TECHNICAL ARTICLE

Y-12 National Security Complex Implementation of the Project Controls System

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KEY WORDS: Cost estimating, earned value, planning , project controls, scheduling, and scope

Sixty years ago, construction of the Y-12 National Security Complex (Y-12) began. Its mission, known as the "Manhattan Project," was to make enough enriched uranium for the first atomic bomb. In 1945, more than 22,000 workers were employed at the site located in Oak Ridge, TN.

Today, Y-12 has approximately 5,000 workers and a modified mission—to manufacture, process, and store special nuclear materials for US national security. This mission also encompasses the manufacturing and remanufacturing of components for thermonuclear weapons. The Y-12 scope of work includes:

- Activities that directly support the readiness of the nuclear weapons stockpile
- Development and maintenance of critical capabilities needed to achieve confidence in the certification of the weapons stockpile without nuclear testing
- Development and maintenance of critical capabilities needed to reduce the threat from weapons of mass destruction
- Assisting other government agencies in the areas of information management, material sciences, precision machining, and hardware prototyping
- Providing the facilities, processes, technologies, and personnel to support the defined missions of Y-12
- Focusing on a program of infrastructure reduction and the modernization of facilities to accomplish its future missions

Y-12 is managed by the National Nuclear Security Administration (NNSA). This government agency assists the Department of Energy (DOE) with national security responsibilities. As a result, NNSA's mission includes the maintenance of a safe, secure, and reliable stockpile of nuclear weapons. In November 2000, NNSA awarded a management and operating contract to BWXT Y-12, L.L.C. (BWXT Y-12) for the Y-12 site.

The managing partners of BWXT Y-12 are BWX Technologies Inc., and Bechtel National, Inc. (Bechtel). This effective relationship brings critical skills expertise to the plant. BWX Technologies has earned a reputation for its capability of full life-cycle management of special nuclear materials, facilities, and technologies. The company boasts an experienced staff of scientists and engineers capable of performing full-scope design, manufacturing activities, and management of nuclear facilities. Bechtel, one of the world's largest engineering construction firms, is well known for its best-in-class engineering, procurement, construction, and project management services. Bechtel's reputation also includes expertise in managing, building, and operating nuclear and environmental facilities.

IDENTIFYING A NEED FOR CONTROLS

At the onset of the new contract, BWXT Y-12 performed a management assessment of the current project management systems. The assessment findings revealed the need for the following.

- a long-range strategic plan;
- a baseline, in order to compare planned work against work performed;
- a standard method to report baseline work performed;
- estimating tools, such as standard resource codes and Y-12-specific unit rates;
- work planning tools;
- a software package that was capable of covering complex projects and programs;
- estimating procedures, and
- estimating support for manufacturing.

Out of these needs came additional requirements for staffing and training. In order to meet the site requirements and establish a project controls system, 200 project controls professionals were required. A personnel recruitment and retention plan was quickly established, as originally only five people were identified as planners. Once the staff was assembled, training was necessary. An assessment was performed to determine the essential and nonessential requirements for each job function, and a training plan that included software and project management training was drafted. Training was provided for the following.

- Success—an estimating software;
- Primavera Project Planner (P3), a scheduling software;

- Systems, applications, and products in data processing (SAP);
- Project management, risk management, and earned value management.

The resolution of these findings provided for the creation of a new BWXT Y-12 entity, the Planning and Integration division, which would institutionalize these needs and implement the necessary changes. This division controls the technical, cost, and scheduling risks inherent in programs and projects at Y-12. To ensure customer satisfaction, a comprehensive and well-designed project plan was developed to keep projects on schedule and below costs. Without this focus on scope, projects would veer toward unplanned work, increased costs, and unhappy clients. For this reason, Planning and Integration measures success through time, cost, scope, safety record, and client satisfaction.

THE INTEGRATION PROCESS

To ensure Planning and Integration's success, a well-defined process that focused on achievement was installed. This process includes the following.

- Creating clear and written specifications of scope of work.
- Turning specifications into manageable units—the "work breakdown structure."
- Allocating resources to tasks, and sequencing the tasks with logic.
- Estimating the costs of each task.
- Executing the plan against the requirements of the schedule.
- Monitoring project performance through an earned value management system.
- Controlling and influencing a project's progress to meet or exceed expectations.

Simple as these seven steps look, the implementation and integration were difficult. Y-12 did not have a project controls organization. Therefore, the first task presented to the BWXT Y-12 Planning and Integration organization was to take an idea from concept to implementation.

PLANNING AND INTEGRATION: IMPLEMENTING A SYSTEM

The mission of the Planning and Integration Division is to provide estimating, program and project controls, baseline development, management and integration, work control, production control, weapons product configuration, all supporting systems (hardware and software), and procedures for all direct-funded work performed at the Y-12 National Security Complex.

To accomplish this mission, Planning and Integration coordinates a customer-driven, program-centered approach that assigns responsibilities to a performance measurement baseline. The customer (NNSA) provides guidance through its budget considerations. The development and use of the performance measurement baseline provides a single point of accountability and a single point for communication. Program and functional managers are responsible for integrating cost, schedule, scope, and maintenance of good customer relations. See Figure 1.

The Planning and Integration division also provides strategic planning, cost estimating, work prioritization, baseline, work authorization, performance measurement, and baseline change control functions to shape this process of producing deliverables. Figure 2 shows the relation of the planning process elements and flow of work.

Strategic Planning

Strategic planning identifies customer expectations and defines feasible strategies to meet those expectations. The process includes the following.

- Developing activities and examining required resources in the 10-year baseline.
- Setting priorities for long and near-term objectives.
- Extracting the annual operating plan and milestones.
- Measuring performance.
- Updating the plan as required.

Cost Estimating

After the customer initiates direction and program managers define the work, the estimating department leads the effort by interacting with the functional managers.

