

Improving DOE Project Performance Using the DOD Integrated Master Plan – 12481

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ABSTRACT

DOE O 413 measures a project's progress to plan by the consumption of funding, the passage of time, and the meeting of milestones. In March of 2003, then Under Secretary, Energy, Science, Card received a memo directing the implementation of *Project Management* and the *Project Management Manual*, including the *Integrated Master Plan* and *Integrated Master Schedule*. This directive states "the integrated master plan and schedule tie together all project tasks by showing their logical relationships and any constraints controlling the start or finish of each task. This process results in a hierarchy of related functional and layered schedules derived from the Work Breakdown Structure that can be used for monitoring and controlling project progress." This paper shows how restoring the IMP/IMS paradigm to DOE program management increases the probability of program success in ways not currently available using DOD O 413 processes alone.

INTRODUCTION

The measures of progress to plan in units meaningful to the decision maker are needed to answer the question – ***How Long Are We Willing to Wait before We Find out We Are Late?*** As recently as January of 2011 updates to DOE O 413.3B were made with focus on four philosophical goals. [3] With this 2011 directive and the 2003 memo to Robert Card (*Project Management and the Project Management Manual*) [1] addressing the use of Integrated Master Plans and Schedules in Section 6.5.1, the measures needed to answer this question are still not specifically stated in the most recent version of the DOE O 413 series. However, the DOD 5000.02 and Integrated Master Plan (IMP) paradigm provides the mechanism to answer the question and should be adopted by DOE. The IMP, as applied by the DOD, defines the incremental increase of a project's maturity, assessed through Significant Accomplishments (SA) and Accomplishment Criteria (AC), using Measures of Effectiveness (MoE), Measures of Performance (MoP), and Technical Performance Measures (TPM). [2]

The memo to Card reflects a nearly identical structure to the DOD Integrated Master Plan and establishes DOE M 413.3–1 (*Project Management for the Acquisition of Capital Assets*) as a primary guidance document using the IMP/IMS in 2003. But the current DOE O 413.3–1 does not include the use on an Integrated Master Plan (IMP) [7], [11].

Applying Card's 2003 DOD IMP paradigm to DOE O 413 series projects will improve the probability of DOE project success through measures of increasing maturity of the deliverables defined in the Integrated Master Plan (IMP), in addition to measures of progress through cost and schedule performance and milestone compliance. [3]

For motivation for this IMP/IMS approach, we need only look to recent reports that provide a sample of assessments: GAO–07–336 *Major Construction Projects Need a Consistent Approach for Assessing Technology Readiness to Avoid Cost Increases and Delays* [4], GAO–09–406 *Contract and Project Management Concerns at NNSA and Office of EM* [5] and GAO–08–1081 *Nuclear Waste: Action Needed to Improve Accountability and Management of DOE's Major Cleanup Projects* [6].

These GAO reports found that ...:

- ... the cost increases and schedule delays that have occurred for most of these projects have been the result of inconsistent application of project management tools and techniques on the part of both DOE and its contractors.[5]
- ... exceeded their original cost or schedule estimates, principally because of ineffective DOE project oversight and poor contractor management. [4]
- ... had life cycle baseline cost increases, from a low of \$139 million for one project to a high of nearly \$9 billion for another, and life cycle baseline schedule delays from 2 to 15 years. These changes occurred primarily because the baselines we reviewed included schedule assumptions that were not linked to technical or budget realities and the scope of work included other assumptions that did not prove true. [6]

Project success depends on answering 5 immutable questions, no matter the domain or the project context in that domain, the project management method, or the agency guidance.

1. What does “Done” look like?
2. What is the path to reaching “Done” on time, on budget, and technically compliant?
3. What resources (time, money, staff, and facilities) are needed to reach “Done”?
4. What impediments will prevent reaching “Done”?
5. How is physical progress to plan measured on the path to “Done?”

Project success starts with describing what “Done” looks like in units of measure meaningful to the decision makers. These measures of performance (technical and programmatic) and effectiveness (the customer’s point of view) are derived from the elements of the Integrated Master Plan – Program Events, Significant Accomplishments, and the Accomplishment Criteria of the baselined Work Packages.

