PERFORMANCE-BASED MANAGEMENT

Eight Steps To Develop and Use Information Technology Performance Measures Effectively

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FOREWORD

The General Services Administration's (GSA) Office of Governmentwide Policy developed this guide to help those who want to gain a further understanding of performance measurement and for those who develop and use performance measures for information technology (IT) projects.

Recent documents related to IT performance measurement were developed by the Office of Information and Regulatory Affairs (OIRA) in the Office of Management and Budget (OMB) and the General Accounting Office (GAO). This paper complements the OIRA guide, "Evaluating Information Technology Investments" and the framework provided in the soon-to-be released GAO Exposure Draft, "Information Technology — Measuring for Performance Results."

The OIRA guide sets out an analytical framework linking IT investment decisions to strategic objectives and business plans in Federal organizations, and supplements existing OMB policies and procedures. The approach relies on the consistent use of performance measures to indicate potential problems. It emphasizes the need for an effective process when applying information technology in this period of reduced resources and greater demand for government services.

The GAO guide assists in creating and evaluating IT performance management systems. It provides examples of current performance and measurement practices based upon case studies. GAO recognizes the need for more research and analysis, but asserts that these practices serve as a starting point to establish effective strategic direction and performance measurement requirements.

This document presents an approach to help agencies develop and implement effective IT performance measures. Patrick Plunkett, a senior analyst with GSA's Office of Governmentwide Policy, developed the approach based on many valuable inputs from colleagues at numerous federal agencies and on research of performance measurement activities in state governments and in private industry.

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INTENDED AUDIENCE

This document is for anyone who develops and implements performance measures for information technology (IT). It is also intended for those who want to understand the principles of performance measurement. This guide describes the major tasks to follow to measure the contribution of IT projects to an organization's goals and objectives. These same principles and tasks also apply when measuring mission performance.

Organizations succeed when their business units and support functions work together to achieve a common goal. This holds true for performance measurement, which entails more than just developing performance measures. It also includes establishing business strategies, defining projects that contribute to business strategies, and evaluating, using and communicating the results to improve performance.

The following are descriptions of the principal roles associated with each step. The roles vary by organization:

- Step 1 - Senior management translates vision and business strategies into actions at the operational level by creating a Balanced Scorecard for the organization. Business units and IT professionals contribute to the Balanced Scorecard by defining the information and IT capabilities that the organization needs to succeed. The IT professionals include managers, analysts and specialists who plan or analyze requirements.

- Steps 2 through 8 (except 4) - IT professionals solicit feedback from business units to refine the information and capabilities defined in Step 1; create a Balanced Scorecard for the IT function and develop performance measures; and communicate results. Together, IT professionals and business units establish baselines, and interpret and use results to improve performance. The IT professionals include managers, analysts and specialists who plan, analyze or deliver IT assets and services.

- Step 4 - IT professionals estimate the cost, value and risk of IT projects to perform Information Economics calculations. Senior management and business unit managers define the evaluation factors and their associated weights to evaluate IT projects. Then they determine the value of each IT project and select the projects that provide the greatest value. The IT professionals include managers, analysts and specialists who analyze the cost or benefits of IT solutions.

EXECUTIVE SUMMARY

The General Services Administration (GSA) prepared this guide to help agencies develop and implement effective information technology (IT) performance measures. Effective performance measures are customer driven; give an accurate and comprehensive assessment of acquisitions, programs, or activities; minimize the burden of data collection; and are accepted and used to improve performance.

Performance-based management links investment planning with the systematic use of select feedback to manage projects and processes. Projects cannot be managed unless they are measured. The "eight steps" constitute a measurement process that includes translating business strategies into actions at the operational level; selecting projects that have the greatest value; developing measurement mechanisms; measuring, analyzing and communicating the results; and finding ways to improve performance. The eight steps provide a logical sequence of tasks that can be integrated with existing management practices.

Successful performance-based management depends upon the effective use of performance measures. The steps to develop and use IT performance measures effectively are:

Step 1: Link IT Projects to Agency Goals and Objectives

The effective measurement of an IT investment's contribution to agency accomplishments begins during the planning stage. Done properly, IT investment planning is based upon the agency mission and strategic business plans. IT organizations build partnerships with program offices and functional areas to define projects that contribute to the agency's goals and objectives. Linking IT projects to goals and objectives can be done using a framework known as the "Balanced Scorecard." The Balanced Scorecard consists of four perspectives that provide a comprehensive view of a business unit. The perspectives include Financial, Customer, Internal Business, and Innovation and Learning. The Balanced Scorecard in Step 2 also serves as a framework to assess performance.

Step 2: Develop Performance Measures

To assess the efficiency and effectiveness of projects, select a limited number of meaningful performance measures with a mix of short- and long-term goals. For large IT projects, the project manager or another key individual leads a team to develop the measures. Measure the outcomes of the IT investment, not just its cost, timeliness and quality. An outcome is the resulting effect of the IT investment on an organization. Examples include measurable improvements in the quality and delivery of the organization's services and products.

To develop performance measures, determine the objectives of the project; decide how requirements will be met; know the purpose of the results; and understand why

the results matter. Measure that which is most important. Agencies will improve the quality of their measures and ensure acceptance if their IT organizations develop and nurture partnerships with customers and stakeholders. Effective performance measures reflect a strong customer focus.

Step 3: Establish Baseline to Compare Future Performance

Baselines enable agencies to determine whether performance improves or declines as a result of an IT investment. Valid baselines are documented, recognized and accepted by customers and stakeholders. Standard agency reports can serve as the baseline if, and only if, the reports apply to the indicators chosen. If no baseline exists, then the performance measures establish the baseline.

Step 4: Select IT Projects with the Greatest Value

In today's tight budget environment, agencies can only fund a limited number of IT projects. Consequently, agencies need to select projects that provide the greatest value. Value is based on the estimated economic return of an IT investment plus its estimated contribution to an organization's business priorities. (This guide uses the terms "IT projects" and "IT investments" interchangeably.) To select the IT investments with the greatest value, establish Investment Review Boards (IRBs) to estimate the value and risks of each investment. The IRB should comprise the major stakeholders from the agency's core functional areas and program offices.

Step 5: Collect Data

The optimal time to focus on the data needed for the chosen indicators is during Steps 2 and 3. Agencies need to ask: "What data are needed to determine the output of the project? What data are needed to determine the effectiveness of the project?" The data used will depend upon availability, cost of collection and timeliness. Accuracy of the data is more important than precision.

Step 6: Analyze Results

After obtaining results, conduct measurement reviews to determine if the project met the objectives and whether the indicators adequately measured results. A key question is: "Do the results differ from what we expected?" During reviews, seek ways to improve performance, refine indicators and identify lessons learned for future projects. The most useful performance reports track results over time and permit identification of trends.

Step 7: Integrate with Management Processes

To assure that results improve performance, integrate them with existing management processes. If the results are not used, no one will take the measurement process seriously. Laws require agencies to submit performance reports with their budget submissions. Because it may take years to realize a project's results, agencies face the challenge of identifying results in their annual budget submissions.

Step 8: Communicate Results

Take the initiative to communicate results internally to improve coordination and increase the focus of workers and managers. Leverage results by sharing them with OMB and Congress to obtain support and continued funding. Communicate results with customers and the public to foster and sustain partnerships.

Implementing Performance-Based Management

Performance measurement requires an investment in resources. Some Federal implementors believe that organizations should dedicate resources up-front to properly set up their measurement structure. Reports from industry and state governments confirm that organizations use more resources initially to develop a knowledge and skills base and to instill performance-based management methods in their organizations. As organizations learn how to develop and use performance measures, less resources are necessary.

Initially, measuring performance and linking IT projects to organization outcomes are hard to conceptualize and recognize due to the inherent ambiguity of outcomes. Practitioners require time and experience before they can develop and use performance measures effectively. Agencies can reduce their learning curve by creating performance measurement guides tailored to their mission.

The amount of resources and time necessary to develop measures depends on the scope of the project; the extent of the partnership between the business and technical groups; quantity and quality of available data; the knowledge and skill of the developers; and the level of proactive involvement by management. The resources needed to develop and use performance measures will vary from project to project.

A change in mindset and culture is required to develop and use performance measures to improve performance. Agencies can lay the foundation for these changes by encouraging and fostering the use of performance measures. This will happen only if senior managers support and participate in the process itself.

It will take time for agencies to institutionalize performance measurement. Agencies can accelerate implementation by consistently using a framework and methodology such as the Balanced Scorecard during project planning and measurement.

INTRODUCTION

The Federal government spends over $25 billion annually on IT systems and services. Do these systems and services improve service to the public? Do these systems and services improve productivity or reduce costs of Federal agencies? Without measuring and communicating the results, how will anyone know?

For the remainder of this decade and into the next century, the Federal government will decrease in size as government balances the Federal budget. IT will play a significant role in making the Federal government more efficient and effective as it downsizes. The Clinger-Cohen Act requires each Executive Agency to establish a process to select, manage, and evaluate the results of their IT investments; report annually to Congress on progress made toward agency goals; and link IT performance measures to agency programs.

The Clinger-Cohen Act evolved from a report by Senator Cohen of Maine, entitled "Computer Chaos." In the report, Senator Cohen identified major projects that wasted billions of dollars because of poor management. To improve the success of IT projects in the Federal sector, Senator Cohen stated the government needs to do better up-front planning of IT projects particularly when they define objectives, analyze alternatives and establish performance measures that link to agency accomplishments.

This publication provides an approach to develop and implement IT performance measures in concert with guidance provided by OMB and GAO. It cites and explains an eight step process to link IT investments to agency accomplishments that meets the requirements of the Clinger-Cohen Act and the Government Performance and Results Act (GPRA).

Congress and OMB emphasize performance measures as a requirement to receive funding. Soon, agency funding levels will be determined to a large degree on the projected results of IT investments and the measures selected to verify the results. This guide presents a systematic approach for developing and using IT performance measures to improve results.

The eight step approach focuses on up-front planning using the Balanced Scorecard. IT performance measures will be effective if agencies adequately plan and link their IT initiatives to their strategies. The Balanced Scorecard translates strategy into action. The eight step approach is a logical sequence of tasks. In practice, some steps can be combined. Because performance measurement is an iterative process, agencies should expect to apply the eight steps repeatedly to obtain effective performance measures and improve performance.

STEP 1: LINK INFORMATION TECHNOLOGY PROJECTS TO AGENCY GOALS AND OBJECTIVES

The process to effectively measure the contribution of IT projects to mission results begins with a clear understanding of an agency's goals and objectives. Linking IT projects to agency goals and objectives increases the likelihood that results will contribute to agency accomplishments. Accordingly, this linkage improves an agency's ability to measure the contribution of IT projects to mission accomplishments.

Accomplishments are positive results that achieve an organization's goals and objectives. Because information system (IS) organizations and IT projects support the mission and programs, the organization's vision and business strategies need to be established before IT projects can be linked to goals and objectives. To establish clear linkage, strategic plans need to define specific business goals and objectives and incorporate IT as a strategic resource.

The GPRA requires executive agencies to develop strategic plans and performance measures for major programs. (See Appendix D for a summary of the GPRA.)

Each strategic business unit (SBU) should have a strategic plan. An SBU is an internal organization that has a mission and customers distinct from other segments of the enterprise. Processing disability claim requests, launching satellites, or maintaining military aircraft are examples of SBUs.

PRINCIPLES OF STEP 1

- *Establish clear linkage, define specific business goals and objectives*
- *Secure senior management commitment and involvement*
- *Identify stakeholders and customers and nurture consensus*

As important as strategic plans can be, they often are forgotten soon after prepared because they don't translate well into action. In most cases, business strategies reflect lofty objectives ("Be our customers' number one supplier.") which are nearly impossible to translate into day-to-day activities. Also, strategic plans typically focus three to five years into the future in contrast with performance measures which focus on on-going operations. This difference in focus causes confusion, and sometimes conflict, for line managers and program managers.

The Balanced Scorecard (BSC) is a framework that helps organizations translate business strategies into action. Originally developed for private industry, the BSC balances short- and long-term objectives. Private industry routinely uses financial measures to assess performance although financial measures focus only on the short-

term, particularly the results of the last year or quarter. The BSC supplements financial measures with measures from three perspectives: Customer, Internal Business and Innovation and Learning.

The Customer Perspective examines how customers see the organization. The Internal Business Perspective examines the activities, processes and programs at which the organization must excel. The Innovation and Learning Perspective, also referenced as the Growth Perspective, examines ways the organization can continue to improve and create value by looking at processes, procedures and access to information to achieve the business strategies.

Used effectively, these three perspectives drive performance. For example, hypothetical Company XYZ developed a BSC that measures customer satisfaction. Their current assessment indicates a serious level of customer dissatisfaction. If not improved, lower sales will result. At the same time, however, the company's financial measures for the last two quarters indicate that sales are healthy. With only financial measures, management would conclude erroneously that the business is functioning well and they need not make changes. With the additional feedback from the customer measures, however, management knows that until recently they performed well, but that something is causing customer dissatisfaction. The company can investigate the cause of the results by interviewing customers and examining internal business measures. If the company is unable to improve customer satisfaction, eventually the result (lower sales) will appear in the financial measures.

The BSC provides organizations with a comprehensive view of the business and focuses management on the handful of measures that are the most critical. The BSC is more, however, than a collection of measures. If prepared properly, the BSC contains a unity of purpose that assures measures are directed to achieving a unified strategy. "Every measure selected for a BSC should be an element in a chain of cause-and-effect relationships, linkages, that communicates the meaning of the business unit's strategy to the organization."[1] For example, do process improvements increase internal business efficiency and effectiveness? Do internal business improvements translate into improved customer service?

A good BSC incorporates a mix of outcome and output measures. Output measures communicate how the outcomes are to be achieved. They also provide an early indication about whether or not a strategy is being implemented successfully. Periodic reviews and performance monitoring tests the cause-and-effect relationships between measures and the appropriateness of the strategy.

Figure 1 illustrates the use of the BSC to link the vision and strategies of an SBU to critical performance measures via critical success factors. The BSC allows managers to examine the SBU from four important perspectives and to focus the strategic vision. The

1. Robert S. Kaplan and David P. Norton, *The Balanced Scorecard: Translating Strategy into Action*, p. 31.

business unit puts the BSC to work by articulating goals for time, quality, and performance and service and then translates these goals into specific measures.

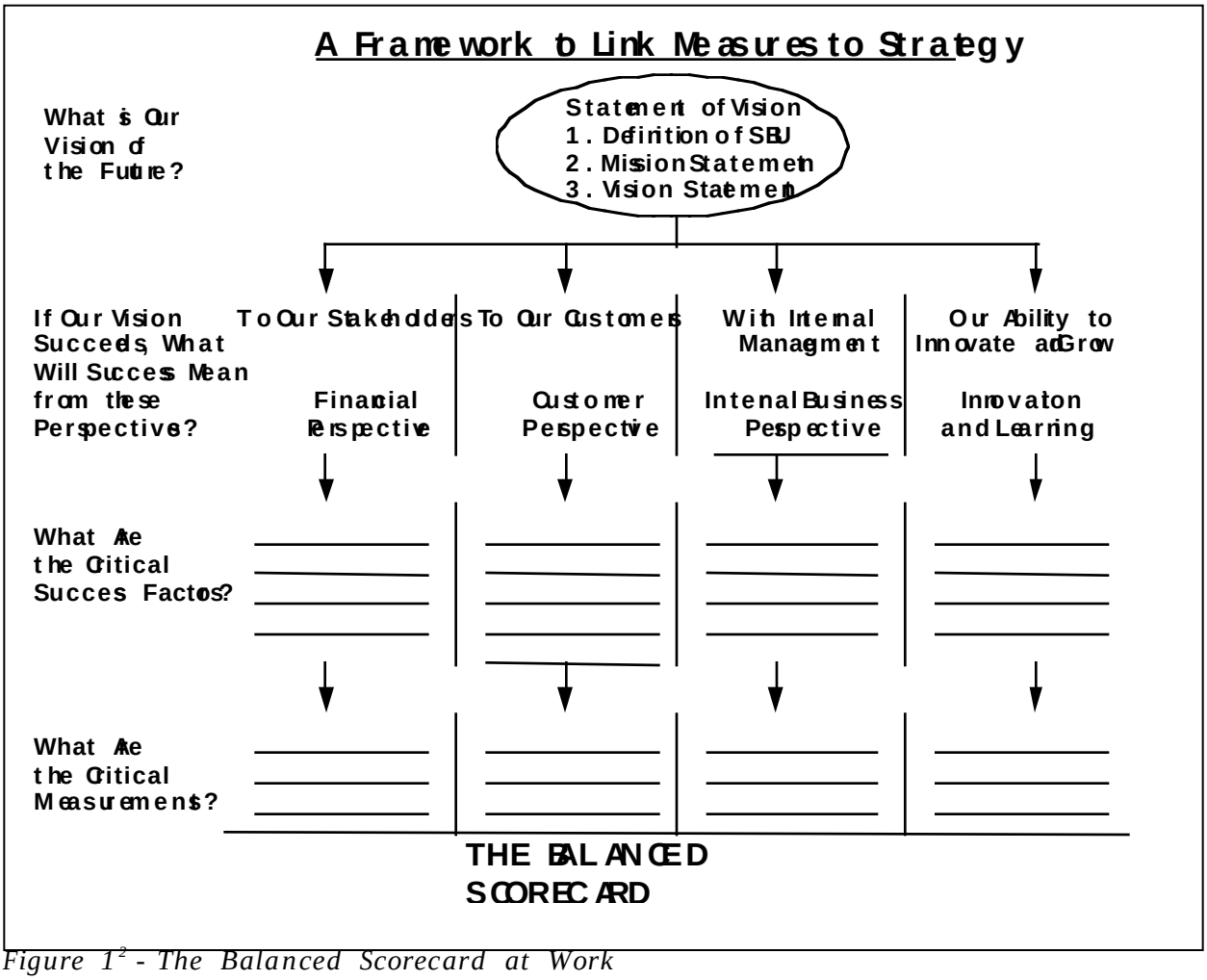

Figure 1[2] - The Balanced Scorecard at Work

For each perspective, the SBU translates the vision and mission into the factors that will mean success. For the success factors to be critical, they must be necessary and sufficient for the SBU to succeed. Each critical success factor or objective needs to focus on a single topic and follow a verb-noun structure. For example, "Improve claims processing time (Internal Business Perspective) by 'X' percent by 'Y' date." The more specific the objective, the easier it will be to develop performance measures. The less specific the objective, the more difficult it will be to develop performance measures.

Figure 2 shows how Rockwater, a worldwide leader in underwater engineering and construction, applied the BSC. A senior management team, that included the Chief Executive Officer, developed the vision and the four sets of performance measures to translate the strategy and critical success factors into tangible goals and actions.

[2] Adapted from Robert S. Kaplan and David P. Norton, "Putting the Balanced Scorecard to Work," *Harvard Business Review*, September-October 1993, p. 139.

