**Cost and Schedule Concept Template**

**1. Introduction**

* **Purpose**: Briefly state the purpose of this document—to define the strategy, principles, and assumptions for developing, tracking, and managing project costs and schedules across the system's lifecycle.
* **Scope**: Define the boundaries of the cost and schedule management effort, specifying what phases, system elements, and types of costs/schedules are covered.

**2. Cost Estimation**

* **Work Breakdown Structure (WBS)**: Describe how the project will be broken down into manageable elements to form a basis for cost estimation and linking technical, cost, schedule, and risk data.
* **Technical Baseline**: Explain how the system’s technical scope and configuration will be used as a foundation for accurate cost estimates.
* **Data Collection and Analysis**: Detail the approach for gathering historical data from similar projects and analyzing current project data to inform estimates.
* **Estimating Methods**: Specify the techniques to be applied, such as parametric modeling (using Cost Estimating Relationships or CERs), analogy, expert judgment, or bottom-up estimation.
* **Iterative Refinement**: Outline the process for updating and refining estimates as the design matures and more information becomes available, ensuring accuracy at each project phase.
* **Life Cycle Cost (LCC)**: Address how the total cost from a system's inception to disposal will be considered, including development, production, utilization, maintenance, and retirement costs.

**3. Schedule Planning**

* **Key Events and Milestones**: Identify major activities, decision points, and deliverables, often visualized in tables or activity diagrams.
* **Sequencing and Dependencies**: Map the logical order of tasks and their interdependencies.
* **Integrated Master Plan (IMP) and Integrated Master Schedule (IMS)**: Describe the use of these tools to outline high-level events, accomplishments, criteria, detailed tasks, timelines, dependencies, and resource requirements.
* **Integration with Cost**: Explain how schedule elements will be linked to cost drivers, enabling resource-loaded schedules and earned value management.

**4. Monitoring and Control**

* **Tracking and Reporting**: Establish processes for comparing planned versus actual performance, supporting proactive management of deviations. This includes measures related to schedule (e.g., late starts/stops) and cost, and using Technical Performance Measures (TPMs) to track technical risks and design progress.
* **Change Management**: Provide mechanisms for updating cost and schedule baselines in response to scope changes or unforeseen events. Proper Configuration Management (CM) is crucial for managing these changes.

**5. Risk Management Integration**

* **Risk Analysis**: Describe how cost and schedule estimates are subject to uncertainty, and how risk analysis will identify, quantify, and mitigate potential overruns and delays. This includes addressing risks from poorly defined needs, immature technologies, and unexpected changes.
* **Opportunity Management**: Consider how opportunities (uncertainties with positive impacts) will be identified and managed to enhance value.

**6. Purpose and Value**

* **Informs Planning and Decision-Making**: Enables stakeholders to make informed trade-offs between cost, schedule, and technical performance.
* **Improves Project Performance**: Contributes to better project outcomes and reduced overruns through robust management practices.
* **Ensures Traceability and Accountability**: Maintains a clear link between requirements, resources, and deliverables, supporting transparency and auditability.
* **Affordability**: Balances system performance, cost, and schedule constraints over the system's life, while still satisfying mission needs and strategic investment goals.

**7. Recommended Representations**

* **Narrative Text**: For context, rationale, and detailed explanations of strategies and processes.
* **Tables**: For summarizing key events, cost breakdowns, and risk mapping.
* **Diagrams**:
  + Activity diagrams to illustrate schedule and cost relationships.
  + SysML Diagrams (e.g., System Context, Internal Block Diagrams) can support visualization of elements related to cost and schedule drivers.
  + Work Breakdown Structure (WBS) diagrams for hierarchical cost and schedule aggregation.
  + Gantt charts or other schedule visualizations (implied by IMS).

**8. Integration with Other Systems Engineering Artifacts**

* **System Concept**: The Cost and Schedule Concept is informed by the high-level vision and boundaries defined in the System Concept.
* **Acquisition Concept**: Decisions made within the Acquisition Concept directly impact the budget and project timelines. It defines preliminary cost and schedule estimates.
* **Development Concept**: Development activities must align with the project’s budget and timeline.
* **Risk Management Concept**: It is intrinsically linked, identifying, quantifying, and mitigating cost and schedule.
* **Test and Evaluation Concept**: Planning for V&V activities, including necessary facilities and resources, begins early to inform budget and schedule planning.
* **Requirements**: Cost and schedule estimates are directly influenced by technical requirements, and conversely, constraints dictate what requirements can feasibly be met.
* **Operational Concept (ConOps) / Operational Concept (OpsCon)**: Preliminary cost and schedule estimates are often included in these early lifecycle concepts.

**9. Special Considerations and Best Practices**

* **Constraints**: Recognize that budget and schedule are often critical external factors that must be met and typically cannot be changed through trade-off analysis.
* **Early Planning**: Emphasize that early planning and accurate estimation can reduce risk of overruns and delays.
* **Trade-off Studies**: Highlight the continuous need for trade-off analyses to balance performance, cost, and schedule to achieve the best overall solution.
* **Avoid Premature Budgeting**: Warn against fixing budgets and schedules too early without sufficient knowledge, as this is a high-risk approach.
* **Avoid Neglecting Later Phases**: Ensure sufficient budget and schedule are allocated for system integration, verification, and validation activities, which are often underestimated.
* **Technical Debt**: Proper SE and project management practices, including upfront activities and addressing risks, help avoid technical debt, which represents accumulated risk due to deferred work.