DOE G 413.5 (*Performance Measurement Baseline*) describes the measurement of progress to plan through Key Performance Parameters (KPP), Cost, and Schedule Performance. These measures do not answer the 5 immutable questions stated above. The answers need to be in units of *Increasing Maturity* of the project outcomes. [8]

DOE O 413.3b (*Program and Project Management for the Acquisition of Capital Assets*) mentions the term *maturity* 14 times. [9] DOE O 413.3–9 (*Project Review Guide for Capital Asset Projects*) mentions *maturity* 9 times.[‡] DOE G 413.3–7A (*Risk Management Guide*) provides guidance for assessing increasing project maturity. [10]

None of these Orders or Guides states HOW to measure increasing maturity or HOW to use these measures to increase the probability of success of the project. The DOD applies the Integrated Master Plan (IMP) paradigm, to assess the increasing maturity of the project through Measures of Effectiveness (MoE), Measures of Performance (MoP), Key Performance Parameters (KPP), and Technical Performance Measures (TPM) to assess the increasing Probability of Project Success (PoPS). The DOD approach is distinctly different from the horizontal master scheduling described in the DOE O 413 series guidance.

EVENT BASED PLANNING IS THE BASIS OF STRATEGY MAKING

From Card’s memo we have a clear and concise connection between the Integrated Master Plan (IMP) and the supporting Integrated Master Schedule (IMS) and the management of DOE projects guided by DOE O 413.3. The following words appear in §6.5.1 of Card’s memo and attached manual section [1].

[‡] NASA style Technology Readiness Levels have been suggested for the DOE through GAO-07-336 [4]

An integrated master plan is a very effective tool for project management. It is the contractor's event-based plan for accomplishing the requirements contained in Statements of Work, Performance Work Statements, Work Authorizations, and other documents which communicate requirements to the contractors. The plan identifies the key activities, events, milestones, and reviews that make up the program or project.

The program or project office, support contractors or the prime contractor may prepare the plan. The plan also identifies those events and activities that will be included in the integrated master schedule. The integrated master schedule is a networked multilayered schedule generated by the contractor that begins with all identified integrated master plan events, accomplishments, and criteria. It also shows the expected start and finish dates of these events and contains all contractually required events and milestones such as reviews, tests, completion dates, and deliveries specified in the Work Breakdown Structure.

The integrated master plan is prepared prior to completion of the Conceptual Design process and is subsequently maintained by the government and the contractor through a collaborative effort involving all the stakeholders. The integrated master plan and schedule tie together all project tasks by showing their logical relationships and any constraints controlling the start or finish of each task.

*This process results in a hierarchy of related functional and layered schedules derived from the Work Breakdown Structure that can be used for monitoring and controlling project progress.**

Strategy Making, IMP/IMS, and Systems Engineering

Building products or facilities, providing services, or remediating environments is a systems engineering process.[†] Components, processes, participants, and their outcomes interact in ways that are described as a system. Engineering of these systems is an interdisciplinary process that deals with the work and tools that manage risk, technical activities, and the human centered disciplines need for success. The strategy for these activities is represented in the DOD by the Integrated Master Plan.

The IMP/IMS is a step by step process to increase the probability of project success by:

1. **Creating A Vision Of The Outcome** – described in the Concept of Operations (ConOps) or Statement of Objectives (SOO).
2. **Analyzing The Current Situation** – to determine viable alternatives for the desired outcomes.
3. **Determining A Strategy** – for moving from the current situation to the outcome, what “maturity increasing” activities must be performed to move forward.
4. **Selecting The Systems Development Activities** – needed to move the “increasing maturity” forward through Significant Accomplishments (SA).
5. **Constructs A Plan Based On These Activities** – arrange the SAs in a logical sequence for each Program Event (PE) to provide increasing level of maturity of the products or service.

* These words taken directly from the attached Manual in the memo are nearly identical to DI-MGMT-81650, Integrated Master Schedule, with three levels of Master Schedules. The terms *Significant Accomplishment* and *Accomplishment Criteria* are used directly in Card's memo they are connected from DID-81650 to the current – under review – is DI-MGMT-81466B, where the Integrated Master Plan (IMP) is mentioned. The DOD *Integrated Master Plan and Integrated Master Schedule Preparation and Use Guide* shows how the connected the resulting IMP with the IMS mentioned in Card's memo.

† “Project Management vs. Systems Engineering Management: A Practitioners' View on Integrating the Project and Product Domains,” Amira Sharon, Olivier L. de Weck, and Dov Dori, *Systems Engineering*, Volume 14, Number 4, 2011.