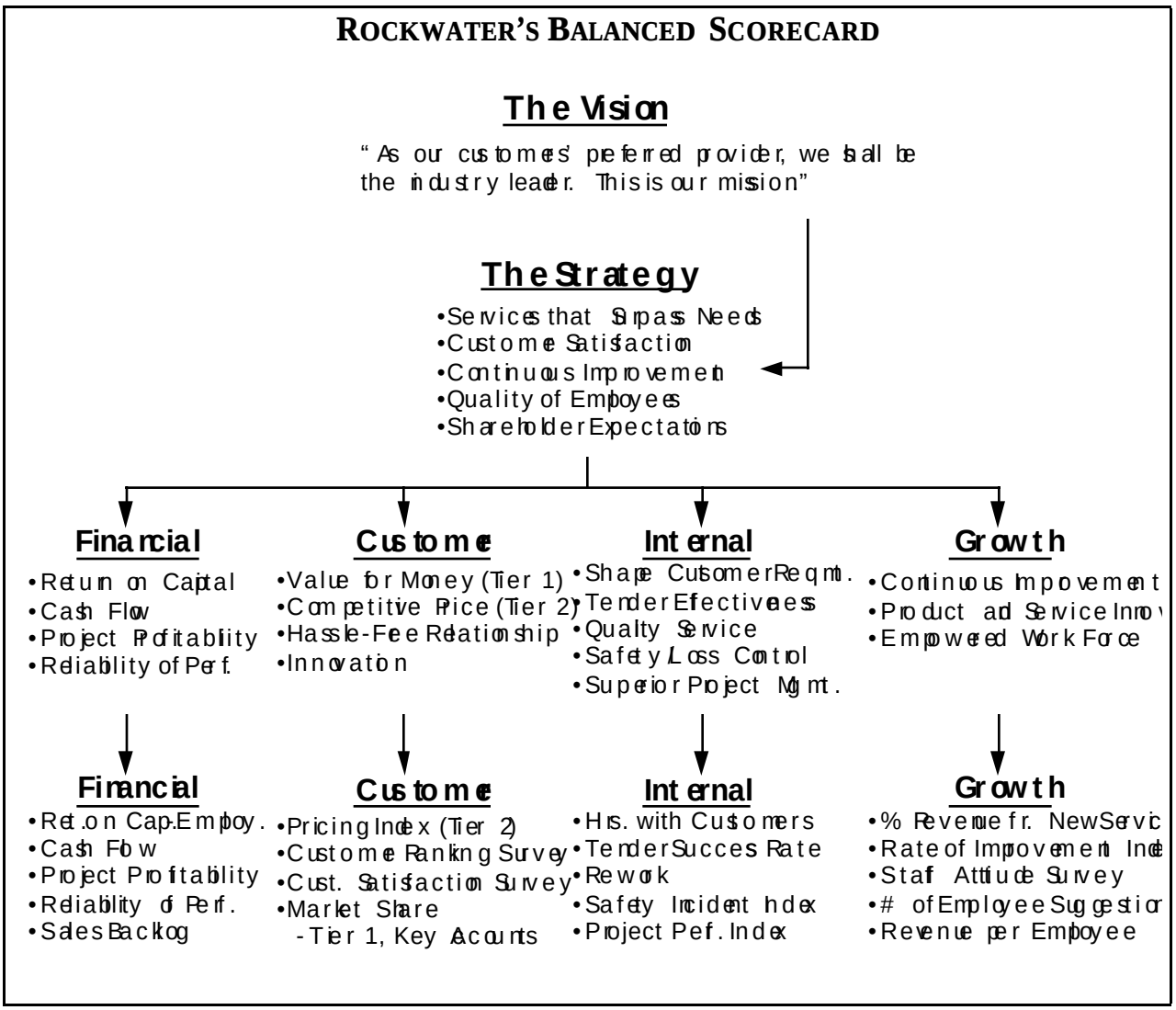

Figure 2[3] *- Rockwater's Balanced Scorecard*

Rockwater has two types of customers. Tier 1 customers are oil companies that want a high value-added relationship. Tier 2 customers are more interested in price. Before using the Balanced Scorecard, Rockwater's metrics focused on price comparisons with its competitors. Rockwater's strategy, however, emphasized value-added business. The Balanced Scorecard enabled Rockwater to implement its strategy and make distinctions between its customers.

Organizations are unique and will follow different paths to build the Balanced Scorecard. At Apple Computer and Advance Micro Devices, for example, a senior finance or business development executive, intimately familiar with the strategic thinking of the

3. Adapted from Kaplan and Norton, p. 135-136.

top management group, constructed the initial scorecard without extensive deliberations. Kaplan and Norton provide a profile to construct a scorecard.[4]

The BSC provides Federal agencies with a framework that serves as a performance measurement system and a strategic management system. This framework allows agencies to:[5]

- Clarify and translate vision and strategy
- Communicate and link strategic objectives and measures
- Plan, set targets, and align strategic initiatives
- Enhance strategic feedback and learning

Because Federal agencies do not have the profit motive of private industry, the orientation of the BSC is different. For private industry, the Financial Perspective represents and assesses a company's profitability. The other perspectives represent and assess a company's future profitability. For government, the Financial Perspective represents the goals to control costs and to manage the budget. The Customer Perspective represents and assesses programs to serve taxpayers or society, other government agencies or other governments. The Internal Business and the Innovation and Learning perspectives represent and assess the Government's ability to continually complete its mission.

The BSC addresses the contribution of IT to the business strategy in the Learning and Innovation Perspective. The contribution includes improved access to information that may improve business processes, customer service and reduce operating costs. After the desired business outcomes and outputs are determined, the IT needs can be identified. A separate BSC is recommended for the IT support function to integrate and assess the IT services provided to the organization. Step 2 addresses the use of the BSC for the IT function and specific projects.

Clear strategic objectives, definitive critical success factors, and mission-level performance measures provide the best means to link IT projects to agency goals and objectives and ultimately agency accomplishments. Some believe that IT performance measures cannot be established until this has been done. Others believe that IT organizations must take the lead within their parent organizations to establish performance measures. Agencies may risk funding for their IT projects if they wait until critical success factors and mission-level measures are in place before developing IT performance measures. Whether the cart is before the horse or not, the experience gained from developing and using IT performance measures helps agencies develop more effective performance measures.

Agencies can identify information needs while developing strategic plans by having a member of the IT project management team (an individual who has extensive knowledge of the agency's programs and operations) involved in development of the strategic plans.

4. Kaplan and Norton, p. 138.
[5] Robert S. Kaplan and David P. Norton, *The Balanced Scorecard: Translating Strategy into Action, p. 10.*

At the least, grant a member access to the latest version of the plan. To identify information needs, agencies should define the following:

- Critical success factor(s) to be implemented
- Purpose and intended outcome
- Outputs needed to produce intended outcomes
- Users of the resulting product or service
- What the resulting product or service will accomplish
- Organizational units involved and their needs

IT professionals identify IT solutions that contribute to their agency's strategies and programs. They do this by exploring ways to apply technology to achieve one or more critical success factors. This requires an understanding of the organization, its structure and its operating environment. Successful IT project managers understand their agency's programs and processes and can describe how technology fosters improvement in agency business performance.

Linking IT projects to agency objectives requires involvement by senior management and consensus among stakeholders. Senior managers possess the broad perspective necessary for strategic planning. Stakeholders (e.g., managers, workers, support organizations, OMB and Congress) have a vested interest in the project. They judge if linkage exists and to what degree it exists. The IT project manager identifies the stakeholders and works to obtain their agreement and support. The project manager faces the challenge of balancing the interests of internal and external stakeholders which often differ.

Example of An IT Project Linked To Agency Goals And Objectives

Figure 3 shows how the Immigration and Naturalization Service (INS) linked its Integrated Computer Assisted Detection (ICAD) system performance measures to the agency's objectives. ICAD is the second generation of automated assisted detection systems used by the United States Border Patrol (USBP). With the installation of remote field sensors connected to Border Patrol communication facilities, ICAD displays remote sensor activity, processes incident (ticket) information, maintains the status of Border Patrol Agents in the field, provides access to state and national law enforcement services, and generates a variety of managerial reports. USBP management utilizes information that ICAD produces to make tactical decisions on the deployment of Border Patrol resources and strategic decisions on future Border Patrol operations.

The INS developed performance measures to show the effect of ICAD at the strategic, programmatic and tactical levels of the organization. At the tactical level, the ICAD performance measures indicate the number of unlawful bordercrossers detected in two categories: migrant and smuggler. By increasing the effectiveness of the border patrol (programmatic level), ICAD contributes to achievement of the strategic goal to promote public safety by deterring criminal aliens. Figure 3 also shows the information INS uses to assess this goal.

Although the INS did not employ the BSC framework, they did use the following principles of the BSC: link IT to organization strategy; use a mix of short- and long-term measures; and select measures that have cause-and-effect relationships.

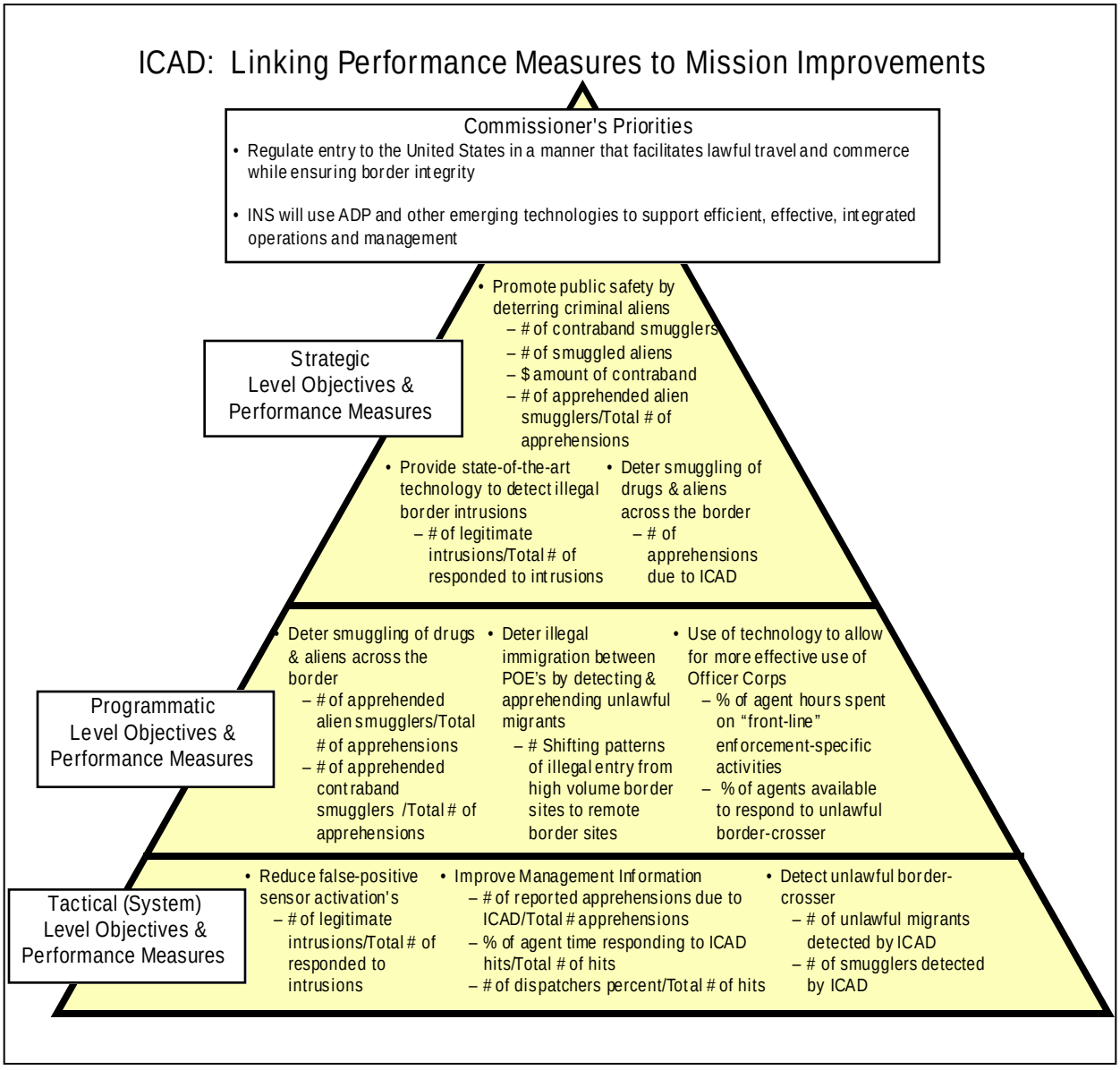

Figure 3 — The Immigration and Naturalization Service's Objectives and Measures for the Integrated Computer Assisted Detection System

Step 2 describes ways to determine what to measure and how to measure IT projects. Step 2 also provides an example of an agency IT measure and describes how to develop IT performance measures using the Balanced Scorecard.

STEP 2: DEVELOP PERFORMANCE MEASURES

No one set of performance measures will be effective for all agencies or for all projects. Organizations differ and their priorities change over time. To be effective, measures must be tailored to the organization's mission and management style. Given that, certain universal concepts and principles apply to agency programs and IT investments.

The concept of performance measurement is straightforward: You get what you measure; and you can't manage a project unless you can measure it. Measurement focuses attention on what is to be accomplished and compels organizations to concentrate time, resources and energy on achievement of objectives. Measurement provides feedback on progress toward objectives. If results differ from objectives, organizations can analyze the gaps in performance and make adjustments.

PRINCIPLES OF STEP 2

- *Focus on the customer*
- *Select a few meaningful measures to concentrate on what's important*
- *Employ a combination of output and outcome measures*
- *Output measures assess efficiency; outcome measures assess effectiveness*
- *Use the Balanced Scorecard for comprehensive view*

Applying the measurement concept to the complex business of government, however, is not as straightforward as it is in the manufacturing sector where a clear "bottom line" exists. For support functions such as information technology, the connection to a bottom line or to the mission of the organization is not always obvious. By integrating the principles of performance measurement into management practices, the connection becomes clearer.

Historically, organizations measured the cost of operating data centers, user reports, lines of print, communications and other elements. Seldom did they measure the contribution of IT to overall organizational performance. As mentioned earlier, the Clinger-Cohen Act mandates that federal agencies measure the contribution of IT investments to mission results.

The principles of performance measurement apply to mission-level programs, procurements and IT investments. The principles include the relationship of inputs, outputs, outcomes and impacts. Figure 4 represents this relationship through the ideal flow of results.

Each project employs people, purchased inputs and some forms of technology. These constitute the inputs. A project transforms the inputs into products or services (outputs) for use by customers. Customers can be taxpayers, other government agencies or internal agency personnel who receive or use the products and services. The outcomes are the effects of the output on the customers. Impacts are the long-term effect of the outcomes. The cloud around the impacts indicates that the impacts are difficult to discern. Semantically, it is difficult to distinguish between long-term outcomes and impacts.

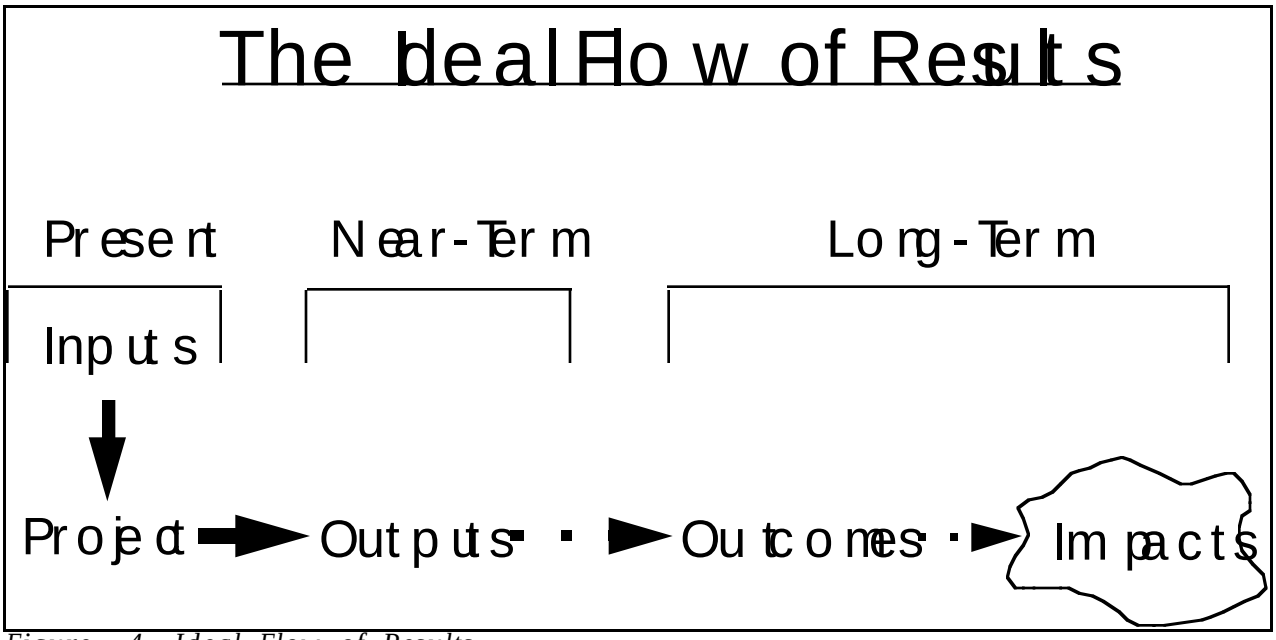

Figure 4—Ideal Flow of Results

The arrows represent cause-and-effect relationships and should be read as "lead to." The thickness indicates the strength of the cause-and-effect relationships. There is a direct relationship between the level of input and the level of outputs. Outputs lead to outcomes but the relationship is less direct than inputs to outputs. Outcomes lead to impacts but the relationship is often negligible, if existent, and difficult to determine. An ideal flow occurs when a relationship exists between inputs and impacts.

The time line provides a context as to when the results occur and will vary by types of projects and between projects. Near-term could be twelve months. Long-term could represent one to three years or even longer. For example, the benefits to the organization (outcomes) as a result of an investment in IT infrastructure may take up to three years to be realized. An investment in a system to improve claims processing could accrue benefits within one to three months.

To illustrate a flow of results for an IT project, consider a project to automate the identification of fingerprints to facilitate law enforcement. The inputs to the project include government personnel (technical, managerial, and contractual), contractor personnel and the IT systems used to develop the system since it is not commercially

available. The systems to be developed are the outputs of the project. The desired outcomes are reductions in the time to identify fingerprints and the costs of identification. The desired impacts of the system on law enforcement groups (local, state and Federal) may be to shorten the time of investigations and increase conviction rates.

Initially, it is easy to get confused with the terminology and lose focus on the measurement principles and the cause-and-effect relationships between activity and results. Another way to look at the type of results is to think in terms of efficiency and effectiveness. Efficiency is about doing things right (output) and effectiveness is doing the right things (outcomes). Doing the right things that contribute to overall success is more important than just doing things right on a project.

Determining What to Measure

Effective performance measures concentrate on a few vital, meaningful indicators that are economical, quantitative and usable for the desired results. If there are too many measures, organizations may become too intent on measurement and lose focus on improving results. A guiding principle is to measure that which matters most.

To assess the business performance of IT, agencies may want to consider the following categories: [6]

CATEGORY	DEFINITION
• Productivity	Efficiency of expenditure of IT resources
• User Utility	Customer satisfaction and perceived value of IT services
• Value Chain	Impact of IT on functional goals
• Competitive Performance	Comparison against competition with respect to business measures or infrastructure components
• Business Alignment	Criticality of the organization's operating systems and portfolio of applications to business strategy
• Investment Targeting	Impact of IT investment on business cost structure, revenue structure or investment base
• Management Vision	Senior management's understanding of the strategic value of IT and ability to provide direction for future action

In Step 1, the BSC provided a framework that translated business strategies into four perspectives: Financial, Internal Business, Customer, and Learning and Growth. These important perspectives give a comprehensive view to quickly assess organizational performance. The Balanced Scorecard focuses on strategy and vision, not on control.[7]

Information needs, or desired outcomes from IT systems, that are linked to business goals and objects are identified after developing the critical success factors for each perspective. These outcomes and information strategies are contained in the Learning

6. Adolph I. Katz, "Measuring Technology's Business Value," *Information Systems Management*, Winter 1993
7. Katz, p. 79.

and Growth Perspective. In a good BSC, they drive performance and link to objectives in one or more of the other perspectives.

Figure 5 shows how the BSC can be used as a strategic management system. Organizations translate their business strategies into objectives for each perspective. Then they derive measures for the objectives and establish targets of performance. Finally, projects are selected to achieve the objectives. Step 4 describes a method to select projects that provide the greatest value. The arrows indicate the linkage between perspectives and an organization's vision and strategy.

