5 Immutable Principles of Project Success [1]

Glen B. Alleman

Improving the Probability of Project Success (PoPS) starts with answering five critical questions, no matter the project domain, the context within that domain, or the method used to manage the project or develop the products or services produced by the project:

1. What does done look like in units of measure meaningful to the decision-makers?
2. What is the plan to arrive at Done the needed time, for the needed cost, with the needed capabilities?
3. Do we have the needed resources, time, money, and facilities to arrive at Done as planned?
4. What impediments will be encountered along the way to Done and their corrective and prevention plans?
5. How do we know we are making progress toward Done as planned?

Asking and answering these questions guides the successful management of any project, program, and portfolio, regardless of domain, context, technology, or development method. This approach can be applied to the development of any system, no matter the business or technical domain.

Any successful method must connect projects and their deliverables with the programs that collect projects into beneficial outcomes, the portfolio of programs, and their business outcomes connected to strategy, mission, and vision. **Figure 1** describes the elements of the 5 Immutable principles, their outcomes, and the artifacts from the project's work effort.

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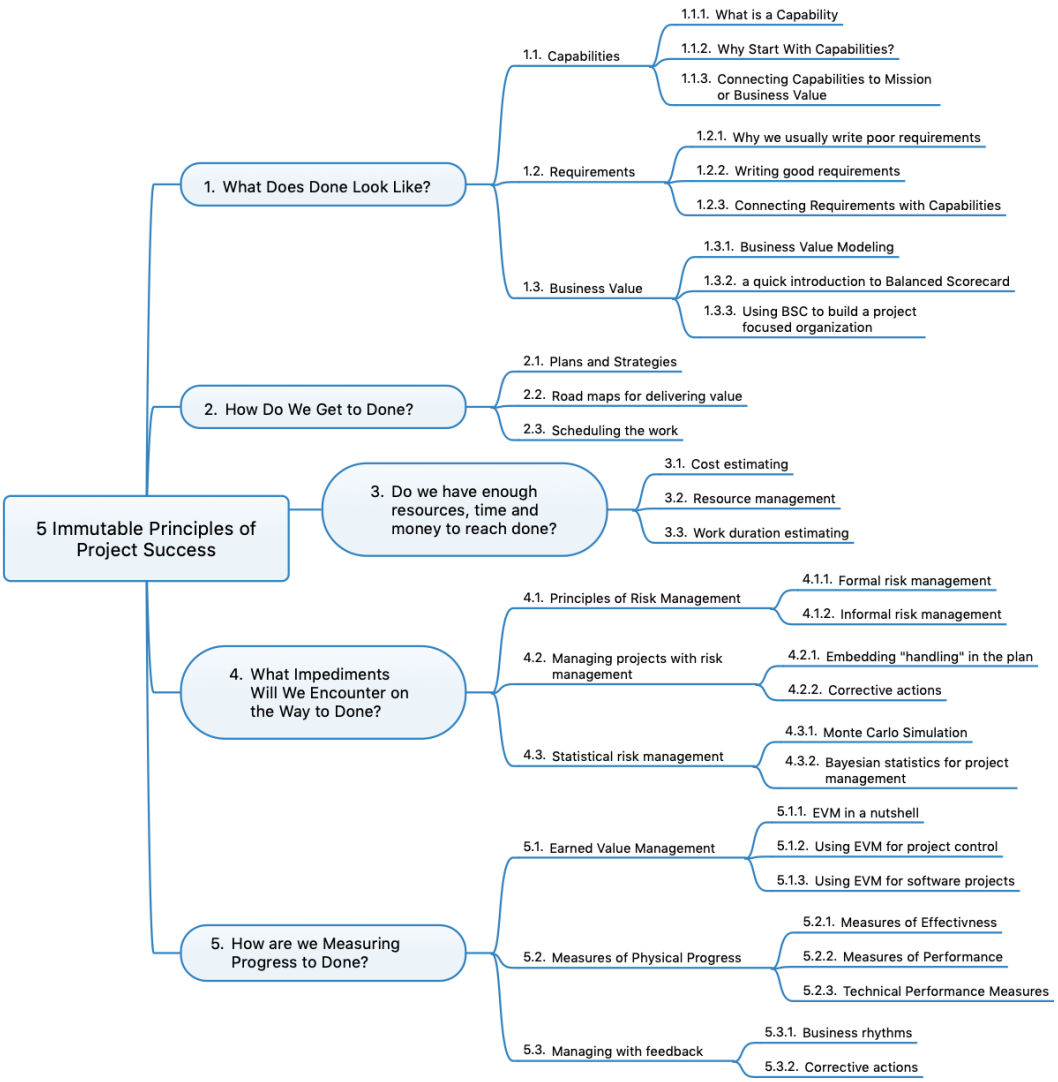

Figure 1 – The 5 Immutable Principles needed to increase the probability of project success, the detailed processes, and the artifacts and outcomes from each process. For each principle, the subprinciples each have evidence of their outcomes.

OVERVIEW

Project managers are tasked with a wide variety of duties. Many are vague, and some are difficult, but they are only somewhat rewarding without a chance of project success. This Probability of Project Success drives many project managers to seek out new and

innovative ways to *Increase* this probability. These 5 Immutable Principles are the basis for *Increasing the Probability of Project Success*.

When discussing projects, five attributes must be established before applying the five Immutable Principles. These five project attributes are:

- The ***Situation*** – projects are risky by their very nature. Handling or retiring risk is a core success factor.
- The ***Problem*** – project management makes use of processes to create measurement data. This data must identify tangible outcomes and their performance measures in units meaningful to the decision-makers.
- The ***Need*** – project management is about avoiding surprises. Measures of physical percent complete used to forecast future performance is the basis of forecasting future performance.
- The ***Context*** – organizations execute projects. Adapting the project management processes to the organization's culture and to the risk tolerance of the project's environment is a critical success factor.
- The ***Solution*** – defining the tangible deliverables using measures of increasing maturity in unit technical performance increases the probability of success.

Through these 5 Immutable Principles, the project manager must provide accurate and credible information to the decision-makers:

- How much is this project going to cost when we are done?
- When will we be done?
- Do we have some notion of the business or mission value produced by the project and how the project will deliver this measurable value?
- What work activities will be performed in what order to produce this business value?

THE 5 IMMUTABLE PRINCIPLES

This white paper describes 5 Immutable Principles, the practices that implement them, the artifacts generated from the practices, and most importantly, how the project manager can put these principles and practices to work in various business and technical domains.

1. WHAT DOES ***DONE*** LOOK LIKE?

Done is a set of *Capabilities* possessed by stakeholders provided by the project. These capabilities describe the system's behavior in terms of "operational concepts." Capabilities answer the question –*what does the system do to achieve beneficial outcomes for the owners?*

Capability planning means: *planning under uncertainty to provide capabilities suitable for the wide range of needs for the business or mission while working within an economic framework that requires choices to be made*. The technical and operational requirements are traceable from the Measures of Effectiveness (MoE) to each deliverable by identifying capabilities. Capabilities state *why* we want this system.