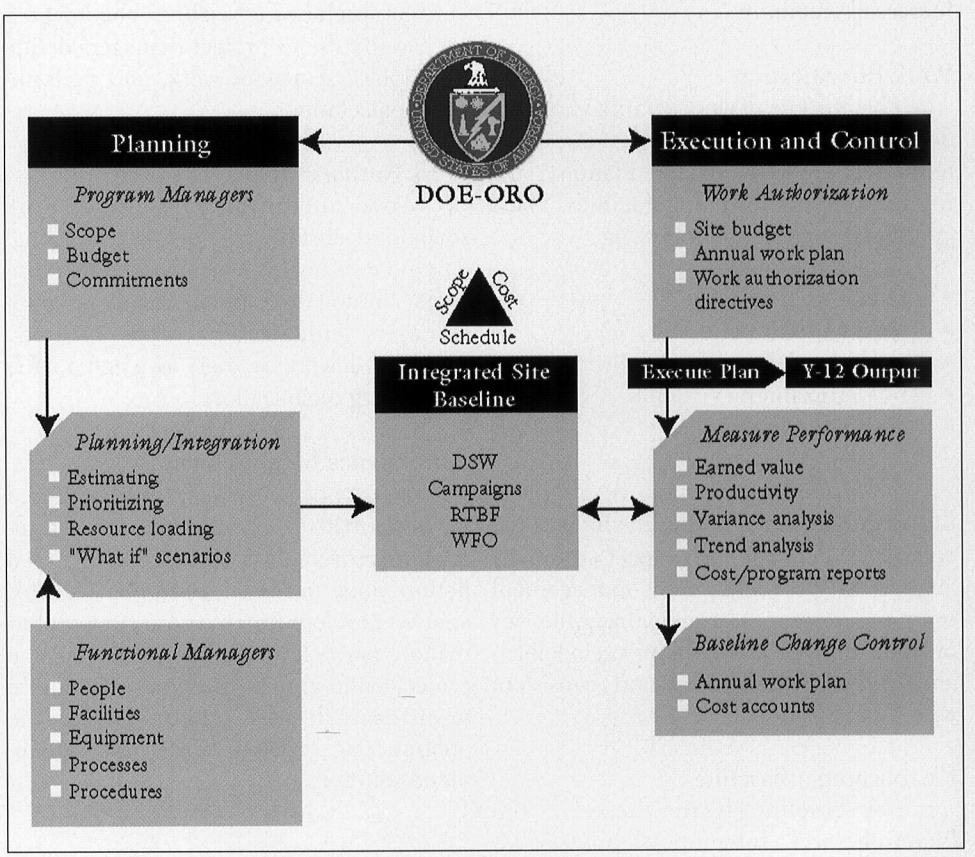

Figure 1— The Performance Measurement Baseline

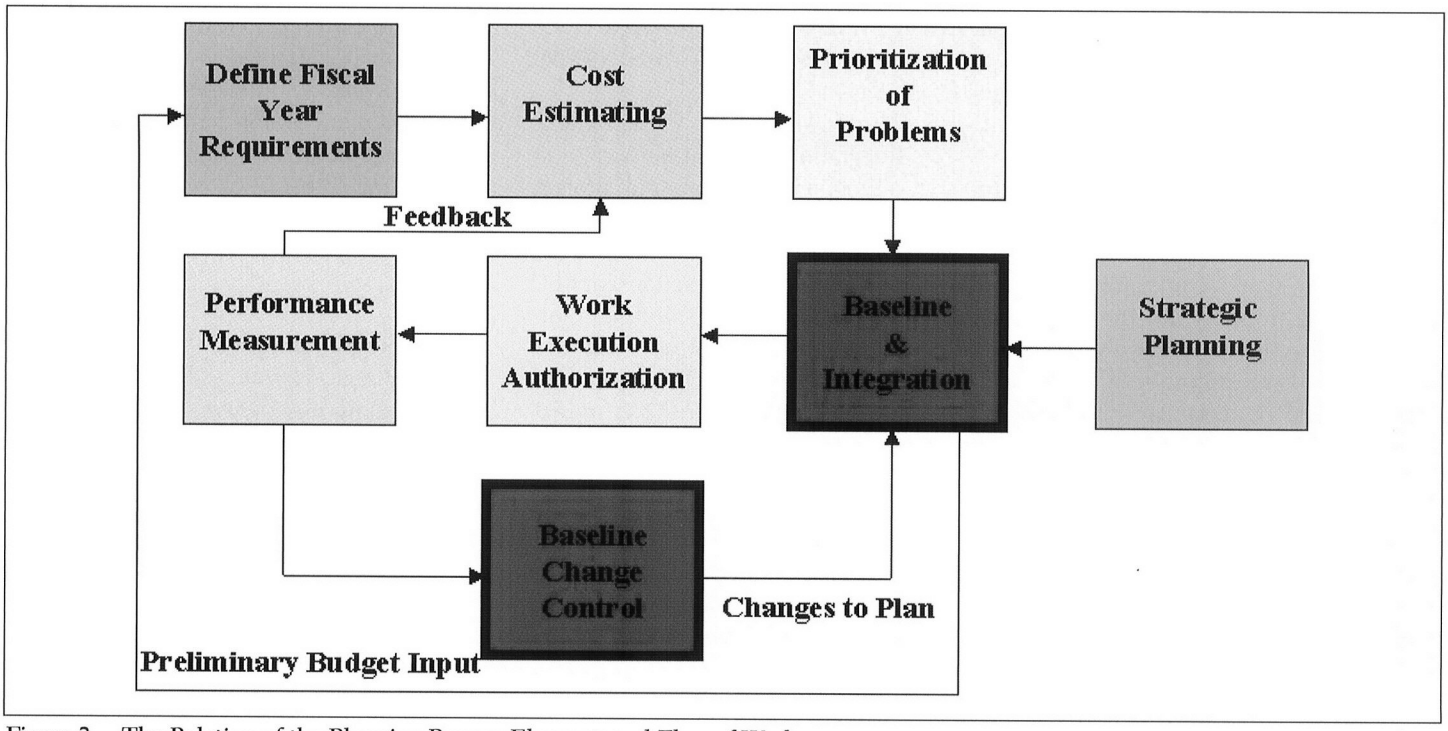

Figure 2— The Relation of the Planning Process Elements and Flow of Work

The personnel, technology, materials, and facilities required to accomplish the work by task are evaluated. Estimating standards, historical costs, and performance rates are established using a basis of estimate, and assumptions are documented. The estimate is prepared in this manner to ensure improved control, better forecasts, and increased credibility.