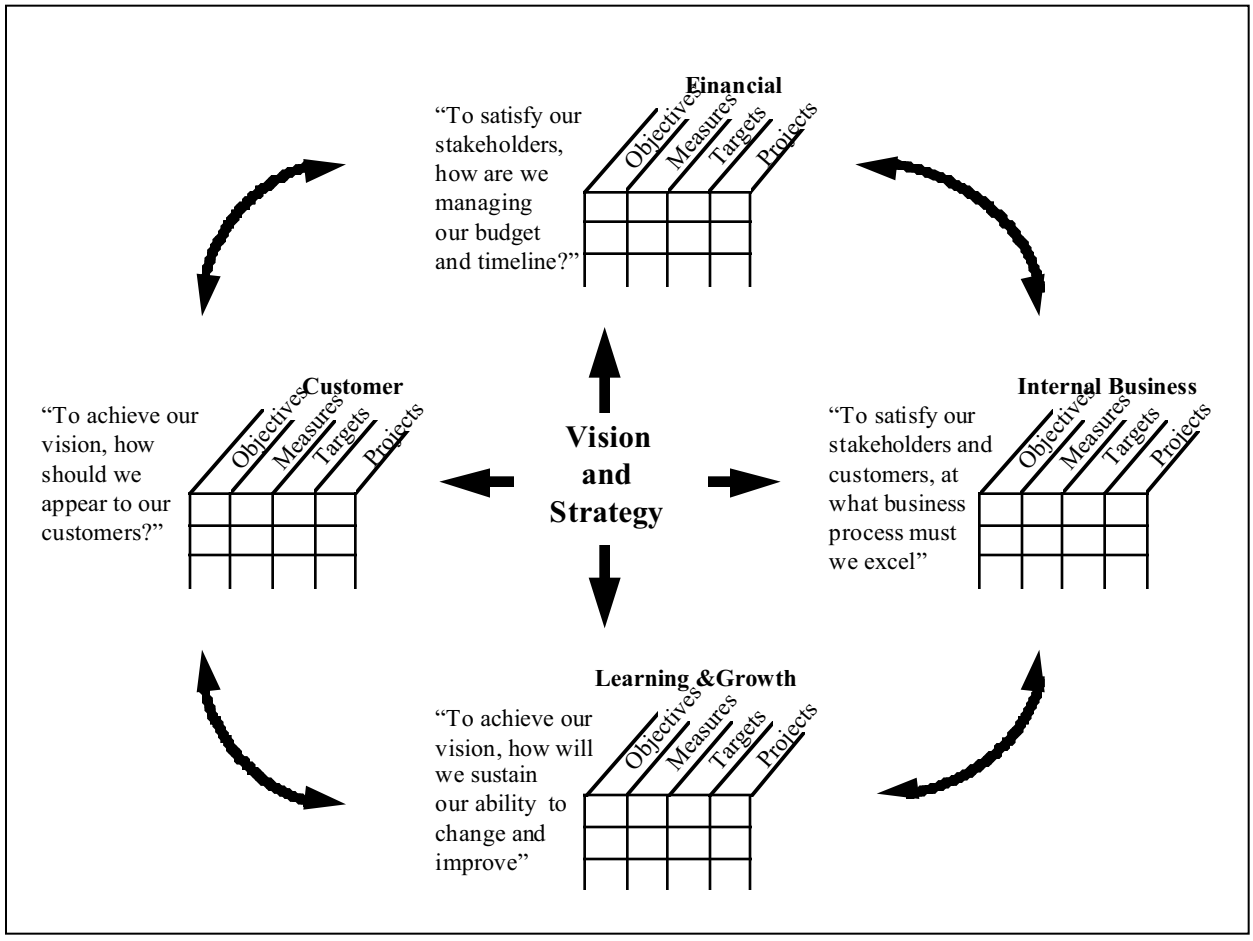

Figure 5—The BSC as a Strategic Management System[8]

A separate BSC for the IT function helps align IT projects and supporting activities with the business strategies. An IT function's BSC links to the Learning and Growth Perspective in the parent organization's BSC. A BSC for the IT function also translates an organization's IT strategic plans into action via the four perspectives.

In an IT BSC, the Customer Perspective represents primarily the organization's business domain. This perspective may include the organization's customers. The

[8]Robert S. Kaplan and David P. Norton, *The Balanced Scorecard: Translating Strategy into Action, p. 9.*

Internal Business Perspective represents the activities that produce the information required by the business domain. The Financial Perspective represents the cost aspects of providing information and IT solutions to the organization. The Learning and Growth Perspective represents the activities to improve the IT function and drive performance in the other perspectives.

To determine what to measure, IT organizations with customers and stakeholders first need to determine the desired outcomes. For IT projects, determine how the system will contribute to mission results (benefits). Then, determine the outputs needed to produce the desired outcomes. Next, analyze alternatives and select the project(s) that will produce the needed outputs. Finally, determine the inputs needed to produce the outputs. Agencies can develop meaningful measures using the formulation questions of Figure 6 with the Balanced Scorecard in Figure 5. (See Supplement 2 for a list of sample measures for each perspective.)

QUESTIONS TO DEVELOP PERFORMANCE MEASURES

- What is the output of our activities?
- How will we know if we met customer requirements?
- How will we know if we met stakeholder requirements?
- How will the system be used?
- For what purpose will the system be used?
- What information will be produced, shared or exchanged?
- Who will use the results?
- For what purpose will the results be used?
- Why do the output and results matter?
- How do the results contribute to the critical success factors?

Figure 6 - Questions to Formulate Performance Measures

The concept of translating an organization's business strategies using the Balanced Scorecard framework is the same for an SBU and the IT function. If the business unit has not defined, or is in the process of defining, its BSC, an organization can build a BSC for its IT functions. The BSC can also be used to assess IT projects and manage the processes that support their completion. This is done by examining the IT projects via the four perspectives using the concepts presented. The challenge becomes aligning IT projects and associated activities with business strategies that may not be specific. Eventually, the IT and business unit BSCs need to be synchronized in the future.

For some IT projects, it may not be important to have a measure for each perspective. Yet, agencies need to attempt to develop goals and measures for each perspective before making that determination. The objective is to identify a few meaningful measures that

provide a comprehensive assessment of an IT project. The advantage of the Balanced Scorecard is that it facilitates alignment of activities to achieve goals.

For example, an organization wants to improve its effectiveness by making better decisions based on the cost of performance. The organization's strategy is to implement activity based management (ABM). ABM is a technique for managing organizational activity based on the actual cost of the activity. The current accounting procedures allocate costs, overhead, for example, on an organizational unit basis. It does not provide the level of data needed for ABM. Correspondingly, the current accounting system does not provide the needed cost information.

To implement the organization's strategy, activity-based costing data is needed. Applying the BSC framework to the IT function, the first step is to establish objectives for each perspective. Customers are concerned with time, quality, performance and service, and costs. The organization establishes goals for these concerns and then translates them into measures for the Customer Perspective. The organization establishes goals for its Internal Business Perspective for the processes that contribute to customer satisfication. The organization can either modify the existing system or an off-the-shelf product with their developers or outsource to a software company.

The Financial Perspective focuses on cost efficiency and effectiveness consistent with the IT strategy to reduce the amount of money spent on legacy systems. It also focuses on providing the information within budgeted costs. The organization examines the Growth Perspective and establishes goals for skill levels for software development or acquisition management. The organization also establishes goals for improving the procedures to provide or acquire the necessary software services.

When constructing a Balanced Scorecard, practitioners choose measures that assess progress toward objectives. Creating the Balanced Scorecard requires involvement by senior managers because they have the most comprehensive view of the organization and their support is necessary for acceptance within the organization.

Deciding How to Measure

Measurement is an iterative process. It focuses an organization on what matters most, that in turn, results in higher performance. Developing performance measures communicates an organization's objectives and aligns activities to achieve them. This is accomplished over time by communicating assumptions about the objectives and the organization and building consensus with associates. Measurement requires the involvement of a range of employees. Implementors often refine their measures to assess the results that are most useful. Measuring performance should not be costly and time consuming. Initially, additional time will be necessary for training and experimentation. The time and resources needed will diminish as performance measurement is integrated into management processes.

To implement their performance measures for the Integrated Workstation/Local Area Network (IWS/LAN) project, the Social Security Administration (SSA) defined the information shown in Figure 7. The information describes the necessary items to implement the measure: what, how, who and when. Category 1 is one of six categories of measures developed for the IWS/LAN project. See Appendix B for the complete set of measures and measures for other projects.

CATEGORY 1

Description:	Productivity benefits identified for the Disability Determination Services (DDS) using IWS/LAN.
Metric:	A computation of the DDS productivity gain by comparing the pre-IWS/LAN baseline data with the post IWS/LAN implementation data.
The measure is:	The number of cases cleared on the pre-IWS/LAN DDS's production and the post-IWS/LAN DDS's production.
The target is:	Target productivity gains will be established upon award of contract. The existing productivity baseline will be computed at that time. Target increase percentages or numeric projections against the baseline will be set and tracked using the measures indicated.
Data Source:	The Office of Disability will use the Comprehensive Productivity Measurement (CPM) to measure the effectiveness of IWS/LAN systems in the disability determination services (DDSs). The CPM is the most accurate productivity indicator available for measuring DDS productivity. CPM is available from the Cost Effectiveness Measurement System (CEMS) on a quarterly basis. The CEMS tracks units of work per person-year.
Responsible Component:	Deputy Commissioner for Programs, Office of Disability, Division of Field Disability Operations
Report Frequency:	The report is produced quarterly. SSA will report semi-annually on the cumulative achievement of the benefits organized on a state-by-state basis.

Figure 7— One of the Social Security Administration's Performance Measures

A combination of output and outcome measures provides an effective assessment. Output measures record whether or not what was done was done correctly and if the products or services were provided as intended. Outcome measures assess whether the completed work contributed to the organization's accomplishments. For example, output measures for an acquisition of a high performance computer assess if the computer complied with the specifications and was delivered on-time and within budget. Outcome measures assess how much, if any, the high performance computer

improved the quality and timeliness of the design of weapon systems or weather prediction, for example.

Outcome measures have more value than do output measures. Outcomes can only be measured, however, upon completion of a project. Measuring intermediate outcomes, if possible, provides an assessment before completion of a project. For example, by implementing a nation-wide system in stages, an agency could assess the performance in one region of the country before implementing the system in other areas.

If an agency cannot develop an outcome measure for an IT project, agencies will have to use business logic to ascertain if the outputs are meaningful and contribute to agency accomplishments. Business logic is based upon common sense and an understanding of the organization, mission and technology gained through knowledge and experience.

Setting Goals

When establishing goals or targets of performance, it is important to have a mix of near-term and long-term goals. This is necessary because it may take years to realize the benefits of the IT investment. This holds particularly true for IT infrastructure investments where benefits may not occur for three to five years. Near-term (less than one year) targets may require organizations to segment projects into modules.

To identify goals, agencies can benchmark other internal projects, other Federal or state agencies and corporations. Benchmarking is a systematic examination to locate and investigate other organizations' practices, processes and results in order to make a true comparison. Benchmarking provides an effective technique whereby agencies compare themselves to world-class organizations. Using this technique, agencies can learn what customers expect of quality, what competitive goals are and how to achieve them. For benchmarking to be effective, organizations with similar processes must be found and workers must have knowledge of benchmarking methods and data collection.

For its Infrastructure Project, the Defense Finance and Accounting Service (DFAS) benchmarked companies to learn the ratio of network nodes per administrator that is efficient and effective for industry. DFAS learned that the ratio 150:1 was common. DFAS also learned valuable ways to manage and operate infrastructures (local area networks, servers, etc.).

The Social Security Administration met with representatives of the Wal-Mart Corporation to discuss IT issues common to their similarly-sized organizations. SSA is an active member of the Gartner Group Networking Best Practices Group. Through this membership, SSA meets with its peers in other corporations to discuss telecommunications connectivity and implementation issues. The exchange of experiences and knowledge from group participants, such as Shell, Southwestern Bell and Allstate, enables SSA to apply best practices in managing its IWS/LAN and wide area network infrastructure.

STEP 3: ESTABLISH A BASELINE TO COMPARE FUTURE PERFORMANCE

The baseline is an essential element of performance measurement and project planning. Without a baseline, goals are mere guesses. Establishing baselines primarily involves data collection and consensus building. The importance of this step requires its separation as a single task. For agencies to assess future performance, they must have a clear record of their current level of performance.

If no baseline exists for the measures chosen, agencies can establish a baseline when they collect the results data. To be effective, the baseline must support the measures used. Establishing a baseline requires collecting data about current processes, work output and organizational outcomes. Some agencies, such as the Social Security Administration and Defense Commissary Agency (DeCA), have done this for years.

PRINCIPLES OF STEP 3

- *Develop baselines …they are essential to determine if performance improves*
- *Be sure baseline data is consistent with indicators chosen*
- *Use existing agency business reports where applicable*

The SSA has been collecting a wide range of productivity data on its operations for over twenty years. The SSA measures productivity by office—the number of cases processed by month and the amount of time to process a claimant's request.

Although DeCA has only existed as an organization since 1991, defense commissaries have existed for decades. Each commissary maintains, on a monthly basis, records of operating expenses and sales. DeCA established its baseline by selecting a typical site and using existing cost and revenue reports. Both SSA and DeCA will use existing reports to determine whether productivity increases and expenses decrease.

The SSA and DeCA will establish baselines just prior to system implementation because the level of performance may have changed over the two years since project initiation. These agencies believe that establishing baselines before implementation will allow them to accurately measure the contribution of their IT projects to agency programs and operations.

Agencies can save time and resources by using existing reports, as SSA and DeCA did. To be worthwhile, formally document baselines and assure their acceptance by customers and stakeholders. The baseline could be based on the output of current

operations, costs, productivity, capacity, level of customer satisfaction or a combination of all of these.

If no baseline data exists, agencies need to select indicators that will establish the basis for comparing future performance. For example, the Federal Aviation Administration (FAA) did not measure the productivity of its oceanic air traffic controllers, or the impact of its current operations on the airline industry as a course of normal business. The FAA recognized the limitations of the current system and its impact on the airline industry, but did not have "hard" numbers for a baseline. As a result, the FAA chose to establish a baseline by conducting a job task analysis and workload analysis. Through these analyses, the FAA defined a typical scenario and measured the average capability of its air traffic controllers and the number of planes they control in oceanic air space. The FAA will use this baseline to determine the cost effectiveness of its Advanced Oceanic Automation System after installation and operation.

The DFAS will establish an IT infrastructure to support its new organizational configuration. To compare the cost effectiveness of its approach, DFAS benchmarked private industry firms to determine the cost of administering similarly sized network configurations. As noted earlier, DFAS found that the typical number of nodes per administrator in industry is 150 to 1. This ratio serves as the DFAS baseline.

Establishing baselines using performance measures linked to goals and objectives also helps agencies better define their information needs. This will improve the formulation and selection of IT projects that will be linked to agency goals and objectives.

STEP 4: SELECT INFORMATION TECHNOLOGY PROJECTS WITH THE GREATEST VALUE

For IT performance measures to assess effectively the contribution of IT investments to mission objectives, the IT investments need to be linked closely to business priorities. In a shrinking budget environment, it is essential the IT projects that are selected produce the greatest value with the resources available. Value consists of the contribution of IT to business performance in addition to discrete benefits. Discrete benefits include cost reduction, cost avoidance, productivity improvement, and increased capacity that results when a particular program area employs technology. This step will describe how to use value as the basis to select IT investments.

Traditionally, Federal and private organizations customarily conduct a cost-benefit analysis to evaluate and select large IT projects. In this analysis, organizations typically identify the non-recurring and recurring costs to acquire, develop, and maintain the technology over its life; and the benefits likely to occur from use of the technology. The types of benefits include: tangible (direct cost savings or capacity increases); quasi-tangible, which focus on improving the efficiency of an organization; and intangible benefits that focus on improving the effectiveness of the organization.

PRINCIPLES OF STEP 4

- *Value includes the IT project's return on investment and contribution to business priorities*
- *The major stakeholders determine the value of IT projects*
- *Select IT projects based upon value and risks*

In the Federal government, the net present value (NPV) method is used commonly to evaluate projects. The NPV method accounts for the time value of money to determine the present value of the costs and benefits through the use of a discount rate. The benefits to cost ratio is an NPV technique for comparing the present value of benefits to the present value of costs. Agencies select the projects with the highest benefit/cost ratio with some consideration of the intangibles benefits and risks associated with each project. Industry typically compares projects on their return on investment (ROI). ROI is the ratio of annual net income provided by the project to the internal investment costs of the project.

The NPV and ROI methods have limitations. They do not adequately factor the intangible benefits of business value. Examples of business value include the contributions of IT projects to long-term strategy or information to better manage core business processes. These methods also assume the availability of funds for all cost-justified projects. Yet, funds are always limited. Furthermore, IT organizations typically

conduct the cost-benefit analyses and select the IT projects with limited input from the user community.

Determining the Value of IT Projects

To determine the value of IT investments according to business priorities, agencies can use the techniques of Information Economics[9] to go beyond traditional NPV and ROI analysis methods. Information Economics is based upon the concepts of value and two-domain analysis. Value is the contribution of IT to enable the success of the business unit. Two-domain analysis segments organizations into business and technology domains to assess the impact of IT investments on each domain.[10] The business domain uses IT. The technology domain provides IT services to the business domain.

Decisions to invest in technology solely for technology reasons rarely support improved business performance. For example, standardizing workstation configurations reduces the cost of maintenance and training. Although the investment appears necessary and prudent, the action has little direct bearing on the business.[11] Therefore, to maximize the performance of IT investments, favor those projects that provide the greatest impact on the performance of the business domain.

Information Economics provides the means to analyze and select IT investments that contribute to organizational performance based upon business value and risk to the organization. This is done using the following business and technology domain factors. Agencies select the domain factors that reflect their business priorities. (See Supplement 1 for more information on Information Economics and a description of the domain factors.)

The business domain factors include the following:

- Return on Investment (ROI)
- Strategic Match (SM)
- Competitive Advantage (CA)
- Management Information Support (MI)
- Legislative Implementation (LI)
- Organizational Risk (OR)

The technology domain factors include:

- Strategic IT Architecture Alignment (SA)
- Definitional Uncertainty Risk (DU)
- Technical Uncertainty Risk (TU)
- Information System Infrastructure Risk (IR)

9. Marilyn M. Parker and Robert J. Benson, *Information Economics (Linking Business Performance to Information Technology)*, Prentice Hall, 1988
10. Parker and Benson, p. 26.
11. Parker and Benson, p. 39.

Organizations customarily evaluate the cost of IT to the technology domain and the benefits of IT to the business domain. Information Economics examines the cost and value that IT contributes to the business and technology domains separately. This provides a more accurate assessment of the impact of an IT investment to the organization.

Using Information Economics tools means the business domain determines the relative importance of the domain factors. Agencies can obtain consensus within the business domain by establishing an Investment Review Board with the major stakeholders identified in Step 1 as the members. The IRB determines the importance of the factors and assigns weights between one and ten to each factor.

The process of assigning weights to the factors helps agencies establish and communicate business priorities. Just establishing the weights provides enormous value. This is especially true when a turnover in senior management or organizational restructuring occurs. Assigning weights communicates the shared beliefs held by senior management. Because agencies implement IT according to their priorities, the weights will vary by agency.

To evaluate each project, the IRB assigns a score of one to five for each domain factor according to specific criteria.[12] The sum of the value factor scores multiplied by the factor weights constitutes the project value. The sum of the risk factor scores multiplied by the factor weights constitutes the project risks. The factor weights and scores can be displayed in an Information Economics Scorecard. An example is shown in Figure 9.

The Information Economics Scorecard allows agencies to assess risks by making them visible through the organizational risk, definitional uncertainty, technical uncertainty and IS infrastructure risk factors. The total risk score for a project may be acceptable to one organization but not to another. Agencies determine whether they can manage or lower the risks. They can lower their IT project risks by improving organizational readiness, reducing the project scope, or segmenting the project into more definitive modules.

Figure 9 shows the Information Economics Scorecard for a proposed payroll system. In this hypothetical example, the organization placed the highest weight, 10, on ROI; and 5, or half the importance of ROI, on strategic match. The organization rated the proposed payroll system high (4) on the ROI factor because of high labor savings.

	Business Domain						**Technology Domain**				**Project Score**	
Factor	ROI	SM	CA	MI	LI	OR	SA	DU	TU	IR	Value	Risk
Score	4	2	0	4	0	3	4	2	1	3		

12. Parker and Benson, p. 146-166.

Weight	10	5	5	2	1	5	2	2	2	2	66	27

Figure 9 — Information Economics Scorecard for a New Payroll System[13]

The payroll system received a low score (2) on strategic match because, although the system allowed the organization to manage its resources more efficiently, it did not contribute significantly to the organizational goals. The payroll system received a 3 on the organizational risk factor because the personnel department did not make adequate plans to integrate the new payroll system into its operations.

For multiple projects, the project scores by factor can be displayed in a table as shown in Figure 10. In this example, the maximum possible value score is 100. The maximum possible risk score is 35. For a project to be selected, its value score must exceed a minimum acceptable score, for example 70, and its risks be acceptable and manageable. Organizations establish their minimum acceptable scores through past experience with IT projects and repeated use of the Information Economics Scorecard. Likewise, organizations determine the acceptable level of risks through analysis of past experience and expert assessment.

After the scores for each project are known, the IRB can rank the projects according to their total value scores and select the projects that provide the most value at an acceptable and manageable level of risk. The IRB then selects the projects with the topmost value given the funds available. Selecting projects using investment selection criteria such as the Information Economics to allocate limited resources is known as capital planning.