6. **Performing A Pilot Set Of Activities** – to confirm they result in desirable outcomes.
7. **Evaluating These Results** – “test” the logic of the SAs to assure increasing maturity will result.
8. **Executes The Processes** – in steps 6 and 7 until the outcome is reached by developing the Accomplishment Criteria (AC) for each SA and the top activities for each AC.

This IMP/IMS approach is the basis of all credible development activities in the DOD. The challenge for the DOE becomes finding how the details of each step are to be defined, developed, and executed in the context of DOE O 413.3b.

STRUCTURE OF THE INTEGRATED MASTER PLAN IN THE DEPARTMENT OF DEFENSE

The Integrated Master Plan showing how work is performed, the criteria for the compliance of that work with the Technical Performance Measures, and the Accomplishments needed to deliver a capability are shown in **Figure 1**.

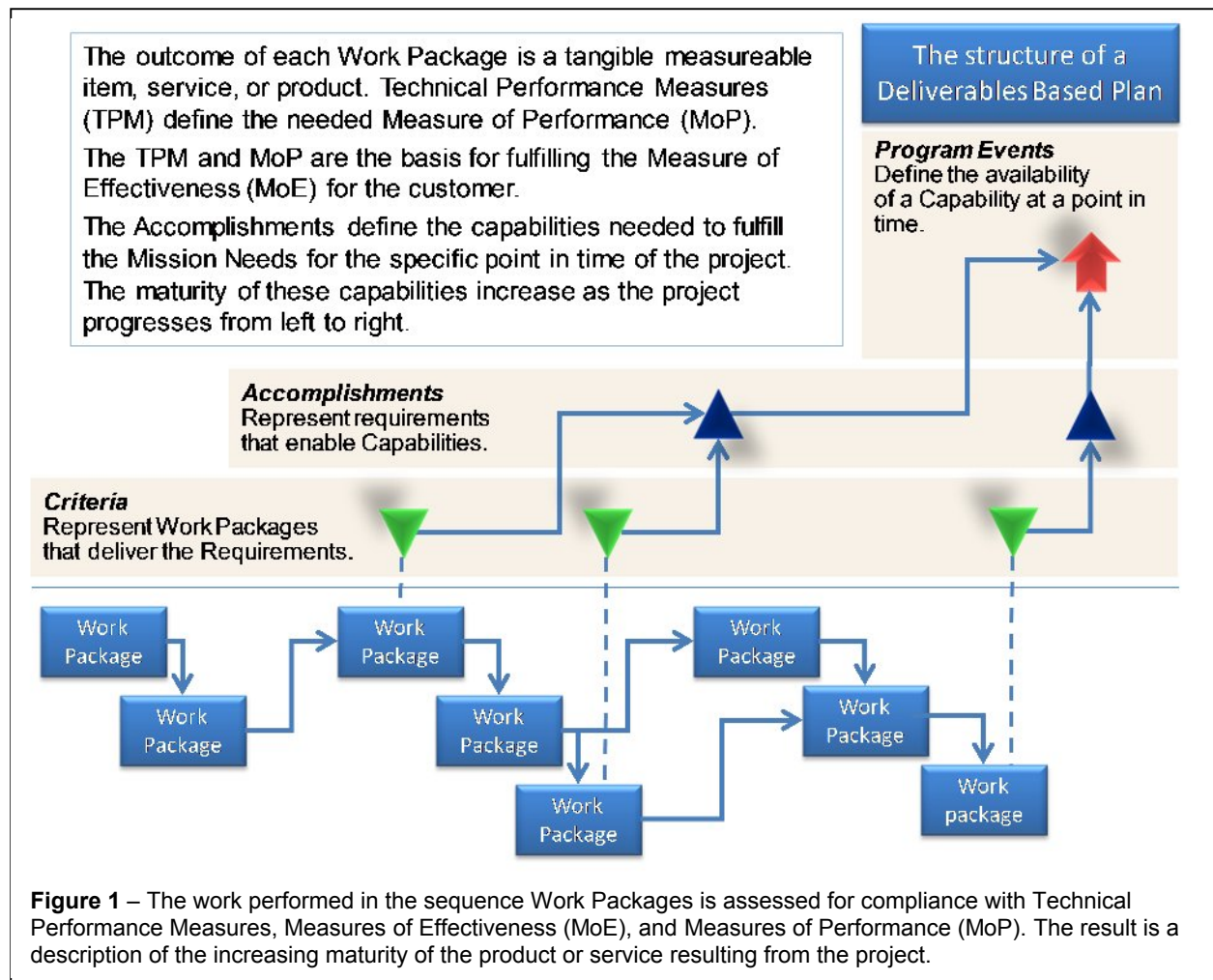
This approach provides tangible evidence of progress to plan in units of measure meaningful to the decision makers. These units include Measures of Effectiveness (MoE) from the customer's point of view, Measures of Performance (MoP) from the contractor's or owner's point of view, the agreed Key Performance Indicators (KPP), and the Technical Performance Measures (TPM) for all work activities.