Work Prioritization

The purpose of work prioritization is to develop a priority-based list that combines customer requirements and Planning and Integration prioritization guidelines. These guidelines include the following.

- safety;
- legal commitments;
- critical milestones and deliverables;
- modernization;
- cost reduction.

Once the combination is complete, the program team considers the budget and completes the required impact sensitivity analysis. BWXT Y-12 senior management examines resources and finalizes the key prioritization list, which helps keep deliverables properly prioritized and consistent with Y-12's mission.

Establishing a Baseline

The baseline is the heart of the Planning and Integration process. It encompasses technical scope, schedule, and resources and addresses funding. The baseline establishes measurement standards for each project. Project schedules are resource loaded by program, function, and critical skills. The baseline is integrated across the complex and includes a three-year detailed site plan, followed by a seven-year comprehensive baseline. The integrated baseline helps project managers define milestones, scopes of work, and performance expectations.

Work Authorization

Work authorization controls work scope and ensures efficient work loading. The process begins when functional managers commit to estimates, and program managers authorize the scope of work. Authorized work is then assigned to the performing organization.

Performance Measurement

After work is released, it is measured for performance. The purpose of performance measurement is to compare planned performance to actual performance. This analysis develops timely and accurate information and eliminates surprises for the project teams and the customer. The task is to manage the exceptions, analyze the options, flag problem areas, and recommend solutions.

Baseline Change Control

The baseline is under total configuration control, and all changes for scope, schedule, and budget are formally made in a baseline change proposal. Once the changes are recognized as needed, schedule and costs are adjusted. The customer then approves the changes. A formal baseline change control process promotes on time delivery and ensures that missions are carried out within budget. See Figure 3.

ORGANIZATIONAL OBJECTIVES

BWXT Y-12's commitment to its mission required the creation of an organization that not only would assist in contract requirements, but would also assist in the growth of its roles and responsibilities. Since the contract inception (November 2000), the original scope of work has increased from the contract's mandated program requirements to encompassing six major capital line items, self-performed construction, complementary work, centralized estimating, infrastructure reduction, and functional planning. The number of capital projects has also increased to six times that of FY 2001. To support the increase in responsibilities and scope, the Planning and Integration organization is divided into five departments:

- baseline management;
- systems and production control;

- cost estimating;
- program controls;
- projects and capital planning.

An explanation of each department's mission, goals and objectives, and major accomplishments follows.

BASELINE MANAGEMENT

The mission of the Baseline Management department is to manage the overall development of the Y-12 10-year baseline (10YB), the annual NNSA direct budget, and the integration of major programs and projects. These elements are compiled into a comprehensive resource-loaded performance baseline. The 10YB supports the forecast of site-wide critical skills, plant capacity, and organizational resource demands.

Goals and Objectives

- Centralize and integrate the planning, budgeting, and execution of all work.
- Implement a comprehensive baseline change control process.
- Develop a long-range planning discipline for the identification of long-range funding requirements.
- Establish a common planning format and infrastructure.
- Develop a detailed performance measurement baseline.

Major Accomplishments

Developed a detailed performance measurement baseline: the Y-12 budget has been segregated into control points for planning and control. One lesson learned from previous experience by Planning and Integration staff was that the successful use of control points requires significant planning detail and coordination. The need for improved planning detail and coordination became apparent in preparing the US federal budget input. The planning improvements implemented include the following.

- Implementation and management of a detailed budget preparation schedule.
- Implementation of resource codes for labor planning.
- Development of a 10-year facilities, equipment, and infrastructure planning list.
- Implementation of the capital asset management process (CAMP) for prioritization.
- Planning by control point.
- Multilevel prioritization and integration of work plans and budgets.

Established industry-standard baseline change control: the effective use of earned value performance management has as its foundation a stable baseline of work to be performed that is expressed in terms of the