PROJECT	ROI	SM	CA	MI	LI	OR	SA	DU	TU	IR	*Value*	*Risk*
Automated Billing Sys.	25	8	6	8	5	0	3	6	4	2	55	12
Driver Pay System	15	8	0	4	0	0	3	2	2	0	30	4
Driver Scheduling Phase 2	45	10	4	6	4	0	12	6	2	0	81	12

13. The table separates value and risk scores because value and risks need to be evaluated separately. This differs from the authors, Parker and Benson. They make a logical error by combining value and risk domain factor scores to compute a total project score. Their approach combines two factors that are unrelated, like adding apples to oranges. For example, the score for a project that has both high value and risk scores may be lower than the score for a project that has both low value and risk scores.

Bar Code Project	50	10	4	10	4	2	15	0	8	6	83	16
Capacity Project	50	10	6	8	4	1	12	0	2	8	90	11

Figure 10 —Project Scores for a Shipping Company Using Information Economics[14]

14. Adapted from Parker and Benson, p. 226.

STEP 5: COLLECT DATA

If organizations address properly the data needed for measurement during the development and selection of their performance measures, the actual collection of data becomes routine. Therefore, the time to address data collection is during development of the performance measures.

The data that agencies need to collect depends on the indicators that are chosen. To some degree, the choice of indicators depends on the data available and the baseline. For each indicator, the IT organization needs to decide up-front the "what, when, how and by whom" of collecting the data. When determining which data are appropriate to assess results, it is important to obtain consensus among customers and stakeholders.

PRINCIPLES OF STEP 5

- *Select data based upon availability, cost and timeliness*
- *Make sure data is accurate …accuracy is more important than precision*

When selecting data and establishing baselines, use the following criteria:[15]

- **Availability:** Are the data currently available? If not, can data be collected? Are there better indicators for which data are currently unavailable?

- **Accuracy:** Are the data sufficiently reliable? Are there biases, exaggerations? Are the data verifiable and auditable? A major challenge in outcome and impact measurement is determining the cause and effect between the investment and the results. The connection may be unclear. When deciding upon the data to collect, accuracy of the data is sufficient and consequently more valuable and cost effective than its preciseness. In an example of the number of people who attended a training class, 25 students attended reflects accuracy, 12 men and 13 women denotes precision.

- **Timeliness:** Are the data timely enough to evaluate performance? How frequently do the data need to be collected and reported? (e.g., monthly, quarterly, semi-annually, etc.). How current are the data?

- **Cost of Data Collection:** What is the cost of collecting the data? Are there sufficient resources, for example, personnel and funding, available for data collection? Is data collection cost effective, that is, do the benefits exceed the costs anticipated?

15. Adapted from The Department of Treasury, *Criteria for Developing Performance Measurement Systems in the Public Sector*, Office of Planning and Management Analysis Working Paper Series, September 1994

STEP 6: ANALYZE THE RESULTS

Results, particularly outcomes, rarely provide meaningful information by themselves. Results must be examined in context of the objectives, environment and external factors. Therefore after collecting the results, organizations conduct measurement reviews to determine how well the indicators worked and how the results contribute to objectives. The purpose of this step is to improve the measures for the next measurement cycle; to look for ways to improve the performance and effectiveness of IT within agencies; and to make meaningful conclusions from the results.

PRINCIPLES OF STEP 6

- *Determine what worked … and what didn't*
- *Refine the measures*
- *Prepare reports that track the results over time*

The measurement reviews examine the effectiveness of the chosen indicators, baseline and data chosen. The team or organization responsible for the results conducts the reviews and includes key stakeholders and customers as appropriate, and the team that created the indicators, if different. The reviews examine the results by answering the following questions. The question used depends on the stage of the project.

QUESTIONS THAT EVALUATE RESULTS

- Were the objectives met? If not, why not?
- Were the IT products or services acquired within budget and on-time? If not, why not?
- Did the indicators adequately measure the results intended? If not, why not?
- Were the objectives realistic?
- How useful and timely were the data collected? If insufficient, what changes are necessary or what types of data are needed?
- Did the staff understand their responsibilities?
- Did the results differ from what was expected or provide the information intended?
- What lessons were learned?
- What adjustments can and should be made to the measures, data or baseline?
- What actions or changes would improve performance?

Project outputs are easier to evaluate than outcomes and impacts. Output measures indicate progress and reflect the level of efficiency. They must be tracked until project completion. Outcomes occur after completion of the project, or its segments or phases. Agencies use intermediate outcomes, if they can be identified, to assess progress towards outcomes of their IT projects before completion. Agencies also use some output measures to assess progress toward project outcomes.

Customers and stakeholders are the ultimate judges of the outcomes and impact of an IT investment. Agencies can use business logic and common sense to assess whether the output of the IT project contributes to the effectiveness of their programs and mission accomplishments.

After completing measurement reviews, the team or responsible component prepares reports and briefings that summarize and track the results over time. Simple, eye-catching graphics summarize performance data better than narrative alone. Examples of graphics include process charts, thermometer diagrams or a dashboard with dials to represent the Balanced Scorecard measures. To facilitate comprehension of the results, use the same report format across projects. Preparing reports according to the frequency established during Step 3 enhances their value.

Not all reports will be understood automatically. Oregon's Office of the Chief Information Officer (CIO) surveyed the recipients of its initial performance reports and found that less than 40 percent either understood or liked some of the reports. Agencies can prepare more effective reports by talking with their customers and stakeholders to learn what is useful to them, and how to better present the information.

If the IT project goals were not met, agencies must identify and explain the factors that inhibited performance. The inhibitors possible are numerous. They could include the design of agency processes, interruptions of funding, site preparation delays, acts of God, change of strategy or requirements, or loss of key personnel.

It becomes easier with practice and experience to develop and use performance measures. Agencies refine their output, outcome and impact measures to adequately track the results intended. Measures change over time as the priorities of the organization change. At the Information Resources Management Conference in September 1996, OMB stated it recognized the difficulty of obtaining outcome measures. Initially, OMB said it would accept output measures.

Figure 11 shows a sample performance report. There is no prescribed format for reporting results. In the future, OMB is likely to specify a format in terms of exhibits to agencies' budget submissions. Reports should be consistent in format to ease comparison of projects.

PERFORMANCE REPORT							
OBJECTIVE:		PERFORMANCE INDICATORS					
Type of Measure	Performance Measures	Near-Term		Mid-Term		Long-Term	
		Target	Actual	Target	Actual	Target	Actual
Input							
Output							
Outcome							
Impact							
Mitigating Factors							

Figure 11 - Sample Performance Report[16]

16. Adapted from *IRM Performance Measures and the GPRA*, Central Michigan University, 1996

STEP 7: INTEGRATE INTO MANAGEMENT PROCESSES

After agencies collect and analyze the measurement data, the payback from performance measurement comes from using the data to improve performance. Many organizations report that if the results are not used, employees will not take performance measurement seriously nor will they make the effort required to apply measurement effectively.

This step describes ways agencies can integrate the results into their management processes and begin to create a performance culture. An organization no longer can take its survival for granted. To remain viable, agencies (as well as organizations and functions within an agency) must demonstrate their value through results. A performance culture encourages and emphasizes activities that contribute to organizational goals and objectives, and continually assesses its activities to improve performance.

PRINCIPLES OF STEP 7

- *Use results or no one will take measurement seriously*
- *Integrate results into business and technology domains*
- *Use results to improve performance not evaluate people*
- *Hold individuals and teams accountable for managing for results*

Performance measurement data can be integrated into a number of management processes within the business and technology domains to improve decision making. The types of management processes and the management level involved depend on the scope of the project and the measures employed. Good performance measures indicate whether the activity was done right (efficiency) and whether the activity was the right thing to do (effectiveness). Output measures assess efficiency. Outcome measures assess effectiveness.

A good Balanced Scorecard provides managers a comprehensive view of the business unit or organization. Using a mix of measures (output, intermediate outcome, and outcome) with a combination of near-, intermediate and long-term goals for a project, agencies can integrate the results into the planning, budgeting, and operation processes in the business domain. In the technology domain, agencies integrate the results into their planning, budgeting, design, development, implementation and operation processes.

For example, an IT modernization project integrates an organization's nation-wide departmental systems and provides more capability to end-users. The purpose of the new system is to increase user productivity by increasing the number of cases processed

by five percent annually over a three year period. The developers from the IT shop and representatives from user organizations participated in the design and development of

measures, managers from both public and private organizations find that inefficient processes are the primary inhibitors to their organization's performance. Consequently, performance measurement often leads to business redesign to achieve higher levels of performance.

The Information Technology Management Reform Act requires agencies to rethink and restructure the way they do business before making costly investments in information technology. Yet a majority of reengineering efforts fail. Failures occur when business units do not take ownership of reengineering efforts, senior management is not committed nor involved, or organizations do not adequately prepare for reengineering. To help agencies succeed at reengineering, GSA developed a Business Process Reengineering (BPR) Readiness Assessment.[17]

The Assessment contains a series of 73 questions designed to help agencies determine their degree of readiness to accomplish worthwhile BPR efforts. Agencies' responses to these questions help them identify the factors necessary for conducting successful BPR programs early in their development. Using this assessment tool to determine readiness helps agencies evaluate their potential for success before committing to major investments in time, money, personnel and equipment.

The relationship between IT investments and agency accomplishments may not be immediately clear or self evident. If linkage of IT projects to agency accomplishments is not possible, managers use business logic and common sense to assess the intangible value of the IT project to their business priorities and objectives. This holds especially true for investments in communication and software infrastructures that support multiple agency programs where benefits can take years to be realized.

All results will not have the same importance or weight. Agencies benefit from studying the results to uncover cause-and-effect relationships and the nature of the results. What do the results actually mean? Are we being effective? Cost may be the main determinant if resources are extremely scarce. However, focusing strictly on cost is risky. Some organizations lose customer loyalty by sacrificing quality for cost containment. Customer satisfaction may hold more importance than cost.

17. To obtain a printed copy, contact GSA's IT Management Practices Division at (202) 501-1332. To obtain a digital copy, visit http://www.itpolicy.gsa.gov/mkm/bpr/gbpr.htm.

STEP 8: COMMUNICATE THE RESULTS

It is not enough to measure, analyze and incorporate the results into management processes. It is vital also to communicate the results inside and outside the agency. Communicating the results internally improves coordination and better utilization of limited resources. Internal communication also builds confidence and support of IT projects if results are favorable. Communicating externally strengthens partnerships with customers; and increases the likelihood for continued support and funding from OMB and Congress. Communicating with customers and stakeholders is important throughout the measurement process.

The type of information to communicate will depend on the intended audience. Table 2 in Supplement 1 identifies the interests by management level. In general, those directly involved in a project are interested in outputs and outcomes. Those farther removed from the project are interested in the outcomes. Did the IT project improve mission performance? How effective was the IT investment? Because of the high visibility of large IT projects, management and oversight bodies want not only to know the effect of the project, they also want to know whether projects are on schedule and within budget.

PRINCIPLES OF STEP 8

- *Communicate results...it's vital for continued support*
- *Share results in a manner that is useful and timely to:*
  —Customers
  —Public
  —OMB
  —Congress

As with performance reports, results convey more meaning when displayed graphically, using bar charts, histograms, thermometer or dashboard diagrams, for example. The graphics will probably need to be explained. Explanations need to be concise and consistent with the graphics chosen and appropriate to the level and interests of the intended audience. Feedback from those who know the intended audience but are not directly involved with the project is useful to assure the results tell a story.

For its customers, Oregon's CIO office tracked completed IT projects. The CIO office produced tabular reports that compared projects by:

- Percentage of billable versus total hours
- Percentage of approved projects delivered within budget
- Percentage of projects that: delivered successfully, implemented best solution, and improved work-life quality

In their annual budget submissions to OMB and Congress, agencies have to report progress toward agency or project goals. OMB and Congress focus on the cost and the outcome of projects (investments). Results, particularly outcomes and impacts, may take years to be realized. Because outcomes do not occur until the end of the project, many agencies work with OMB and Congress to plan and identify intermediate outcomes to demonstrate progress. Agencies explain how project outputs and intermediate outcomes lead to project outcomes.

The explanations include a summary of the resources employed, the project goals and the results obtained. The explanations include the reasons why there are, if any, significant variances between the goals and the results. Identify and explain the impact of external influences (e.g., funding or contract interruptions, acts of Nature, changing priorities, technology changes) that inhibited performance. The impact must be relevant. The explanation includes the actions that were taken or will be taken to improve performance or to put the project back on track.

The main focus on IT projects is whether they created efficiencies and effectiveness for the organization. Proving this by explaining the results may not be sufficient. Results may have more meaning if compared to leading organizations. The comparisons could be with Federal, state or private organizations. Educating stakeholders and customers is another benefit of benchmarking. However, the comparisons must be valid and relevant to the project.

For coordination and alignment of activities, some agencies publish the results on their Intranets. For both internal and external customers and stakeholders, it is best to eliminate surprises. Communication of results is done through budget submittals. Agencies benefit if they meet with budget examiners and congressional staffers to explain their projects and results. Be aware and sensitive to their peak work periods. Meet during “off-crunch” periods to explain projects and results in progress. Being in the dark or an unknown breeds suspicion that works against an agency’s efforts.

Be aware of customers’ budget cycles. The results may help them in their planning and budget processes. Expect to be questioned on the results, particularly outcomes. On highly visible or mission-critical projects, it may be wise and worth the expense to have the results verified from recognized outside experts.

THINGS TO CONSIDER

or performance measurement to be useful to their organizations, agencies need to address the issues of organizational maturity, accountability, and resources.

Organizational Maturity

Developing and using performance measures to improve performance requires a change in mindset and culture. Agencies lay the foundation for these changes by encouraging and fostering the use of performance measures. This only happens when senior managers are supportive and involved in the process itself.

Initially, performance measures and the linkage of IT projects to organizational outcomes may be hard to conceptualizalc0.26uganurePrafeczatiagere requi timizalcby

Resources

Performance measurement requires an investment in resources. The INS believes that agencies should dedicate resources up-front to properly set up an agency performance-based management structure. Reports from industry and state governments confirm that more resources are used initially to develop a knowledge base and instill performance-based management methods in their organizations. As organizations learn how to develop and use performance measures, less resources are necessary.

The amount of resources and time to develop measures will depend on the scope of the project, partnership of the business and technical groups, data available, knowledge and skill of the developers, and how proactive management becomes. The resources needed to develop and use performance measures will vary from project to project as they did for the projects surveyed for this report.

Conclusion

The eight steps discussed in this paper provide a systematic process for developing IT performance measures linked to agency goals and objectives. Agencies establish this linkage during the planning stage of the IT project. The Balanced Scorecard provides a framework for agencies to translate business strategies into action. A good Balanced Scorecard provides a comprehensive view of an organization. It also helps IT organizations align their projects and activities with business and IT strategies.

A mix of short-, intermediate and long-term measures are needed to gauge the efficiency and effectiveness of IT projects to agency goals and objectives. Results need to be analyzed to learn how to improve performance and the measures themselves. Measurement is an iterative process. Measures improve with time and experience. For measurement to be taken seriously, the results must be used by management. Throughout the measurement process, communication with stakeholders and customers is vital for performance measures to be effective. Communicating the results internally improves coordination and support. Communicating the results with OMB and Congress garners support and continued funding of initiatives.

Agencies developing performance measures may benefit from the lessons learned on the High Performance Computer Modernization Program. This program will provide state-of-the-art high performance computing and high speed networks for scientists and technicians in the Department of Defense (DoD). The objective of this program is to improve the quality of research through more realistic models and quicker solutions.

DoD was surprised at how difficult it is to quantify the measures. As the process evolved, they realized they had underestimated the time required and the resources needed. Later, DoD was pleasantly surprised at the value of doing performance measures. While requiring substantial effort, DoD considered the time and resources spent a worthwhile investment.

PERFORMANCE-BASED MANAGEMENT

SUPPLEMENTS

SUPPLEMENT 1: DEVELOPING PERFORMANCE MEASURES

This supplement provides additional information to Step 2 for developing performance measures for IT projects.

Laws That Require Performance Measures

Currently, Federal laws require Federal agencies to measure the performance of fixed asset acquisitions over $20 million (includes IT services), IT investments, and agency programs. The scope of the performance measures depends on the project's complexity and size, the life-cycle phase and purpose of the IT investment. Legislative mandates require Federal agencies to measure the performance of their IT projects from acquisition to implementation. For example:

- For all acquisitions over $20 million, OMB requires Executive Agencies to develop and submit performance measures (OMB Bulletin 95-03). Measures must include cost, schedule and performance. The Federal Acquisition Streamlining Act (FASA) requires agencies to meet, on average, 90 percent of their acquisition cost and schedule goals without a reduction in performance.

- The Cinger-Cohen Act (a.k.a. Information Technology Management Reform Act) applies to acquisition and implementation. The Clinger-Cohen Act requires Executive Agencies to measure the performance of their IT investments and link their IT investments to agency accomplishments. The degree to which this is doable depends on the scope of the investment. An investment closely tied to an agency line of business or a program is easier to link to agency accomplishments. An investment in infrastructure is more difficult to link to accomplishments.

- The Clinger-Cohen Act also requires Executive Agencies to explore business process reengineering before making a significant investment in IT. The degree of business process transformation has a direct influence on the range of potential benefits and agency accomplishments. For example, the benefits of a successful business process reengineering effort will be dramatically greater than an investment in infrastructure or end-user computing without reengineering.

- The Government Performance and Results Act (GPRA) requires agencies to develop and submit strategic plans and performance plans for their major programs. The GPRA applies to an IT investment if the investment is a major agency program or provides a significant contribution to the agency's programs. If an IT investment is closely linked to an agency program, it may not be possible to segregate the contributions of the IT investment.

Table 2 illustrates the interests and types of measures by management level and the corresponding legislative mandate. The intent of all three laws is the same: improve the performance of agencies by requiring them to define the goals of their acquisition and programs, linking their investments to results, and communicating the results to OMB and Congress. See Appendix D for additional information on FASA, GPRA and ITMRA.

MANAGEMENT LEVEL	INTERESTS	TYPE OF MEASURES	LEGISLATIVE MANDATE
• Agency	Strategic, Organizational Impact, Resources Utilization, Service to the Public	Impacts	GPRA & ITMRA
• Programs	Effectiveness, Quality, Delivery, Cycle Time, Responsiveness, Customer Satisfaction	Outcomes	GPRA & ITMRA
• Operations	System availability, systems capability and/or capacity Technical	Inputs/Outputs	ITMRA
• Acquisitions	Cost, Schedule, Performance Requirements	Inputs/Outputs	FASA & ITMRA

Table 2[18]—Management Level Measures/Legislative Mandate

Figure 3 in Step 1 shows the measures constructed by the Immigration and Naturalization Service for the Integrated Computer Aided Detection (ICAD) system. INS developed three levels of measures for ICAD: strategic, programmatic and tactical. The INS measures correspond to agency, programs, operations and acquisitions management level shown in Table 2. INS also developed measures for the Information Technology Partnership (ITP) contract to track the contractor's performance by task order (See Appendix C).

Getting Started

Organizations typically establish a team to develop the performance measures for large IT projects. The most effective teams include the IT project manager or a member(s) of the IT management staff. Successful teams have a strong customer focus and consistently solicit input from customers and stakeholders who judge the performance of IT projects.

The FAA used an Integrated Project Team (IPT) comprised of a program manager, project leader and engineers to develop performance measures for the Oceanic System Development and Support Contract. Although users and customers were not involved in the actual development of the measures, the IPT used their input and feedback.

18. Adapted from Department of Treasury, *Performance Measurement Guide*, 1993, p. 21.

On task orders for the Information Technology Partner contract, the INS uses service-level agreements between the customer (program offices), the Information Resources Management task manager and the contractor. The service level agreements document project goals and objectives, establish task costs and schedules, and develop performance measures for contract tasks and program-level measures for high-impact, mission-critical tasks.

