Project Manager, you may not have direct control over the team member selections, but it must be verified that the assigned staff are capable of completing their necessary tasks.

3.3.2 Input

A. From Project Management Plan:

   1. Roles and responsibilities

   2. Organization chart

   3. Staff management plan

3.3.3 Procedures

A. Meet with necessary Resource Managers to determine staff availability and credentials. Have the project budget and scope on hand to discuss who can best fulfill the necessary project obligations while staying within budget.

B. More experienced staff members may be able to complete the project tasks faster, but will cost more per hour for their use. Offsetting their costs using lower–level staff members and the China office is one way to compress the schedule without going over budget with higher staff level employees.

C. Utilizing staff with previous client or sector experience may expedite the project, as they are more familiar with the type of project at hand, even before the new project kicks off.

D. Multiple offices may be required to staff the project, depending on availability of the resources. Utilizing the Office Communicator during internal meetings is one method of communication to allow impromptu desktop sharing, as necessary.

3.3.4 Tools and Techniques

A. Pre–assignment occurs when resources are assigned to a project in advance. This occurs with nearly every proposal, as you are assigned the staff to assist in the proposal development. There is no guarantee that this will be the staff assigned to the project upon award; however, a download between the proposal staff and project staff leads should occur prior to the project kick–off.

B.   Acquisitions may be required if SSOE is not capable of performing the work. New staff may need to be hired to fill a specific need or to meet upcoming demand. Alternately, external staff can be contracted for the duration of the project to fill the necessary resource requirements. Another option is to subcontract portions of the work to individual consultants, if the contract with the Client allows.

C.   The use of virtual teams is strongly encouraged to support projects. This allows the PM to utilize resources from other locations that he may not have available at the primary project location. The use of the China office on projects and interactions with the local team is an example of a virtual team.

3.3.5   Output

A.   Project Staff Assignments – Names of the assigned resources dedicated to the project should be referenced in the Project Management Plan (PMP). This portion of the PMP should be updated as reassignments are made throughout the duration of the project.

B.   A Resource Calendar can be created to document each resource's availability, including both other project responsibilities and PTO time. This will help in identifying the need for contingency plans, and determining if a specific resource will need additional help to stay on schedule. This can be done in the resource module of Deltek or in scheduling programs.

C.   Discipline Work Plan

3.3.6   References

A.   Project Management Body of Knowledge Section 9.2 – Acquire Project Team

Executing

3.3.7 Flow Chart
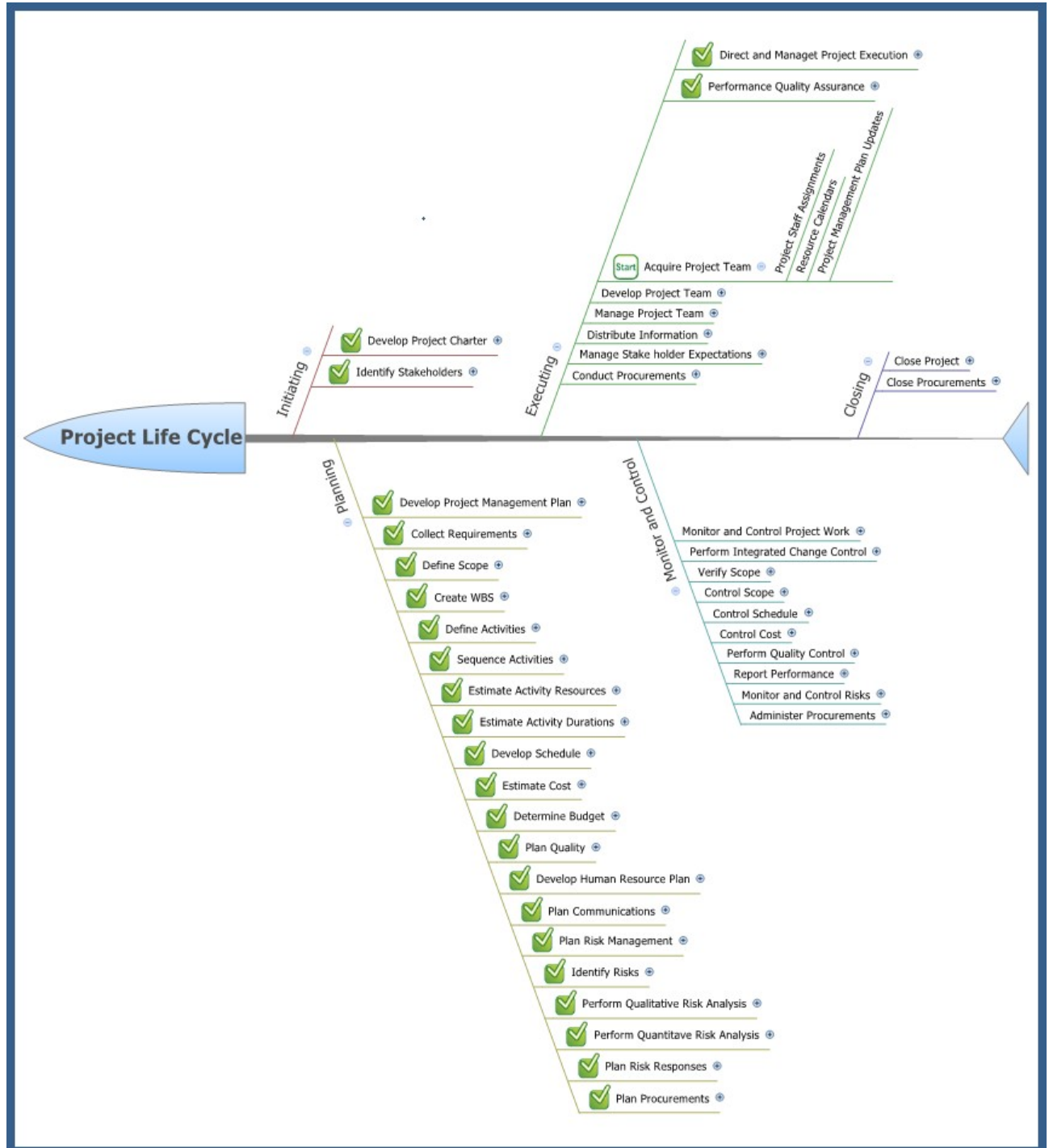
Executing

3.4 Develop Project Team

3.4.1 Summary

A. A PM needs to have the necessary skill sets to lead and communicate effectively with the project team. The PM needs to encourage team interaction and a team environment to strengthen the performance of the team. A key to successful team development is maintaining a level of trust with the team that will raise morale and reduce the likelihood of conflict, thus reducing non–productive time spent on the project.

3.4.2 Input

A. Staff assignments

B. Human Resource Plan (from the Project Management Plan)

C. Resource availability/Resource Calendars

3.4.3 Procedures

A. Start by assessing the team members assigned in 3.3 Acquire Project Team. Refer to the Human Resource Plan developed in 2.13, which should be part of your Project Management Plan, to review which rewards, training, and disciplinary actions would be most appropriately used with the team assigned. If necessary, update the Human Resource Plan as team performance assessments are evaluated throughout the project.

B. Communicate, communicate, communicate. The PM needs to have effective communication, leadership, problem solving, and motivational skills in order to help develop the project team. Often referred to as "soft skills," this skill set, particularly communication, can make or break a project.

C. Conflicts within the team can be reduced if the Project Manager attempts to anticipate others actions, acknowledge their concerns, and follow up with their issues. Implementing "Great Client Service" internally on the project can keep things moving smoothly.

D. Training the team members through either formal or informal measures, to ensure they are adequately prepared to handle their task assignments throughout the project, is a proactive approach to ensuring success on the project. Reviewing the available training sessions available through the intranet or volunteering a team member for a mentoring situation can help the team member develop their skills not only for the project at hand, but their overall career development and path forward.

3.4.4   Tools and Techniques

A.   Team Building Activities

1.   Having lunch with each other, when team members from external offices are together, provides valuable face time and promotes team–building.

2.   Spend the first five minutes of each meeting with an ice breaker topic, especially with a newly formed team, to get to know each other.

B.   Establish ground rules and state clear expectations.

C.   For a particularly long or resource intensive project where the staff members will be fully dedicated to one project, establishing a task force and locating the team members within close proximity of each other may be considered. This would depend upon the intensity of the project, the location of the team members (single office or multiple), the availability of space, and management discretion.

D.   Resource Recognition and Rewards – Approved and appropriate recognition and rewards should have been developed during the Develop Human Resource Plan process. It is important to reward only positive behavior. Rewarding the team as a whole rather than creating individualized rewards, encourages a team atmosphere rather than a competitive one.

1.   A team member working overtime because of an aggressive schedule is an example of positive behavior. Overtime worked due to poor planning is not.

3.4.5   Output

A.   Team performance assessments, measuring:

1.   Were objectives met?

2.   Was the schedule met?

3.   Was the project completed within budget?

B.   Recommendations to both the team member and their immediate supervisor for training in skill sets, and competencies needed, should be made to increase team effectiveness, both for the project at hand and future projects.

Executing

3.4.6   References

A.   Project Management Body of Knowledge – Section 9.3

3.4.7   Flow Chart

3.4 Develop Project Team (9.3).doc
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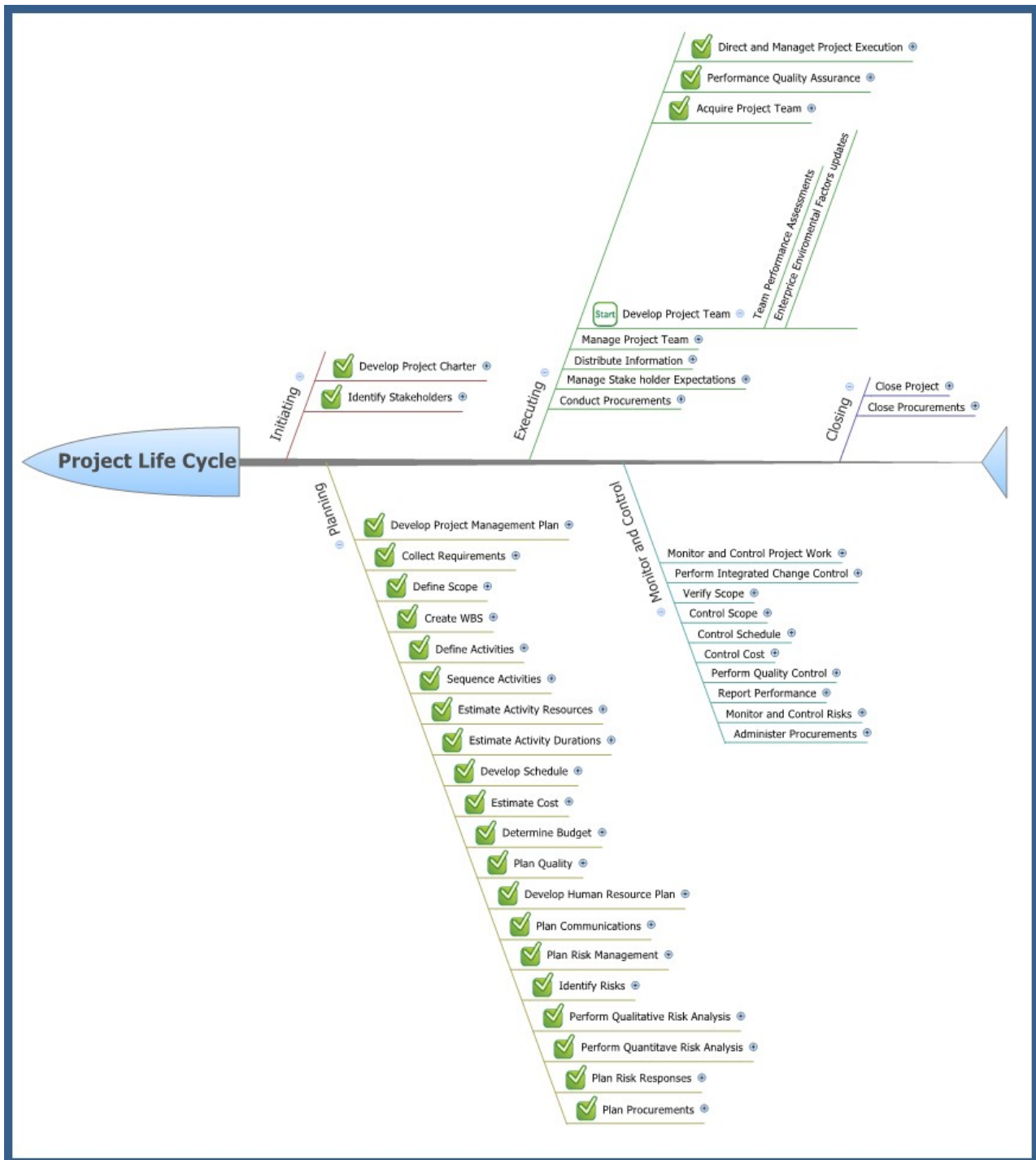
Executing

3.5 Manage Project Team

3.5.1 Summary

A. This phase of the project requires tracking each team member's performance through observation, providing feedback as necessary and managing conflict and changes to optimize the team's performance on the project. The PM needs to utilize his "soft skills," such as communication, conflict management, and leadership while guiding his team and recognizing high performance.

3.5.2 Input

A. Project Staff Assignments, including project team member list (Section 3.3 Acquire Project Team)

B. Human Resource Plan from the Project Management Plan (Section 2.13 Develop Human Resource Plan and Section 2.1 Develop Project Management Plan)

    1. Roles and Responsibilities

    2. Organization Chart

    3. Staffing Management Plan

C. Team Performance Assessments

D. Performance Reports (Section 4.8 Report Performance)

    1. Used to control schedule, cost, and quality, as well as aid in scope verification.

    2. Information obtained from performance reports will assist in forecasting human resource requirements and updating the staff management plan.

E. Organizational process assets

    1. ENR Magazine and other publications

    2. Reward structure

3.5.3 Procedures

A. The PM needs to be involved with the team to monitor progress toward deliverables, personal accomplishments with individual team members, and to resolve interpersonal issues before they become a problem.

B.   Project performance should be evaluated by the PM and constructive feedback should be given to the team members in order to help them develop overall and to increase efficiency on the project.