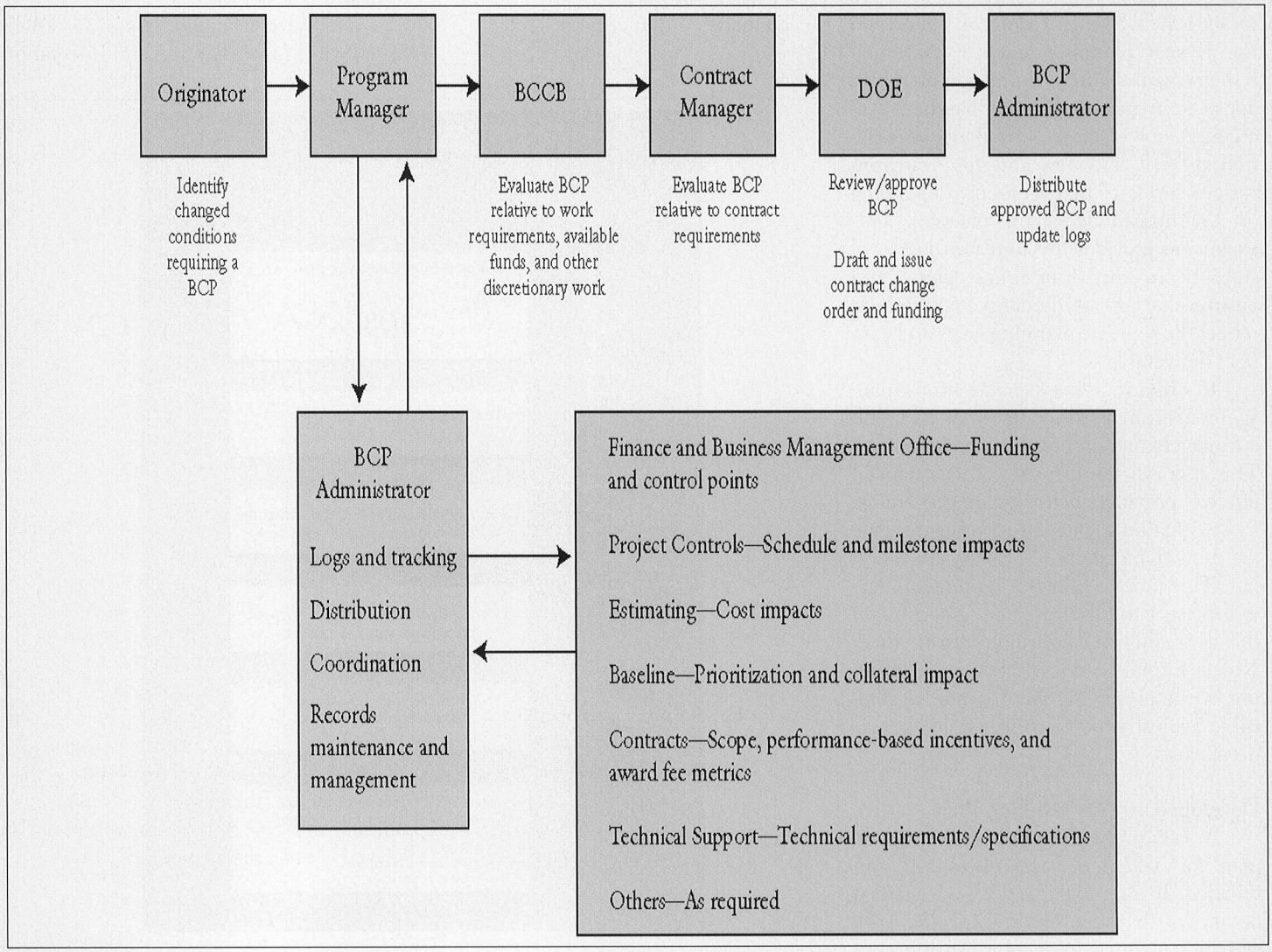

Figure 3— Baseline Change Control Process

work to be completed (scope), the planned cost required to complete the work (cost), and the time frame during which it will be completed (schedule). The single greatest challenge in implementing an earned value management system is the implementation of a change control process that preserves the original project baseline for performance measurement while simultaneously providing the historical tools used by the chief financial officer and NNSA to adequately manage the expenditure of funds and ensure that control points are not exceeded.

The first step in implementing the new change control process was to review the existing procedures and the informal capital projects procedures. The result is a consolidated, single procedure to be used for all baseline changes, which supports the execution of capital projects and programs and meets the requirements of DOE Order 413.3.

The next major change was the expansion of the change control process to include the US federal budget baseline and the 10-year planning baseline. Although less stringent change control requirements apply to these future year baselines, all changes now require formal documentation, as well as review and approval from various levels of management (depending on the magnitude of the change). This expansion provides for a greater degree of stability in our long-range plans and ensures that proposed changes continue to reflect the strategic planning goals and contract deliverables.

In order to better separate funds management from performance management, a funds change process was implemented. This process, used by the chief financial officer, provides better management to those situations where the project scope has not changed, but funding allocation has. This process allows a funding change to a project to offset over or underruns in the cost incurred during performance. Now a formal record of changes in funding, while preserving the original baseline value against which performance is measured, exists.

Developed 10-year Baseline Plan

A comprehensive 10-year baseline plan for Y-12 has been developed and released. It is a single, integrated, tactical document that identifies the specific work activities planned to accomplish the contract deliverables and implement the long-range strategic objectives of the complex.

SYSTEMS AND PRODUCTION CONTROL

The mission of Systems and Production Control is to provide the Planning and Integration division with common procedures, instructions, computer systems and hardware, and training for project planning, scheduling, inventory control systems, pricing, and reporting.

Goals and Objectives

- Define, develop, or procure, and implement standard software and hardware.
- Provide training in the use of computer software and procedures.
- Define requirements for a project controls system for Y-12.
- Evaluate software.
- Evaluate computer hardware.
- Develop project controls systems guidance and work instructions.
- Enhance the planning, tracking, scheduling, and reporting of the Y-12 manufacturing system.
- Develop consistent means for estimating jobs, establishing standards, and measuring performance.

MAJOR ACCOMPLISHMENTS

Define requirements for project controls systems for Y-12

One Planning and Integration objective was to establish an earned value project controls system for Y-12 that fulfills most of the fundamental requirements of a certified DOE earned value project controls system. Based on prior project controls earned value system implementations, requirements were defined that would meet the needs of Y-12, as well as fulfill NNSA expectations.