When formulating strategies and developing measures, it is important to consider the following six benchmarks. The author of these benchmarks believes organizations will be judged by them in the next decade:[19]

- Quality
- Productivity
- Variety
- Customization
- Convenience
- Timeliness

Characteristics of the Balanced Scorecard

The Balanced Scorecard has the following characteristics:

- Translates business objectives into performance measures
- Serves as a portfolio of measures that are interrelated
- Provides a comprehensive view of the entire IT function
- A project may have measures in more than one perspective
- Allows operational measures to be used also
- Assesses multiple projects (this is important when projects consist of modules)
- Facilitates integration and alignment of projects to common objectives

Sample Measures for the Balanced Scorecard

As agencies formulate performance measures, they may want to consider the following measures for their Balanced Scorecards:

Financial Perspective—Focuses on the costs of IT

- Planned versus actual contribution of IT project to the business domain
- Return on Investment or Internal Rate of Return of each project
- Percentage of projects completed on-time and within budget
- Cost reduction or cost avoidance within program or line of business
- Ratio of expenses of legacy systems to total IT expenses

19. Russell M. Linden, *Seamless Government: A Practical Guide to Re-Engineering in the Public Sector,* Jossey-Bass Publishers, 1994, p. 14

Internal Business Perspective—Focuses on internal processes that deliver products and services

- Staffing — Planned versus actual level
- Alignment of the IT project with the strategic IT plan and architecture
- Cost of services or operations — Planned versus actual
- Service — Ratio of the number of requests closed to number of requests received
- Acquisitions:
  - Schedule — Planned versus actual contract award date or delivery dates
  - Percentage of task orders on-time, within budget
  - Cost —Variance between budgeted cost of work scheduled, budgeted cost of work performed and actual cost of work performed

Customer Perspective—Focuses on how the customer experiences the project or system

- Level of understanding of requirements
- Level of satisfaction with the computer systems, networks, training and support
- Productivity enhancement
- Convenience—Access to the right information and the right time
- Responsiveness —Ratio of the number of service or assistance requests completed within acceptable time to the total number of requests

Learning and Innovation Perspective—Measures the degree the project includes innovative technology and contributions to worker development

- Degree to which new technologies are introduced to maintain competitiveness or currency
- Percentage of change in costs of new procedures to old procedures
- Percentage of change in cycle times of new procedures to old procedures
- Percentage of users and IT personnel trained in use of technology
- Percentage of employee satisfaction

Figure 12 lists some sample quality measures:

INDICATORS OF REQUIREMENTS AND QUALITY CHARACTERISTICS

There are no absolute indicators or expressions of customer requirements and expectations. However, the following are typical ways to express quality and effectiveness characteristics:

Product Quality Characteristics

• Meets specifications or needs	– Customer requirements fulfilled
	– Customer requirements specified
• Reliability	– Actual time
	– Project time
• Accuracy	– Number of errors
	– Number of transactions
• On Time	– Actual delivery time
	– Promised delivery time
• Knowledgeable service	– Experts assigned to task
	– Total experts available
• Responsiveness	– Turnaround time
• Meets implied commitments	– Number of report redesigns
	– Number of report requests

Service Quality Characteristics

• Programs implemented	– Programs proposed and planned
• Project completed on-time	– Projects completed
• Projects completed within budget	– Projects completed
• Projects completed	– Projects planned
• Number of errors after innovation	– Number of errors before innovations

Figure 12—Sample Quality Measures[20]

20. Department of Treasury, Performance Measurement Guide, p. 47.

SUPPLEMENT 2: SELECTING IT PROJECTS WITH THE GREATEST VALUE

his supplement provides additional information supporting Step 4—identifying the cost, benefits and value of IT projects. After agencies define the project mission and critical success factors in Step 1, develop performance measures in Step 2, and a baseline in Step 3, they identify and estimate the IT project's value and risks.

Table 1 lists the typical costs and benefits and possible opportunities associated with IT investments. In this table, the benefits and opportunities may apply to any of the costs. Agencies can use these to identify the costs and benefits of their IT projects.

COSTS	BENEFITS AND OPPORTUNITIES
Non-recurring: (one-time) • Hardware • Software • Network hardware and software • Software & data conversion • Site-preparation • Installation • Initial loss of productivity Recurring: (on-going) • Hardware Maintenance • Software Maintenance • Systems Management • Data Administration • Software Development • Communications • Facilities (rent) • Power and co	

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Table 1 - Examples of IT Costs, Benefits and Opportunities[21]

Agencies can estimate the acquisition and support costs for the useful life of IT projects through market research and past experiences. As shown in Table 1, the life-cycle costs consist of non-recurring, or one-time costs, and recurring, or on-going costs. In addition to these direct costs, there are the costs associated with the impact of IT investments on an organization, e.g., initial loss of productivity. The impact costs can be non-recurring or recurring, for example, the cost of training the systems development staff on a new client-server system (non-recurring), plus the costs of integration and management of both the new system and the existing system (recurring). Although not part of the hardware and software acquisition costs, these realities may affect the performance of the organization for some time.

Using Table 1, agencies can identify the benefits generated from their IT investments. By transforming their business operations and selecting IT projects that will complement and facilitate transformations, agencies can increase the benefits of their IT investments. Figure 13[22] illustrates how potential benefits vary with the degree of business transformation.

21. Selections from Parker and Benson, p. 101 and Daniel R. Perley, Migrating to Open Systems: Taming the Tiger, McGraw-Hill, 1993

22. Remenyi, Money, and Twite, *A Guide to Measuring and Managing IT Benefits*, Second Edition, NCC Blackwell Limited, Oxford, England, p. 19.

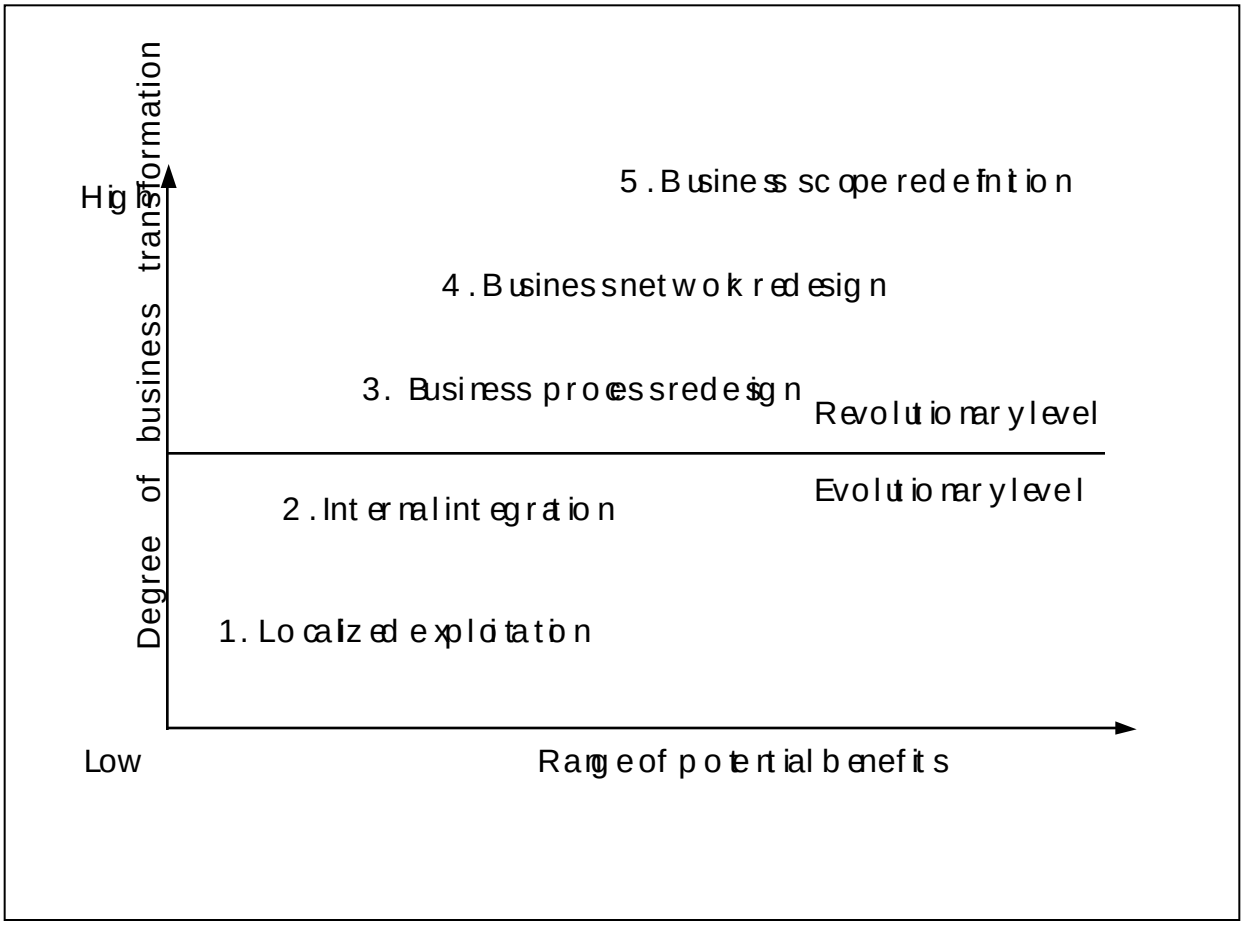


Figure 13 — Benefits and Degree of Business Transformation

Localized exploitation and internal integration represent the traditional approach of automating existing tasks and departmental IT resources. At most, they include only incremental changes to the business. Business process redesign uses IT to change dramatically how an organization performs work. The Clinger-Cohen Act requires agencies to reengineer their processes before making a significant investment in IT. Business network redesign refers to linking an organization's networks externally to customers' and suppliers' information systems. For government agencies, this would equate to interconnecting their information systems to other agencies, contractors and the public.

Business scope redefinition refers to expanding the view of agencies to reorganize the Federal government around specific policies or functions. The Federal government's approach to job training provides an example of this. Currently, approximately 15 programs provide job training benefits for eligible citizens. Conceivably, by coordinating and integrating those programs, the government could provide more effective training and reduce the costs of delivery. The Federal government often implements policy piece-meal. Only by expanding traditional thinking to focus outside their organizational boundaries can agencies discover and estimate the potential benefits of business transformations.

Information Economics and Scorecard Factors

Agencies can determine the value of their IT projects by applying the techniques of Information Economics.[23] The techniques enhance simple return on investment (ROI) analysis by expanding the concepts of quantifiable costs and benefits to include value. Simple ROI and net present value analysis compare only the discrete benefits (cost avoidance and cost displacement directly related to an investment) to the non-recurring and recurring costs for the life of the project. Information Economics provides ten factors to assess the value and risks of IT projects to the business and technology domains. Agencies may use these factors or create their own.

The Information Economics Scorecard factors are:[24]

- **Enhanced Return on Investment (ROI)**— Assessess the cost-benefit analysis plus the benefits created by the IT investment on other parts of the organization. Parker and Benson provide techniques for assessing costs and benefits of the impact of an IT investment on other departments of the organization. They also describe techniques for quantifying the benefits associated with increasing the value of a function. For example, electronic form processing provides a data entry clerk with the capability to process claims, a higher value function.

- **Strategic Match (SM)** — Assesses the degree to which the proposed project corresponds to established agency strategic goals. This factor emphasizes the close relationship between IT planning and corporate planning and measures the degree to which a potential project contributes to the strategy. Projects that are an integral and essential part of the corporate strategy receive a higher score than those that are not. Strategic Match assesses the extent to which an IT investment enables movement towards long-term direction.

- **Competitive Advantage (CA)** — Assesses the degree to which projects create new business opportunities, facilitate business transformation (e.g., interorganization collaboration through electronic commerce), increase the agency's competitiveness or improve the agency's reputation or image. Competitive Advantage requires placing a value on a project's contribution toward achieving one or more of these objectives.

- **Management Information (MI)** — Assesses a project's contribution to management's need for information about core activities that involve the direct realization of the mission, versus support activities. Measuring a project's contribution to the core activities of the business implies that the agency has identified its critical success factors. This measurement is obviously subjective because improved management information is intangible, but the benefit

23. Parker and Benson
24. Parker and Benson, p. 144 - 166.

measurement can be improved if the agency first defines those core activities critical to its success, then selects a general strategy to address these issues.

- **Legislative Implementation (LI)** — Assesses the degree to which the project implements legislation, Executive Orders and regulatory requirements. For example, Federal law requires INS to process passengers arriving at airports from international flights within 45 minutes. A project receives a high score if it directly implements legislation; a moderate score if it indirectly implements legislation; and no score if the project does neither.

- **Organizational Risk (OR)** — Assesses the degree to which an information systems project depends on new or untested corporate skill, management capabilities and experience. Although a project may look attractive on other dimensions and the technical skills may be available, unacceptable risks can exist if other required skills are missing. This does not include the technical organization, which will be measured on another dimension. Organizational risk also focuses on the extent to which the organization is capable of carrying out the changes required by the project, that is, the user and business requirements. For example, a high score (5) reflects that the business domain organization has no plan for implementing the proposed system; management is uncertain about responsibility; and processes and procedures have not been documented.

- **Strategic IS Architecture (SA)** —Assesses the degree to which the proposed project fits into the overall information systems direction and conforms to open-system standards. It assumes the existence of a long-term information systems plan — an architecture or blueprint that provides the top-down structure into which future data and systems must fit.

- **Definitional Uncertainty (DU)** — A negatively-weighted factor that assesses the degree of specificity of the user's objectives as communicated to the information systems project personnel. Large and complex projects that entail extensive software development or require many years to deliver have higher risks compared to those projects segmented into modules with near-term objectives.

- **Technical Uncertainty (TU)** — Assesses a project's dependence on new or untried technologies. It may involve one or a combination of several new technical skill sets, hardware or software tools. The introduction of an untried technology makes a project inherently risky.

- **IS Infrastructure Risk (IR)** —Assesses the degree to which the entire IS organization is both required to support the project, and prepared to do so. It assesses the environment, involving such factors as data administration, communications and distributed systems. A project that requires the support of many functional areas is inherently more complex and difficult to supervise; success may depend on factors outside the direct control of the project manager.

Additional Investment Decision Factors

The Office of Management and Budget in conjunction with the General Accounting Office published an approach that ranks IT projects using Overall Risk and Return factors.[25] See Appendix E for descriptions of these factors.

OMB and GAO's approach is very similar to the Information Economics Scorecard. Both approaches evaluate IT projects based upon their business impact, not just their return on investment. Both approaches evaluate risks. The advantages of the Information Economics Scorecard are its quick comparison of investments, and its detailed methodology for scoring IT investments.

25. *Evaluating Information Technology Investments: A Practical Guide*, Version 1.0, Office of Management Budget, November 1995, p. 8.

PERFORMANCE-BASED MANAGEMENT

APPENDICES

APPENDIX A—KEY SUCCESS FACTORS FOR AN INFORMATION SYSTEMS PERFORMANCE MEASUREMENT PROGRAM[26]

The following items are critical to the success of performance based management system:

- Management support and involvement from all levels in the organization to counteract resistance to change associated with introduction of new policies.
- Appropriate measures that include defining the goals and objectives, identifying the measures to be used, evaluating the costs and benefits, and then implementing the cost-effective measures.
- All the IS activities must be included, even those that are outside the IS department in the program areas.
- Start small and measure the processes, not the people. Fewer measures mean less initial cost; measures can be added. Measure how things are done, and the result, not the people.
- Provide feedback by using the results and reporting where improvements are being made.
- Periodically review the measures to determine their usefulness and continued applicability.
- Be patient. Performance measurement is a long-term process and may have no immediate pay-off because of the learning process involved.

26. State of Texas, Office of the State Auditor, *A Guide to Measure the Performance of Information Systems*, April 1991

APPENDIX B— AGENCY MEASURES

This appendix includes the performance measurement plans from the following six Federal agencies:

- Defense Commissary Agency
- Defense Finance and Accounting Service
- Director, Defense Research and Engineering
- Federal Aviation Administration
- Immigration and Naturalization Service
- Social Security Administration

These measurement plans describe how six Federal agencies will assess the results of their major IT projects and acquisitions. These plans present different measurement approaches and can serve as a source of ideas for other agencies as they construct their own measurement plans.

The SSA's performance measures focus primarily on business process improvements. There are six categories of measures: state disability determination productivity, service delivery process improvement, IWS/LAN local processing infrastructure capability, equipment replacement, and pricing analysis and technology refreshment over the life of the contract. Although the SSA did not use the Balanced Scorecard framework to develop its measures, their measures provide a comprehensive view of the IWS/LAN project.

The Defense Commissary Agency (DeCA) uses a combination of acquisition and project measures to assess the Point of Sale (POS) acquisition. DeCA intends to measure acquisition and operating costs, technical contract requirements and customers' expectations for technical performance and quality, and the acquisition schedule (contract award) and implementation schedule. The Defense Accounting Finance Service Infrastructure program, Defense High Performance Computing Program, FAA Oceanic System Development and Support acquisition, and the INS ITP contract also use a combination of acquisition and program measures.

Defense Commissary Agency

Point of Sale Modernization Program

Performance Measurement Plan

Introduction: Point-of-Sale Acquisition will provide the Defense Commissary Agency (DeCA) with new point-of-sale equipment at 300 commissaries worldwide. The systems will have the capability of equipment found in any modern grocery store. DeCA's current equipment is obsolete. The new systems will provide innovative capabilities such as acceptance of credit and debit cards, increased security, and better scanning of Universal Product Codes. The new systems will be based upon an open systems architecture, commercial operating systems and easily upgraded hardware and software. The following is DeCA's performance measurement plan:

1. PROGRAM DESCRIPTION

The Defense Commissary Agency (DeCA) -the product of a 1991 consolidation of Military Service commissary functions -operates approximately 300 commissaries worldwide. Every commissary uses a point of sale (POS) system to process customer purchases, capture sales and financial data from those purchases, produce management reports, and provide information to other DeCA business systems. DeCA's current POS configuration consists of several unique systems that use proprietary hardware platforms. Most of those systems were installed in 1985 and 1986, placing them at the end of their serviceable life. In addition, components are malfunctioning at a higher than normal rate, which slows the checkout process and adversely affects customer service. The existing POS system inhibits DeCA from satisfying its primary mission of providing "...an efficient and effective worldwide system of commissaries."

A new, commercially proven POS system will enable DeCA to improve its efficiency and reduce its operating costs. The new system will also enable DeCA to offer its customers more services including coupon scanning, check authorization using a central data base, and electronic payments. It should further enhance DeCA's ability to interface with both internal business systems and external systems by using industry standard communication techniques. The new POS system will use personal computer-based hardware, open operating systems such as DOS and UNIX, and applications developed using standard programming languages. Furthermore, it will possess the same architecture, features, and functions found in commercial grocery POS systems, which will enable DeCA to offer similar services to its customers.

2. PROGRAM OBJECTIVES

DeCA has established objectives for its new POS system in three areas: cost, technical/quality, and schedule. It has further broken out those objectives into specific goals, with overall lower operating costs and improved business practices underlying each goal. The goal categories are listed below:

- Cost
  - Operating costs

- Acquisition costs

♦ Technical/quality

- Technical contract requirements
- Customer expectations for technical performance and quality

♦ Schedule

- Contract award
- Implementation schedule

3. COST OBJECTIVES

3.1 Operating Costs

The primary goal of DEC's POS modernization program is to reduce POS operating costs. Specifically, DeCA wants to reduce its POS hardware maintenance costs. DeCA will measure all costs associated with the POS modernization program using a Cost/schedule Status Report (C/SSR) and **other** contract documentation.

3-1.1 OPERATING COSTS GOAL

DeCA has established a goal of reducing its POS operating costs by 50 percent when compared to the projected life-cycle operating costs of the current POS systems.

3.1.2 OPERATING COSTS BASELINE

DeCA estimates that it will incur total operating costs of slightly more than $124 million for the period FY96 through FY03 if it retains the current mix of POS systems. DeCA currently pays approximately $12 million each year to maintain its POS systems and expects this amount to increase substantially at the end of the current maintenance contract. The projected maintenance cost for the new POS system is estimated at approximately $7.8 million per year, or $62 million over the 8-year contract. DeCA will realize reduced operating costs at every commissary that receives the new POS system. Table I shows the **total** operating cost savings that DeCA expects from implementing the new POS system.

Table 1. ***Operating Cost Savings***

Status quo operating and support costs		**$124,423,297**
Estimated operating and support costs	**$62,621,969**	
Net savings	**$61,801,328**	
Percentage savings	**49.67%**	

3.2 Acquisition Costs

DeCA will measure the acquisition cost of the new system by reviewing and summarizing all contract actions, including contract modifications against the contract baseline data.

3.2.1 ACQUISITION COSTS GOAL

DeCA plans to acquire the new POS system with less than 15 percent variance in total cost.

3.2.2 ACQUISITION COSTS BASELINE

The baseline costs from the winning contractor's bid are expected to be available in October 1995. The contractor will provide a life-cycle cost estimate and monthly C/SSRs. Table 2 shows DeCA's estimates of the cost to acquire and maintain the new POS system.