2. HOW ARE WE GOING TO GET TO ***DONE***?

Starting with each desired capability, a set of technical and operational requirements must be built. Each requirement must be testable and traceable to the desired capability. Requirements are *elicited* through a fact-finding and classification process. The evaluation and rationalization of the requirements answer the question, "why do I need this?" in terms of operation benefits.

With these requirements, we need to determine what the ***PLAN*** is for arriving at ***DONE***. The ***PLAN*** is the ***STRATEGY*** for the successful completion of the project. The plan describes the "path" to the end. The Plan describes what "done" looks like. Not only at the end but along the way to "done." The Plan describes the increasing maturity of the deliverables of the project. The units of measure for the maturity and when a specific value for this unit of measure should be present. This means the plan has a sequence of increasing maturity.

The Plan is NOT a Schedule, which is time-based. The Plan is sequence-based, relationship-based, and maturity based for the deliverable. The Schedule tells us "when" this maturity should appear.

3. DO WE HAVE ENOUGH RESOURCES, TIME, AND MONEY TO GET TO ***DONE*** AS WE PLANNED?

Once we know what ***DONE*** looks like in units of measure meaningful to the decision makers and our Plan and Schedule to reach ***DONE*** in the planned time, with the planned budget, we must determine if we have enough of everything we need to reach ***DONE***.

This includes funding, adequately trained and qualified staff, facilities, a reliable supply chain for materials needed to implement the project, and any other consumables.

4. WHAT IMPEDIMENTS WILL WE ENCOUNTER ALONG THE WAY?

All risk to project success comes from uncertainty – reducible (Epistemic) and irreducible (Aleatory). Risk handling strategies are needed to continually assess what can go wrong in the project, determine which of these risks are most important, and implement handling strategies to prevent or correct the source of the risk. Risk Management is not Issue Management. Risks *may* happen in the future with some probability of occurrence or from an underlying stochastic process. Risks, when they do occur, will have some undesirable impact on the project. This impact has a range of possibilities. Risk handling is required for reducible uncertainties, and margin (Cost, Schedule, or Technical) for irreducible uncertainties.

5. HOW CAN WE TELL WE ARE MAKING PROGRESS TO PLAN?

With our plan, schedule, resources, and a clear and concise description of ***DONE***, how can we tell if we're progressing toward ***DONE***? Do we know how much progress we *should* make at some point in the future? What are the units of measure for this progress?

These measures must be in units of *physical percent complete* (P%C) of the effectiveness and performance of the project outcomes. The passage of time and consumption of money are not measures of progress to plan

PRINCIPLE NUMBER 1

The 1st Immutable principle is to answer the question: *What Does Done Look Like*? The Project Management Institute (PMI) suggests we define the requirements. But our approach starts one step before that, with Needed System Capabilities.

This approach is similar to the AACEI Total Cost Management (TCM) guidance. Other project management methods suggest this as well. I'm afraid that's not right; requirements need a reason to exist. Answering the question of *Why* is the proper starting point. *Why are we doing the project*? *Why is the customer willing to spend money to have work performed*?

Five Immutable Principles

1. What Does ***DONE*** Look Like?
2. How Do We Get There?
3. Do We Have Enough Time, Resources, And Money To Get There?
4. What Impediments Will We Encounter Along The Way?
5. How Do We Know We Are Making Progress?

If we don't have an answer to *Why*, it is difficult to determine which requirements – technical or operational – can be assigned a value. To answer the question, *Why* we must develop a set of needed capabilities? The term *capability* may be new to some project managers, so let's look at a simple definition of the term:

Ca·pa·bil·i·ty – the capacity of being used.

This definition is too simple. It's from TOGAF® (The Open Group Architectural Framework). The *capacity of being used* must be applied to a project and the products produced by that project. The noun *capability* can now be used with a verb in project management Capability Planning. We need to plan the capabilities the system will produce before we can know *why* we are implementing specific requirements.

So, what's the definition of *capability planning*?

> *Capability–based planning focuses on planning, engineering, and delivering strategic business capabilities to the enterprise. It is business–driven and business–led and combines the requisite efforts of all lines of business to achieve the desired capability. Capability–based planning accommodates most, if not all, of the corporate business models. It is especially useful in organizations where a latent capability to respond (e.g., an emergency preparedness unit) is required and the same resources are involved in multiple capabilities. Often the needs for these capabilities are discovered and refined using business scenarios*.

Capability–Based Planning has long been entrenched in the US, UK, Australian, and Canadian Defense domains. The associated governance mechanisms and rigorous capability derivation (capability engineering) have emerged from the systems engineering domain. What does a capability sound like? Here are some actual capability statements from projects I've worked on:

- We need the *capability* to pre-process insurance claims at $0.07 per transaction rather than the current $0.11 per transaction.
- We need the *capability* to remove 1½ hours from the retail ordering process once the merger is complete.
- We need the *capability* to change the Wide Field Camera and the internal nickel hydride batteries while doing no harm to the telescope.
- We need the *capability* to fly 4 astronauts to the International Space Station, dock, stay 6 months, and return safely.

- We need the *capability* to control the Hell Fire Missile with a new touch panel while maintaining the helicopter's existing navigation and guidance capabilities.
- We need the *capability* to comply with FAR Part 15 using the current ERP system and its supporting work processes to qualify for new contract issues by the US Air Force for our products.

When we try to answer the question of *what done looks like*, we need more than the cost, schedule, and requirements to be fulfilled. We need to see that there is a pre-agreed-upon set of capabilities that will be available to the users of the resulting system. We need tangible evidence that the capability produced by the project is present, meets the Measures of Effectiveness (MoE) and Performance (MoP), and adheres to the Key Performance Parameters and Technical Performance Measures.

Here's how to discover the capabilities needed success of your project.