The trends in these measures (MoP, MoE, KPP, and TPM) reveal project progress and when compared with standard contingency values, highlight when corrective actions should be considered. These measures of the system technical performance have been chosen because they are indicators of increasing maturity of the project outcomes that impact the probability of project success. They are based on high risk or significant driving requirements or technical parameters. These measures are analogous to the programmatic measures of expected total cost or estimated time-to-completion (Earned Value Management measures).

Actual versus planned progress of these measures are tracked through the IMP/IMS so engineers, constructors, and project managers can assess progress and the risk associated with each measure. These measures are attached to each Significant Accomplishment and Accomplishment Criteria shown in **Figure 1** to provide measures of increasing maturity, as well as other measures needed to assess the probability of project success.

These measures are distinctly different from measures of cost and schedule performance and their related milestone compliance. Cost, schedule, and milestone compliance are necessary, but do not sufficient to provide visibility into the effectiveness of the project for the customer. Measures of Effectiveness (MoE) are operational measures of. Measures of Performance (MoP) characterize physical or functional attributes relating to the system operation, measured or estimated under specific conditions. Key Performance Parameters (KPP) represents the capabilities and characteristics significant enough that failure to meet them can be cause for reevaluation, reassessing, or termination of the project.

These three measures (MoE, MoP, and KPP) are the heart of the IMP/IMS Significant Accomplishments and their Accomplishment Criteria that provide direct measure of increasing maturity of the projects outcomes.



Department of Defense Processes Integrated with DOE O 413.3b and 413.5

The U.S. Department of Defense (DOD) makes use of Event Based Plans to define the integrated product development and integration using measures of increasing maturity. This approach enhances project planning, scheduling, and successful execution. This plan is a hierarchy of Project Event(s), each event supported by specific Accomplishments, and each accomplishment associated with specific Criteria to be satisfied for its completion.

This approach is different from the traditional horizontal schedule that measures progress through cost and schedule performance. While deliverables are defined in the Integrated Master Schedule (IMS), measures of Effectiveness (MoE), Performance (MoP), and its related Key Performance Parameters (KPP) and Technical Performance Measures (TPM) are not embedded in the Performance Measurement Baseline (PMB).

By applying the IMP paradigm, a vertical Plan is created where each Accomplishment defines the desired result(s) prior to the completion of an Event that indicates a level of the project's progress. Accomplishment Criteria provide tangible evidence that a specific accomplishment has been completed according to its Measure of Effectiveness and Measure of Performance.

DOE G 413.5 *Performance Measurement Baseline* defines the Scope, Design, Key Performance Parameters, Cost, Schedule, and supporting Documentation for the project. But this PMB does not define the Accomplishments and Criteria that must be met to successfully deliver the outcomes of the project.

Using the IMP paradigm, units of measure of performance meaningful to the decision makers are installed in the PMB from the Accomplishments and Criteria for the detailed work activities. This approach makes the Integrated Master Schedule (IMS) clearer by showing what DONE looks like in terms of deliverables and the criteria for success of those deliverables embedded in the IMS.

The connection of the performance of work efforts to the Criteria, Accomplishments, and Project Events is the Earned Value Management (EVM) System. The EVM System defines the measures of progress to plan at the work performance level. These measures are used to define progress for each Criteria and Accomplishment. This provides Project Management with direct measures of physical percent complete for each deliverable from the project.

Figure 1 shows the programmatic structure needed to improve the probability of project success, using the Integrated Master Schedule paradigm, with Accomplishments, and Criteria as measures of project performance based on MoE, MoP, and TPMs. **Figure 2** shows how each of these measures is related to produce visibility to the performance of the project.