C.   Conflicts need to be managed quickly and effectively when they begin to arise. There is no way to avoid all conflicts during a project, but they must be dealt with in order to allow for greatest productivity. Sources of conflict may include people's workloads and project priorities.

1.   Creating ground rules from the start and utilizing effective communication practices may help is minimizing conflicts encountered.

2.   When disciplining or correcting a team member, it is usually best to do this in private in coordination with the department manager if necessary. It can be embarrassing and counter-productive to do this in front of the entire team or a group of people.

3.   Focus on the problem at hand, and not past experiences when dealing with a conflict.

D.   A PM must focus on their interpersonal skills, including:

1.   Leadership to inspire the project team to achieve high performance.

2.   The ability to influence the team and stakeholders, as the PM very rarely has direct authority over their team.

3.   Effective decision making to keep the project on-task as unexpected situations arise.

3.5.4   Tools and Techniques

A.   Team Rewards

1.   VIP Awards

2.   Spot Awards

3.   SSOE Company Store apparel or gift certificates

B.   PMBOK recognizes 6 techniques for resolving conflict:

1.   Collaborating – Looking at everyone's viewpoint and combining them into a consensus. All parties walk away feeling that their input was valued and taken into consideration.

2. Compromising – Making all parties content by finding a middle-ground.

3. Smoothing/Accommodating – Rather than focusing on differences, emphasize on the areas of agreement. This can help those having the conflict realize that their viewpoints may not be that different from each other, and may help them prioritize what the actual issues are.

4. Confronting/Problem Solving – Looking at various alternatives to "solve" the conflict having open conversations with the interested parties.

5. Forcing – Forcing one viewpoint on everyone. While sometimes the only way to move forward, the losing party will feel cheated of their input.

6. Withdrawing/Avoiding – Ignores the problem but does not resolve it. In very few instances is this an effective way to handle a conflict.

C. Some conflict resolution techniques are more effective overall than others, but each situation will require its own analysis to determine which approach should be used.

D. Keeping an issue log to document the conflicts that arise, who is responsible for their resolution, the time-frame in which the resolution should be met, and the final resolution may help in keeping the same conflicts from arising repeatedly throughout the project.

3.5.5 Output

A. Lessons learned may arise from conflict management.

B. Staffing changes may take place due to outside influences, such as other projects, or by choice. The Staffing Management Plan of the Project Management Plan may need updated if this occurs.

C. Preventative actions, such as having more than one person up-to-speed on a project in case outside obligations or personal events occur that remove the design lead from the project, may keep the project from losing time.

3.5.6 References

A. Project Management Body of Knowledge Section 9.4 – Manage Project Team

Executing

3.5.7 Flow Chart
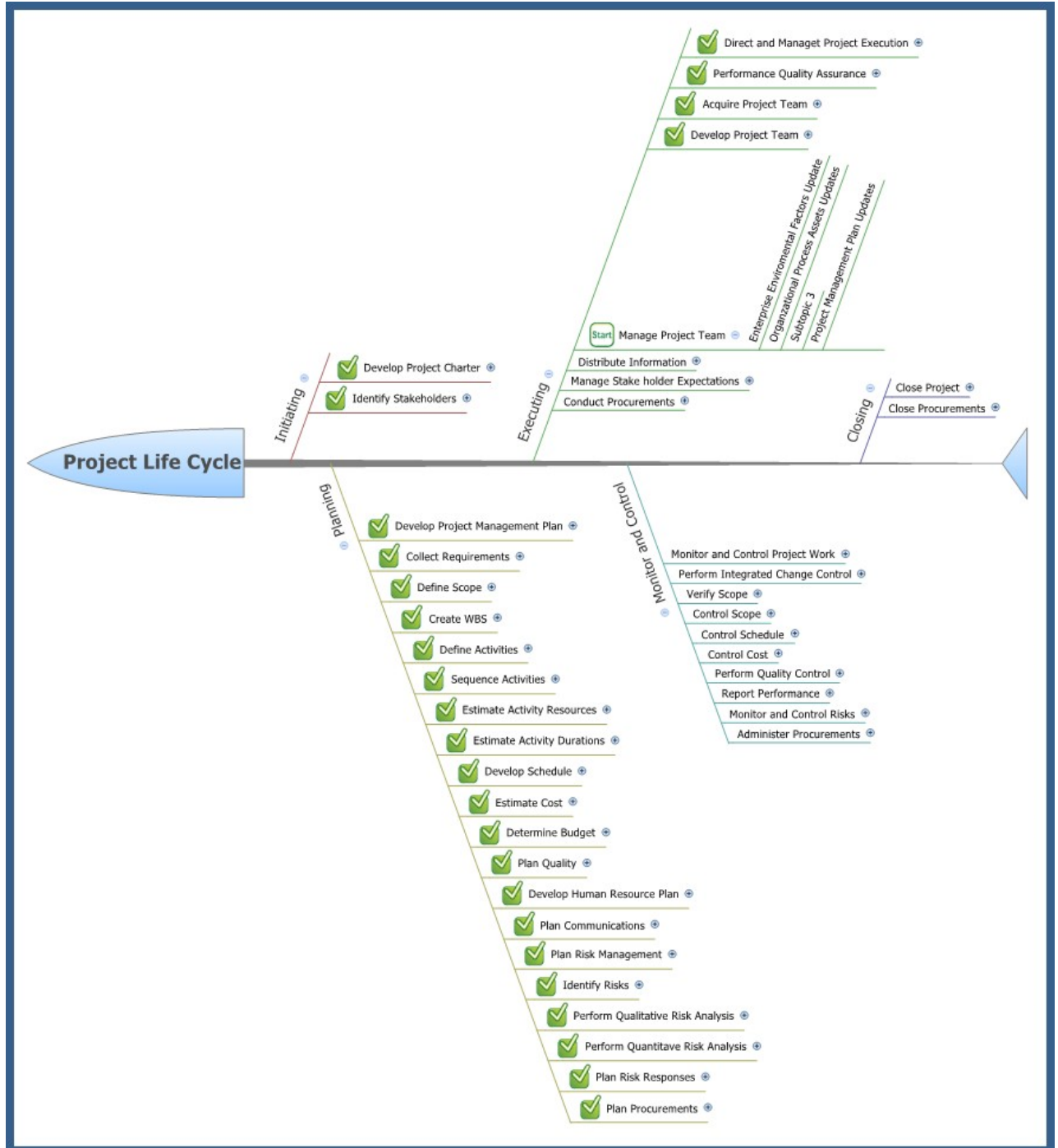
Executing

3.6 Distribute Information

3.6.1 Summary

A. Making needed information available to project stakeholders in a timely manner, as defined in the Communications Management Plan.

3.6.2 Input

A. Project Management Plan - Communications Management Plan (See Section 2.14 Plan Communications)

B. Work performance information and reports

3.6.3 Procedures

A. Meet with individuals, small groups, specific disciplines, or the entire team depending upon the topic. Make sure all interested parties are involved in discussions to avoid re-hashing the same information multiple times.

B. Document meetings with meeting minutes and distribute to all who attended, as well as other interested parties. Give the necessary stakeholders a short time frame (one or two business days) to submit corrections to the meeting minutes. If necessary, update and reissue.

C. DO NOT rely strictly on email to communicate with the team. Use your judgment to determine when a phone call or in-person conversation needs to take place to best facilitate the conversation.

3.6.4 Tools and Techniques

A. Develop and distribute an agenda prior to meetings.

B. Use meeting to deal with conflicts, when appropriate

C. Verify phone conversations with a follow-up email. This puts the conversation in writing, and gives both parties the chance to verify that the same information was both sent and received by all parties.

D. Information Distribution Methods, including Distribution Lists, SharePoint, ProjectWise, Prolog, and other information sharing software packages

Executing

3.6.5 Output

A. Project reports, including status report and status logs

B. Feedback from stakeholders

C. Lessons Learned

3.6.6 References

A. Project Management Body of Knowledge Section 10.3 - Distribute Information

Executing

3.6.7   Flow Chart

Executing

3.7 Manage Stakeholder Expectations

3.7.1 Summary

A. Constant communication and working with the stakeholders to address their needs as soon as they're identified. Actively managing the stakeholders expectations will increase the likelihood of project success, as the stakeholder will understand both the risks and benefits of the decisions being made. It is important to anticipate their needs rather than wait for the stakeholder to find fault or issue with the project, in order to influence their expectations of the situation.

3.7.2 Input

A. Stakeholder Register and Stakeholder Management Strategy (See Section 2.1 – Identify Stakeholders)

B. Project Management Plan – Communication Management Plan (See Section 2.14 – Plan Communications)

C. Issue Log (also known as an IO Matrix or Action Item list)

D. Change Log (also known as a PCO Log)

3.7.3 Procedures

A. This phase of the project relies heavily on the soft skills of the Project Manager. Effective communication is key to building trust and resolving conflict with the stakeholders and overcoming their resistance to necessary changes.

B. The ability to negotiate and present yourself in a professional manner when presenting or writing is also important when coordinating and directing a group of people who may not have the same interests in the project or its final direction.

3.7.4 Tools and Techniques

A. Active listening

B. Negotiating skills

3.7.5 Output

A. Lessons learned

B. Corrective or preventative actions

C. Change requests

D.   Project Management Plan updates

E.   Stakeholder register or stakeholder management strategy updates

F.   Issue log updates

3.7.6   References

A.   Project Management Body of Knowledge Section 10.4 – Manage Stakeholder Expectations

B.   Project Management Body of Knowledge Appendix G – Interpersonal Skills

Executing

3.7.7 Flow Chart

Executing

3.8 Conduct Procurements

3.8.1 Summary

A. Collecting the bids or proposals and awarding the contract. The prospective sellers spend the majority of the cost to prepare the bid or quote.

3.8.2 Input

A. Project management plan (See Section 2.1 – Develop Project Management Plan).

B. Procurement documents, such as: (also see Section 2.20 – Plan Procurements)

    1. Requests For Quote (RFQ) and Purchase Orders (PO)

    2. Bid Packages and Contracts

        a. Drawings and specifications

        b. Bid proposal forms

        c. Sample contract

        d. General and Supplementary Conditions

        e. Owner's safety manual and other site specific requirements

        f. Contract schedule

C. Evaluation criteria form.

D. Proposals from qualified sellers.

E. Risk register and risk contracts (See Section 2.19 – Plan Risk Responses)

F. Procurement Management Plan, including make–or–buy decisions.

3.8.3 Procedures

A. Conducting a prebid meeting allows all the prospective sellers to meet with the buyer (SSOE, the Owner, or both) to discuss the Bid Package(s). This allows the sellers to receive the same information at the same time, and gives them an opportunity to ask questions regarding scope, content, schedule, etc.

B.   Evaluation criteria should be determined prior to receiving bids. Defining the criteria in a matrix format can help in the evaluation of multiple bidders. Below is an example:

Bid Tab Form	Listed Importance	Define Quality Criteria When sending out Proposal
Delivery	.5	
$$$	.2	
Insurance	.1	
PE	.1	
Financial	.1	

C.   During project execution, the contract forms are used by SSOE to develop bid packages according to the Procurement Management Plan and project schedule. Bid packages are preferably issued to prequalified bidders by invitation only. Sealed Bids are submitted in a competitive manner on a fixed–price basis. The bids are opened, tabulated, and a determination is made to identify those bidder(s) to invite to bid review meetings.

    1.   The more complete and detailed the bid pack, the more accurate and consistent the bids will come back.

D.   The purpose of the bid review meeting is to conduct a thorough review of the bidders Bid Proposal. The primary objectives are to verify that the Bid Proposal covers the complete scope of work of the project, and to identify whether any discrepancies existed in the Bid Documents that affected the contractor's bid proposal.

E.   Perform the screening process to ensure they have met the minimum seller requirements established.

F.   Determine the apparent successful bidder for the contract. At this point, it will be necessary to obtain additional information necessary for the contract documents, primarily certificate(s) of insurance and wage rate structures for the contractor and subcontractors.

G.   Contract documents are then prepared and submitted to the Owner for review/approval. The contract will be between the Owner and Contractor. Two copies are prepared and sent to the Owner for review. Upon approval, the Owner first sends the contracts to the contractor for signature. The contractor signs both copies and sends the copies to the Owner for signature. Following owner signature, one copy of the signed contract is

returned to the contractor.   The contract is now considered to have been "executed."

3.8.4 Tools and Techniques

A. Prebid meetings.

B. Purchase Order or Contract documents.

C. Review subcontractor evaluation forms from previous projects.

3.8.5 Output

A. Selected Sellers

B. Contract or Purchase Order – mutually binding

C. Resource availability

D. Requested changes

E. Procurement management plan updates:

1. Including Cost, Scope, and Schedule baselines

2. Procurement Management Plan

3.8.6 References

A. Project Management Body of Knowledge – Section 12.2

Executing

3.8.7   Flow Chart

```
┌─────────────────────────────────────┐
│ Receive, open and tabulate bids.     │
│ Confirm all required bid documents   │
│ have been submitted.                 │
└─────────────────────────────────────┘
                  │
                  ▼
┌─────────────────────────────────────┐
│ Review any clarifications and        │
│ qualifications included in bids.     │
└─────────────────────────────────────┘
                  │
                  ▼
┌─────────────────────────────────────┐
│ Identify those bidders to conduct    │
│ bid review meetings with.            │
└─────────────────────────────────────┘
                  │
                  ▼
┌─────────────────────────────────────┐
│ Conduct bid review meetings to       │
│ determine whether bidder has         │
│ provided for full requirements of bid│
│ package or RFQ in its Bid Proposal   │
│ or Quotation.                        │
└─────────────────────────────────────┘
                  │
                  ▼
┌─────────────────────────────────────┐
│ Identify the apparent successful     │
│ bidder.  Prepare the contract or     │
│ purchase order documents to be       │
│ issued to the successful bidder.     │
│ Obtain the necessary signatures to   │
│ fully execute the contract or        │
│ purchase order.                      │
└─────────────────────────────────────┘
```

Executing

Direct and Managet Project Execution ⊕
Performance Quality Assurance ⊕
Acquire Project Team ⊕
Develop Project Team ⊕
Manage Project Team ⊕
Distribute Information ⊕
Manage Stake holder Expectations ⊕

Initiating
Develop Project Charter ⊕
Identify Stakeholders ⊕

Executing
Start Conduct Procurements ⊕
Select Sellers
Procurement Contract Award
Resource Calendars
Change Requets
Project Management Plan Updates
Project Document Updates

Closing
⊖ Close Project ⊕
Close Procurements ⊕

Project Life Cycle

Planning
Develop Project Management Plan ⊕
Collect Requirements ⊕
Define Scope ⊕
Create WBS ⊕
Define Activities ⊕
Sequence Activities ⊕
Estimate Activity Resources ⊕
Estimate Activity Durations ⊕
Develop Schedule ⊕
Estimate Cost ⊕
Determine Budget ⊕
Plan Quality ⊕
Develop Human Resource Plan ⊕
Plan Communications ⊕
Plan Risk Management ⊕
Identify Risks ⊕
Perform Qualitative Risk Analysis ⊕
Perform Quantitave Risk Analysis ⊕
Plan Risk Responses ⊕
Plan Procurements ⊕

Monitor and Control
Monitor and Control Project Work ⊕
Perform Integrated Change Control ⊕
Verify Scope ⊕
Control Scope ⊕
Control Schedule ⊕
Control Cost ⊕
Perform Quality Control ⊕
Report Performance ⊕
Monitor and Control Risks ⊕
Administer Procurements ⊕

Monitoring and Controlling

4.1   Monitor and Control Project Work

4.1.1   Summary

A.   Monitoring and controlling the project work consists of measuring the performance of the project to what was defined in the Project Management Plan (PMP). Corrective or preventative actions may need to be taken to keep the project in line with the PMP, and if deviations from the PMP need to be taken, change requests need recognized. Risks need to be identified and tracked to ensure the proper risk responses have been developed and are being implemented if necessary.