Software Evaluation

A software evaluation team was established within the Planning and Integration

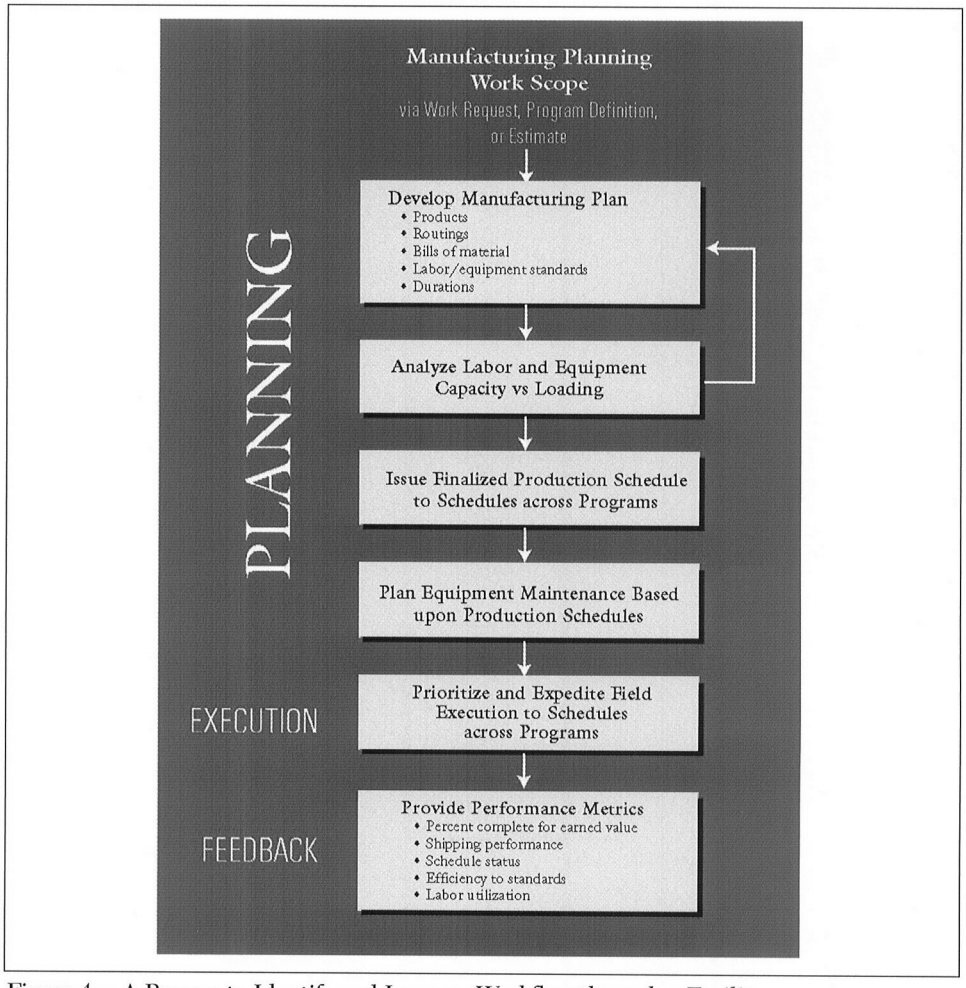

Figure 4— A Process to Identify and Improve Workflow through a Facility

division to evaluate potential vendors for scheduling and costing software. After the development of a software requirements matrix and a review of potential software vendors, the decision was made to select P3, as the Y-12 project controls scheduling tool; and COBRA, as the Y-12 cost processing tool. After the selection of the scheduling tool (P3) and the cost processor (COBRA), an implementation plan was executed using P3 and COBRA.

After several months of use of P3 and COBRA, it was determined that the staffing and maintenance of COBRA as the project controls cost processor was more significant than anticipated because of the business rules for pricing work at Y-12. The Y-12 site had been using limited functionality of SAP for several years. After evaluating the potential use of SAP as the project controls cost processor, it was decided to eliminate COBRA as the project controls cost processor and use the project systems module of SAP. The decision to use SAP has proven to be the most effective means of implementing enterprise work planning and pricing.

Another major change since the award of the management contract to BWXT Y-12 is the decision that construction would be no longer be contracted. All construction is to be self-performed by BWXT Y-12. NNSA construction work requirements must meet DOE Order 413.3. Existing project controls systems and software were not able to satisfy the DOE management and reporting requirements. Therefore, an additional system was developed using Bechtel proprietary software in conjunction with P3 and SAP. The new system provides the necessary multiyear project management and reporting requirements to meet the contractual requirements.

Project controls systems guidance: during development of the project controls implementation plan, a need was identified for a project controls system description and supporting procedures.

As part of the project controls systems guidance, the Systems and Production Control department has the responsibility to provide training to all Planning and Integration personnel on division-specific functions. Staffing to support training for P3 and SAP is complete. Technical support is also established for both P3 and SAP. Onsite P3 training sessions have been conducted for all Planning and Integration personnel. SAP training is also available on an as-needed basis. Guidance documentation includes desktop instructions.

Manufacturing planning, scheduling, and execution: part of the Planning and Integration implementation plan included a review and evaluation of the planning, scheduling, tracking, and reporting procedures for the Y-12 manufacturing system. It was determined that significant enhancements should be made to the existing system. An implementation plan was developed to significantly expand the functionality of the manufacturing system. This plan includes the creation of a pilot project within a single manufacturing facility. More robust system definitions were initially developed and implemented in the pilot facility; implementations in the remaining facilities were scheduled over 18 months. Figure 4 shows a process to identify and improve workflow through a facility.