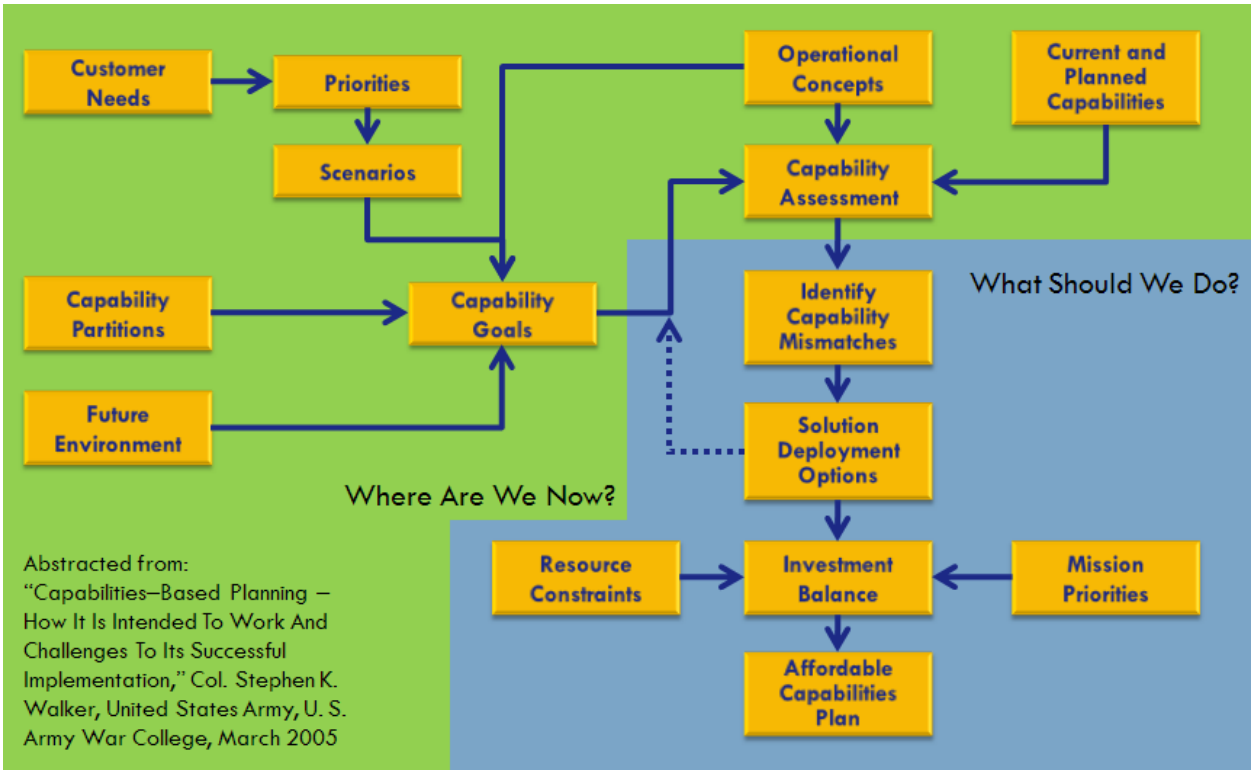

Figure 2 – Capabilities Based Planning starts with identifying customer needs through scenarios rather than technical requirements. This approach answers *why I want this and what I will do with it when I get it*. The *Concept of Operations* (ConOps) contains scenarios implementing the needed capabilities. With the ConOps, the requirements are derived that fulfill each Capability. Then can each requirement have a reason for being present?

PRINCIPLE NUMBER 2

With the description of *Done* established, the 2nd Immutable Principle can tell us how to reach *Done* as planned. The first step is to separate scheduling from planning and the execution of the schedule. There are three elements in answering the question, *How Do We Get There*?

Five Immutable Principles

1. What Does DONE Look Like?
2. **How Do We Get There?**
3. Do We Have Enough Time, Resources, And Money To Get There?
4. What Impediments Will We Encounter Along The Way?
5. How Do We Know We Are Making Progress?

1. The ***Plan*** – the strategy for the successful completion of the project.
2. The ***Schedule*** – the steps needed to fulfill the Plan.
3. ***Execution*** – the physical performance of these steps to deliver the results defined in the Plan.

A good Plan tells us:

- What DONE looks like in units of measure meaningful to the decision makers. These units include Measures of Effectiveness (MoE), Measures of Performance (MoP), Key Performance Parameters (KPP), and Technical Performance Measures (TPM). Notice that these measures do not include cost and schedule. While necessary, cost and schedule performance measures are not sufficient to show the project's ability to accomplish the mission and vision of the stakeholders.
- What are the Accomplishments along the way toward being done, that must be in place for success?
- What are the Criteria for each of these Accomplishments, which will measure compliance of the Accomplishment with the MoE, MoP, KPP, and TPMs?
- What is the sequence of the work that produces tangible evidence of compliance with the Criteria?

With the Plan established, let's look at **Table 1** for ways to improve the credibility of the resulting Integrated Master Schedule.

Table 1 – steps for improving the credibility of the Integrated Master Schedule. The activities and the artifacts increase the Probability of Project Success (PoPS).

Planning and Scheduling Activities	Artifacts that provide improvements to the credibility of the schedule
Build the requirements in a requirements management tool	✓ A trace from requirements to the work activities of the schedule ✓ Only do the work that produces the planned value to the customer

Planning and Scheduling Activities	Artifacts that provide improvements to the credibility of the schedule
Build the Plan before you build the project schedule	✓ Define the strategy for success before defining the steps to implement that strategy ✓ Define the Measures of Effectiveness (Customer facing) and Measure of Performance (Engineering facing)
Manage the project with a project management tool	✓ Excel and Power Point are worthless, don't make lists, make activity networks instead. ✓ All tasks need successors and predecessors to define the critical path
Make task durations fit a duration guideline	✓ Answer the question: *How long are you willing to wait before you find out you're late or over budget?* ✓ Make task durations match the risk
Use RACI to assign accountability for the deliverables	✓ Single points of accountability are required for all deliverables
Every task has a deliverable	✓ Do only work that produces value to the customer. ✓ No Level of Effort in the Plan or Schedule.
Have a Plan–B and a Plan–C	✓ Bad things happen to good projects – plan on this and have alternatives.
All costs and durations are random variables	✓ Know the built-in variances. ✓ Never use *Point Estimates* to make decisions.
In the end it's the people	✓ Work gets done through the people. ✓ Have the best possible people, treat them well, and reward them appropriately.

With the Plan in place, a Schedule defines the work and the sequence of that work to produce the deliverables. But this schedule must define what *DONE* looks like first, before defining the work efforts to get to *DONE*. This approach starts with defining the maturity assessment points in the project where we ask and answer the question – *what level of maturity for each deliverable is needed at this point in the project to continue to make progress as planned.*

Figure 3 describes the process of ***Vertically*** scheduling the project for each Program Event, through Work Packages to their Accomplishment Criteria, to the Significant

Accomplishments, to the Program Event. Only then, can planning take place ***Horizontally*** for the dependencies between Program Events or Milestones.

These Events or Milestones are assessments of planned maturity of the products or services. They are maturity assessments, where pre–defined deliverables are assessed to assure Technical Performance – measures of what DONE looks like – is being met against the pre–defined metrics. As well that the pre–defined levels of risk are being retired or mitigated as planned.

The elements of this approach include:

Events or Milestones:
- Project unique, key transition points between major program activities.
- Points of convergence across the entire program where specific functionality comes together for release, testing, or integration.
- Key decision points where it is necessary to assess progress in achieving objectives before proceeding.
- May include major DoD milestone reviews, program design reviews, tests, deliveries, and other key progress demonstration or risk mitigation points.
- Should be well distributed over the program/project period, and not inordinately clustered. It is not desirable to have too long a period pass without checking critical program progress.

Accomplishments:
- For each Event or Milestone, the project shall state what progress is to be measured at the event. This breakdown of principal tasks and activities become the Offeror's accomplishments."
- An accomplishment is the desired result(s) prior to or at completion of an event or milestone that indicates a level of the program's progress.
- The Accomplishments are critical efforts that must be completed prior to completing an Event or Milestone.