Table 2. ***Total POS Modernization Costs***

Cost category	**Cost ($)**	
Equipment	**87,776,952**	
Software	**2,942,541**	
Maintenance	**38,095,719**	
Support services	**13,949,027**	
Supplies	**23,453,185**	
Total	**166,217,424**	
DITCO contracting fee (2%)	**3,324,348**	
Total baseline requirement (FY94 dollars)	**169,541,772**	
Total escalated baseline requirement (then-year dollars)		**195,090,889**

4. TECHNICAL/ QUALITY OBJECTIVES

The technical and quality goals for DeCA's new POS system focus on two areas: how well the contractor meets the requirements identified in the contract; and how well the performance of the contract meets DeCA's technical and quality expectations for a modem POS system.

4.1 Technical Contract Requirements

4.1.1 CONTRACT REQUIREMENTS GOAL

DeCA's goal for the technical performance of its new POS system is to keep the amount of significant technical variances during the testing, implementation, and operation of the new POS system below one per reporting period.

4.1.2 CONTRACT REQUIREMENTS BASELINE

The technical baseline for DeCA's new POS system is established in the POS modernization solicitation, DCA200-95-R-008, Section C, January 1995.

4.1.3 CONTRACT REQUIREMENTS SOURCE

The source of technical performance data for DeCA's new POS system will be the C/SSR technical variance reports and quarterly summaries.

4.2 Customer Expectations for Technical Performance and Quality

DeCA's POS program will provide new hardware and software to two groups of customers: retail customers; and DeCA operators in the commissaries, regional offices, and DeCA Headquarters. Retail customers will interface with the new POS system during the check-out process. Commissary personnel win operate the cash registers and in-store processors, while regional and headquarters personnel will interface with the system through terminals that accommodate remote maintenance, generation of reports, and monitoring system performance. All of these interfaces will be evaluated for "customer satisfaction" throughout the life of the new POS system. The customer satisfaction data will be obtained through DeCA surveys. Survey participants will include the POS program manager, several commissary officers, and a sample of commissary customers.

4.2.1 TECHNICAL PERFORMANCE AND QUALITY GOAL

The goal of DeCA's new POS system is to provide commissary customers and system operators with a state-of-the-art POS system. DeCA seeks to increase customer satisfaction by 20 percent over the current level of satisfaction experienced by commissary customers and operators in the categories listed in Table 3.

4.2.2 TECHNICAL PERFORMANCE AND QUALITY BASELINE

The technical performance and quality baseline will be based on the results of the customer satisfaction surveys, which will be available in October 1995.

4.2.3 TECHNICAL PERFORMANCE AND QUALITY SOURCE

DeCA will update its customer satisfaction surveys every two years. Consistent with the results from the October 1995 survey, all future surveys will focus on the performance categories shown in Table 3.

Table 3. ***Customer Expectations for Technical Performance and Quality***

		POS Operators			
Performance category	**Retail**		**Store**	**Region**	**Headquarters**
	Customers				
Customer interface and ergonomics	**X**				**X**
Data integrity and accuracy	**X**		**X**	**X**	
Availability			**X**	**X**	**X**
Maintainability			**X**	**X**	**X**
Reliability			**X**	**X**	**X**
Keeping pace with industry	**X**		**X**	**X**	

5. SCHEDULE OBJECTIVES

5.1 Program Milestones

DeCA's goal is to update the POS system in all commissaries by the end of FY98. DeCA's POS modernization program office has identified several high-level acquisition, test, and implementation milestones associated with satisfying that goal. Further, DeCA has prepared a detailed implementation schedule that will result in approximately 300 commissaries receiving the new POS system over a three-year period. DeCA will monitor the contractor's progress against its major program milestones and detailed installation schedule using the C/SSR and other program documentation.

5.1.1 ACQUISITION SCHEDULE GOAL

DeCA's acquisition schedule goal is to meet all major acquisition, test, and implementation milestones within three months of their original dates, and all milestones with less than six months total schedule variance.

5.1.2 ACQUISITION SCHEDULE BASELINE

Table 4 shows DeCA's major acquisition, test, and implementation milestones for the new POS system.

Table 4. ***Major Acquisition, Test, and Implementation Milestones***

Milestone	Date
RFP release	**January 1995**
Contract award	**October 1995**
System testing complete	**2nd Quarter 1996**
Full operational capability (FOC)	**4th Quarter 1998**

Note: **RFP = request for proposal.**

5.2 Implementation Schedule

DeCA will implement POS systems on an as needed basis. DeCA operates several stores that are in critical need of POS modernization. Geographic installation efficiencies will be realized where possible, however, the deployment of new POS systems will be made on a most needed basis.

5.2.1 IMPLEMENTATION SCHEDULE GOAL

DeCA's goal is to implement the POS program with less than 15 percent schedule variance over the three year deployment cycle.

5.2.2 IMPLEMENTATION SCHEDULE BASELINE

DeCA plans to install 50 new POS systems within one year of contract award, 125 within the second year following contract award, and another 125 during the third year. The deployment schedule is not location specific and allows the necessary flexibility to meet DeCA's operational needs.

DEFENSE FINANCE AND ACCOUNTING SERVICE

FEDERAL INFORMATION PROCESSING INFRASTRUCTURE

PROPOSED PERFORMANCE MEASURES

Introduction: The Defense Finance and Accounting Service Infrastructure Project will establish the infrastructure and capabilities to support the new Defense Finance and Accounting Service (DFAS) organizational structure. In 1991, to streamline operations and increase effectiveness, the Department of Defense began consolidating functions and personnel from over 300 Defense Accounting Offices into 21 operating locations aligned under five DFAS processing centers. DFAS needs IT resources to standardize and consolidate finance and accounting operations. The following is DFAS's performance measurement plan:

1. Customer Satisfaction

Goal: Meet the long term FIP Infrastructure needs of DFAS and improve access to information between DFAS Centers and Operating Locations.

Measure: FIP Infrastructure contractor's performance in achieving customer objectives after award and degree of satisfaction.

Strategy: The FIP Infrastructure Program Manager (PM) will conduct a survey of end users, project officers, and technical leads (collectively referred to as users) every six months after implementation of proposed technical architecture. Users will complete survey instrument that will be designed to rate the contractor's integration attributes. Attributes rated will include:

a. Knowing the Customer

- Understands how proposed technical architecture will integrate with existing architecture.
- Sensitive to customer re-training/tooling needs for proposed technical architecture.
- Constantly looks for ways to help DFAS implement operating locations on schedule.

b. Competence

- Projects implemented effectively
- Technical competence
- Re-training/tooling capability

c. Reliability

- Provides deliverables that are on time, within budget, and complete
- Regularly follows-up before and after implementation of accepted technical architecture proposal.

d. Strategic Partnership

- Invests the time needed to learn about existing DFAS technical environment
- Makes recommendations to help DFAS achieve strategic goals
- Proposes a technical architecture that has a measurable bottom line impact.

e. Customer Oriented Culture

- Makes recommendations based on customer need, not contractor's priorities
- Facilitates transfer of skills to DFAS employees
- Develops partnership to achieve mutual goals.

f. Assurance

- Uses proven analysis methodology
- Shows accountability throughout project
- Consistent staffing

g. Responsiveness/Problem Solving

- Responds to issues of dissatisfaction
- Uses effective change request procedures
- Takes ownership for problems
- Flexible in solving problems

h. Communication

- Good listening skills
- Effective presentations
- Awareness of their full range of services
- Regular updates on project status

i. Courtesy

- Shows mutual interest
- Effectively manages relationship (Coordinates with various stakeholders across organization)

The survey will identify the project requirements which are successful or unsuccessful at meeting DFAS' technical infrastructure needs. The PM will analyze problem areas, report results, and develop recommendation for promoting successful practices and correcting unsuccessful ones.

2. Implement DFAS Operating Locations

Goal: Reduce DFAS operating costs by providing a standardized technical architecture which facilitates the consolidation of finance and accounting operations.

Measure: Reduce number of DFAS operational sites from over 300 to 21 locations aligned under the 5 DFAS processing centers. This measure will involve the implementation of the required technical architecture and network to support the scheduled consolidation and opening of designated operating locations.

Strategy: The PM will ensure implementation of cost effective technical solutions that will meet DFAS consolidation requirements. Monitor the implementation schedule for the designated operating locations and ensure technical architecture is in place prior to scheduled opening of operating locations. An evaluation and cost assessment will be conducted for each operating location six months after opening to determine if technical requirements and goals were met. Results of the multiple operating location evaluations will be consolidated in a single annual report. The evaluation will include an assessment of the degree of the consistency, compatibility and interoperability of all system components and work flow applications.

3. Implement an Enterprise Local Area Network for DFAS

Goal A: Reduce the operating and overhead cost of managing a LAN.

Measure: Establish a Central Enterprise LAN (ELAN) Management team with less than 150 personnel to support the ELAN for all of DFAS. Implementing separate or standalone LANs by site, organization or office would require 440 personnel to provide LAN management support because each individual LAN would require a LAN support person.

Strategy: It is our strategy to implement an Enterprise LAN for the total DFAS workforce instead of several smaller LANs by site, organization, or office. Since the total size of the DFAS workforce is approximately 22,000 personnel, we will achieve significant savings by implementing an ELAN with central LAN management. A central LAN management team will be established at a ratio of one LAN support person per 150 to 250 users in lieu of the average projected support of one LAN support person per 50 users for local implementation of a LAN.

Goal B: Reduce the need to build redundancy into the LAN.

Measure: Standardize the LAN solution implemented at DFAS sites by reducing the number of different LAN solutions from three to one. Establishing master licensing agreements for standard office automation (OA) software instead of buying approximately 22,000 separate copies of OA software to support each DFAS employee.

Strategy: The strategy is to implement a standard ELAN solution which will eliminate the different LAN solutions currently implemented within DFAS. Through this contract the winning vendor will recommend a technical infrastructure solution which will be approved by the Program Manager. Once approved the technical infrastructure solution will be implemented as the DFAS ELAN. A part of the technical infrastructure solution will address the office automation software requirements within DFAS. Our strategy is to establish master licensing agreements for OA software to support the DFAS OA requirement instead of obtaining individual copies of this same software for each employee workstation. A master licensing agreement will provide DFAS the greatest flexibility to provide the required OA software for every employee that needs it as well as provide for future upgrades and software support of that same software.

DEPARTMENT OF DEFENSE

HIGH PERFORMANCE COMPUTING MODERNIZATION PROGRAM

MAJOR SHARED RESOURCE CENTERS

Performance Metrics

Introduction: The Defense High Performance Computing (HPC) Modernization Program will provide state-of-the-art high performance computing and high speed networks for DoD scientists and technicians. The HPC systems will be comparable to those in academia and industry and will enhance the development of weapon and warfighting systems. The objective is to improve the quality of research through more realistic models and quicker solutions. The following is the draft HPC performance measurement plan for the high performance computers only. Performance measures for the high speed networks were not available.

Mission Description.

The Director, Defense Research and Engineering (DDR&E) is responsible for ensuring the modernization of the Department of Defense (DoD) laboratories with high performance computing (HPC) capabilities to support the science and technology (S&T) program and the developmental test and evaluation (DT&E) program. Computational science and high performance computing are playing a pivotal role in changing the way research and development (R&D) are conducted. HPC supports the increasingly complex and computationally intensive R&D required by the S&T and DT&E communities. This role is illustrated in two key documents recently prepared by the DoD High Performance Computing Modernization Program (HPCMP) within DDR&E. The *Mission Need Statement* (MNS), dated June 1995, addresses the need to provide and sustain significantly higher performance computing capability. The underlying requirements are captured in the HPCMP *Functional Description*, dated June 1995. The HPCMP will undertake activities designed to keep the major shared resource centers (MSRCs), the distributed centers (DCs), and supported research community abreast of technology advancements and trends in the use and exploitation of the best state-of-the-practice in all areas of HPC including computers, algorithms, and software needs.

The scope of the DoD HPC modernization effort includes fulfillment of the HPC requirements for research, development, test, and evaluation (RDT&E) efforts under the cognizance of the DDR&E and the Director of Test, Systems Engineering and Evaluation (DTSE&E). The program must encompass and address the need for a complete systems environment enabling the researcher to do work seamlessly from the workstation to the computing platform. The systems are incomplete without adequate data storage, scientific visualization, software tools and libraries, and advanced algorithm capability. The program must address the need for robust wide area networking to link the MSRCs to DCs and to the scientists and engineers at remote facilities. This will be accomplished through the use of the Defense Research and Engineering Network (DREN). Finally, it is necessary to engage *academe* and industry in cooperative initiatives to improve applications and parallel algorithm development, software engineering methodologies, and software tools and libraries to use the HPC systems effectively. This effort is known

as the Common HPC Software Support Initiative (CHSSI). The DoD HPC environment will be incomplete and will operate at a greatly reduced effectiveness if any of these components is slighted.

System Description.

The HPCMP has been successful in forging a true DoD corporate program to address the HPC requirements of the S&T and DT&E programs. This corporate program supports a vision of maintaining and extending the United States' technological advantage in warfighting systems by providing to its scientists and engineers high performance computing capabilities and programming environments that are second-to-none in industry or academia. Four components have been created: (1) a set of four Major Shared Resource Centers (MSRCs) that are patterned after the National Science Foundation's supercomputing centers; (2) a group of smaller Distributed Centers that focus on either exploring the state-of-the-art in computational capabilities where local expertise exists within the DoD laboratories and test centers or providing HPC capabilities to address HPC requirements that cannot be met by the MSRCs; (3) the Defense Research and Engineering Network (DREN) that interconnects DoD's user community and its computational centers and allows remote users routine access to these centers; and (4) the Common HPC Software Support Initiative (CHSSI), which provides support for the efficient, effective transition of DoD application software to the newer scalable architectures with their promise of substantial increases in computational performance.

Major Shared Resource Centers

This document focuses on performance metrics for the MSRCs. Since contract awards have not yet been made for the MSRCs, there are a number of detailed, contract-level metrics that cannot be determined until awards are made. Metrics contained in this document include HPCMP program-level metrics for all components and MSRC-level metrics not detailed in the contract awards. A detailed description of the MSRC component of the program follows. The cornerstone of the HPCMP is the set of four MSRCs that will provide complete HPC environments, including a substantial majority of computing capability provided by the program. The nature of the majority of user requirements, large batch-oriented scientific and engineering computations, allow this consolidation of computational resources at a few major sites with large systems that can be time-shared effectively from remote sites.

This consolidation allows the very largest of systems to be provided, resulting in an ability to solve the largest possible computational science problems. These MSRCs are located at the Army Corps of Engineers Waterways Experiment Station, Vicksburg, MS; the Naval Oceanographic Office, Stennis Space Center, MS; the Army Research Laboratory, Aberdeen Proving Ground, MD; and the Aeronautical Systems Center, Wright-Patterson Air Force Base, OH. Each of the four MSRCs currently operates large HPC systems that are available to the entire S&T and DT&E user communities.

The HPCMP is executing a large acquisition that will result in complete HPC environments at each of the four sites, including substantial upgrades in computational capabilities at each center. The complete environment will also include extensive capabilities to address user requirements other than hardware, including software, programming environments, and training. Software will include not only the usual complement of systems software and programming tools, but also an extensive array of commercially available applications software packages in all computational technology areas. A unique feature at each MSRC will be the programming environment and training component. This component, in addition to extensive training on a wide variety of user needs, will also include the development of systems tools and software to facilitate the effective and efficient utilization of scalable architectures as DoD's computational scientists and engineers transition their workload to these promising systems.

HPCMP Program-Level Metrics.

Metrics Category	Description
Cost	Are program cost increases within 10% of the Approved Program Baseline? (15% is a Baseline breach)
Schedule	Is schedule slippage within 60 days of the dates in the Approved Program Baseline? (90 days is a Baseline breach)
Requirements	Is the fraction of sustained performance requirements that are satisfied between 20% and 80%?
Performance	Have Critical Operational Issues been met during developmental test and evaluation and operational test and evaluation events? (Enclosure 1)
	Is DREN-level data transport availability, as experienced by HPC end-user sites and users, greater than or equal to 98.5%?
	Is total utilization by the Services/Agencies, aggregated across all HPCMP HPC systems, within 5% of the officially allocated values?
User Satisfaction	In the User Satisfaction Survey, is the average of responses to items 4-7 in the "General Program" question (Enclosure 2) "Satisfied" or higher?

HPCMP program-level metrics describe the performance of the overall HPC Modernization Program. Cost and schedule are considered at the program level. Requirements, performance, and user satisfaction are all addressed in terms of issues that incorporate the entire program. For example, the fraction of sustained performance requirements that are satisfied is determined as aggregated over all HPC systems provided by the program, not on an individual basis. Likewise, allocations to each Service/Agency are examined in the aggregate over all HPC systems provided by the program, not system by system for which substantial deviations from the overall allocation to each Service/Agency may occur. A major segment of the performance metrics are codified in the critical operational issues as given in the programs Test and Evaluation Master Plan (TEMP). The user satisfaction survey is used to determine how well the overall program is performing in disseminating required information to its users and allowing an easy access process to its resources.

MSRC-Level Metrics.

Metrics Category	Description
Cost	Are costs at each MSRC within 10% of the Approved Program Baseline? (15% is a Baseline breach)
Schedule	Is schedule slippage of major events at each MSRC within 60 days of the dates in the Approved Program Baseline? (90 days is a Baseline breach)
Performance	Is the performance of each MSRC contractor rated as "Excellent" (93%) in Technical Performance, Management, and Cost on each semi-annual Award Fee Determination?
	Are the systems at the MSRCs maintaining an effectiveness level (operational availability) greater than or equal to 95%?
Turnaround Time	Is the ratio of the total job turnaround time to job computation time less than or equal to 5 for each HPCMP system at each MSRC?
User Satisfaction	In the User Satisfaction Survey, is the average of responses rating the different features of each HPCMP system at each MSRC (Enclosure 3) "4" or higher?

MSRC-level metrics pertain to each individual MSRC, and, collectively, they contribute to the program-level metrics as previously described. Cost and schedule are examined for individual MSRCs. Performance is measured in terms of each MSRCs contractual performance and the availability of its systems. An analysis of turnaround time on each system is crucial to determine whether available resources are meeting requirements in a timely fashion, particularly for time-critical applications. Responses to the user satisfaction survey based on each HPC system are used to determine how those systems are individually meeting users' needs.

Enclosure 1: Critical Operational Issues (COI) for Developmental and Operational Test and Evaluation.

Criteria, based on user-validated requirements, will be developed for each COI as test planning progresses. Supporting the evaluation of each criterion will be one or more measures of effectiveness (MOEs) and the associated measures of performance (MOPs) which will define the data requirements. An actual S&T or DT&E subject matter expert has been assigned for each COI by the HPCMO as a technical point of contact to the Joint Interoperability Test Command (JITC). A full listing of the criteria, MOEs, MOPs, and data requirements will be included in the JITC's operational test and evaluation plan (OTEP). The JITC will collect data during operational test and evaluation (OT&E) that will support the resolution of the following COIs.

Critical Operational Issues

COI	Title	Description
1	Performance	Are user operational performance requirements of the DoD S&T and DT&E communities met?
2	Compatibility, Interoperability, and Integration	Does the HPCMP system provide the compatibility and interoperability required for sharing resources among local and remote users; as well as the capability to integrate with existing HPC and planned HPCMP assets across networks?
3	Reliability, Availability and Maintainability	Does the HPCMP system operate consistently enough to support user problem solving requirements?
4	Growth Potential	Does the PL1 HPCMP system provide a technologically sound foundation for migration to PL2 and PL3?
5	Programming Environment and Training	Do the programming environments at the MSRCs promote development of new software, transfer of existing custom software, and technology transfer with academia, industry, and other government HPC activities?
6	Usability	Does the HPCMP system's human-computer interaction (HCI) support ease of learning, ease of use, safety, effectiveness and efficiency and user satisfaction?
7	Security and Vulnerability	Does the HPCMP system protect its information, provide adequate system protection and possess the ability to survive potential threat interference?

Enclosure 2: HPCMP User Satisfaction Survey General Program Rating Question

Please indicate your level of satisfaction with the HPCMP in the following areas by placing a check in the appropriate column.