COST ESTIMATING

The mission of the Cost Estimating department is to provide standardized, consistent, and traceable cost estimates that are substantiated with adequate and appropriate documentation. The Cost Estimating department provides expertise in the development of cost estimates, material buy lists, and labor requirements, as well as the application of overheads, escalation, and contingency. Additionally, cost estimating efforts provide support as requested for management directives including life-cycle cost

Type (Intended Use)	Probable Accuracy	% of Scope Known	Required Descriptions for Estimate	Estimate Basis			Contingency Guidelines
				Critical Tooling, Equipment	Materials, Supplies, Outside Labor	Internal Labor	
Planning (budgetary, conceptual, feasibility)	≥±30%	<10%	General project scope, schedule, desired end objectives	Time and materials based on source matter expertise, recent actual costs for similar/historical projects adjusted for escalation, relative comparison, ratio to other projects, trend analysis, etc.			≥25%
Definitive (cash work, WFO, production)	±10%	≥40%	Complete design, process, schedule, quantity, delivery, acceptance	Vendor quotes adjusted for possible price escalation with some critical components committed	Vendor cost quotes, national pricing references or current billing rates, based on quantity takeoff	Estimated or engineered labor hours using individual rates by discipline	5 to 15%
Title I/II (construction, approved for construction)	±10%	≥60%	Complete design, process, schedule, quantity, delivery, acceptance based on Title I or II drawings and specifications	Vendor quotes adjusted for possible price escalation with some critical components committed	Vendor cost quotes, national pricing references or current billing rates, based on quantity takeoff	Estimated or engineered labor hours using individual rates by discipline	5 to 15%
Bid Check	±5%	100%	Complete bid package	Vendor quotes adjusted for possible price escalation with some critical components committed	Vendor cost quotes, national pricing references or current billing rates, based on quantity takeoff	Estimated or engineered labor hours using individual rates by discipline	0 to 10%

Figure 5— Cost Estimate Types

analysis, cost-payback analysis, and cost savings initiatives.

Goals and Objectives

- Assemble a fully-functional and centralized cost estimating organization.
- Develop standardized processes, tools, and reports for the cost estimating function.
- Establish estimating processes.
- Create a resource dictionary.
- Create a historical database.
- Develop an estimating guide.

Major Accomplishments

Establish estimating process: BWXT Y-12 policy for the development of estimates was established in early November 2000. A draft cost-estimating procedure, including formats for estimate documentation and types of estimates (see Figure 5), was provided to the cost estimating staff for immediate use. The draft was based on best practices gathered from other DOE sites, corporate team members, DOE requirements and guidance, and professional estimating academia. After extensive review and briefings with performers and program managers, the draft was issued as a formal company procedure.

Estimating Guide

A comprehensive cost estimating guide for use at Y-12 was compiled and issued. This guide is entirely electronic in form and resides on a network drive that is accessible to all cost estimating staff members. The guide's topical index, which is linked to the document, resides on a network drive that is used by Planning and Integration personnel. The guide has been developed to provide information ranging from basic estimating processes/methods to advanced discussions on the calculation of escalation and contingency estimators and other interested parties. The guide provides a common, consistent database of information on topics such as the estimate development process, labor, and nonlabor resource dictionaries, overhead rates and application methods, standards for various activities based on actual experience at Y-12, and links to both government and commercial reference sources. Because the document is completely electronic, data can be added and/or revised and released for use immediately.

PROGRAM CONTROLS

The mission of Program Controls is to provide the planning and control support for ensuring that the program team has a well-developed, documented, and realistic scope, schedule, and cost baseline. Program Controls also provides execution feedback through performance measurement and configuration control of authorized work and budgets.

Goals and Objectives

- Develop a 3-year, resource-loaded performance measurement baseline for defense programs that can be used for earned value performance measurement.
- Develop a complementary work three-year, resource-loaded performance measurement baseline for use in earned value performance measurement.
- Test planned project controls approaches on selected pilot projects.
- Establish earned value performance measurement capability for FY 2001 for defense programs.
- Evaluate and establish resource-loaded schedules for earned value performance measurement on nondefense programs and other major initiatives at Y-12 as appropriate.
- Develop a 3-year, resource-loaded performance measurement baseline for all direct-funded work.
- Review internal and external reporting and establish new formats and standards

Major Accomplishments

Test planned project controls approaches on selected pilot projects: during the transition period from the former contractor to BWXT Y-12, three major contract initiatives were selected for immediate implementation of baseline management and earned value techniques. For each project, an integrated team was established