Criteria:
- Are measurable and useful indicators demonstrating the required level of maturity and or progress has been achieved?
- Criteria include using Technical Performance Measures and other metrics wherever possible to provide measurable criteria. Preferably the accomplishment criteria should avoid using percent completed and avoid citing data item report numbers rather than identifying and summarizing results.

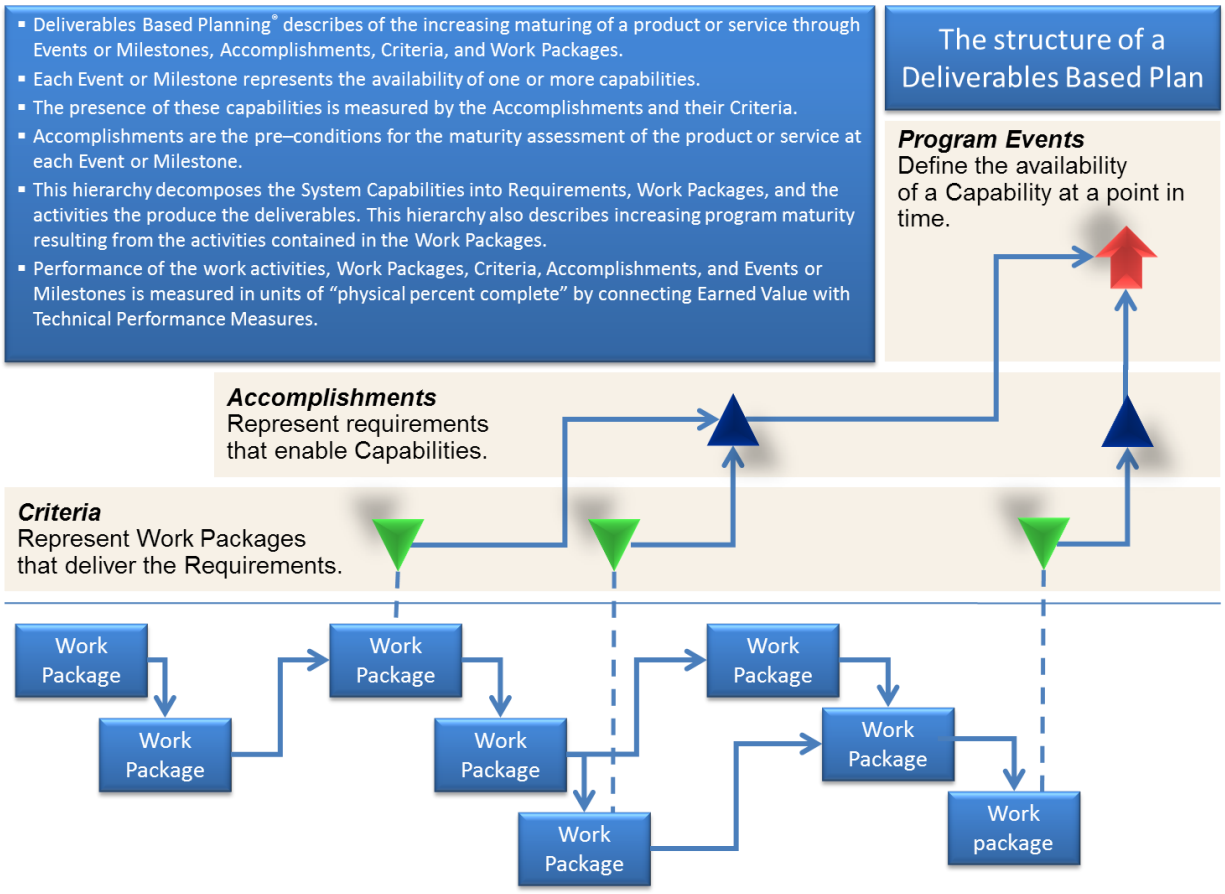

Figure 3 – this approach to defining the master schedule is a paradigm change from traditional techniques. This change starts by measuring progress as the completion of Accomplishment Criteria and the fulfillment of Significant Accomplishments. This progress is described as physical percent complete rather than measuring progress through the passage of time and consumption of resources.

PRINCIPLE NUMBER 3

The question answers the 3rd Immutable Principle of successful project management processes *Do We Have Enough Of Everything We Need To Reach Done as Planned*?

By everything, it means time, money, resources, facilities, support, and any other item needed to complete the project successfully.

The first question has to be *how do we know what we need*? The answer to that starts with the Performance

The 5 Immutable Principles

1. What Does DONE Look Like?
2. How Do We Get There?
3. **Do We Have Enough Time, Resources, And Money To Get There?**
4. What Impediments Will We Encounter Along The Way?
5. How Do We Know We Are Making Progress?

Measurement Baseline (PMB). The PMB is a time-phased budget plan for accomplishing work against which contract performance is measured. It includes the budgets assigned to scheduled control accounts and the applicable indirect budgets. What this means is that we know what work we need to perform, in what order we need to perform that work, what we have budgeted for the performance of that work, and most importantly, what the outcomes of that work are and how they are connected to the answers to the first two questions – What does done look like and How do we get there?

When we look closer at the PMB, there are three baselines, as shown in **Figure 4**.

The Performance Measurement Baseline (PMB) is the primary assessment document for assuring the credibility of a program plan. The PMB is the baseline of the cost, schedule and deliverables for each Work Package in the plan.

Constructing the PMB requires knowledge of the business requirements, skill in developing the Work Packages that produce the deliverables for these requirements, and discipline in assembling the cost, schedule and relationships between the Work Packages. It is the discipline that requires the most focus for the planners and program controls staff. Without this discipline, the development of a credible baseline is simply not possible.

In the end the Project Manager must “know” in intimate detail each work effort, its deliverables and resource requirements, the performance measurement criteria and the dependencies that form the critical path through the program schedule.

The concept of a Deliverable is at the core of the Performance Measurement Baseline (PMB). It is the deliverables that customer purchased, not the work effort to produce the deliverables.

- Deliverables are the units of measure of progress to plan.
- Deliverables are what the customer has paid money for.
- Deliverables contain the business capabilities, the associated value that fulfills the requirements of the business plan.

The details of the three baselines in **Figure 4** are:

The ***Technical Performance Baseline*** is the requirements flow down and traceability map for each deliverable in the program.

- A critical performance measure of the Technical Performance Baseline is the stability of requirements. The expected technical achievement for the actual

progress is compared using periodic measurements or tests starts with the Technical Performance Baseline.

- An important aspect of the Technical Performance Baseline is to define the units of measures for each deliverable that defines what "done" looks like at each incremental assessment of maturity.

The ***Schedule Performance Baseline*** is the sequence of Work Packages and Planning Packages that produce the products or services from the program. This baseline contains the schedule margin derived from the Monte Carlo simulation described in DID 81650.