4.1.2   Input

A.   Project Management Plan (See Section 2.1 – Develop Project Management Plan)

B.   Work performance information (See Section 4.8 – Report Performance)

C.   Government and industry standards

D.   Lessons Learned

4.1.3   Procedures

A.   Expert judgment must be exercised by the PM to interpret the information collected from the various reports. Constant conversations need to take place with the team to determine their level of completeness with the deliverables, if there are issues the team is running into, and to ensure that the team is staying within the defined scope.

B.   Review the schedule, project status reports, deliverables, and resource utilization at regular intervals set dependant on project size and phase.

1.   Weekly review is recommended; however, throughout slower portions of the project biweekly may be sufficient.

C.   Identify Lessons Learned opportunities as they are encountered.

D.   Record TAV items

E.   Verify ISO standards are being met in accordance with the Project Management Plan.

Monitoring and Controlling

4.1.4   Tools and Techniques

    A.   Scheduling Software

    B.   Deltek

    C.   ISO Checklist

    D.   Other software packages used to track project progress

4.1.5   Output

    A.   Forecast reports

    B.   Change requests, including corrective and preventative actions

    C.   Project Management Plan and project document updates

4.1.6   References

    A.   Project Management Body of Knowledge Section 4.4 – Monitor and Control Project Work

Monitoring and Controlling

4.1.7   Flow Chart
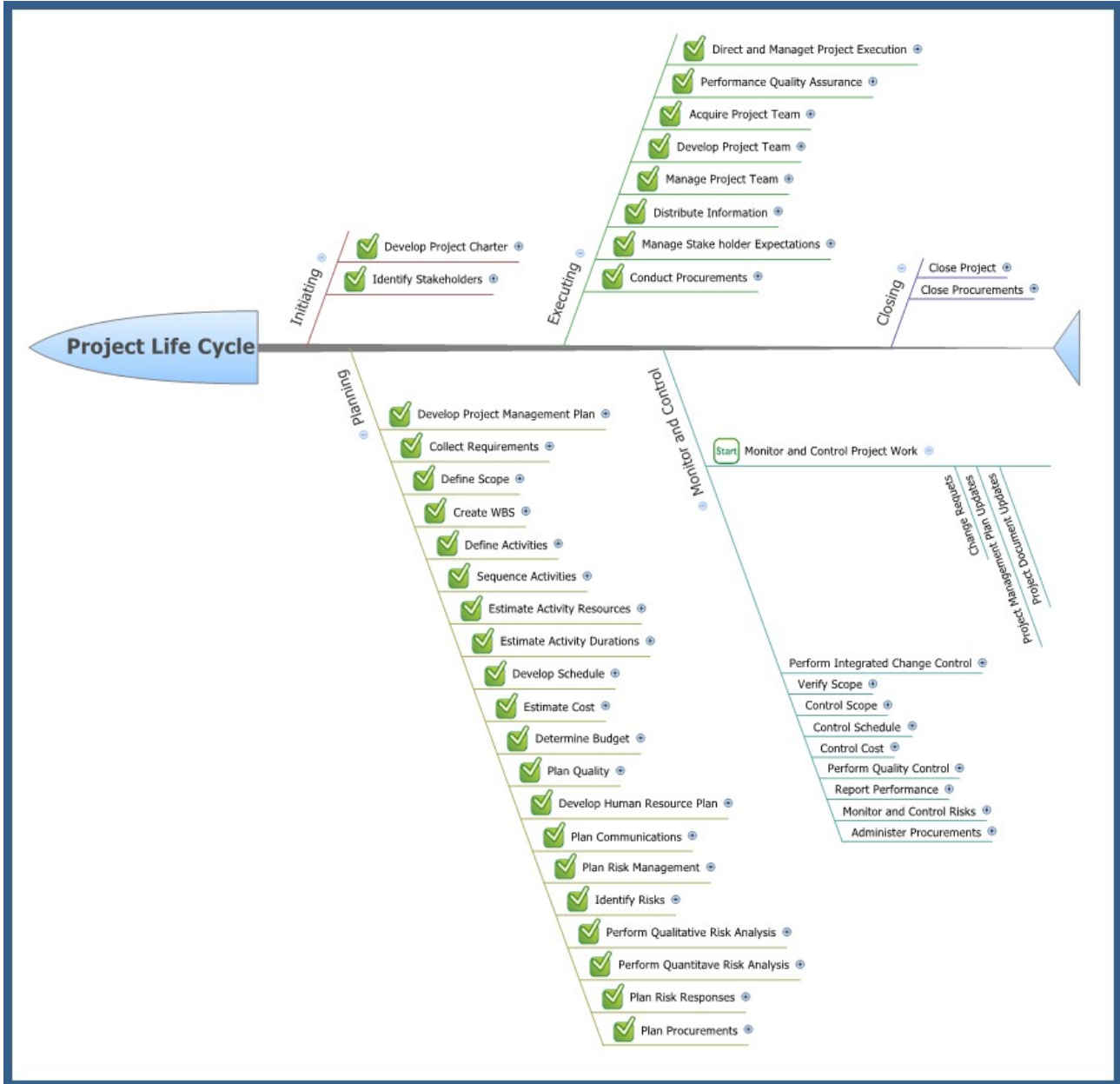
Monitoring and Controlling

4.2 Perform Integrated Change Control

4.2.1 Summary

A. Perform Integrated Change Control (ICC) is the process of approving or rejecting, and the overall management of, changes to the deliverables and Project Management Plan (PMP). Depending upon the PMP, some project documents may also need updated through the ICC process. It is of the utmost importance to ensure that only approved changes are incorporated into the project in order to control cost, schedule, and client expectations.

4.2.2 Input

A. Project Management Plan and other Project Documents (See Section 2.1 – Develop Project Management Plan)

B. Work Performance Information (See Section 4.8 – Report Performance)

C. Change Requests

4.2.3 Procedures

A. The PM needs to be watchful of the project team or other stakeholders attempting to circumvent the ICC process in modifying the project deliverables.

B. Project Change Orders and other change requests need to be formally identified as they are encountered and analyzed as soon as possible.

  1. Very often, changes can be implemented without causing project disturbance early on, but if left unattended can become a project risk.

  2. It is important to be clear to both the client and internal team what is in scope and out of scope, as client "wish–list" items are mentioned throughout meetings, emails, etc., after the project budget is set. The client needs to understand they are impacting the cost and schedule with every modification they request.

C. The PM should request the assistance of the project discipline leads when writing Project Change Orders, to get their expert opinion on the best wording of the scope change and the expected cost and schedule impact.

  1. The PM needs to evaluate the requested change in full, realizing that it not only affects the obvious change being

requested, but its potential to impact other processes, such as the project quality standards, risks, and staffing assignments.

D. Although Project Change Orders are typically thought of as cost additions, change requests can be cost additions or reductions, changes to the schedule, or any other request to deviate from the formal PMP.

E. As deviations from the PMP are encountered, the PM needs to identify a preventative or corrective action to either keep the project from veering off course, or bring the project back in line. The PM may choose to discuss these actions with the client or other stakeholders before making a decision.

F. Some clients may request a Change Control Board to review and approve/reject all project change requests. This can range anywhere from a formal board, to an informal group of people (or person) that must review all change requests. It is important to identify the clients' requirements and approval process during the Planning stage of the project.

G. The PM should identify a plan to communicate approved and rejected change requests regularly to the project team, client, and other interested stakeholders. A few suggestions include:

1. The PM should keep a log to track all change requests, including their status, due date, responsibility, and final resolution.

2. The PM can include change requests as a recurring agenda item on their internal and external weekly coordination meetings. At this time, pending change requests, approved/reject change requests, and preventative/corrective actions can be discussed and reviewed.

3. The PM can send out email reminders weekly (or during another time–frame that makes sense for the project size and complexity) of pending change requests, approved/rejected change requests, and preventative/corrective actions planned or in place.

H. As soon as a change order is approved, the PM ensures the following is updated:

1. Project Plan

2. Schedules

3. Deltek Project Plan

4. DWP's (if used)

5. Scope of Work

6. Project Management Plan

4.2.4   Tools and Techniques

A. Utilizing a configuration management system with the ICC provides a higher level of standardization with monitoring the baseline scope, schedule, and costs with requested changes. Specific systems in place that can assist with this process include:

1. Primavera scheduling software can be used to identify a baseline schedule, then track the approved changes implemented.

2. Deltek Project Planning has the capability to save a baseline which can later be used for comparisons.

B. Create and maintain a change request log.

C. Standard SSOE PCO template.

4.2.5   Output

A. Baseline updates

B. Project Management Plan updates

C. Change request status updates:

1. It is not uncommon for a change request to be sent back to the originator for more information or to revise the change request based on the discussions held and new information

4.2.6   References

A. Project Management Body of Knowledge Section 4.5 – Perform Integrated Change Control

Monitoring and Controlling

4.2.7   Flow Chart
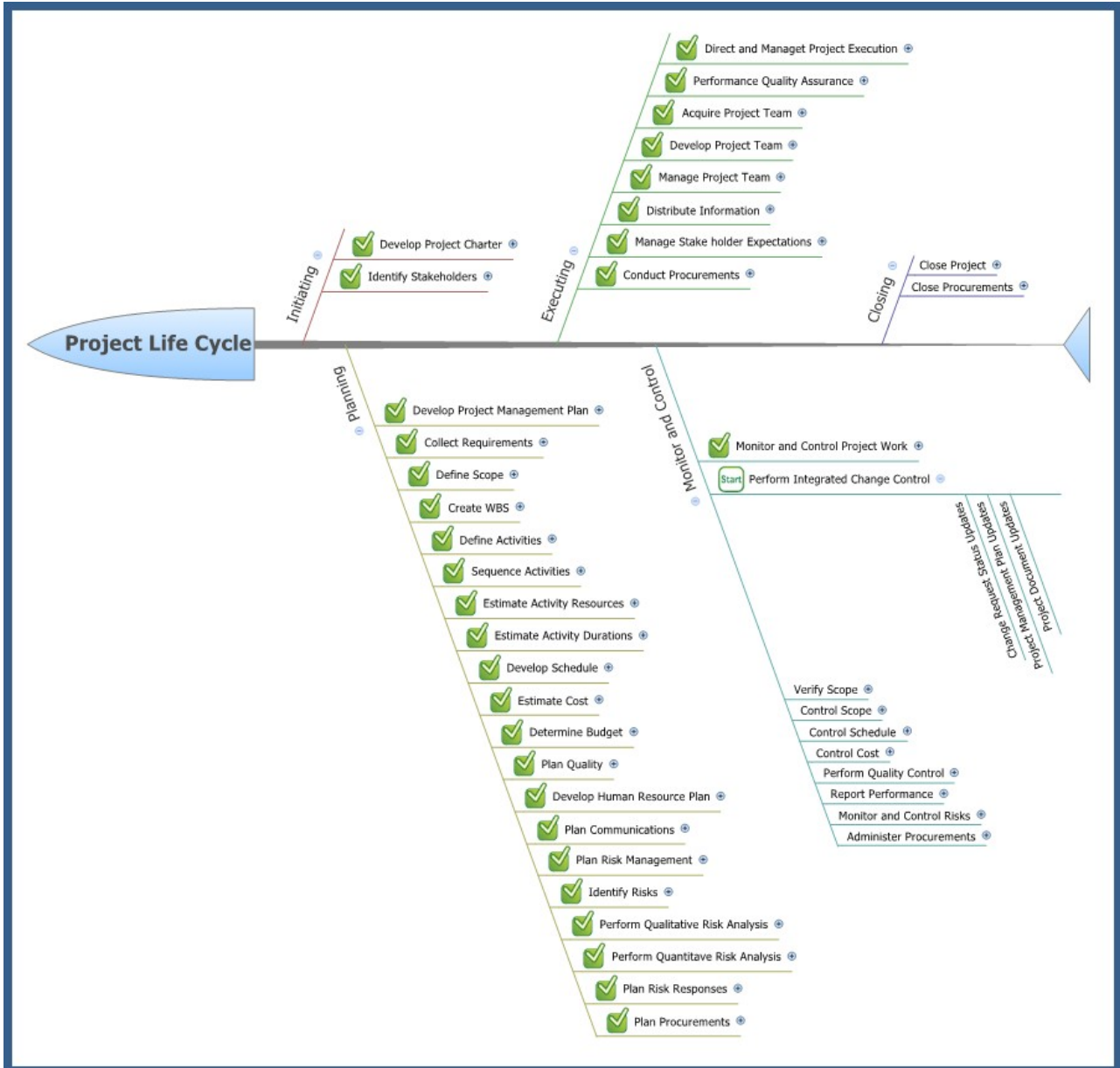
Monitoring and Controlling

4.3   Verify Scope

4.3.1   Summary

A.   Scope verification is the formal acceptance of the completed project tasks and deliverables by the customer. Verifying the scope that has been performed meets the requirements of the project scope statement and quality plan, as discussed and agreed to in Section 2.2 – Collect Requirements.