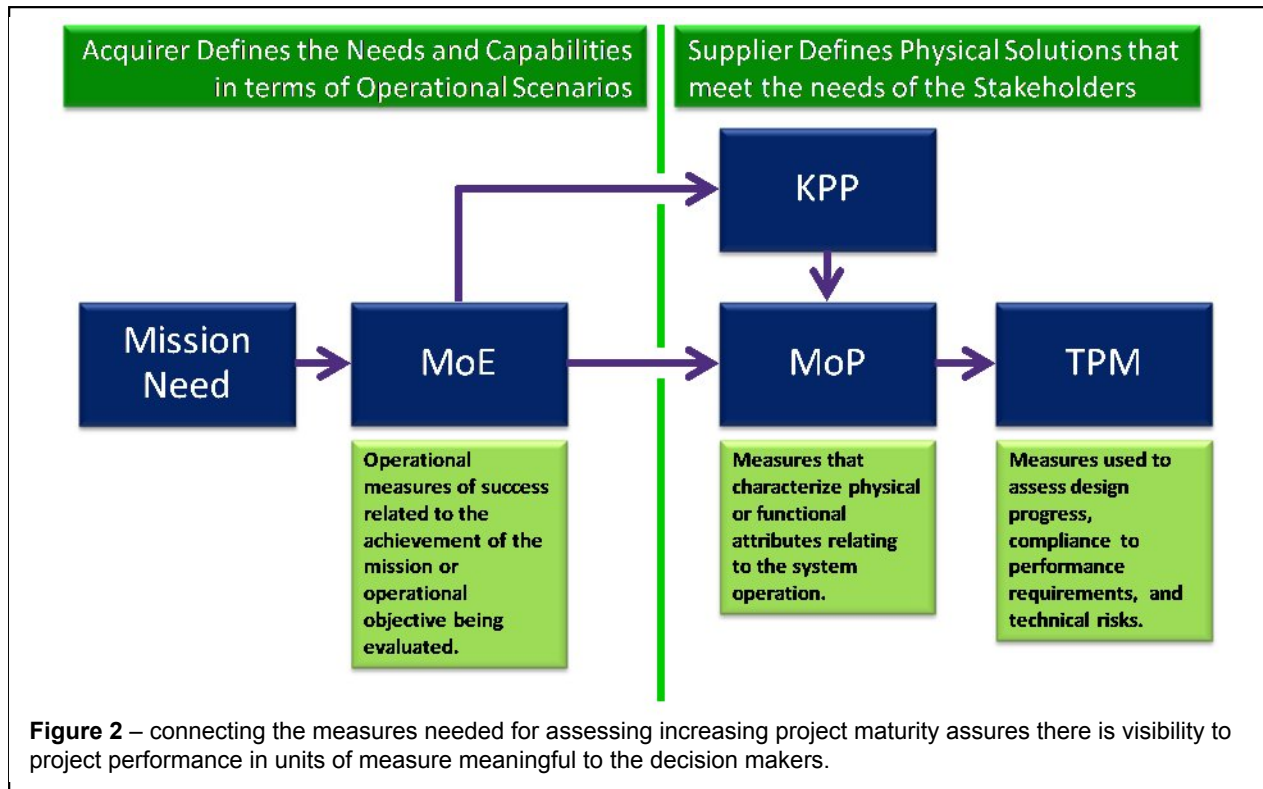
How the Department of Defense Measures Maturity of the Project's Outcomes

DOE O 413.3b mentions *maturity* 14 times in the context of design, procurement, and technology readiness assessment. The measure of maturity has two sides of a project – the buyer side and the producer side, i.e. The Customer and the Builder.

- **Measures of Effectiveness** – are closely related to the achievements of the mission or operational objectives evaluated in the operational environment, under a specific set of conditions. MoE's are stated in units meaningful to the buyer and focus on the capabilities independent of any technical implementation, and are connected to the mission success.
- **Measures of Performance** – characterize physical or functional attributes relating to the system operation measured or estimated under specific conditions. MoP's are attributes that assure the system has the capability to perform and assure the design requirements can satisfy the Measures of Effectiveness.

Along with the Measures of Effectiveness and Measures of Performance, two other measures are needed to “connect the dots.”