The ***Cost Performance Baseline*** is the "authorized time-phased budget–at–completion (BAC) used to measure, monitor, and control overall cost performance on the program." This budget is held in the cost accounting system and used to connect the work effort with the planned budget for each deliverable.

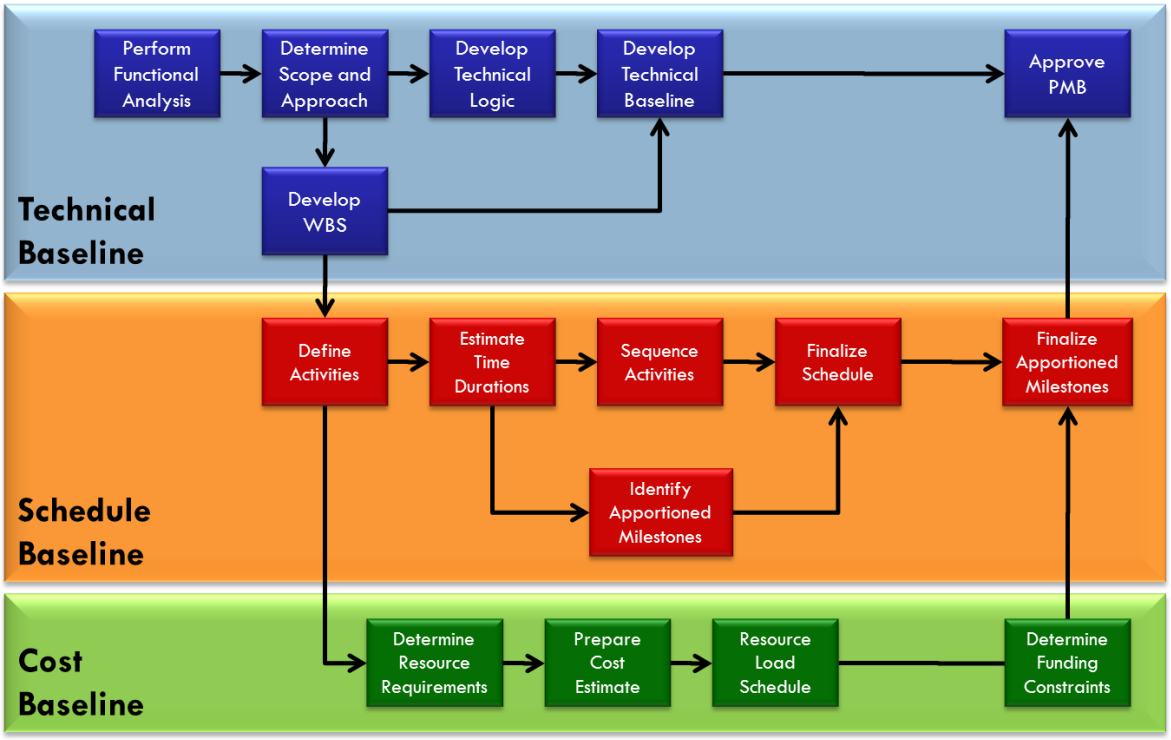

Figure 4 – the three elements of the Performance Measurement Baseline. The Technical Baseline is the requirements flow down and traceability map for each deliverable. The schedule baseline is the sequence of Work Packages and Planning Packages that produce the products or services from the program. The Cost Baseline is the "authorized time–phased budget–at–completion (BAC) used to measure, monitor, and control overall cost performance on the program."

Building the Performance Measurement Baseline and determining if we have enough of everything, we need is straight forward process at first glance. Below are the steps with an overview of their activities.

With the resulting Performance Measurement Baseline, the Project Manager has the beginnings of the raw materials for "managing the project." But more is needed.

For success, the Project Manager must:

Capture anything and everything that has her attention.
Define actionable things discretely into outcomes and concrete next steps.
Organize reminders and information in the most streamlined way, in appropriate categories, based on how and when she needs to access them.
Keep current with frequent reviews of the six horizons of the Project Manager's commitments:

1. ***Mission*** – The purpose of the project is stated in terms meaningful to the stakeholders.
2. ***Vision*** – A description of what Done looks like in units meaningful to the stakeholders.
3. ***Goals*** – the Capabilities delivered to the customer needed to fulfill the mission and vision.
4. ***Areas of Focus*** in the execution of the project needed to increase the Probability of Success
5. ***Project Outcomes*** – The tangible deliverables described in Measures of Performance.
6. ***Actions*** – both corrective and preventative that keep the project GREEN provides alternatives to reach the goals and maintain the confidence that the project will fulfill the Mission, Vision, and needed capabilities defined by the stakeholders.

The Performance Measurement Baseline fulfils its last of these six items (1–6). **Figure 5** describes the activities and their outcomes that increase the probability of success for a credible Performance Measurement Baseline.

Activity	Outcome
Identify elements for the Work Breakdown Structure	▪ Starting with the system capabilities needed to fulfill the mission or business case, list the Functional Requirements that address each needed capability. ▪ For each Functional Requirement, define the Technical Requirements. ▪ Identify individual work elements that fulfill the Technical Requirements ▪ The Work Elements are the terminal nodes in the WBS and are the candidates for Work Packages.
Construct Work Packages from the WBS element	▪ Each Work Package must contain only discrete work that produces a named deliverable. ▪ This work must have an estimate of its duration, effort, and the needed resources.
Assemble the Work Package into a logical activity network	▪ Each Work Package should have predecessors and successors, expect the first and last Work Package. ▪ Each Work Package produces a 100% formed deliverable.
Assign resources to the network of Work Packages	▪ For each Work Package, needed resources should be named and their effort spread across the period of performance. ▪ This *balancing* process is done for each Work Package before *balancing* the project
Turn the activity into a credible schedule	▪ Schedule *margin* and probabilistic risk assessment are performance to identify risk, buffers, and risk mitigation or retirement activities.

Figure 5 – the activities and the resulting outcomes that increase the probability that the Performance Measurement Baseline will credibly represent the project's needs, the work activities that must be performed, and the measure of performance of those work activities.

PRINCIPLE NUMBER 4

The 4th immutable principle of successful project management answers the question; *What are the impediments we'll encounter along the way; how do we deal with them, so our progress is not impeded or at least not impeded too much*?

The 5 Immutable Principles

1. What Does DONE Look Like?
2. How Do We Get There?
3. Do We Have Enough Time, Resources, And Money To Get There?
4. **What Impediments Will We Encounter Along The Way?**
5. How Do We Know We

Discovering and handling risks is a primary role for project management and the technical staff. For this effort to be successful there must be is sufficient set skills and experiences necessary to "manage" the identified risks. A favorite quote that sets the tone for this effort:

> *Project managers should be continuously wary. This sustained attitude only comes from experience.* [2]

The first step in managing risks starts with the recognition there is a step-by-step process for each activity risk handling process.