4.3.2   Input

A.   Project Management Plan (See Section 2.1 – Develop Project Management Plan

    1.   Project Scope Statement (See Section 2.3 – Define Scope)

    2.   WBS and WBS Dictionary (See Section 2.4 – Create WBS)

B.   Requirements documentation (See Section 2.2 – Collect Requirements)

C.   Validated deliverables

4.3.3   Procedures

A.   Review the deliverables by verifying them against the requirements and expectations determined in the Collect Requirements section of the planning phase.

B.   SSOE typically does this in the form of incremental design reviews. The final design review is generally considered the formal acceptance of the product prior to issuing the documents.

C.   Quality control should be performed before handoff of the deliverables to the client.

4.3.4   Tools and Techniques

A.   Standard checking process

B.   Review meetings

4.3.5   Output

A.   Accepted deliverables

B.   Requested changes

C.   Recommended corrective action

4.3.6 References

A. Project Management Body of Knowledge Section 5.4 – Verify Scope

4.3.7 Flow Chart

Monitoring and Controlling

4.4 Control Scope

4.4.1 Summary

A. Scope control is monitoring the scope statement against the work being performed by reviewing the WBS and project requirements and comparing them to the work actually being completed. Preventing scope creep or uncontrolled changes through the change management process outlined in the Integrated Change Control Section (4.2) and controlling the impact of the changes are also functions of controlling scope.

4.4.2 Input

A. Project Management Plan (See Section 2.1 – Develop Project Management Plan)

1. Project Scope Statement (See Section – 2.3 Define Scope)

2. Change Management Plan (See Section 4.2 – Perform Integrated Change Control)

3. Requirements Management Plan (See Section 2.2 – Collect Requirements)

B. Work Performance Reports (See Section 4.8 – Report Performance)

C. I/O Matrix

D. Approved change requests

4.4.3 Procedures

A. Performance and Variance Reports are two acceptable ways to monitor and control scope in conjunction with the Integrated Change Control Process. Cost variance and performance reports can be done in Deltek and/or Scheduling Programs. Schedule performance is best managed within a scheduling tool.

B. The PM should be evaluating any variations from the baseline scope and determine if any preventative or corrective actions, such as a project change order, is necessary.

C. If changes are needed to be made, they should be identified in the project schedule, Deltek, and the Change Management system.

Monitoring and Controlling

4.4.4   Tools and Techniques

A.   Project Performance Report example – Primavera

New Process Kitchen				Project Performance - Evaluation								08-12-09 16:03
Activity Name	Budgeted Labor Units	Actual Labor Units	Remaining Labor Units	Activity % Complete	Performance % Complete	Budgeted Total Cost	Earned Value Cost	Actual Total Cost	Estimate To Complete	Estimate At Completion Cost	Cost Performance Index	Schedule Performance Index
New Process Kitchen	7713h	3173h	7783h		39.11%	$698,496	$265,269	$268,276	$533,451	$801,727	0.99	0.95
Project Management	1230h	479h	585h		30%	$160,921	$31,473	$51,664	$115,049	$166,713	0.61	0.85
Project Project Management	760h	330h	430h		30%	$87,000	$23,400	$38,874	$90,706	$129,579	0.60	0.86
Project PM Summary 0001.10	760h	330h	430h	48.42%	30%	$87,000	$23,400	$38,874	$90,706	$129,579	0.60	0.86
Facilities Project Management	470h	149h	156h		30%	$73,921	$8,073	$12,790	$24,344	$37,133	0.63	0.84
Facilities PM Summary 0001.20	235h	79h	156h	49.02%	30%	$71,564	$8,073	$10,433	$24,344	$34,776	0.77	0.84
Facilities PM Estimate Summary 0001.30	235h	71h	0h	49.02%	30%	$2,357	$0	$2,357	$0	$2,357	0.00	0.00
Process	3377h	1705h	2005h		37.7%	$265,176	$99,970	$137,913	$279,668	$417,581	0.72	0.69
PFD's / P&ID's / Mass Balance	1301h	873h	760h		60%	$81,651	$48,991	$73,034	$48,689	$121,724	0.67	0.60
PFD's / P&ID's / Mass Balance Summary 0002.10	1301h	873h	760h	50%	60%	$81,651	$48,991	$73,034	$48,689	$121,724	0.67	0.60
Raw Ingredients up to Likwifiers	660h	172h	488h		30%	$62,306	$18,692	$16,035	$37,415	$53,450	1.17	1.07
Raw Ingredients up to Likwifiers Summary 0002.20	660h	172h	488h	41.51%	30%	$62,306	$18,692	$16,035	$37,415	$53,450	1.17	1.07
Likwifiers thru Surge Tanks	752h	353h	400h		15%	$71,404	$10,711	$29,932	$169,616	$199,548	0.36	0.68
Likwifiers thru Surge Tanks Summary 0002.30	752h	353h	400h	36.07%	15%	$71,404	$10,711	$29,932	$169,616	$199,548	0.36	0.68
Equipment Modeling (China)	398h	272h	127h		60%	$25,853	$15,512	$15,468	$10,312	$25,779	1.00	0.60
Equipment Modeling (China) Summary 0002.40	398h	272h	127h	85%	60%	$25,853	$15,512	$15,468	$10,312	$25,779	1.00	0.60
Pricing (Vendor Quoting)	80h	16h	64h		15%	$7,490	$1,124	$1,680	$9,520	$11,200	0.67	0.00
Pricing (Vendor Quoting) Summary 0002.50	80h	16h	64h	0%	15%	$7,490	$1,124	$1,680	$9,520	$11,200	0.67	0.00
Administration	186h	20h	167h		30%	$16,472	$4,942	$1,764	$4,116	$5,880	2.80	1.09
Administration Summary 0002.70	186h	20h	167h	47.57%	30%	$16,472	$4,942	$1,764	$4,116	$5,880	2.80	1.09
Depalletizing	49h	39h	19h		60%	$4,012	$2,407	$3,424	$2,283	$5,707	0.70	1.62
Depalletizer Layout Summary 0003.10	49h	39h	19h	65.22%	60%	$4,012	$2,407	$3,424	$2,283	$5,707	0.70	1.62
Process Utilities	1035h	202h	1617h		30%	$82,500	$24,750	$16,936	$44,417	$61,353	1.46	0.84
Steam / Condensate	270h	124h	538h		30%	$21,000	$6,300	$9,808	$22,885	$32,693	0.64	1.07
Steam / Condensate Summary 0004.10	270h	124h	538h	40.93%	30%	$21,000	$6,300	$9,808	$22,885	$32,693	0.64	1.07
Water	350h	58h	684h		30%	$27,000	$8,100	$5,200	$12,133	$17,333	1.56	1.07
Water Summary 0004.20	350h	58h	684h	28.85%	30%	$27,000	$8,100	$5,200	$12,133	$17,333	1.56	1.07
Compressed Air	150h	4h	146h		30%	$12,000	$3,600	$352	$821	$1,173	10.23	1.07
Compressed Air Summary 0004.30	150h	4h	146h	36.81%	30%	$12,000	$3,600	$352	$821	$1,173	10.23	1.07
Floor Drains	110h	16h	94h		30%	$9,000	$2,700	$1,408	$3,285	$4,693	1.92	0.30
Floor Drains Summary 0004.40	110h	16h	94h	17.86%	30%	$9,000	$2,700	$1,408	$3,285	$4,693	1.92	0.30
Relocations	90h	0h	90h		30%	$7,000	$2,100	$0	$4,900	$4,900	0.00	1.07
Relocations Summary 0004.50	90h	0h	90h	35.52%	30%	$7,000	$2,100	$0	$4,900	$4,900	0.00	1.07
Administration	65h	0h	65h		30%	$6,500	$1,950	$168	$392	$560	11.61	1.09
Administration Summary 0004.60	65h	0h	65h	27.03%	30%	$6,500	$1,950	$168	$392	$560	11.61	1.09
Controls	541h	120h	421h		21.1%	$50,325	$10,579	$13,938	$45,511	$59,448	0.76	0.85
System Architecture	180h	96h	84h		30%	$16,700	$5,010	$10,818	$25,241	$36,058	0.46	0.94
System Architecture Summary 0005.10	180h	96h	84h	46.03%	30%	$16,700	$5,010	$10,818	$25,241	$36,058	0.46	0.94
Design Deliverables	321h	24h	297h		15%	$29,725	$4,459	$3,120	$17,680	$20,800	1.43	0.74
Design Deliverables Summary 0005.20	321h	24h	297h	31.25%	15%	$29,725	$4,459	$3,120	$17,680	$20,800	1.43	0.74
Administration	40h	0h	40h		30%	$3,900	$1,110	$0	$2,590	$2,590	0.00	1.05
Administration Summary 0005.30	40h	0h	40h	35.9%	30%	$3,900	$1,110	$0	$2,590	$2,590	0.00	1.05
Architectural	202h	272h	420h		60%	$18,580	$28,068	$17,340	$6,269	$23,609	1.62	1.90
Depalletizer Bldg D/B Package	102h	58h	49h		60%	$9,500	$5,700	$3,214	$2,143	$5,357	1.77	1.38
Arch - Depalletizer Bldg D/B Package Summary 00	102h	58h	49h	52.08%	60%	$9,500	$5,700	$3,214	$2,143	$5,357	1.77	1.38
Rig Room Modifications	51h	100h	368h		60%	$4,095	$22,368	$6,190	$4,127	$10,317	3.61	2.10
				Page 1 of 2				TASK filter: WBS Summary Activities Only.				
												© Primavera Systems, Inc.

B.   Cost Performance Report example (Longeway EV) – Deltek

EV CPI Report

SSOE, INC.				For the period 7/24/09 - 8/20/09						Tuesday, August 18, 2009 11:21:44 AM
Estimate Overhead	EV Pct Comp	Budget Hours	JTD Hours	Budget Hrs % Used	Total Comp (Budget)	JTD Billing	Budget $ % Used	Rev Type	JTD Revenue	CPI
Project Manager: Stauffer, John										
009-00053-00 Concerto (CJ3)	81.99	12,621.01	12,954.75	1.03	1,441,798.00	1,293,467.25	.90	EVH	1,131,528.20	.97
Total for Stauffer, John	81.99	12,621.01	12,954.75	1.03	1,441,798.00	1,293,467.25	.90		1,131,528.20	.97
Final Totals	81.99	12,621.01	12,954.75	1.03	1,441,798.00	1,293,467.25	.90		1,131,528.20	.97

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4.4.5   Output

A.   Work performance measurements – planned versus actual (See 4.8 – Report Performance)

B.   Project Management Plan

1.   Updated project scope statement

a.   WBS and WBS Dictionary

b.   Scope Baseline

C.   Requested changes

D.   Recommended corrective actions

E.   Lessons Learned

4.4.6   References

A.   Project Management Body of Knowledge Section 5.5 – Control Scope

Project Management Guidelines
Monitoring and Controlling

4.4.7   Flow Chart
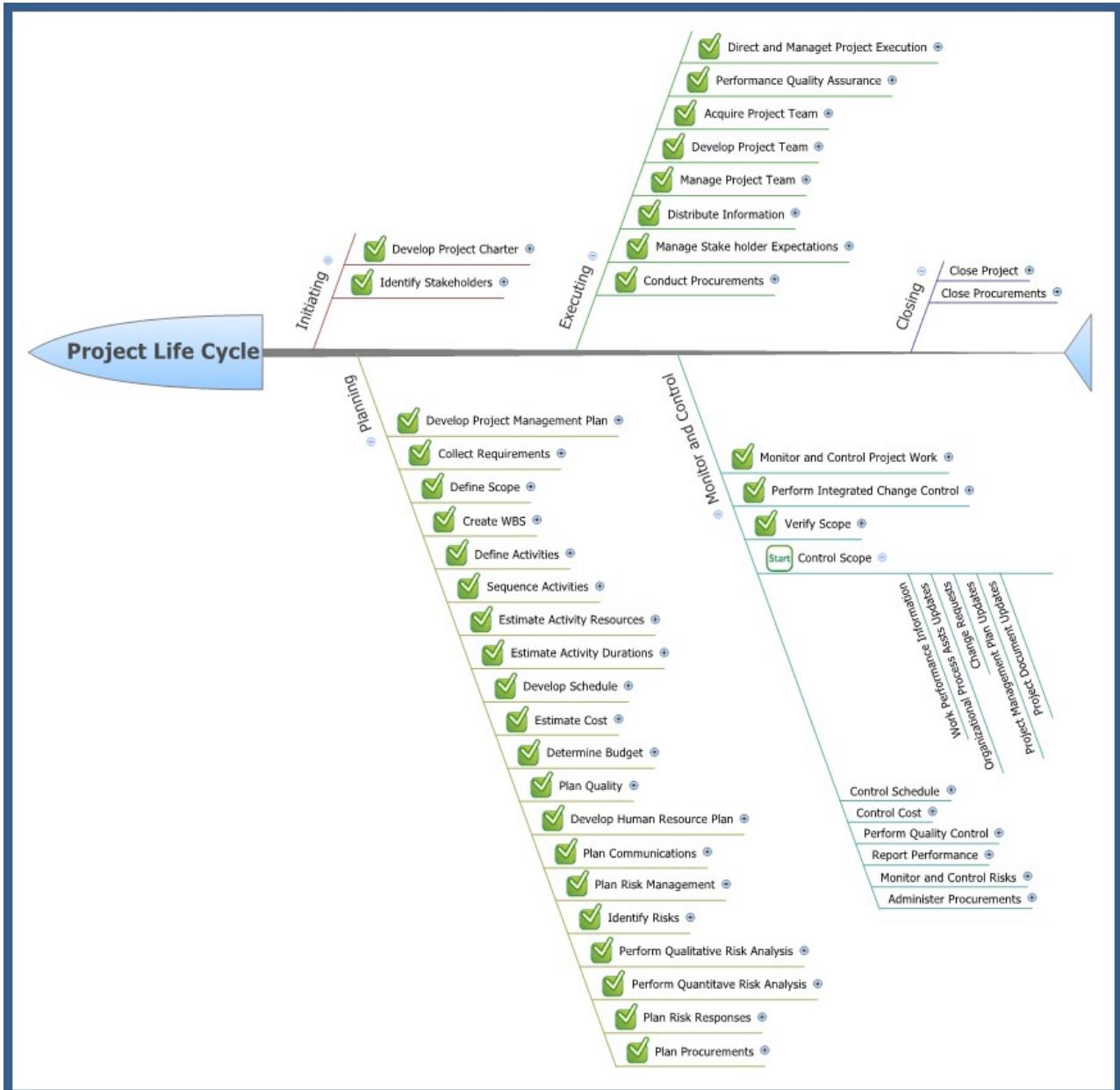
Monitoring and Controlling

4.5   Control Schedule

4.5.1   Summary

A.   Schedule control is monitoring the current status of the project against the baseline of the schedule and determining what activities have changed and what caused them to change. Gathering activity information, reviewing work performance data, and evaluating variances are all part of controlling the schedule. The Integrated Change Control process is also a component of schedule control when changes impact scope, time, or budget. Schedule control is a joint effort between the client, project management, and the project controls team.