	N/A	Totally Dissatisfied	Dissatisfied	Indifferent	Satisfied	Totally Satisfied
1. Access to the HPCMO Program Manager						
2. Access to other HPCMO staff						
3. Location of the HPCMO						
4. Access to information about the program *via* electronic means						
5. Access to information about the program *via* the HPCMO						
6. Access to information about the program *via* HPC Users Group meetings						
7. Ease in establishing accounts on HPCMP systems						

b. For each HPC system that you checked (✓), please rank your level of satisfaction using the following scores:

0 N/A
1 Totally dissatisfied
2 Dissatisfied
3 Indifferent
4 Satisfied
5 Totally satisfied

System	Overall Satisfaction	Ease in accessing system	Ease in using system	Satisfaction with available hardware	Satisfaction with available software	Satisfaction with turn-around time	Satisfaction with available storage	Satisfaction with availability of multiple processors for parallel computing	Satisfaction with efficiency of scalable computing	Satisfaction with technical knowledge of User Services	Satisfaction with level of training available
C90/ CEWES											
C90/ NAVO											
Y-MP/ CEWES											
Y-MP/ NAVO											
CM-5/ AHPCRC											
CM-5E/ NRL											
SP2/ MHPCC (Unclass)											
SP2/ MHPCC (Class)											
Paragon/ ASC											
Paragon/ NCCOSC (Class)											
Exemplar, NCCOSC											
T3D/ AFDTC											
Power-Challenge/ ARL											

Enclosure 3: HPCMP User Survey System Satisfaction Question.

FEDERAL AVIATION ADMINISTRATION

OCEANIC SYSTEM PERFORMANCE METRICS

Introduction: The Oceanic System Development and Support (OSDS) contract will provide the Federal Aviation Administration (FAA) with services to develop a system that automates the air traffic control in the Atlantic, Pacific, and Arctic Oceans. Currently, with the exception of Alaska, radar coverage is non-existent, navigation is by limited on-board systems, and air-ground communications come through a third party via high frequency radio. Because the existing system is manual, the FAA has limited ability to accommodate changes in aircraft flight paths, achieve better aircraft fuel and time efficiency, and avoid air turbulence. The objectives of OSDS are to maintain the existing level of safety while reducing the required distance separating in-flight aircraft; permit frequent in-flight path changes; and increase the productivity of air traffic controllers. The following is a description of the OSDS performance measures:

The Oceanic and Offshore Integrated Product Team (IPT) selected measurements to monitor and assess: product efficiency and quality, system cost and schedule, customer/user benefits, partner satisfaction, and team processes. Oceanic and Offshore metrics are broken out into four key areas. A brief synopsis for each area and their components are discussed below.

1. 0 Oceanic Service Metrics

The Oceanic Service Metrics consist of Oceanic Service Efficiency, Oceanic Service Workload and Oceanic Service Fidelity. These metrics examine the impact and benefit of oceanic automation for both our customers and FAA partners. These customers include the airlines, general aviation and military aircraft; our FAA partners include oceanic controllers, system maintainers, automation staff, and flight standards. The oceanic service metrics provide measures to assess cost and time savings to the users and maintainers of the system, workload reduction for the controllers, as well as the IPT's ability to manage service efficiency and fidelity.

Oceanic Service Efficiency

- Monitors the ability of the oceanic system to provide reduction in direct operating costs to the users. FAA will measure its success by how much it will:

  - save flying time
  - save fuel

- Monitors the ability of the system to meet users' changing needs. FAA will measure its success by how much it will:

  - reduce the procedural restrictions in the system
  - increase the number of user preferred route and altitude requests
  - reduce the deviations between routes and altitudes requested versus trajectories flown
  - increase acceptable level of traffic in sectors/airspace

- increase the number of decisions involving pilots/controllers as well as ATM/AOCs collaboration

- Predicts the variance in the system as experienced by the users. FAA will measure success by how much it will:

  - reduce the difference between estimated and actual flying times
  - reduce variation in system performance associated with changes in weather
  - increase acceptance of users' first preferences for oceanic routes, entry altitudes and entry times made with direct user inputs

- Access the ability of the users to enter the oceanic airspace and obtain services on demand. FAA will measure success by how much it will:

  - accommodate random routing and dynamic rerouting
  - decrease clearance processing time by direct pilot/controller communications

- Measure the amount of time over the optimum that it takes to complete the operation. FAA will measure success by how much it will:

  - reduce ground delays
  - permit enroute flying time closer to the optimum

Oceanic Service Workload

- Measures change in controller workload and productivity

- Provides insight into the establishment of priorities for new automation systems

- Measures manual controller tasks associated with each sector and compare to the workload with automation

- Compares estimated and predicted controller workload levels under specified operational environmental conditions.

Oceanic Service Fidelity

- Ensures that the delivered system is providing additional measures of safety by monitoring the number of operational errors and deviations per year

- Provides a means to determine if the delivered automation system is assisting in the reliability of the communications service.

2.0 Oceanic Acquisition Metrics

The Oceanic Acquisition Metrics consist of Oceanic Acquisition Development Costs, Oceanic Acquisition Quality and Oceanic Acquisition Development Time. A selected set of Oceanic Acquisition Metrics are being used by the IPT to effectively monitor all contracts. The Oceanic Acquisition Metrics incorporate software management indicators to monitor acquisition development costs, quality and development time. Data will be

required as an OSDS contract deliverable, which will be analyzed by the metrics team and presented to the IPT. The specific software management indicators used for each area are described in the following sections.

Oceanic Acquisition Development Costs

- Monitors costs associated with the development of the oceanic projects
- Software management indicators have been levied on all new contracts within the oceanic area. Use of software indicators will permit project tracking, cost, schedule and risk mitigation.
- A specific software management indicator which will be used within the program is the indicator for software size. The software size indicator tracks changes and the magnitude of the software development effort. The lines of code to be developed directly relate to the software engineering effort necessary to build the system

Oceanic Acquisition Quality

- Product quality will be measured throughout the life cycle to ensure that oceanic requirements are not abrogated by the contractor.
- The metrics will assess oceanic quality by obtaining input from oceanic users, technicians, logistics personnel and quality reliability officers.
- The software management indicators require the developing contractor to provide statistics and trend analysis charts of the project s software requirements and design stability. Reports generated by oceanic contractors, will show the contractors internal processes as they relate to changes in requirements down to modifications of the actual Computer Software Configuration Item.

Oceanic Acquisition Development Time

- Provide visibility into the oceanic contractors' adherence to their baselined schedules.
- Software management indicators in contracts allow the IPT to determine from contract award throughout the life of the project significant indicators, which may cause schedule impact if not monitored.
- The indicators provide visibility into software risk areas and software complexity, as well as examine the contractor's actual design process.
- The main goal of these metrics will be to show any schedule impact, early in the project, so that the IPT could effect a resolution for a possible schedule delay.

3.0 Oceanic Service Program Costs

These metrics will establish a means to determine the change in operational and maintenance costs through the use of new automation.

- Monitors the actual operational and maintenance costs for oceanic facilities, equipment, and staffing.

4.0 Oceanic Team Metrics

The specific metrics outlined below measure the team dynamics and the performance of team decision processes. These metrics will assess team relationships and quantify the benefits derived by empowering the IPT.

These metrics will be monitored with the goals of demonstrating the benefits from the transition from a matrix organization to an IPT and continuing process improvements to increase team effectiveness.

Oceanic Cycle Time

- Provides a means to measure the oceanic acquisition and implementation IPT processing times, as compared with other FAA projects, as well as, previous oceanic processing times before formulation of the IPT.

- The goal is to reduce the cycle time by utilizing the IPT expertise to streamline lengthy processes.

Oceanic Team Effectiveness

- Monitors IPT effectiveness and efficiency. A survey is distributed biannually to monitor the IPT's decision-making effectiveness, sense of empowerment, value of team efforts to the end product, and overall commonality of goals and objectives.

Oceanic Product Quality and Satisfaction

- Monitors customer satisfaction by preparing surveys which are distributed to oceanic users throughout a project s life-cycle.

- These monitor our partners' satisfaction as documentation is delivered, systems are deployed, and training has been accomplished.

Customer Satisfaction Survey

Airways Facility Personnel	Strongly Disagree - Strongly Agree
1. The PIP clearly identified the implementation planning process.	① ② ③ ④ ⑤ NA
2. Adequate funding was provided from the program office to support implementation activities.	① ② ③ ④ ⑤ NA
3. The site implementation plan clearly identified space, power, HVAC, and communications requirements.	① ② ③ ④ ⑤ NA
4. Changes to AF procedures were clearly defined.	① ② ③ ④ ⑤ NA
5. Maintenance training materials were thorough and comprehensive.	① ② ③ ④ ⑤ NA
6. Maintenance operation impacts were clearly defined.	① ② ③ ④ ⑤ NA
7. The hardware components were delivered on schedule.	① ② ③ ④ ⑤ NA
8. Delivered hardware documentation is thorough and comprehensive.	① ② ③ ④ ⑤ NA
9. The delivered system is easy to maintain.	① ② ③ ④ ⑤ NA
10. Site AF staffing impacts were clearly identified prior to system delivery.	① ② ③ ④ ⑤ NA
11. Test requirements were clearly documented in the site test plan.	① ② ③ ④ ⑤ NA
12. Adequate technical resources were provided to test the system.	① ② ③ ④ ⑤ NA
13. Support and test equipment were provided and delivered on schedule.	① ② ③ ④ ⑤ NA
14. The maintenance plan was clearly defined and timely promulgated.	① ② ③ ④ ⑤ NA
15. Adequate supply support materials were delivered on schedule.	① ② ③ ④ ⑤ NA
Air Traffic Personnel	Strongly Disagree - Strongly Agree
1. The new system makes my job easier.	① ② ③ ④ ⑤ NA
2. The new system allows me to do the same tasks faster.	① ② ③ ④ ⑤ NA
3. The training fully prepared me for using the new system or function.	① ② ③ ④ ⑤ NA
4. The new system fully meets its intended functionality.	① ② ③ ④ ⑤ NA
5. Procedural changes for the new system or function were fully defined.	① ② ③ ④ ⑤ NA
6. Transition to the new system or function was easy.	① ② ③ ④ ⑤ NA
Air Traffic Personnel: Automation, Airspace and Procedures	Strongly Disagree - Strongly Agree
1. The PIP accurately defined the implementation planning process.	① ② ③ ④ ⑤ NA
2. The technical and training documentation was thorough and comprehensive.	① ② ③ ④ ⑤ NA
3. The technical documentation accurately reflects the software.	① ② ③ ④ ⑤ NA
4. The system was very stable when first delivered.	① ② ③ ④ ⑤ NA
5. Adequate resources were provided from the IPT for the system tests.	① ② ③ ④ ⑤ NA
6. The data reduction and diagnostic programs are helpful and easy to use.	① ② ③ ④ ⑤ NA

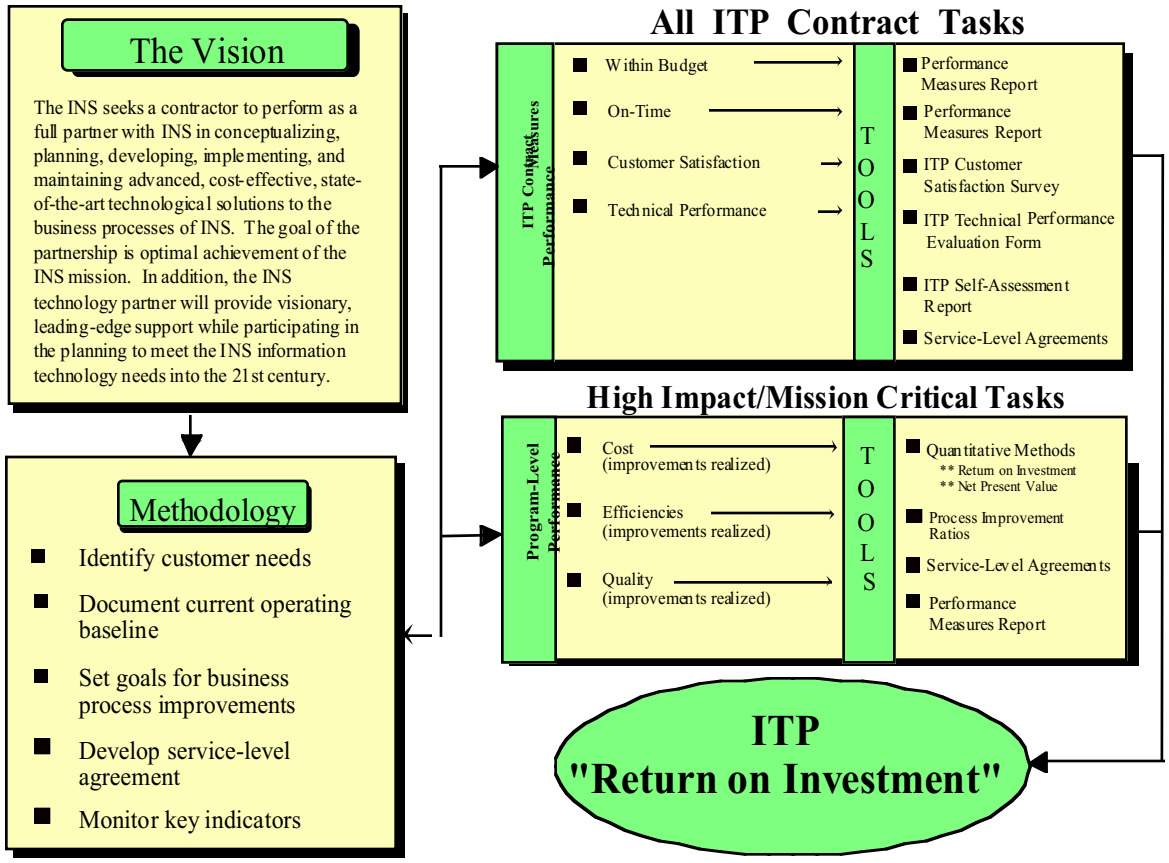
7. The program office provided adequate assistance in developing the Site Implementation Plan (SIP).	① ② ③ ④ ⑤ NA
8. The region and site personnel were involved early in the development and decision process.	① ② ③ ④ ⑤ NA

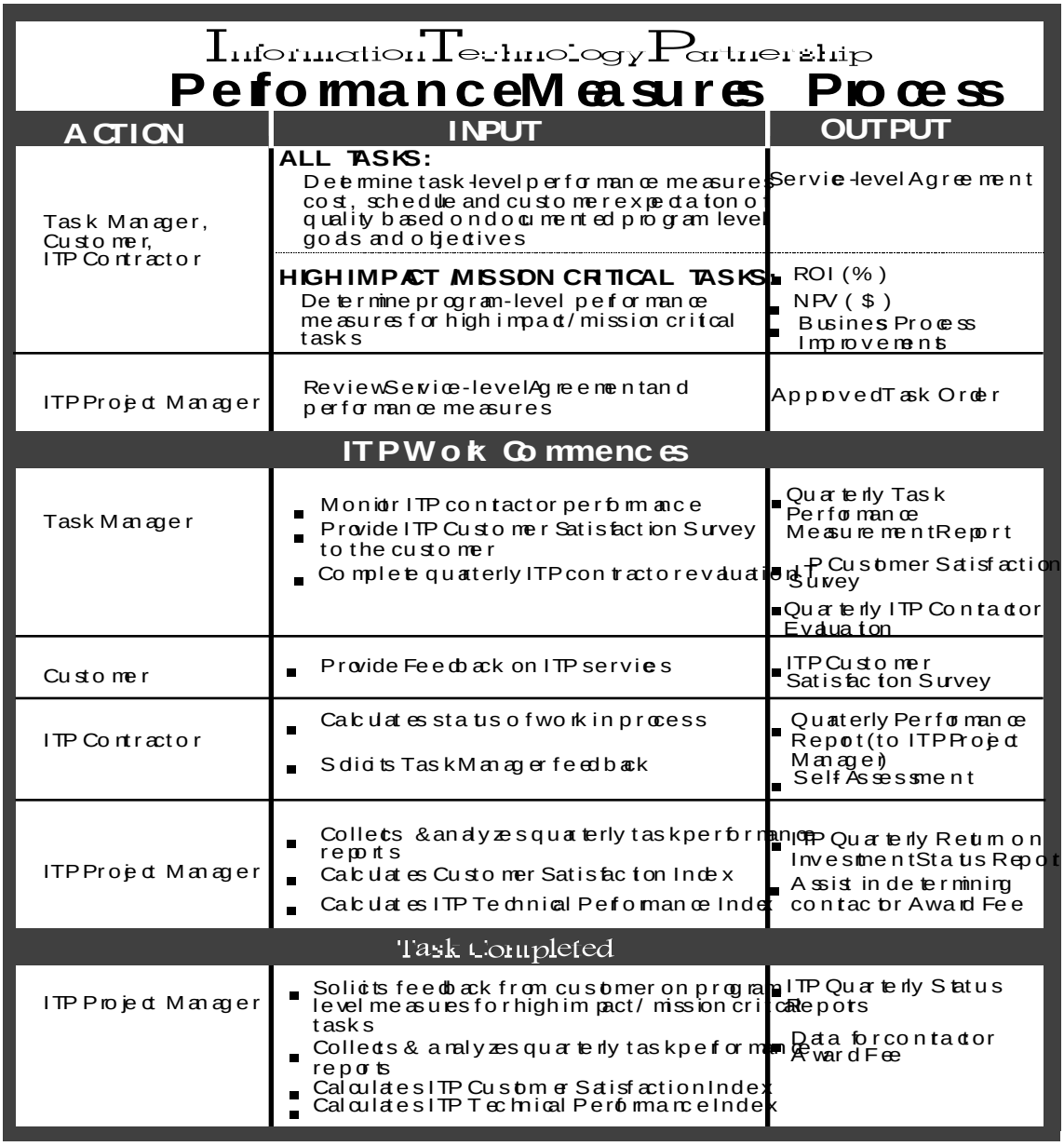
Immigration and Naturalization Service

Information Technology Partnership

Introduction: The Information Technology Program (ITP) provides the Immigration and Naturalization Service (INS) a support services task order contract. The ITP contractor functions as a proactive, forward-thinking, strategically oriented partner who assists the INS to develop information management strategies. The contractor provides support for various tasks throughout the IT life cycle including systems planning, analysis, design, development and maintenance. The ITP objectives are to respond to increased workload throughout the agency by automating information systems, and to establish a standardized systems architecture to provide access to critical mission information. The following describes the INS approach to performance measurement.