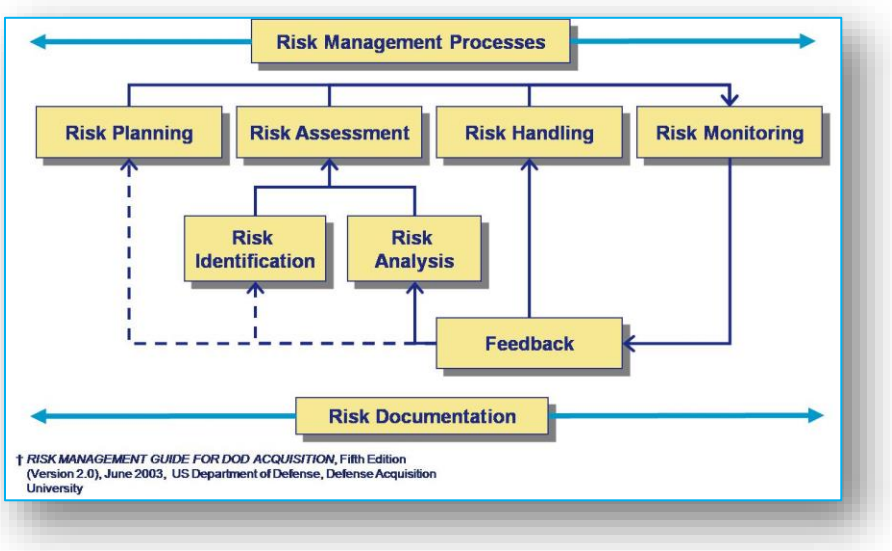

Figure 6 – The US Department of Defense risk management process. There are many approaches to managing risk, but this approach covers all aspects of risk management and has a well–established basis for success.

[2] Abstracted from Earnest Gann's *Fate is the Hunter*, Chapter VI "Of Numbers and their power to reduce the presumptuous quickly."

There are many Risk Management frameworks. The Department of Defense framework described in the *Risk Management Guide for DOD Acquisition* is the standard for all complex programs. All other frameworks leave out process details and create more risk than they remove.

Risk measures future uncertainties in achieving program performance goals and objectives within defined cost, schedule, and performance constraints. Risk can be associated with all aspects of a program (e.g., threat, technology maturity, supplier capability, design maturation, performance against plan) as these aspects relate across the Work Breakdown Structure (WBS) and Integrated Master Schedule (IMS). Risk addresses the potential variation in the planned approach and its expected outcome. While such variation could include positive and negative effects, this guide will only address negative future effects since programs have typically experienced difficulty in this area during the acquisition process.

Risk Management – is an organized methodology for continuously identifying and measuring the unknowns; developing mitigation options; selecting, planning, and implementing appropriate risk mitigations; and tracking the implementation to ensure successful risk reduction.
Effective risk management depends on risk management planning; early identification and analyses of risks; early implementation of corrective actions; continuous monitoring and reassessment; and communication, documentation, and coordination.

Risk Planning – is the process of developing and documenting an organized, comprehensive, and interactive strategy and methods for identifying and tracking risk areas, developing risk handling plans, performing continuous risk assessments to determine how risks have changed, and assigning adequate resources.

Risk Assessment – is identifying and analyzing program areas and critical technical process risks to increase the probability/likelihood of meeting cost, schedule, and performance objectives.

Risk Handling – is the process that identifies, evaluates, selects, and implements options to set risk at acceptable levels given program constraints and objectives.

Risk Monitoring – is the process that systematically tracks and evaluates the performance of risk–handling actions against established metrics throughout the acquisition process and develops further risk–handling options, as appropriate.

In nearly every guide for managing risk it is suggested that risk mitigation is the "handling" strategy. This approach allocates funding and schedule margin for the "mitigation" processes when the risk "comes true."

Usually when the risk "comes true" and turns into an issue, the budget has been consumed and the project's time has passed. A better approach is to "buy down" the risk to eliminate the risk before it can turn into an issue.

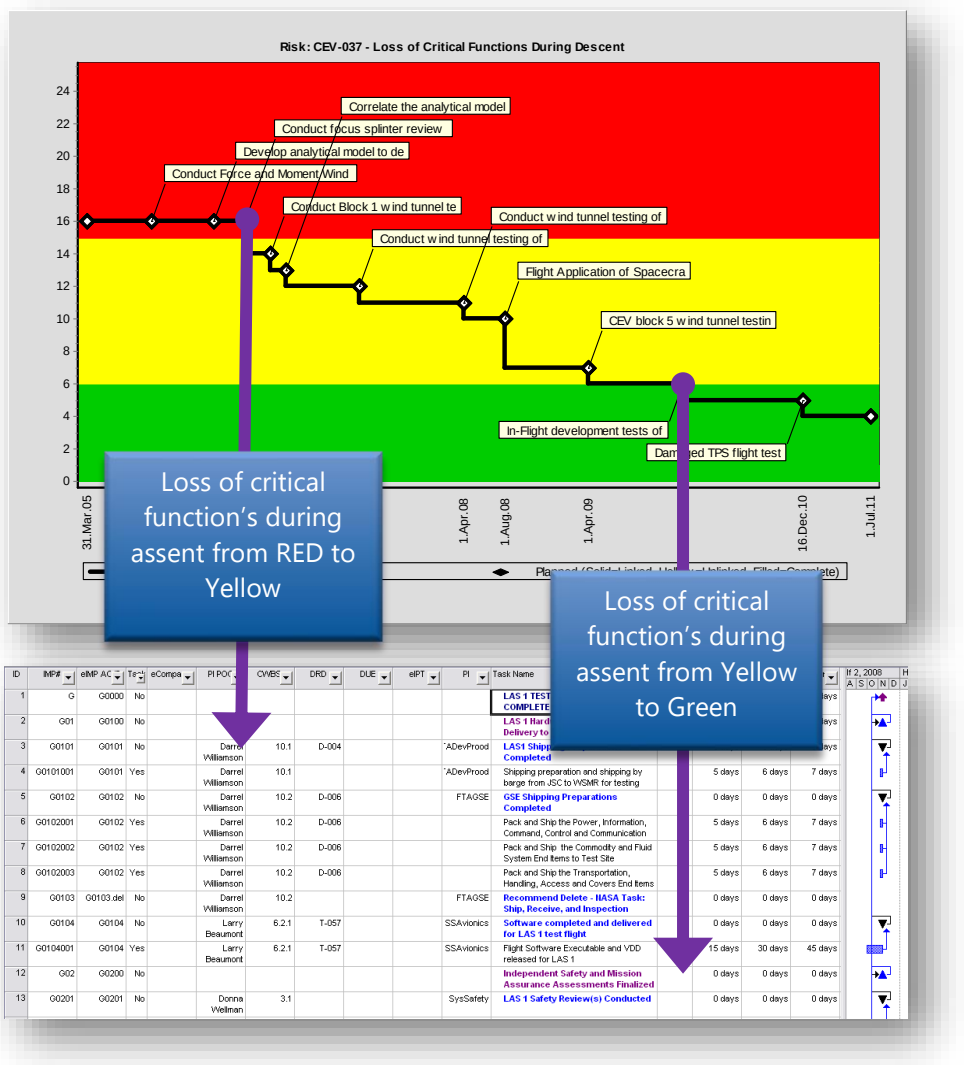

Figure 7 *– all risk handling processes must be physically connected with the Integrated Master Schedule (IMS), showing where in time the risk is reduced to the next lower level, and what activities are needed to reduce these risks.*

Figure 7 is an example of *buying down* or *retiring* the risk of the product – in this case a flying machine – of being overweight. By *retiring* the overweight risk, the project can make the risk go away. The cost for this retirement is traded for the needed budget and schedule margin that must be consumed when the risk turns into an issue.