4.5.2   Input

A.   Project Management Plan

1.   Schedule Management Plan (See Section 2.1 – Develop Project Management Plan)

2.   Baseline Schedule (See Section 2.9 – Develop Schedule)

B.   Current Schedule

C.   Work Performance Information, including status updates on the project's activities

4.5.3   Procedures

A.   Performance information and schedule updates can be obtained from a scheduling status report sent from the management team to the discipline leads for comments, then returned to the PM or scheduler to update the schedule. Schedule status can also be a reoccurring item in the weekly coordination meetings, and this information can be obtained then and passed along, if necessary, to the project scheduler. Schedule updates should then be reviewed in the next project meeting.

B.   The schedule should be evaluated for slippage from the baseline by looking at a variance report. If the schedule changes will not impact the overall project schedule, the PM needs to evaluate if corrective action really needs to be taken.

C.   A performance report should also be looked at the see if the project is still on track. The Schedule Performance Index (SPI) and schedule variance (SV) are two indicators as to how the project is performing.

D.   When there are schedule changes that impact the critical path the schedule may need to be looked at to determine if it needs to be compressed to meet the project milestone dates. Schedule compression can be found in the schedule development schedule (see 2.21).

4.5.4   Tools and Techniques

A.   Resource Leveling – This tool can allow you to balance your resource needs and look at options as to how to compress the schedule. Variance Analysis – Looking at SPI (Earned Value/ Planned Value) and SV (Earned Value – Planned Value), along with total float, will give you a magnitude of the degrees of variance on the projects and help decide if any preventative or corrective actions are necessary.

4.5.5   Output

A.   Project Management Plan Updates

1.   Schedule baseline to incorporate any changes made to the baseline.

2.   Cost baseline – Changes that impacted the cost of the project.

3.   Work Performance Measurement – The SPI and SV should be documented, reported by WBS, and sent to the project team.

B.   Requested Changes, Preventative and/or Corrective Actions – These actions should be processed through the integrated change management process.

4.5.6   References

A.   Project Management Body of Knowledge – Section 6.6.

Monitoring and Controlling

4.5.7   Flow Chart
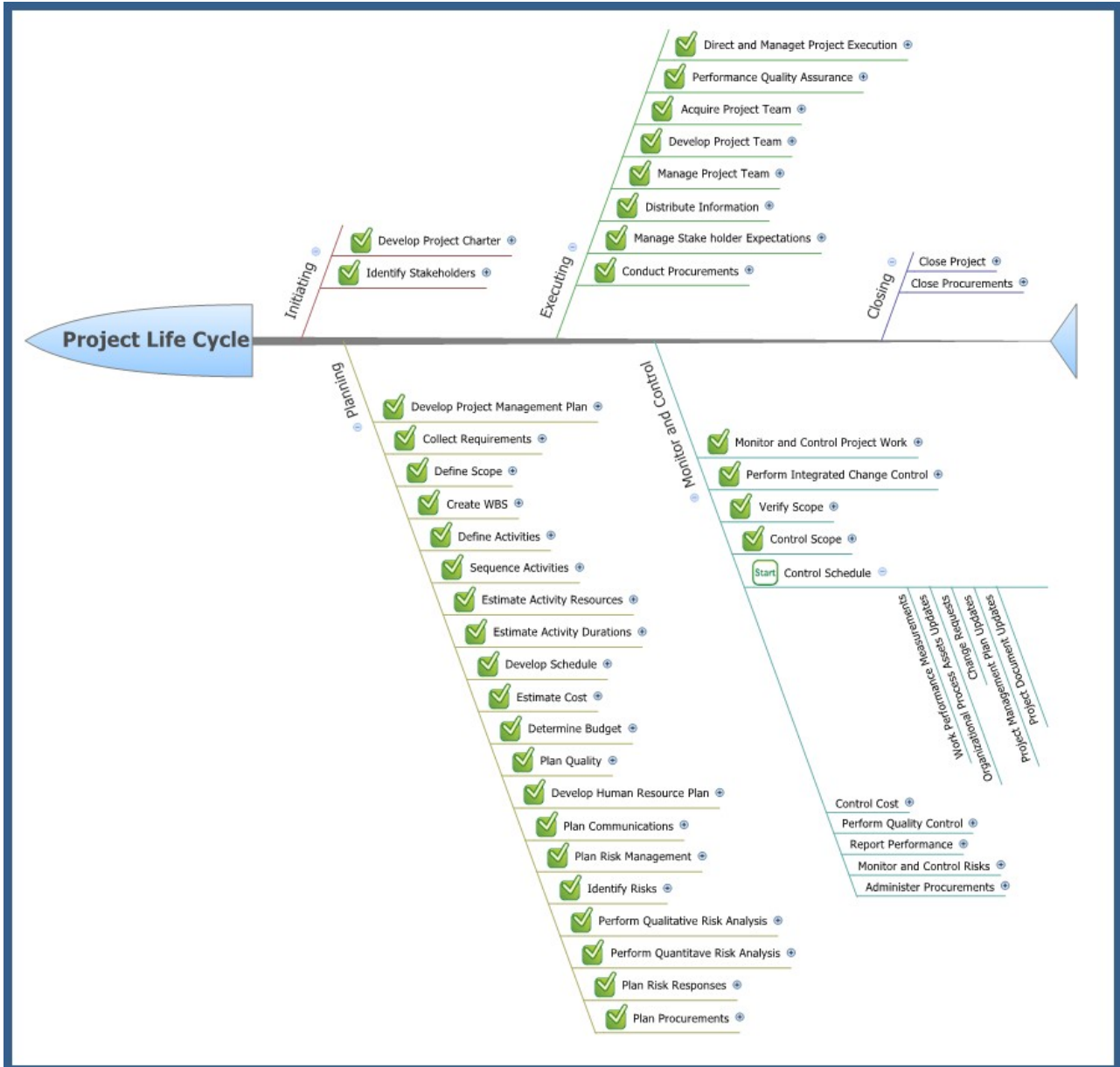
Monitoring and Controlling

4.6 Control Cost

4.6.1 Summary

A. Cost control is the process of monitoring the cost baseline and managing it against the performance and changes that are being made against the baseline. Effective cost control involves knowing what you have spent to date, what is the value of the work you have performed, and where will the budget end up at the end of the project. A project manager who knows those answers will have a greater success of completing the project under budget. There is little value in knowing the actual cost is less than the budget, unless there is an understanding on performance. Cost control is analyzing the relationships between these values.

4.6.2 Input

A. Project Management Plan

1. Cost baseline

2. Cost Management Plan

B. Project funding requirements

C. Work performance information

4.6.3 Procedures

A. Cost control can be done in the scheduling program or within the planning module in Deltek. The schedule or plan should be reviewed and updated as defined in the cost management plan.

B. A Cost Performance Report from the scheduling software can be run or "The Longeway – EV" report can be run in Deltek.

C. Key points to analyze on either report:

1. What is the Cost Performance Index (CPI)?

a. If it is less than 1.0, the project is not performing according to the plan. If it is greater than 1.0, the project is trending to come in under budget. The CPI tolerance needs to be considered depending on the stage the project is in and how performance is being evaluated. If the project is taking a milestone approach to work performance, the CPI may be underperforming until the milestone has been achieved. If it is still below 1.0 after the milestone, preventative or corrective action may

need to be addressed to complete the project with in the authorized budget.

2. What is the cost variance?

   a. Cost variance looks at the earned value of the WBS versus the actual cost. If the variance is negative, the project is trending to complete over budget.

3. What is the Estimate at Completion?

   a. If the estimate at completion is greater than the budget at completion, the project again is trending to run over budget based on the current work performance.

D. Forecasting and recognizing trends before the WBS element or project is key to effective cost control.

4.6.4 Tools and Techniques

A. Deltek

B. Contract Manager

C. Biweekly Cost Report

D. Project Cost Report

E. Earned Value Technique (EVT)

1. Cost Variance (CV) = EV–AC

   a. Negative = over budget

   b. Positive = over budget

2. Cost Performance Index (CPI) = EV/AC

   a. Less than 1.0 over budget

   b. Greater than 1.0 under budget

3. Schedule Variance (SV) = EV–PV

   a. Negative – Behind schedule

   b. Positive – Ahead of schedule

4. Schedule Performance Index (SPI) = EV/PV

    a. Less than 1.0 is behind schedule

    b. Greater than 1.0 is ahead of schedule

F. Forecasting

1. Estimate AT complete (EAC) = AC + ETC (Estimate to complete)

or

EAC = AC + ETC (remaining budget)

EAC = AC + (BAC – EV)

or

ETC adjusted by performance

ETC (CPI factored) = (BAC–EV) CPI project

EAC = AC + ETC (CPI factored)

EAC = AC + (BAC–EV)/CPI project

4.6.5 Output

A. Work Performance Measurements and Forecasting Reports

Activity Name	Budget At Completion (BAC) - Labor Units	Actual Labor Units	Remaining Labor Units	Activity % Complete	Performance % Complete	Budget At Completion	Actual Total Cost	Earned Value Cost	Estimate To Complete	Estimate At Completion Cost	Cost Performance Index	Schedule Performance Index
New Process Kitchen	7713h	3173h	7783h		37.63%	$698,496	$268,276	$262,828	$535,651	$803,927	0.98	1.01
Project Management	1230h	479h	586h		30%	$160,921	$51,664	$49,276	$120,549	$172,213	0.93	0.76
Project Project Management	760h	330h	430h		30%	$87,000	$38,874	$26,100	$90,706	$129,579	0.67	0.83
Project PM Summary 0001.10	760h	330h	430h	48.42%	30%	$87,000	$38,874	$26,100	$90,706	$129,579	0.67	0.83
Facilities Project Management	470h	149h	156h		30%	$73,921	$12,790	$22,176	$29,843	$42,633	1.73	0.69
Facilities PM Estimate Summary 0001.30	235h	71h	0h	49.02%	30%	$2,357	$2,357	$707	$5,500	$7,857	0.30	0.84
Facilities PM Summary 0001.20	235h	79h	156h	49.02%	30%	$71,564	$10,433	$21,469	$24,344	$34,776	2.06	0.69
Process	3377h	1706h	2009h		37.7%	$265,176	$137,913	$99,970	$279,868	$417,581	0.72	0.96
PFD's / P&ID's / Mass Balance	1301h	873h	760h		60%	$81,651	$73,034	$48,991	$48,689	$121,724	0.67	1.08
PFD's / P&ID's / Mass Balance Summary 0002.10	1301h	873h	760h	50%	60%	$81,651	$73,034	$48,991	$48,689	$121,724	0.67	1.08
Raw Ingredients up to Likwifiers	660h	172h	488h		30%	$62,306	$16,035	$18,692	$37,415	$53,450	1.17	1.37
Raw Ingredients up to Likwifiers Summary 0002.20	660h	172h	488h	41.51%	30%	$62,306	$16,035	$18,692	$37,415	$53,450	1.17	1.37
Likwifiers thru Surge Tanks	752h	353h	400h		15%	$71,404	$29,932	$10,711	$169,616	$199,548	0.36	0.68
Likwifiers thru Surge Tanks Summary 0002.30	752h	353h	400h	36.07%	15%	$71,404	$29,932	$10,711	$169,616	$199,548	0.36	0.68
Equipment Modeling (China)	390h	272h	127h		60%	$25,053	$15,468	$15,512	$10,312	$25,779	1.00	0.66
Equipment Modeling (China) Summary 0002.40	390h	272h	127h	65%	60%	$25,053	$15,468	$15,512	$10,312	$25,779	1.00	0.66
Pricing (Vendor Quoting)	80h	16h	64h		15%	$7,490	$1,680	$1,124	$9,520	$11,200	0.67	2.90
Pricing (Vendor Quoting) Summary 0002.50	80h	16h	64h	0%	15%	$7,490	$1,680	$1,124	$9,520	$11,200	0.67	2.90
Administration	186h	20h	167h		30%	$16,472	$1,764	$4,942	$4,116	$5,880	2.80	0.90
Administration Summary 0002.70	186h	20h	167h	47.57%	30%	$16,472	$1,764	$4,942	$4,116	$5,880	2.80	0.90
Depalletizing	49h	39h	19h		60%	$4,012	$3,424	$2,407	$2,283	$5,707	0.70	0.89
Depalletizer Layout Summary 0003.10	49h	39h	19h	65.22%	60%	$4,012	$3,424	$2,407	$2,283	$5,707	0.70	0.89
Process Utilities	1035h	202h	1617h		30%	$82,500	$16,936	$24,750	$44,417	$61,353	1.48	1.70
Steam / Condensate	270h	124h	538h		30%	$21,000	$9,808	$6,300	$22,895	$32,693	0.64	1.05
Steam / Condensate Summary 0004.10	270h	124h	538h	40.93%	30%	$21,000	$9,808	$6,300	$22,895	$32,693	0.64	1.05
Water	360h	58h	664h		30%	$27,000	$5,200	$8,100	$12,133	$17,333	1.56	1.89
Water Summary 0004.20	360h	58h	664h	28.65%	30%	$27,000	$5,200	$8,100	$12,133	$17,333	1.56	1.89
Compressed Air	150h	4h	146h		30%	$12,000	$352	$3,600	$821	$1,173	10.23	1.62
Compressed Air Summary 0004.30	150h	4h	146h	36.81%	30%	$12,000	$352	$3,600	$821	$1,173	10.23	1.62
Floor Drains	110h	16h	94h		30%	$9,000	$1,408	$2,700	$3,285	$4,693	1.92	5.06
Floor Drains Summary 0004.40	110h	16h	94h	17.86%	30%	$9,000	$1,408	$2,700	$3,285	$4,693	1.92	5.06
Relocations	90h	0h	90h		30%	$7,000	$0	$2,100	$4,900	$4,900	0.00	2.34
Relocations Summary 0004.50	90h	0h	90h	36.52%	30%	$7,000	$0	$2,100	$4,900	$4,900	0.00	2.34
Administration	65h	0h	65h		30%	$6,500	$168	$1,950	$392	$560	11.61	3.19
Administration Summary 0004.60	65h	0h	65h	27.03%	30%	$6,500	$168	$1,950	$392	$560	11.61	