- **Key Performance Parameters (KPP)** – Represent the capabilities and characteristics so significant that failure to meet them can be cause for reevaluation, reassessing, or termination of the project. KPPs have a threshold or objective value. These characterize the major drivers of performance and are considered Critical to Customer (CTC).
- **Technical Performance Measures (TPM)** – are attributes that determine how well a system or system element is satisfying or expected to satisfy a technical requirement or goal. These measures assess the design process, define compliance to performance requirements, and identify technical risk, including projected performance. The TPMs are limited to critical thresholds.



CONNECTING DOE O 413.3B WITH DOD MEASURES OF MATURITY

Table 1 is a summary of DOE O 413.3b's Critical Design stages and the activities performed at each stage. For each of these, we'll demonstrate how they would be applied in the Department of Defense Integrated Master Plan and Integrated Master Schedule paradigm and show how these connections can add value and increase the probability of success for DOE projects.

Connections between the Critical Design stages and the elements of the Integrated Master Plan are shown in **Table 2**. These connections can be applied to current DOE O 413 series projects, guided with the Card memo [1] and the Bosco order [3].

The outcome of this approach is a programmatic architecture where performance is measured through cost and schedule adherence as well as direct measures of increasing maturity supported by measures of effectiveness and performance needed to assessing the probability of project success.

Used Earned Value for activities contained in Work Packages, measures of physical percent complete toward the Accomplishment Criteria are provided. These Accomplishment Criteria are then direct measures of progress toward the Significant Accomplishments needed to measure this increasing maturity of each Program Event.

This architecture is shown in **Figure 1**, where both vertical traceability to increasing maturity and horizontal traceability to activity progress are integrated in a single Performance Measurement Baseline.

Project Acquisition Process and Critical Decisions					
Project Planning Phase		Project Execution Phase			Mission
Pre-conceptual Design	Conceptual Design	Preliminary Design	Final Design	Construction	Operations

CD-0	CD-1	CD-2	CD-3	CD-4
Actions Authorized by the Critical Design Approval				
<ul style="list-style-type: none"> Proceed with the conceptual design. Request PED funding. 	<ul style="list-style-type: none"> Allow expenditure of PED funds. 	<ul style="list-style-type: none"> Establish baseline budget for construction. Continue design. Request construction funding. 	<ul style="list-style-type: none"> Approve expenditure of funds for construction. 	<ul style="list-style-type: none"> Allow start of operations or project close out.
Critical Design Pre-Requisites				
<ul style="list-style-type: none"> Justification of mission need. Acquisition strategy Pre-conceptual planning. Mission need. Independent Project Review. 	<ul style="list-style-type: none"> Acquisition plan. Conceptual design. Preliminary project execution plan and baseline range. Project data sheet for design Verification of mission need. Preliminary hazard analysis report. 	<ul style="list-style-type: none"> Preliminary design. Review of contractor project management system. Final project execution plan and performance baseline. Independent cost estimate. NEPA Project data sheet for construction. Draft preliminary Safety Analysis Report. Performance Baseline External Independent Review. 	<ul style="list-style-type: none"> Update project execution Plan and Performance Baseline Final design and procurement packages. Verification of mission need. Budget and congressional authorization and appropriation enacted. Approval of safety documentation. Execution readiness Independent Review. 	<ul style="list-style-type: none"> Operational readiness review. Project transition to operations. Final safety report.

Table 1 – summary of CD activities from DOE O 413.3b, 29 November 2010 describe the *attributes* or *exit criteria* for each of the Critical Decision. The documents that define the processes and content of many of these deliverables do not directly speak to the increasing maturity of the project's outcome. The terms "preliminary, draft, approved verified, and final," are used but the Significant Accomplishments and the Accomplishment Criteria needed assessment the maturity of the project at each of these reviews is not defined.

Mapping the IMP/IMS Paradigm to the DOE Critical Design Reviews

The DOE O 413 series defines activities to be performed during the execution of a project. The DOD *Integrated Master Plan and Integrated Master Schedule Preparation and Use Guide* defines how to build the IMP and IMS that will increase the probability of success for the project [2].