The next section will discuss how we can measure progress to plan in units meaningful to the decision makers. This should always be a measure of Physical Percent. Cost, schedule, technical performance, or other measures of the product itself. Never the passage of time or the consumption of resources.

But before going there, here's one final reminder for the difficulties we encounter when try to manage risk…

> *Of all the causes which conspire to blind Man's erring judgment and misguide the mind, What the weak head with the strongest bias rules, – Is pride, the never-failing vice of fools.*
> – Alexander Pope (English Poet, 1688–1744)

PRINCIPLE NUMBER 5

The 5th and final immutable principle of successful project management answers the question *How Do We Know We Are Making Progress*?

The 5 Immutable Principles

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2. How Do We Get There?
3. Do We Have Enough Time, Resources, And Money To Get There?
4. What Impediments Will We Encounter Along The Way?
5. **How Do We Know We Are Making Progress?**

With a clear and concise description of DONE, in units of measure meaningful to the decision makers, with a Plan and a Schedule baseline established for delivering the outcomes, with confirmation that we have enough resources, time, and money, with the impediments identified and handling plans in place, the remaining question is *how do we knowing we are going to make it on–time, with the planned budget, and that the product or service is going to work*?

The solution starts with defining the measures needed to answer the question. These measures include:

Mission need – stated in terms of *Capabilities* needed to accomplish the desired outcome. The mission, vision, and strategic goals are derived from the Project Management Plan (PMP), Project Charter, or Project Strategy (Project Balanced Scorecard).

Measures of Effectiveness (MoE) – operational measures of success that are closely related to the achievements of the mission or operational objectives evaluated in the operational environment, under a specific set of conditions. These measures are stated in units meaningful to the buyer, focused on capabilities independent of any technical implementation, and are connected to the mission success.

Measures of Performance (MoP) – characterize physical or functional attributes relating to the system operation, measured or estimated under specific conditions. These measures assure the system has the capability to perform and provide an assessment that ensures the system meets the design requirements that satisfy the Measures of Effectiveness

Key Performance Measures (KPP) – represent the capabilities and characteristics so significant that failure to meet them can be cause for reevaluation, reassessing, or termination of the program.

Technical Performance Measures (TPM) – are the attributes that determine how well a system or system element is satisfying or expected to satisfy a technical requirement or goal.

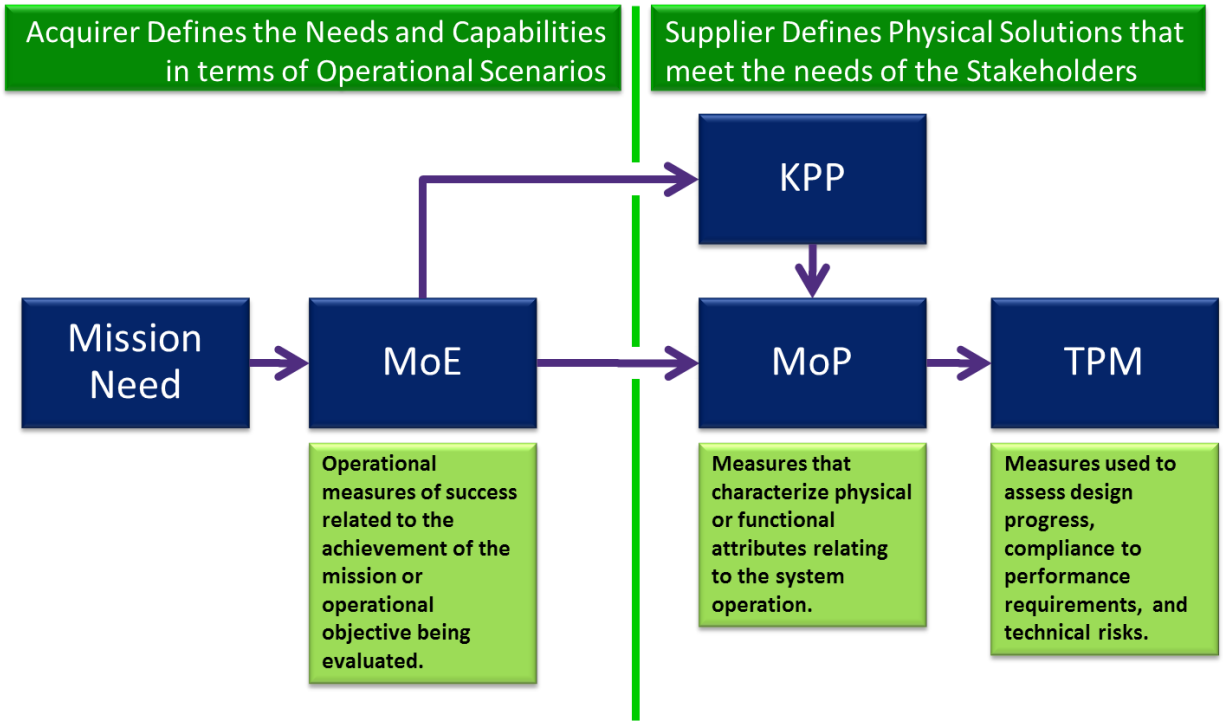

Figure 8 – these measures provide to progress to plan. Each measure has units tailored to the needs of the recipient. The customer speaks in terms of Mission and Effectiveness. Providers (developers, engineers) speak in units of Performance, Key Performance Parameters and Technical Performance Measures. The unit measure connecting all of these is Earned Value.

All measures of Effectiveness and Performance are in tangible units. These *Completion Criteria* speak to *Done*. For example:

- All drawings of the configuration-controlled item complete per engineering procedures. Signed off and entered into the database as complete.
- Software module unit tested, and peer reviewed to attest to the baseline functionality and requirements.
- Technical data package for design of the fire detection system completed per engineering procedures and meets all baselined, allocated requirements, and technical performance criteria.
- Courseware module complete per learning objective procedures.
- Test procedure completed and approved and includes all baselines and allocated requirements.

Phrases like this appear to be overkill. But ask this question *how do we know what done looks like*? The answer should be in tangible evidentiary materials delivered at the planned time for the planned budget.

These types of descriptions are included in the Work Breakdown Dictionary. Sorry to include this concept so late, but it is part of the Performance Measurement Baseline back in the second Immutable Principle.