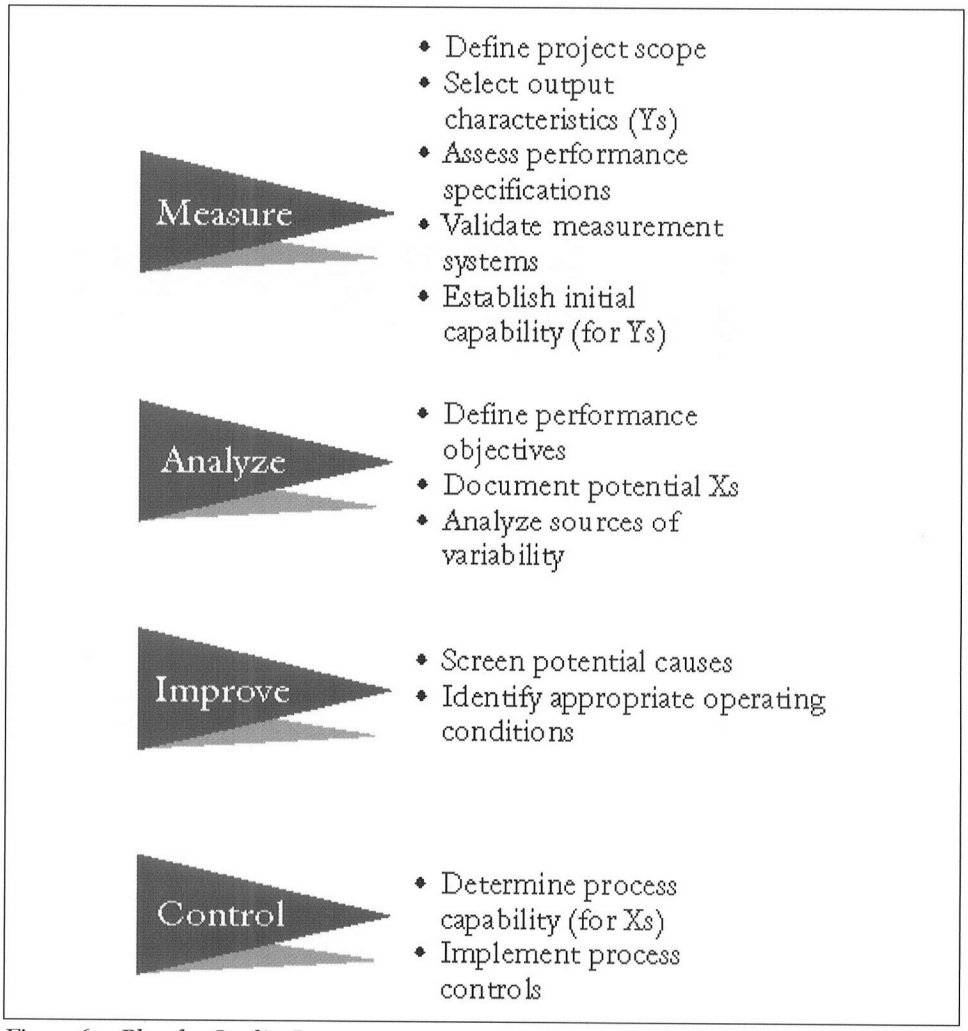

Figure 6— Plan for Quality Improvement

and trained in baseline establishment and management and earned value techniques. The teams defined the scope and developed detailed plans and resource-loaded schedules. Within 90 days, every pilot project had established performance measurement baselines and were reporting earned value data.

Establish Earned Value Performance Measurement Capability for FY 2001 for Defense Programs

Because of the size of scope of the remaining defense programs, a phased approach was used to bring each into compliance with earned value reporting. Initially, cost loading was used on summary level schedules to report earned value. Within 120 days, the first of three defense programs had established a performance measurement baseline and was reporting earned value performance measurement. The remaining two defense programs followed 30 and 60 days later.

Develop a three-year, resource-loaded performance measurement baseline: the cost loaded schedules developed for initial earned value reporting were expanded, and additional logic relationships were added for FY 2002 and 2003. Approximately 650 resource codes were used to resource load the more detailed schedules. In addition, each nonlevel of effort activity was assigned an objective, quantifiable performance measurement technique.

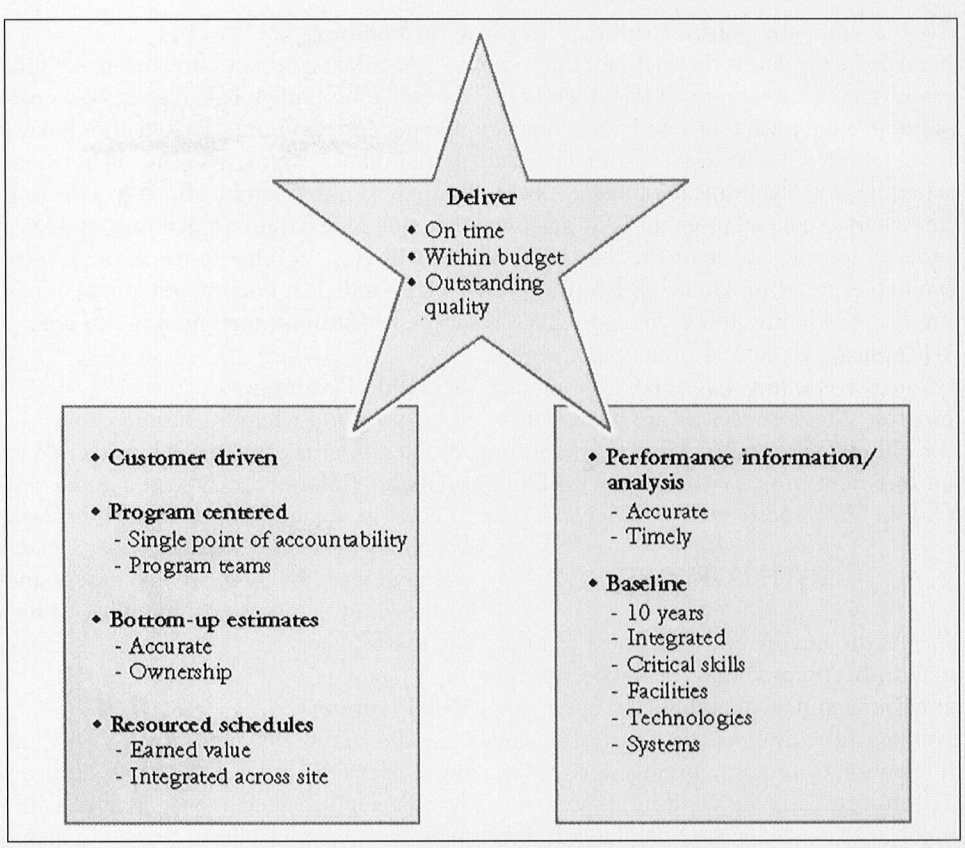

Figure 7— Planning and Integration Expected Performance Model

PROJECTS AND CAPITAL PLANNING

The mission of the Projects and Capital Planning department is to support BWXT Y-12 project management in the development of project schedules and preparation of cost analysis and reports for all project-oriented tasks within the complex. It is this department's charge to solicit and gather all essential data so that project managers can make sound financial decisions regarding resource acquisition, long-term commitments, major procurements, and financial forecasts.