B.   Requested change

C.   Recommended corrective action

D.   Project management plan updates

      1.   Cost Performance baseline

      2.   Cost Management Plan

4.6.6   References

A.   Project Management Body of Knowledge Section (7.3)

B.   Deltek Training Documents

C.   Project Controls Departments

Monitoring and Controlling

4.6.7   Flow Chart
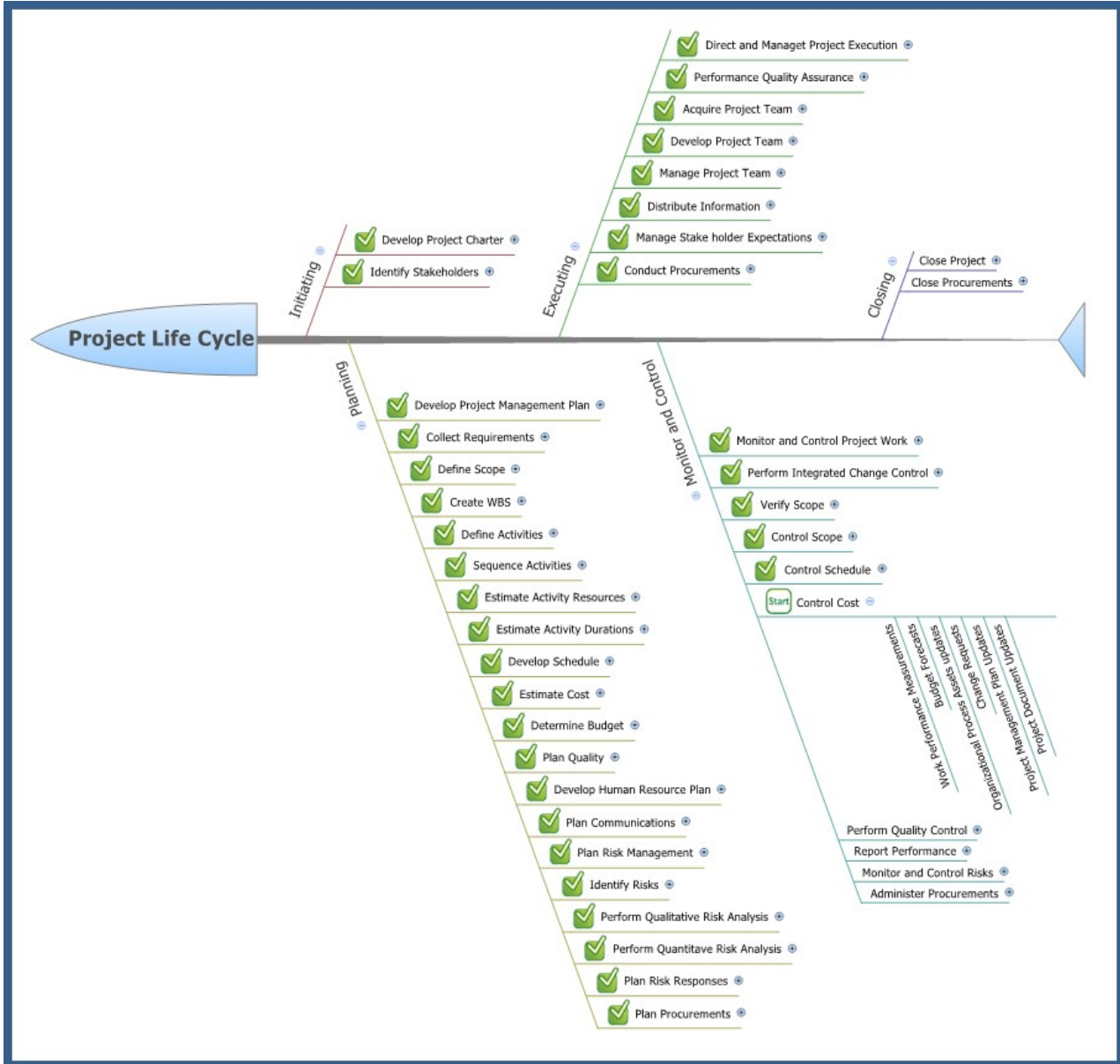
Monitoring and Controlling

4.7   Perform Quality Control

4.7.1   Summary

A.   Quality Control consists of performing the tests and inspections that were described in the planning phase to ensure that the specific measurements the project is performing as planned. This will help the PM know if his quality plan is working. Quality control is an ongoing process throughout the project.

4.7.2   Input

A.   Project Management Plan (See Section 2.1 – Develop Project Management Plan)

   1.   Quality Management Plan (See Section 2.12 – Plan Quality)

      a.   Quality Metrics and Checklists

      b.   PM ISO checklist

B.   Work Performance Information

   1.   Planned versus actual

C.   Approved Change Requests

D.   Deliverables (See Section 3.1 – Direct and Manage Project Execution)

4.7.3   Procedures

A.   The PM could perform quality inspections focusing on the correctness of the work. Checking the work periodically while it is being performed to see if it is conforming to the standards and measurements determined in the Quality plan. The discipline captains shall utilize SSOE's checking procedure on drawings and specifications before packages are issud to the client. The PM could request to see the color copy of the checked deliverables prior to issuing them in order to ensure that the Discipline Captains are utilizing this system.

B.   Quality inspections can be technical inspections, cost inspections, PM coordination check, and schedule inspections.

   1.   Technical – Focusing on technical completeness, drawing consistency, and/or following CAD standards. This can be a periodic review or predetermined milestone review to performance.

2. Cost – Reviewing the planned versus the actual costs, and determining the earned value to compute the cost performance index (CPI) for the project to ensure the project is performing according to the plan. This is recommended to be done biweekly for most projects.

3. Schedule – Reviewing the project baseline and comparing it to where the project actually stands. Looking at the Schedule Performance Index (SPI) to determine if the project is performing as planned. Schedule Analysis or inspection is also recommended to be done biweekly for most projects.

C. The Quality audits are performed by the quality assurance (ISO team) during their scheduled reviews. It is the responsibility of the PM to adhere to the Quality Procedure standards throughout the duration of the project.

4.7.4 Tools and Techniques

A. SSOE technical checking procedure.

B. Cause and Effect Diagrams (AKA Ishikawa or fishbone diagrams)

1. If you are having quality issues, using the cause and effect diagram to determine the root cause.

C. Control Charts

1. Can be used to show trends on the project, such as performance and earned value analysis, number or issues identified, and number outstanding to be addressed.

D. Pareto Chart or Diagram

1. Will help identify when problems or issues are and help determine the causes. Twenty percent of the causes solve eighty percent of the problems. Primavera Contract Manager, for those projects using the software, has the ability to gather information to develop these charts. An issues list can also be a source of information to develop a chart to identify the causes.

4.7.5 Output

A. Completed ISO checklist

B. Lessons Learned

C. Validated deliverables

D.   Project management plan update

E.   Recommended corrective or preventative action

4.7.6   References

A.   Project Management Body of Knowledge – Section 8.3

4.7.7   Flow Chart
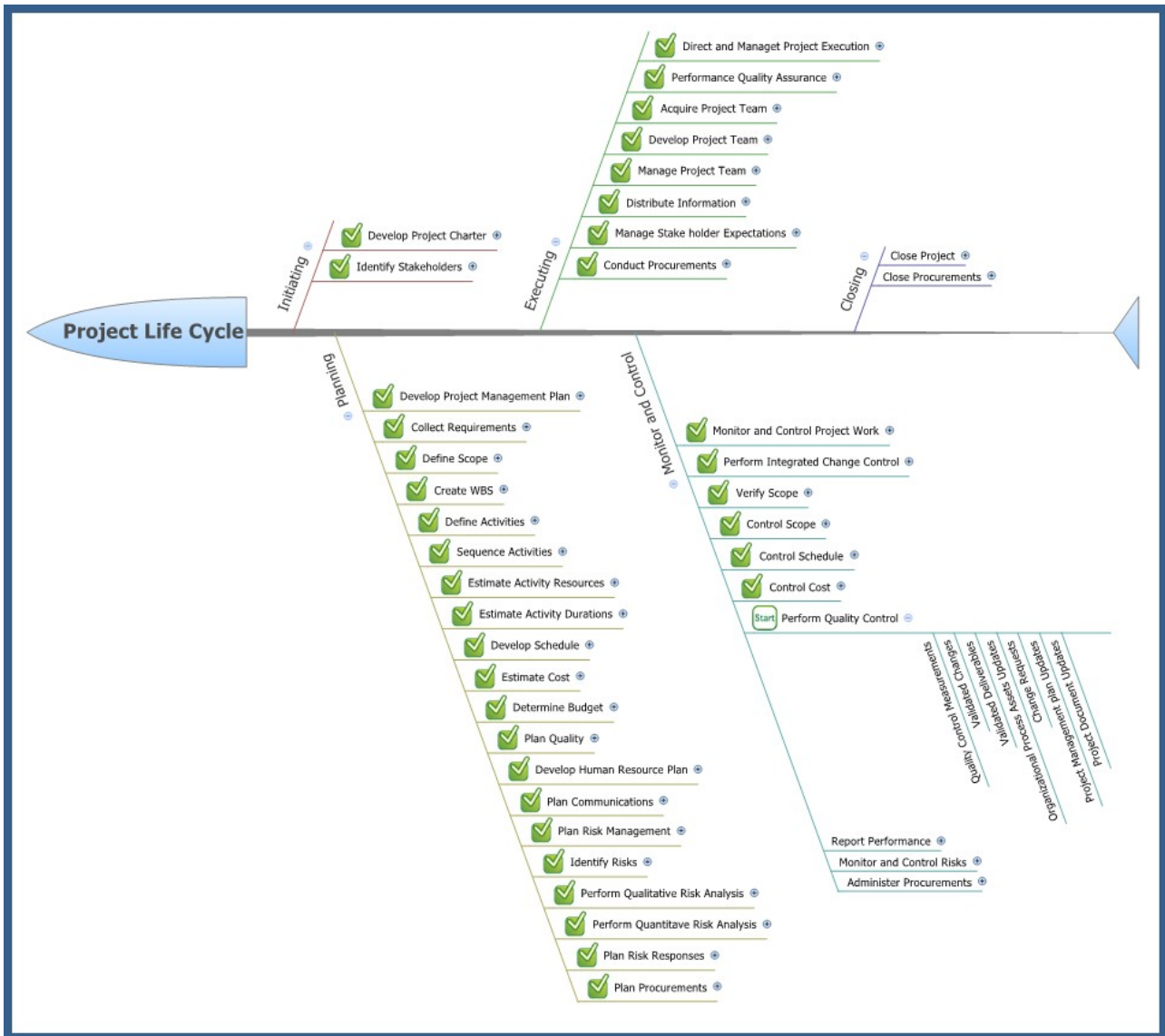
Monitoring and Controlling

4.8   Report Performance

4.8.1   Summary

A.   Performance reporting is gathering all the data that has been collected on performance from the scope, schedule, and cost updates and distribute the reports in the appropriate level of detail to the stakeholders.

4.8.2   Input

A.   Project Management Plan

1.   Schedule Baseline

2.   Cost Baseline

B.   Work Performance measurement

C.   Forecasted completion

4.8.3   Procedures

A.   The report information should include status and performance information on scope, schedule, cost, quality, resources, risk, and procurement. Forecast and variance analysis should also be included on a report.

B.   It is not enough to only look at one of these elements. Cost for the project could look like it will come in under budget; however, the schedule could reflect the project is behind, or the cost spent to–date is going according to plan but the resource utilization is behind, therefore, using high dollar resources but not spending the planned hours leading to cost overrun when the project is complete.

C.   Gather the information to assemble the report. Have a status review meeting to establish two–way communication. Set action responsibilities to action items or issues that need resolved. This is more effective than issuing a status report for the team to read.

Schedule

Cost Performance

Cost Performance — 008-00590-01 - New Process Kitchen

Cost

Legend:
- Estimate At Completion
- Actual Labor
- Planned Value
- Budgeted Labor
- Remaining Labor
- Earned Value

Page 1 of 1

Project Updated: 27-Jul-09

Monitoring and Controlling

Resource Utilization

Monitoring and Controlling

Performance Reports – Primavera

Performance Reports – Deltek

4.8.4   Tools and Techniques

    A.   Deltek

    B.   MS Project

    C.   Primavera Project Management

    D.   Primavera Contract Manager

4.8.5   Output

    A.   Project Status Report – Depending on the size and complexity of the project, this can be a simple report with percent complete by WBS and status on scope, schedule, cost, and quality. More complete projects would contain items such as:

        1.   What's been done

        2.   What's in process

        3.   What's behind

        4.   What's at risk

        5.   Approved changes

    B.   Biweekly cost report or Performance Report – These reports can be internal or external to include planned, actual, EV, status, etc., used to determine how the project is performing.