The grammar used to speak about making progress to plan is shown in **Figure 9.**

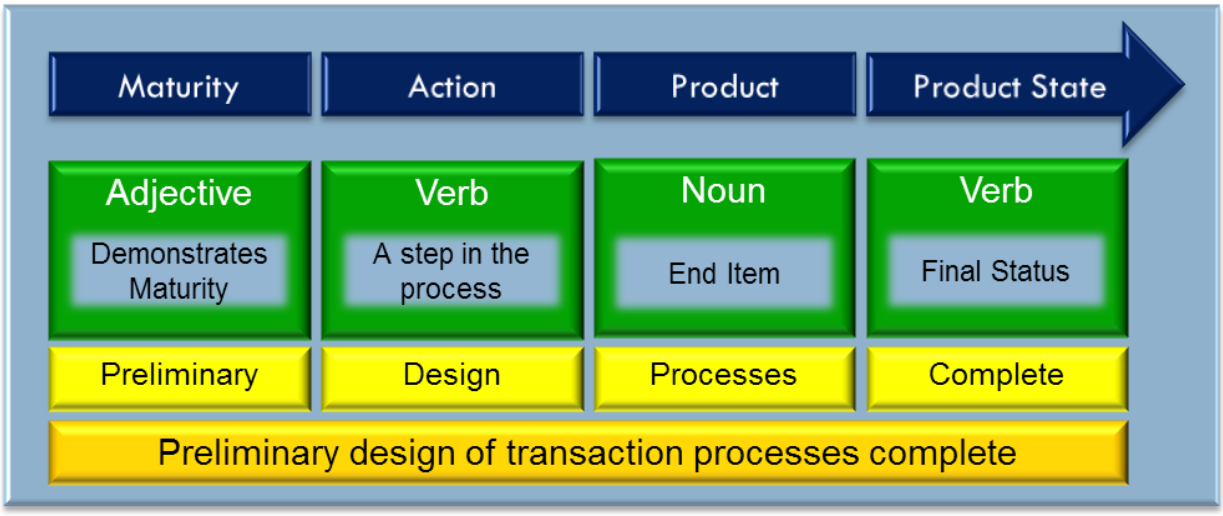

Figure 9 – when we speak about progress, work activities, completion criteria or any other activity in the Integrated Master Schedule, using a grammar. This grammar has nouns and verbs. What actions are being taken. Which items are these actions being taken against.

Each element of the Integrated Master Schedule – each work activity – should have a grammar that speaks to its Maturity, Action, Product, and Product State.

Table 2 – Sample words used for stating measures of progress in the Integrated Master Schedule. This grammar provides insight into what to do during the work effort, how to measure progress, and the expected outcome of this work effort.

Maturity	Action	Product	Product State
Preliminary	Design	The product or service delivered resulting from the work activities	Complete
Initial	Develop		Delivered
Final	Engineer		Approved
Intermediate	Construct		Analyzed

With this grammar, the participants in the project can ask and answer *what does DONE look like* in terms meaningful to the decision makers.

This phrase is repeated often in this series of articles for the simple reason it is not used enough in many project management contexts.

Increasing The Probability Of Project Success Is About Measuring Progress

Increasing the Probability of Program Success (PoPS) requires asking and answering the 5 Immutable Principles. This is necessary but not sufficient. For success program *Health Factors* are needed for calculating this *probability of program success*. These health factors provide objective and quantifiable measures for comparing and evaluating the likelihood of success for a program.

This evaluation and comparison starts with determining the factors issues that adversely impact success of the program execution:

- Program requirements
  - Parameter requirements – progress toward defining capability requirements and meeting those requirements through achievement of Measures of Effectiveness, Measures of Performance, Key Performance Indicators, and Technical Performance Parameters
  - Scope evaluation – stability of capability requirements (scope or quantity) from the previously established baseline and the impact of requirements changes on program cost and schedule.
  - Concept of Operations (ConOps) – Progress toward developing the Concept of Operations (CONOPS) and using it to inform program requirements and strategies.
- Program resources
  - Budget – sufficient current year funding for the planned work
  - Manning – stability and adequacy of technical and managerial staff
- Program planning and execution
  - Cost and schedule estimating – Status of cost and schedule estimating activities, the confidence level associated with the current cost and schedule estimate, and the difference between the Program Office and independent cost estimates.
  - Cost and schedule performance – measures of physical percent complete against planned percent complete at planned evaluation intervals
  - Subcontractor performance
  - Test and evaluation performance – progress toward defining and executing the Test and Evaluation Strategy/Test and Evaluation Master Plan (TEMP) and the adequacy of test resource capabilities to accomplish key test activities. Status of identified performance risks, issues and major deficiencies.

Technical maturity – Identification and tracking of Critical Technology Elements (CTEs) to ensure technologies are sufficiently mature [based on Technology Readiness Level (TRL) requirements] and available to meet the user's needs.
Program risk assessment – assessment of technical and programmatic risks, the risk handling processes, and the risk retirement plans embedded in the Integrated Master Schedule (IMS)
Contract execution – performance major subsystem measured by the Earned Value Management.

Externalities that positively and negatively impact program success
Fit for mission – program alignment with ConOps and business or mission objectives
Program advocacy – support for the program demonstrated by key stakeholders
Interdependencies – integration assessment of shared crucial, significant, or enabling interdependencies.

These *health factors* are decomposed into metrics and assessed using criteria tailored to the program's lifecycle.

Let us remind ourselves of Five principles one last time:

1. ***What does done look like?*** – What are the needed capabilities that the project will produce? Do we know what these are in terms understandable by the project's stakeholders? Is there a consensus that these descriptions are sufficient for everyone to recognize done when it arrives?
2. ***How do we get there?*** – do we have a credible plan, schedule, and cost profile for the planned work that will produce done?

3. ***Do we have everything we need to execute that plan and schedule?*** – do we know what we need when we need it, how to acquire these needed items, a plan to acquire them, and every other question around resources and materials? This is essentially a supply chain problem for the project.

4. ***What is going to cause this project to get into trouble?*** – do we have a credible risk management process guided by a formal method? Not just a list of risks, but a "risk handling" process with planned responses to each risk, with cost and schedule allocated to each response?

5. ***How do we know we are making progress? –*** There is only one way to answer this. We measure physical percent complete at the planned time that percent is expected to be at a planned value. If we don't meet that planned percent complete

within the planned variance, then we're late, probably over budget, and most likely not complying with the planned technical performance.

Figure 10 *– Fence at Carnegie Mellon University West*

About the Author

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Glen B. Alleman leads the Program Planning and Controls practice for Niwot Ridge, LLC. In this position, Glen brings his 30+ years' experience in program management, systems engineering, software development, and general management to bear on problems of performance-based program management.

Mr. Alleman's experience ranges from real time process control systems to product development management and Program Management in a variety of firms including Logicon, TRW, CH2M Hill, SM&A, and several consulting firms before joining Niwot Ridge, LLC. Mr. Alleman's teaching experience includes university level courses in mathematics, physics, and computer science.

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