Goals and Objectives

- Provide a trained, experienced staff and comprehensive procedures that provide the necessary information for baseline development, management, and control for projects and personnel
- Assist project teams in defining the scope of work, developing appropriate estimates based on procedure, and developing schedules using defined standard formats, processes, and tools.
- Ensure that the team performance baseline plan is completed on schedule.
- Ensure that the performance baseline is maintained in configuration control through the use of approved change control procedures.
- Provide project controls support for all direct-funded capital improvement projects.
- Provide construction project controls expertise in support of all projects in the complex. These projects may require the oversight by the construction department of direct-hired labor or the oversight of subcontractors performing the work

Major Accomplishments

Capital project earned value management process improvement: during FY 2001, earned value was generally calculated by the monthly change in the overall percent complete for a project and applied to the project's budgeted cost of the work scheduled, presenting an overall project performance. Starting in FY 2002, performance summary reports were developed that provided the budgeted cost of the work scheduled at each terminal work breakdown structure or each charge number. This provided earnings and performance at a lower work breakdown structure level. For example, a typical terminal work breakdown structure would be: title I engineering, procurement, install equipment, or project integration.

Currently, a multiyear earned value system in SAP is being used. Earned value is electronically calculated in SAP by loading from P3 the percent complete for every schedule activity. The percent complete is calculated at the terminal work breakdown structure level where actuals in SAP are matched with earnings. Standard cost performance reports are available from the project, providing terminal work breakdown structure detail for management reporting of earned value and performance. This full use of electronic data transfers between P3 and SAP increases productivity and efficiencies and eliminates the need to maintain the manual spreadsheets for calculating earnings and performance.

Line item project performance measurement baseline: BWXT Y-12 establishes project work breakdown structures follow-

ing the company contract summary work breakdown structure. Project baselines are established according to DOE Order 413.3 (a range baseline at CD-1 and performance baseline at CD-2). Cost estimates and schedules are electronically linked. A baseline change control program is in place to process, review, and approve changes to a project. A trend program has been implemented to identify those changes. BWXT Y-12 is using an earned value management system to monitor and report on project progress. Progress reports are presented to the client each month. Monthly reporting on line item projects complies with DOE Order 413.3 reporting requirements.

PATH FORWARD

As the quality and timeliness of information becomes key to the success of the enterprise and as technologies open new avenues for advancement, Planning and Integration cannot remain in a steady state. The future calls for continuous improvements. To meet future challenges, cost engineers and project planners must continue to improve in these areas.

Communications

Planners have quickly moved from the challenges of the historic demands for written and oral communications to the additional demands of the electronic age including faxes, e-mail, and web page informational exchanges. This expansion in communication methods has caused an exponential increase in communication channels within the business organization. The need for the cost engineer and planner to work across all levels and across all functional departments within the organization will require more effort than ever before to ensure effective and efficient communications.

Scope Planning

As the pressures increase for improved profitability in the private enterprise and for improved productivity in the government sector, accurate definition of scope will also cause significant changes. The definition and control of scope is critical to setting customer expectations and delivering a product on time and within budget. The planner's tools of a work breakdown structure and a work breakdown dictionary are key to the successful solution for this change.

Cost Planning

Accurate estimates are the basic fundamental building block to every cost engineering and planning system within today's marketplace. With scarcity of critical human resources and technology affecting the enterprise daily, cost planning and control will grow in importance in the future. Details and clear documentation are a few of the key attributes required in this area.

Schedule Planning

In a world where meals are cooked in minutes, international travel is measured in hours, and information is passed from coast to coast in seconds, time management will become a greater challenge. Today's management team is well aware that time is one of the most valuable commodities within the marketplace.

Risk Planning

The days of qualitative, "rule of thumb" evaluation of project risk are over. Today's sophisticated managers and company executives have been trained in quantified decision-making and statistical evaluation. The cost engineer of tomorrow will be required to be knowledgeable in the area of risk identification, quantified methods of risk definition, and statistical analysis.

Human Resources

As the planner works with personnel across all technical disciplines, the challenge of work relationships will increase. Increased pressure for performance will require the planner to understand and use the best methods of motivation and communication for each of the project team members.

Quality

Programs such as Six Sigma will not only drive the planner to be knowledgeable in the area of products and technology, but also in planning processes and management systems. The quality and timeliness of information is key to the success of the business enterprise in a highly competitive marketplace. The cost engineer and planner will be constantly found as a source of data and information to drive quality improvement and performance metrics. See Figure 6.

Procurement

The international marketplace will cause the cost engineer and planner to increase their expertise in the areas of foreign currency and business practices. Partnerships across the globe will require planners to work with personnel of other cultures, languages, and business methods.

Integration

Integration will always be the key to a successful project and business enterprise. Developing good cost engineering practices, developing plans, and managing change control will be more critical in tomorrow's business environment. The cost engineers and project planners will be key resources to the management team and within the project team in pursuing a successful business enterprise in an environment of growing competition and international application.

From the beginning of its contract, BWXT Y-12 had a plan to improve the scheduling and performance measurement of the work at Y-12. The creation of the Planning and Integration division as an organization to help managers focus their efforts was one element of this plan. The attention applied to the management of funds at Y-12 has been and remains very important in the execution of the government's work. However, the complexity of the scope of work required that the work planning process receive increased attention, equal to the level given to funds management. The performance-metrics tools deployed can now highlight a problem in cost or a schedule execution. Management can focus on deviations to resolve issues and return to planned performance (Figure 7).

To complete its mission, Planning and Integration developed five organizations to provide the necessary support. Each department has their own goals and objectives and ensures that resources are available for the activities that are of highest importance to the defense of our country. Continued success requires continuous improvements in organizational systems and in the preparation of all personnel, including cost engineers and project planners. The engineers and planners that comprise BWXT Y-12's Planning and Integration division install the systems, procedures, and controls necessary to maintain a rigid, yet dynamic, baseline to meet

the rigorous demands of today and the ability to forecast the future. ◆

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Editor's Note: This article was originally a technical presentation at the 2003 AACE International Annual Meeting in Orlando, Fla. It was submitted for consideration for publication in the **Cost Engineering** journal. After undergoing peer review, the article has been revised and updated for this printing.

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