DOE O 413.3–9 and 413.3–16 Guidance	DOD IMP/IMS Guidance
CD–0: Approve Mission Need	Understand the Project
<ul style="list-style-type: none"> ▪ Identification of a mission–related need and translation of this gap into functional requirements for filling the need. ▪ The mission need is independent of a particular solution and should not be defined by equipment, facility, technological solution, or physical end item (413.3A). ▪ The focus for Technology Assessment, at this stage, is on clear statement of the requirements of the input and the desired output of the process. 	<ul style="list-style-type: none"> ▪ Define mission outcome as a Concept of Operations (ConOps) ▪ Partition system capabilities into classes of service within operational scenarios. ▪ Connect the capabilities to system requirements using some visual modeling notation. ▪ Define Measures of Effectiveness (MoE) and Measures of Performance (MoP). ▪ Define the delivery schedule for each measure of performance and effectiveness.
CD–1: Alternative Selection and Cost Range	Develop Project Structure
<ul style="list-style-type: none"> ▪ Identification of the preferred technological alternative, preparation of a conceptual design, and development of initial cost estimates 	<ul style="list-style-type: none"> ▪ Assign costs to each system element using a value flow model. ▪ Assure risk, probabilistic cost and benefit performance attributes are defined. ▪ Use cost, schedule and technical performance probabilistic models to forecast potential risks to project performance.
CD–2: Performance Baseline	Create IMP / IMS
<ul style="list-style-type: none"> ▪ Completion of preliminary design, development of a performance baseline that contains a detailed scope, schedule, and cost estimate. ▪ The process of technology development, in accordance with the approved TMP should support all CTEs reaching TRL 6; attainment of TRL 6 is preferable and indicates that the technology is ready for insertion into detailed design. 	<ul style="list-style-type: none"> ▪ Decompose scope into work packages ▪ Assign responsibility for deliverables ▪ Arrange work packages in a logical order ▪ Develop BCWS for work packages ▪ Assign work package measures of performance ▪ Set Performance Measurement Baseline
CD–3: Start of Construction	Execute Performance Measurement Baseline
<ul style="list-style-type: none"> ▪ Completion of essentially all design and engineering and beginning of construction, implementation, procurement, or fabrication. A TRA is only required if there is significant technology modification as detailed design work progresses. ▪ If substantial modification of a technology occurs, the TRA should be performed and a focused TMP developed or updated to ensure that the modified technology has attained TRL 6, if possible, prior to its insertion into the detailed design and baseline. 	<ul style="list-style-type: none"> ▪ Performance authorized work ▪ Accumulate and report work package information ▪ Analyze work package performance ▪ Take corrective management action ▪ Maintain Performance Measurement Baseline

Table 2 – for each 413 CD, specific IMP/IMS guidance can be applied to increase the probability of project success, by creating evidence of increasing maturity in units of measure meaningful to the decision makers.

CHANGING THE PROGRAM PLANNING PARADIGM FROM HORIZONTAL TO VERTICAL

Building an IMP / IMS requires a change in the normal paradigm of project management. This change means stopping the measurement of progress as the passage of time and consumption of funding – to measuring progress by the completion of Accomplishment Criteria and the fulfillment of Significant Accomplishments.

It means moving from horizontal scheduling to vertical planning. These words are probably meaningless at this point. The description of this paradigm provides an understanding of this concept, the benefits to the project management, and the processes needed to deliver these benefits. In many cases, the horizontal schedules are the starting point for the project. This occurs for several reasons:

- The project started without an IMP or a real IMS. They first built a horizontal schedule in the manner of “shop floor” schedule. This is usually for the Period of Performance of the Program.
- The project was inherited from a higher or lower level process. Either as a subcontractor or a part of an IPT team, the schedule is focused on the functional aspects of the project.

In many cases, the conversion from horizontal to vertical planning is required or desired. The effort to do this conversion involves several steps:

- Identify the Program Events and where in the schedule these events take place.
- Identify which work in the schedule “lands” on which event. If there is work that crosses an Event boundary, then it will need to be “broken” into two (2) parts. One that “lands” on the Event and one that restarts at the completion of the Event.

IMP / IMS FEATURES AND BENEFITS

The IMP and IMS focuses on specific areas of the project, which have been shown to be problems with more traditional approaches. The primary focus is on project maturity Event based planning provides a “singularly” focused process allowing each IPT to answer the question – “what do I need to do for a specific event?” For example Preliminary Design Review (PDR): List all the accomplishments needed for PDR? What activities need to be performed for each of these accomplishments? When all the activities are completed, the criteria satisfied, and the accomplishments completed then a measurement of “maturity” can take place?

This approach is not described in the DOE O 413 series of guidance.