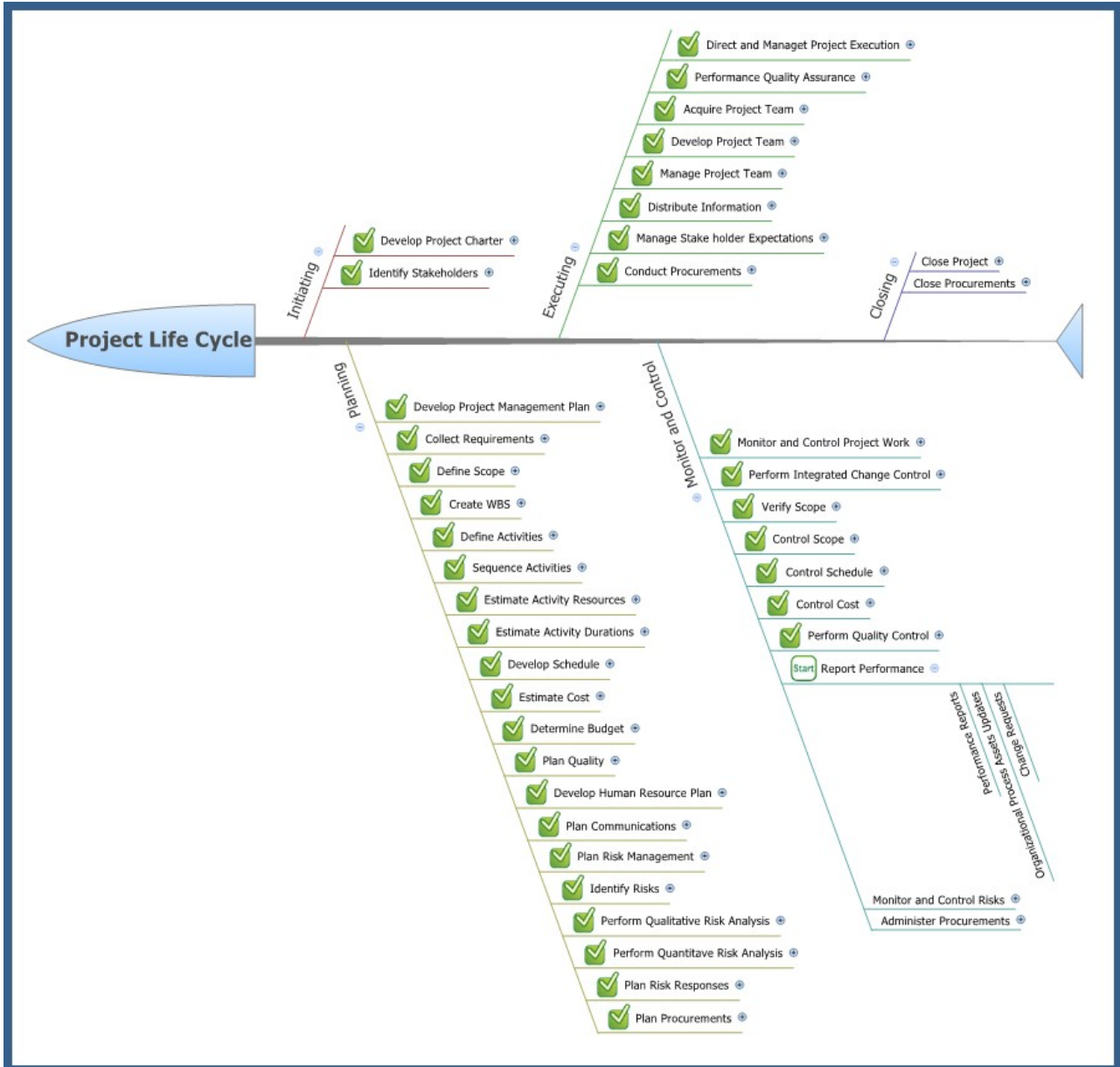   C.   Forecast report baseline versus EAC variances, indexes, risk, and impact.

4.8.6   References

    A.   Project Management Body of Knowledge – Section 10.5

Monitoring and Controlling

4.8.7   Flow Chart

Monitoring and Controlling

4.9 Monitor and Control Risk

4.9.1 Summary

A. Monitoring and controlling risk is a continuous process throughout the life cycle of the project. Risks will continuously change during the life of the project, new risks will occur, and some risks will no longer be. The intent is to identify the new risk, analyze current risk to determine if it is still a valid risk, implement response plans, and evaluate the responses for effectiveness on existing risks.

4.9.2 Input

A. Project Management Plan

B. Risk Register

C. Work Performance Information

D. Performance Reports

4.9.3 Procedures

A. The Risk owner generally performs the following tasks, and reports the findings to the PM on a regular basis, such as a project meeting.

   1. Perform a risk audit to assess how the project is responding to the risks and the effectiveness of the response plan. Decide if alternate strategies (contingency or fall–back plan) need to be developed.

   2. Execute any Risk Response plans, contingency plans, or fall backs. Don't be afraid to escalate the risk, make a decision, and move forward with the response plan. Waiting too long will only increase the risk.

   3. Review the reserves or contingency in cost and schedule.

   4. Assess any new risks through questions or quantitative analysis and add to the risk register.

   5. Update the risk register.

4.9.4 Tools and Techniques

A. Variance and Trend Analysis – Using the Earned Value technique, by comparing the planned result to the actual result, is one way to look at the variances of the risks. The results of this analysis can help predict the potential outcomes or deviations from the plan.

B. Status Meetings – Adding risk to the agenda and discussing it regularly will improve the likelihood that risks will be identified. The amount of time discussing risk can be minimal, depending on the number of risks and the level or difficulty of the response plans. The meeting will help make it a more common activity and the team will remember to identify threats or opportunities as they work on the project.

4.9.5 Output

A. Updates to the Risk Register

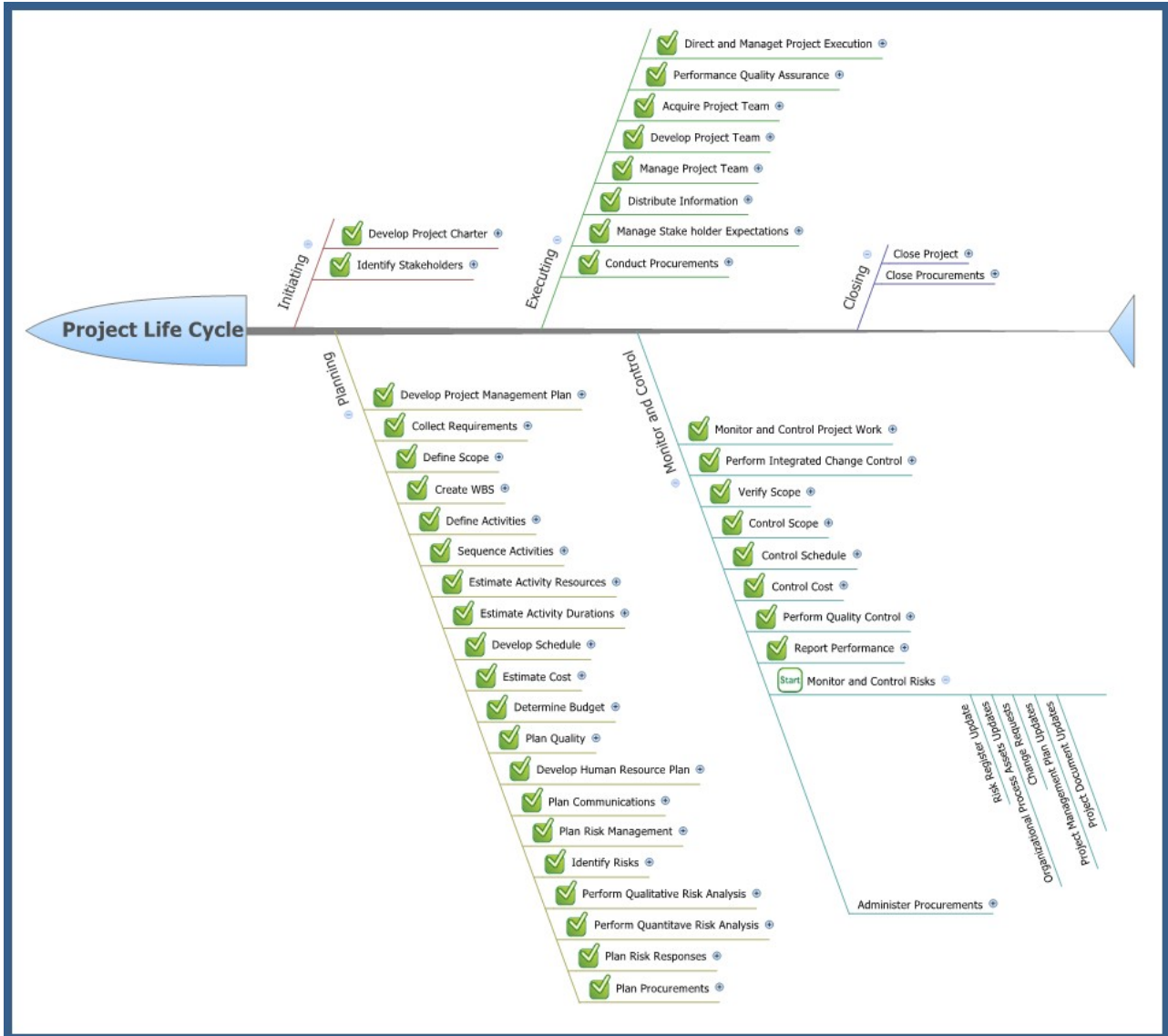B. Change Requests

C. Updates to the Project Management Plan

4.9.6 References

A. Project Management Body of Knowledge – Section 11.6

Monitoring and Controlling

4.9.7 Flow Chart

4.10   Contract Administration

4.10.1   Summary

A.   Contract Administration is very similar to monitoring your internal project team, only there are contractual agreements in place defining acceptable performance. Also included in this phase of the project is approving invoices and paying the seller. The Contract Documents may need to be amended as the project progresses, following the Change Management Plan.

4.10.2   Input

A.   Signed Contract

B.   Contract documents, including scope and terms and conditions

C.   Project Management Plan, specifically the Procurement Management Plan (See Section 2.20 – Plan Procurements)

D.   Work performance information

E.   Approved Change Requests

F.   Payment Procedures

4.10.3   Procedures

A.   Review Change Management and Payment Processing procedures with signatories.

B.   Administer performance reviews with the seller based on the Contract Documents. Depending on the type of the contract, this may be similar to the 30%, 60%, 90% reviews often held with the owner.

C.   Set up performance reporting requirements, measurement, and acceptance criteria, and procedures.

D.   Identify out–of–scope work, and incorporate this work into the contract through the contract change management procedures.

E.   Review payment requests and invoices submitted in accordance with the contract or purchase order requirements and the Payment Processing procedures.