Features of IMP/IMS	Benefits to the Program
Provides an understanding and alignment of required tasks with events starting with the proposal	Drives down cost of execution by connecting changes with the impact of changes that occur early in the project life cycle when costs are lower and are made visible from day one.
Integrates relationships of products and development processes	Improves management visibility by connecting activities with events Permits better understanding of risk and how it impacts cost, schedule, performance
A disciplined approach to planning and implementation activities	Provides a framework for using integrated tools, teams, and processes with vertical traceability Serves as foundation for systematic programmatic improvement efforts
Iterative planning, tracking, and reporting process	Allows project flexibility – on ramps and off ramps tied to events Highlights details early – ties maturity events with activities
Event–Driven Planning	Relates project events in terms of success – Accomplishments and Criteria Reduces risk by ensuring that maturity of the plan is incrementally demonstrated prior to starting follow–on activities
Increases visibility of entire project to the project team	Improves measurable maturity and impact analysis Promotes project buy–in and team commitment through shared events Fosters proactive management at all levels through measurable outcomes

Features of IMP/IMS	Benefits to the Program
Resource and Earned Value Loadable	Provides foundation for Earned Value Reporting and EVMS
Key customer events included	Encourages a win-win attitude with customers
Clear communication of how the team views the project	Improves effectiveness through a common set of tools, measurements and defined outcomes

Table 3 – IMP/IMS features and that are not directly provided by executing DOE O 413 series guided projects using measures of cost, schedule, and milestone performance.

THE PIECES NEEDED TO INCREASE THE PROBABILITY OF PROJECT SUCCESS

Using the DOE Critical Decision (CD) review guide, the Integrated Master Plan paradigm is applied to increase the probability of project success.

DOE CD Outcomes	IMP / IMS Processes to create outcomes
CD-0: Approve Mission Need	
<ul style="list-style-type: none"> Developing the mission need and acquisition strategy 	<ul style="list-style-type: none"> Define the Significant Accomplishment needed to fulfill the mission need and implementation strategy. Define these in units of performance, effectiveness, and technical compliance. Define the Measures of Effectiveness (MoE) and Measures of Performance (MoP) for each mission need. (see Figure 2 for relationship between these measures).
<ul style="list-style-type: none"> Pre-conceptual planning 	<ul style="list-style-type: none"> Define the “increasing maturity” flow for the work needed to fulfill the mission need and acquisition strategy. Define the Technical Performance Measures (TPM) for each outcome at the planned level of maturity – in the DOE language the Technology Readiness Level (TRL) has similar words
CD-1: Alternative Selection and Cost Range	
<ul style="list-style-type: none"> Preliminary project execution plan Verification of mission need 	<ul style="list-style-type: none"> Integrated Master Plan logical “Value” flow, showing how each outcome from the work efforts satisfies the Accomplishment Criteria in units of Measures of Effectiveness (MoE) and Measures of Performance (MoP) measured against the planned MoE and MoP. Develop Basis of Estimate (BoE) for each Significant Accomplishment and Accomplishment Criteria (see Figure 1 for IMP/IMS structure). Connect the BoEs with each measure of maturity and the planned cost to reach that level of maturity.
CD-2: Performance (Measurement) Baseline	
<ul style="list-style-type: none"> Preliminary design review Review project management system Final project execution plan Independent cost estimate External independent review 	<ul style="list-style-type: none"> PDR and other reviews assess planned and actual maturity of Significant Accomplishments (SA) and the Accomplishment Criteria (AC). Probabilistic assessment of cost, schedule, and technical performance for each SA and AC.
CD-3: Start Construction	
<ul style="list-style-type: none"> Final design review Execution readiness review Execute the Performance Baseline 	<ul style="list-style-type: none"> Starting with the Work Packages, execute each Accomplishment Criteria and measure actual performance against planned performance using MoE and MoP.

Table 4 – for each 413 CD, specific IMP/IMS processes and their outcomes increase the probability of project success through tangible evidence of increasing maturity in units of measure meaningful to the decision makers.

CONCLUSION

Using DOE O 413 series guidance, adding the Integrated Master Plan and Integrated Master Schedule paradigm would provide a hierarchical set of performance measures for each “package of work,” that provides measureable visibility to the increasing maturity of the project.

This measureable maturity provides the mechanism to forecast future performance of cost, schedule, and technical outcomes in ways not available using just the activities in DOE O 413. With this information project managers have another tool available to address the issues identified in GAO–07–336 and GAO–09–406.

REFERENCES

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