F.   Perform audits on the sellers to ensure quality is met for the deliverables.

4.10.4   Tools and Techniques

A.   Conflict Management:

1.   Sharepoint site for access to information pertaining to project: contract, schedules, changes, etc.

2.   Primavera Contract Manager

3.   Define clear ground rules upon award of the contract so that all parties are on the same page.

4.10.5   Output

A.   Contract and Purchase Change Requests

B.   Project Management Plan Updates

1.   Procurement Management Plan

2.   Baseline Schedule
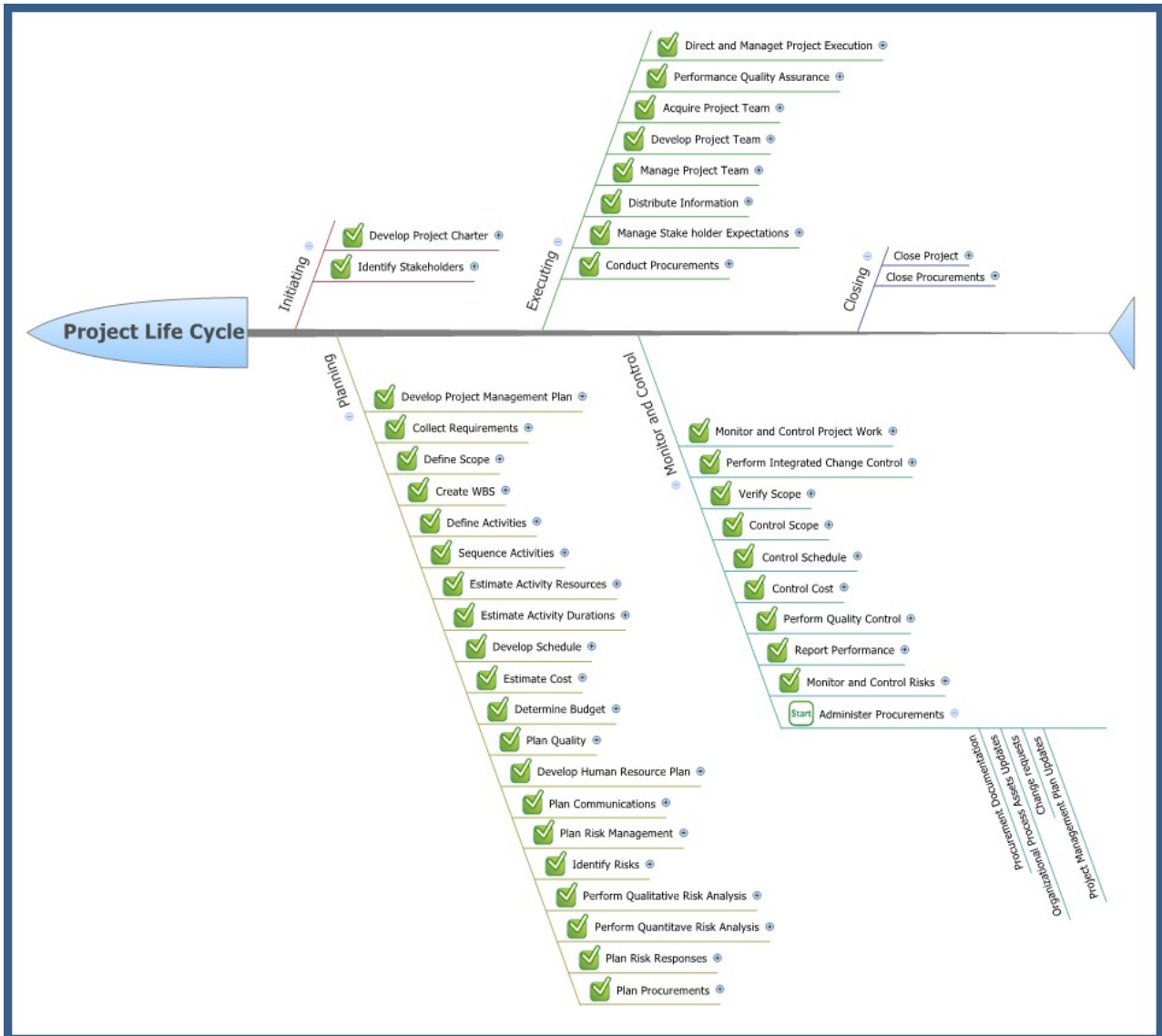
C.   Invoices and Payment Requests

4.10.6   References

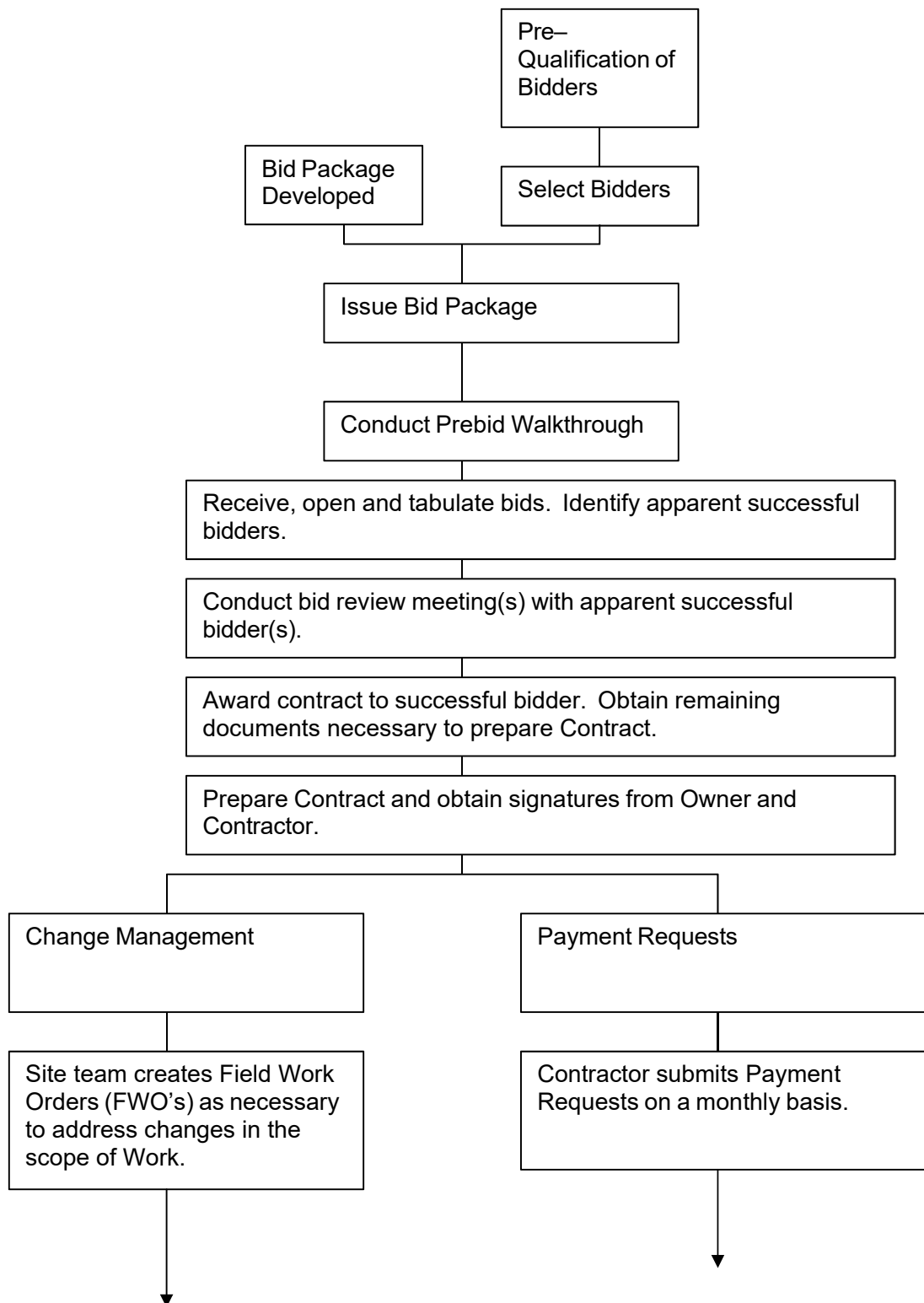A.   See Project Management Body of Knowledge Section 12.3

Monitoring and Controlling

4.10.7   Flow Chart

Monitoring and Controlling

```
                          ┌─────────────────┐
                          │ Pre–            │
                          │ Qualification of│
                          │ Bidders         │
                          └─────────────────┘

┌─────────────────┐       ┌─────────────────┐
│ Bid Package     │       │ Select Bidders  │
│ Developed       │       │                 │
└─────────────────┘       └─────────────────┘
```

Issue Bid Package

Conduct Prebid Walkthrough

Receive, open and tabulate bids. Identify apparent successful bidders.

Conduct bid review meeting(s) with apparent successful bidder(s).

Award contract to successful bidder. Obtain remaining documents necessary to prepare Contract.

Prepare Contract and obtain signatures from Owner and Contractor.

Change Management

Payment Requests

Site team creates Field Work Orders (FWO's) as necessary to address changes in the scope of Work.

Contractor submits Payment Requests on a monthly basis.

Monitoring and Controlling

Contract Change Orders (CCO's) created to incorporate FWO's with established cost into the Contract Value.

Payment Requests reviewed by site team to confirm completed work is commensurate with amount of Payment Request.

At completion of contract, final FWO issued to signify contract completion. Related CCO issued.

Payment Requests reviewed by Contract Services to confirm all required paperwork has been submitted.

Following approvals, payment issued to Contractor.

Contractor required to submit Unconditional Partial Waivers of Lien for work paid for on the previous Payment Request.

Contractor submits final payment request for retainage release. Upon approval, retainage released to Contractor. Contractor submits final Waivers of Lien.

Contract Completed and closed.

Closing

5.1 Close Project

5.1.1 Summary

A. Project Close takes place when the deliverables are ready for final handover to the client. Closeout consists of two phases: Administrative Closure and Contract Closure.

B. Administrative closure involves the following: verification of final billing and receipt of payment, full document archiving has taken place, lessons learned have been completed, and the project close process has been completed in Deltek.

C. Contract Closure involves verification that all work has been completed correctly and satisfactorily in accordance with the contract.

5.1.2 Input

A. Project Management Plan (See Section 4.3)

B. Final contract, including all revisions and project change orders

C. Work Performance Information (See Section 4.4)

D. Deliverables (See Section 4.4)

5.1.3 Procedures

A. Administrative Closure

1. Customer Feedback – Formal feedback is managed by an external (COACT) auditor under the supervision of the Marketing group. It is expected that the PM constantly asks for feedback throughout the project life cycle. A client satisfaction survey is no longer required to be completed by the PM after each project. Corporate Marketing, with the assistance of COACT, contacts our clients on a quarterly basis for feedback. Each quarter a different contact for each client will be contacted, so that feedback is not always coming from the same individual. Each feedback session is documented by COACT and returned to Corporate Marketing. Corporate Marketing then forwards the survey to the SSOE employee that manages the client relationship, as well as the SBU manager. A response to the survey may or may not be needed.

Closing

B.   Lessons Learned

1.   The PM is responsible for conducting a Lessons Learned Session with his internal team, where applicable, and fill out Lessons Learned in the database provided on the intranet. If the client is willing to participate, they should also be included. The lessons learned will help improve future planning, execution, and performance projects.

C.   Budget Updates

1.   If needed, one final budget update should be completed prior to the project being made dormant in Deltek. The Project Earnings Report or equivalent should be reviewed to verify that the project is recognizing revenue correctly. If the budgets appear to be accurate, no further action is required. If budgets need to be updated, make the appropriate changes to the Project Plan and submit the "Toolbox – Project Revision Report" to the Project Accounting Coordinator (PAC). Further details on Deltek procedures can be found in the Deltek SharePoint site https://portal.ssoe.com/SiteDirectory/Deltek/default.aspx.

D.   Project Close/Project Close Form

1.   Project Closeout procedures have been created to assist with closing the project in Deltek. This procedure needs to be completed prior to the final invoice being sent to the client. The Project Accounting Coordinator (PAC) will not be able to make the project dormant and the project won't be able to realize all of its revenue until this procedure has been completed. The PM is responsible for closing the project and assuring that all billing has been finalized. See Form B5.4 Project Inactivation/Closeout form for step–by–step instructions.

2.   Archiving of documentation is typically done by the Project Manager Assistant (PMA) in accordance with the Project Documentation Retention ProcedureWI-CCS-001 http://intranet/infobase/WorkInstructions/Documents/CORP/CS/WI–CCS–001%20Rev%201.pdf. The files are typically scanned and electronically stored.

3.   The SBU manager and PM should coordinate and provide information to the Marketing staff to write a formal project profile summary to be used for future sales efforts.
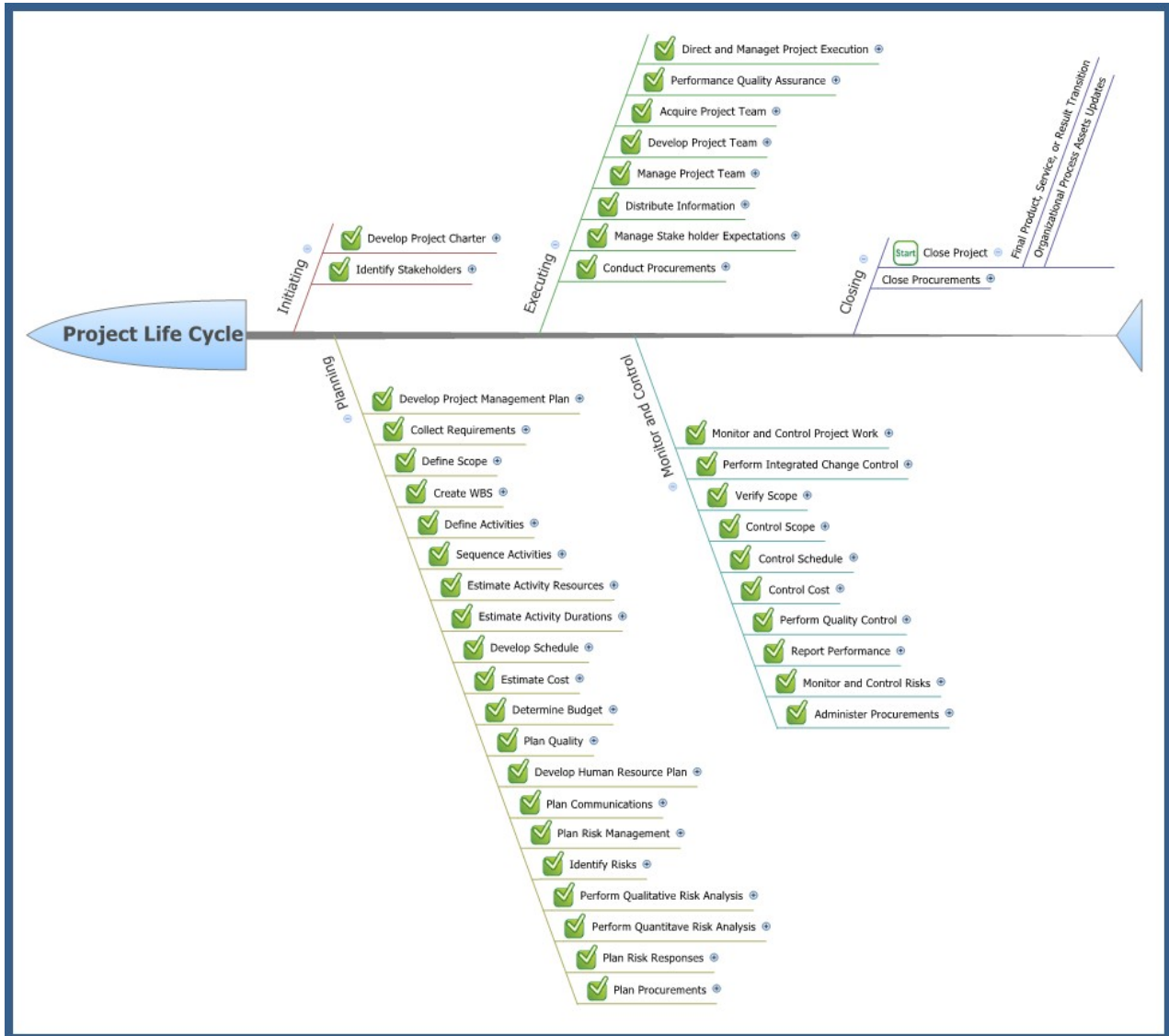
Closing

4. All projects are encouraged to compile a formal list of added value to the client, identified throughout the course of execution. The list will be submitted to the appropriate SSOE client manager. See the Total Added Value Process in the Monitoring and Controlling section.

E. Contract Closure

1. The PM is responsible for assuring the product was completed in accordance with the contract and the client is satisfied. See Section 12.6 Contract Closure for further details on contract closure.

2. A formal letter to the client indicating closure is sent once the project is complete.

5.1.4 Tools and Techniques

A. Lessons Learned on Intranet

B. Project Close Form

C. Deltek Forms

D. Total Added Value Log on SharePoint site

5.1.5 Output

A. Final Handover and acceptance of deliverables

B. Administrative Closure

C. Contract Closure

5.1.6 References

A. Project Documentation Retention WI–CCS–001

B. Project Inactivation/Closeout Form

C. Project Management Body of Knowledge Section 4.7

Closing

5.1.7 Flow chart

Closing

5.2 Contract Closure

5.2.1 Summary

A. This section defines methods and means for closing out a contract, including making final payments and reconciling open claims.

5.2.2 Input

A. Contract Terms and Conditions

B. Subconsultant final invoices

C. Project Management Plan – Procurement management Plan (See Section 2.20)

5.2.3 Procedures

A. PM evaluates the Vendors and or Subconsultants.

B. PM closes project in Deltek, in accordance with Deltek work instructions.

5.2.4 Tools and Techniques

A. Document Control Logs

B. PCO logs

C. Vendor Evaluation Form

D. Lessons Learned

E. Deltek – Purchase Order system, in accordance with Deltek work instructions

5.2.5 Output

A. Vendor Evaluation Form

1. See QSP-023 Purchasing Procedure

2. Lessons Learned

5.2.6 References

A. Project Management Body of Knowledge Section 12.4

Closing

5.2.7   Flow Chart