ITP Business Performance Measurement Plan





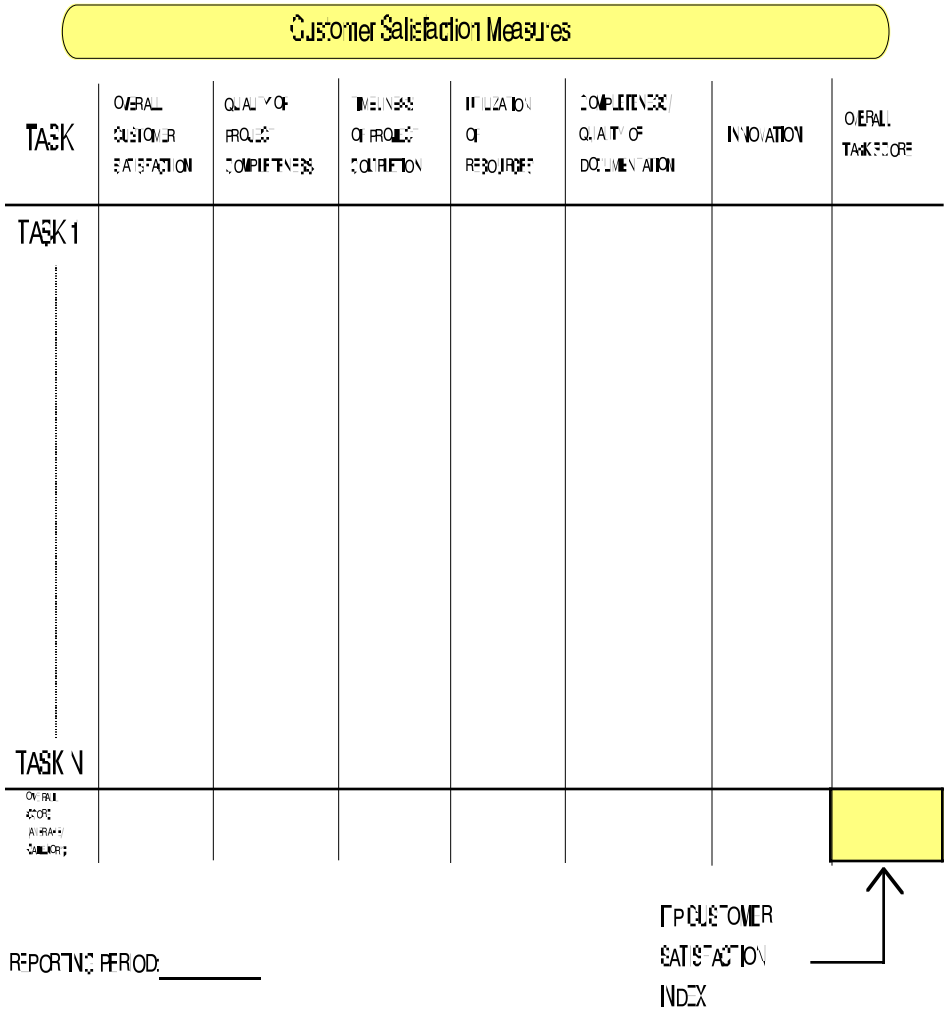
Information Technology Partnership

Pefomance Measures Process

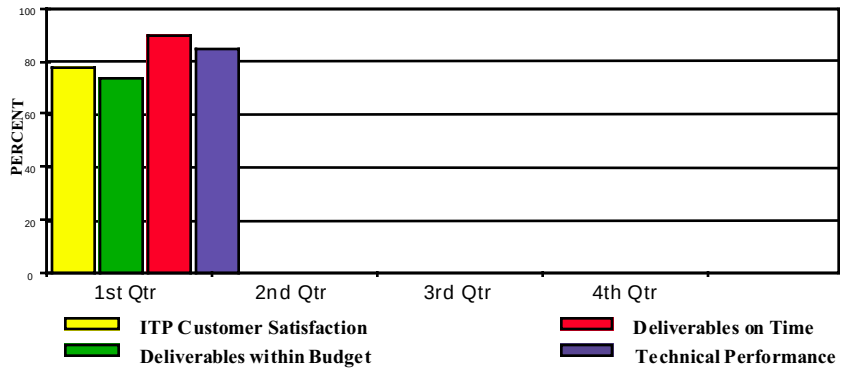
ACTION	INPUT	OUTPUT
Task Manager, Customer, ITP Contractor	**ALL TASKS:** Determine task-level performance measures cost, schedule and customer expectation of quality based on documented program level goals and objectives	Service-level Agreement
	HIGH IMPACT MISSION CRITICAL TASKS: Determine program-level performance measures for high impact/mission critical tasks	ROI (%) NPV ($) Business Process Improvements
ITP Project Manager	Review Service-level Agreement and performance measures	Approved Task Order
ITP Work Commences		
Task Manager	Monitor ITP contactor performance Provide ITP Customer Satisfaction Survey to the customer Complete quarterly ITP contractor evaluation	Quarterly Task Performance Measurement Report ITP Customer Satisfaction Survey Quarterly ITP Contactor Evaluation
Customer	Provide Feedback on ITP services	ITP Customer Satisfaction Survey
ITP Contractor	Calculates status of work in process Solicits Task Manager feedback	Quaterly Performance Report (to ITP Project Manager) Self Assessment
ITP Project Manager	Collects & analyzes quarterly task performance reports Calculates Customer Satisfaction Index Calculates ITP Technical Performance Index	ITP Quarterly Return on Investment Status Report Assist in determining contactor Award Fee
Task Completed		
ITP Project Manager	Solicits feedback from customer on program level measures for high impact/ mission critical tasks Collects & analyzes quarterly task performance reports Calculates ITP Customer Satisfaction Index Calculates ITP Technical Performance Index	ITP Quarterly Status Reports Data for contactor Award Fee

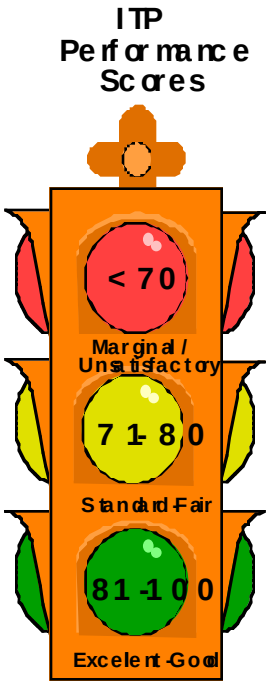
ITP CUSTOMER SATISFACTION

SUMMARY MATRIX



Calculating a Quarterly ITP Contract Performance Index





Performance Measures	*Score*	*Weight*	*Weighted Score*
Customer Satisfaction	75	.30	22.5
Within Budget	70	.20	14.0
On-Time	89	.20	17.8
Technical Performance	85	.30	25.5
ITP Performance Index			**79.8**

Social Security Administration

Integrated Workstation/Local Area Network

Introduction: Intelligent Workstation and Local Area Network (IWS/LAN) acquisition is the first phase of the Social Security Administration's (SSA) infrastructure modernization program. The SSA plans to modernize its processes to improve the disability and appeals process, to improve public access to SSA, to turn SSA into a paper-less agency and to establish a cooperative processing architecture. IWS/LAN will replace SSA's existing "dumb" terminals with intelligent workstations and LANs at approximately 1,300 district and branch offices, program service and teleservice centers. SSA developed six categories of measures for IWS/LAN.

Category 1

Description: Productivity benefits identified for the state Disability Determination Services (DDS) using IWS/LAN.

Metric: A computation of the DDS productivity gain by comparing the pre-IWS/LAN baseline data with the post IWS/LAN implementation data.

The measure is: The number of cases cleared on the pre-IWS/LAN DDS's product
and the post-IWS/LAN DDS's production.

The target is: Target productivity gains will be established upon award of contract The existing productivity baseline will be computed at that time Target increase percentages or numeric projections against the baseline will be set and tracked using the measures indicated.

Data Source: The Office of Disability will be using the Comprehensive Productivity Measurement (CPM) to measure the effectiveness of IAN systems in the disability determination services (DDSs). The CPM is the most accurate productivity indicator available for measuring DDS productivity. CPM is available from the Cost Effectiveness Measurement System (CEMS) on a quarterly basis. The CEMS tracks units of work per person-year.

Responsible Component: Deputy Commissioner for Programs, Office of Disability, Division of Field Disability Operations

Report Frequency: The report is produced quarterly. SSA will report semi-annually on the cumulative achievement of the benefits organized on a State by State basis.

Category 2

Description: SSA baseline automation savings generated by the implementation of IWS/LAN in SSA field offices and hearing offices.

Metric:

a. Reports on productivity of SSA field office employees by comparing production data before and after IWS/LAN installation.

b. A computation of the change in hearing level productivity by comparing pre-IWS/LAN receipt baseline data with post-IWS/LAN receipt data.

The measure is:

a. The productivity change is the earned hours (volume (total cases completed) * national unit rate) divided by actual hours for a control group compared to itself before and after IWS/LAN.

   The national productivity change for non-IWS/LAN field offices compared to IWS/LAN field offices.

b. The total OHA field office productivity index (PI) which consists of the primary activities in the disposition of cases, i.e., case preparation, decision drafting, and decision typing. These activities will be weighted according to the relative "hands-on" time for these activities involved in getting out a decision. To determine the PI, the weighted "points" are multiplied by the "number" of actions for each activity arriving at the activity points. All activities are added to each other to compute the total points. The total points are divided by 5.7 (the value of an equivalent disposition) yielding production. The total production is then divided by the staff work-years (total hours worked divided by 2080) which yields the PI. A period before IWS/LAN installation will be established as a baseline to assess impact on PI resulting from IWS/LAN installation.

The target is:

a. Targeted productivity changes will be computed starting from the baseline for the measures that exist at award of the IWS/LAN contract.

b. Targeted productivity index will be computed starting from the baseline at the time prior to IWS/LAN installation compared to productivity index after IWS/LAN. Target productivity increases will be set relational and incremental to achieving the service level objectives outlined in the Improve the Appeals Process strategic initiative.*

Data Source:

a. For field offices, productivity measures will be based on SSA's Productivity and Cost Measurement System (PCMS).

b. OHA will pull productivity data for selected hearing offices from its Monthly Activity Report (MAR). The MAR is generated primarily from data entered into the Hearing Office Tracking System in each hearing office. The before and after comparison will be made for the offices on a monthly basis.

Responsible Component: Deputy Commissioner for Human Resources, Office of Workforce Analysis -- PCMS

Deputy Commissioner for Programs, Office of Hearing and Appeals -- MAR

Report Frequency: SSA will report semi-annually.

* The Social Security Strategic Plan: A Framework for the Future, SSA Publication No. 01-001, September 1991, and the Report of the Strategic Priority Workgroup, Improve the Appeals Process, January 1992

Category 3

Description: Improvements in service delivery related to IWS/LAN usage.

Metrics:

a. SSA will report on existing quality measures for the 800 number. Based on pilots already conducted, SSA expects improved payment accuracy and service delivery accuracy through use of the 800 Number Expert System on the IWS/LAN. Payment accuracy reflects whether the Teleservice Center action/information (or failure to act or provide information) has a reasonable potential to affect payment or eligibility. Service delivery accuracy reflects whether the Teleservice Representative (TSR)'s response results in the desired service delivery outcome to the customer. SSA will compare IWS/LAN 800 Number Expert System TSR user results to non-IWS/LAN TSR user results.

b. SSA is implementing dial-in access as part of the IWS/LAN project. This dial-in access gives SSA employees who are outside the full-time offices the same functional ability and significantly improves service levels to the SSA customers who deal with SSA at geographically remote contact stations. This metric will look at the increase in number of remote locations and client population served by this new capability.

The measure is:

a. The payment error/accuracy and service error/accuracy counts of teleservice representative's use of the 800 Expert System.

b. The number of remote service sites and the population served due to the availability of dial-in access.

The target is:

a. Error/accuracy counts for both payment and service will have improvement targets set against the current baseline for these measures existing at the time of the IWS/LAN contract award. Statistically significant targets will be selected for percentage or numeric measures. As applicable, these targets will be relational and incremented to accuracy objectives set to accomplish SSA's customer service goals (e.g. "We will provide service through knowledgeable employees... and meeting our customer's preferences for "handling business with SSA by telephone, a majority prefer to do so through SSA's 800 number.")*.

* Putting-Customers First SSA Publication No. 05-10030, September 1994

b. Targets for remote service sites and population served will vary from month to month over the IWS/LAN implementation period. General national targets will be to average 3.5 percent increase per month in number of offices with remote automated services available and an average of 175,000 increase in client population served by this new capability per month. These targets are set to achieve the goals of SSA's customer service pledge to "provide equitable service to our customers" and ensure that "our services are accessible".*

Improvements in service delivery related to IWS/LAN metric category 3 is one that may be modified to reflect measurements in systems that SSA establishes to track its performance against its new Customer Service Standards.

Data Source:

Metric (a)--The Office of Program and Integrity Reviews (OPIR) monitors a sample of the 800 number calls to produce the payment accuracy and service delivery accuracy measures.

Metric (b)--Improved Public Access - The Office of the Deputy Commissioner for operations (DCO) will provide information on the number of contact stations and remote service sites that are served using the new dial-in service capability.

Responsible Component: Deputy Commissioner for Operations, Office of Automation Support, and the Deputy Commissioner for Finances, Assessment, and Management, Office of Program and Integrity Reviews

Report Frequency: SSA will report on a semi-annual basis.

* Putting Customers First SSA Publication No. 05-10030, September 1994

Category 4

Description: IWS/LAN Local Processing Infrastructure Capability. SSA will report on the IWS/LAN implementation progress. During the acceptance period, SSA will provide reports on the status of acceptance. When the national installation begins, SSA will provide a report on the number and location of LANs installed.

Metric:

a. During the acquisition phase, SSA will advise higher monitoring authorities of the progress being made toward contract award by complying with the special conditions set forth in the DPA (i.e., submitting status reports every 6 months, presenting post-bid and pre-award briefings, etc.).

b. When the national installation begins, SSA will provide a report on the number and location of LANs installed by month.

The measure is:

a. The contract status activity report for IWS/LAN procurement.

b. The individual office/site LAN installation by month, district office, state, and cumulative number of LANs installed.

The target is:

a. Report produced every 6 months. Acquisitions completed within the estimates established-by the Office of Acquisition and Grants.

b. Seventy-five (75) LAN installations per month and all installations completed in twenty-nine (29) months from first field installation date. Targets were set to provide the most responsive and practical timeframes for implementation of the IWS/LAN infrastructure for baseline automation benefits and distributed data processing application platforms. The time table also facilitates SSA's Customer Service Pledge objectives by providing advanced systems to speed SSA service, such as the appointment process, the SSA card replacement request, new SSN card requests, and information on claims, programs, client data, and other SSA business functions.

Data Source:

a. Prior to contract award, project status reports will be generated, as required, by the contracting officer.

b. After contract award, project status reports will be generated monthly to the office of the Deputy Commissioner for Systems.

Responsible Component: Deputy Commissioner, Office of Systems, Office of Telecommunications; office of Finance, Assessment and Management, Office of Acquisition and Grants; and Deputy Commissioner, Office of operations, Office of Automation Support.

Report Frequency: Semi-annually or as requested

Category 5

Description: Existing terminal redeployment and phase out. As the IWS/LAN is installed across all SSA regions, their Terminal Acquisition Project (TAP) terminals (i.e., IBM 3270) will be redeployed to other SSA field offices that are not receiving IWS/LAN until late in the installation schedule. When these relocation requirements are met, SSA intends to release to Government excess all remaining TAP devices that are removed from IWS/LAN installed offices.

Metric:

The IWS/LAN installed office's existing TAP terminal base will be redeployed to SSA field offices that have had outstanding requirements for these resources. Once redeployment is complete, SSA will also report on the release to Government excess of all TAP devices that are removed from IWS/LAN installed offices..

The measure is: The SSA office (City/State), IWS/LAN install date, number of TAP terminals, number of terminals redeployed, number of terminals excessed, and date of the activity.

The target is: Average redeployment of 615 TAP workstations per month for 12 months starting at first IWS/LAN phase I field office installation month. Average release of 820 TAP workstations per month over a 48 month period starting at first IWS/LAN phase I field office installation month.*

Data Source:

SSA will report on the number and location of redeployed and excessed TAP devices. This report is a product of our existing property management and maintenance contract support system.

Responsible Component: Deputy Commissioner, Office of Systems, Office of Telecommunications, Division of Integrated Telecommunication Management

Report Frequency: This report will be provided on a semi-annual basis.

* Metric assumes the planned ratio of workstations per employee is implemented.

Category 6

Description: IWS/LAN contract cost and pricing details will be provided. SSA will also report on any technology substitution provisions or activity over the contract life.

Metrics:

a. At contract award, SSA will provide GSA with all pricing and cost material for the new contract. SSA will be available to further discuss in detail with GSA any cost provisions that GSA would want SSA to report on over the life of the contract.

b. SSA will provide GSA with the contract's technology substitution language and will report on any technology substitution proposals that are received and evaluated by SSA.

The measure is:

a. At contract award, a list of pricing and cost material for the new contract.

b. A report on any technology substitution proposals received by the contracting officer.

The target is: Report pricing structure at award of contract. Report technology substitutions and associated pricing within 60 days of acceptance of proposals.

Data Source:

a. Office of Acquisition and Grants contract award.

b. Office of Acquisition and Grants contract award.

Responsible Component: Deputy Commissioner for Finance, Assessments, and Management, Office of Acquisition & Grants

Report Frequency: Frequency of report will be semi-annual.

APPENDIX C—PERFORMANCE MEASUREMENT LEGISLATION

This appendix provides summaries of the performance-based management requirements from:

- The Clinger-Cohen Act of 1996
- Federal Acquisition Streamlining Act (FASA) of 1994
- Government Performance Results Act (GPRA) of 1993

The Clinger-Cohen Act of 1996

(Also known as Information Technology Management Reform Act)

The Clinger-Cohen Act focuses on capital planning and performance-based measurement. Agencies will be required to integrate their IT investment plans and performance measures into the budget process.

Requires Director of OMB to:

- Report to congress at budget submission on:

  (1) Net program performance benefits achieved as the result of major capital investments made by executive agencies in information systems, and

  (2) How benefits relate to the accomplishments of the goals of the executive agencies.

- Compare the performance of the use of IT by executive agencies and disseminate to the heads of the executive agencies

- Evaluate the information resources management practices of executive agencies related to the performance and results of IT investments made by Executive Agencies, and take appropriate steps to enforce accountability. Specific actions taken by the Director may include:

  (1) Recommending a reduction or an increase in any amount for information resources proposed by the head of the executive agency for the budget submitted.

  (2) Reducing or otherwise adjusting apportionments and reapportionments of appropriations for information resources.

  (3) Using other authorized administrative controls over appropriations to restrict the availability of resources.

(4) Designate an executive agent for the executive agency to contract with the private sector for the performance of information resources management or the acquisition of information technology.

Requires Each Executive Agency Head to:

- Establish a process to select, manage and evaluate the results of IT investments
- Submit annual reports on progress in achieving goals with budget submission
- Link IT performance measures to agency programs
- Revise mission-related processes before making significant IT investments

Government Performance And Results Act (GPRA)

This provides for the establishment, testing, and evaluation of strategic planning and performance measurement in the Federal Government, and for other purposes. Major features include strategic planning and the annual submission of the performance plans and reports for fiscal year (FY) 1999.

Strategic Planning
Calls for submission by each agency to OMB by September 30, 1997 a strategic plan (developed in consultation with Congress) for program activities covering five years (and updated at least every three years), including:

- A comprehensive mission statement
- Outcome-related goals and objectives
- A description on how performance goals (see below) relate
- An identification of key external factors
- A description of program evaluations used

Annual Performance Plans and Reports
Calls for OMB to require, from each agency beginning with FY 99, an annual performance plan covering the activities listed in the agency's budget, including:

- The establishment of performance goals for each program
- Expressed goals in objective, quantifiable, and measurable form
- A description of resources and activities needed to meet the goals
- The establishment of performance indicators
- A basis for comparing results with goals
- Provides for alternative to objective and quantifiable form

Also, no later than March 31, 2000, each agency is to submit a report on program performance for the previous fiscal year. The required information may be included in the annual financial statements.

Federal Acquisition Streamlining Act (FASA)

Title V of this act applies to both defense and civilian agencies. The Secretary of Defense is charged with implementing performance-based management for defense acquisition programs; and the Administrator of the Office of Federal Procurement Policy (OFPP) is responsible for ensuring implementation by civilian programs.

Title V establishes a government policy: "that agencies should achieve, on average, 90 percent of the cost and schedule goals established for major and non-major acquisition programs without reducing the performance or capabilities of the items being acquired."

Title V:

- Requires agency heads to approve or define the cost, performance, and schedule goals for major acquisition programs. (Chief Financial Officers are required to evaluate the cost goals proposed for each major acquisition program.)

- When a program fails significantly to meet established schedule, cost or performance goals, Title V directs the agency head to determine whether there is a continuing need for the program; and identify suitable actions to be taken, including termination.

- Requires the Administrator of OFPP to report annually to Congress on agencies' progress in implementing Title V.

- Complements the required performance-based management system with a requirement that civilian agencies develop a "results oriented acquisition process" for determining whether the acquisition of non-commercial items satisfies agency program needs.

- Requires the OMB Deputy Director for Management to develop an enhanced performance incentive system for the acquisition work force keyed to the achievement of the acquisition program goals.

APPENDIX D—OMB AND GAO INVESTMENT FACTORS

OMB and GAO identified the following Overall Risk and Return Factors.[27]

The Risk Factors

Investment Size - How large is the proposed technology investment, especially in comparison to the overall IT budget?

Project Longevity - Do projects apply a modular approach that combines controlled systems development with rapid prototyping techniques? Are projects as narrow in scope and brief in duration as possible to reduce risk by identifying problems early and focusing on project versus realized results. Modular approaches are considered less risky.

Technical Risk - How will the proposed technology be integrated into existing systems? Will proposed investments take advantage of commercial-off-the-shelf software and systems? How will the complexity of the systems architecture and software design affect the project?

The Return Factors

Business Impact or Mission Effectiveness - How will the investment contribute toward improvement organization performance in specific outcome-oriented terms?

Customer Needs - How well does the investment address identified internal and/or external customer needs/demands for increased service quality and timeliness or reductions in costs?

Return on Investment - Are the return on investment figures using benefit-cost analysis thresholds reliable and technically sound?

Organizational Impact - How broadly will the technology investment affect the organization (i.e., the number offices, users, work processes, and other systems)?

Expected Improvement - Is the proposed investment being used to support, maintain, or enhance existing operations systems and processes (tactical) or designed to improve future capability (strategic)? Are any projects required by law, court ruling, Presidential directive, etc.? Is the project required to maintain critical operations--payroll, beneficiary checks, human safety, etc.--at a minimal operating level? What is the expected magnitude of the performance improvement expected from the technology investment?

27. *Evaluating Information Technology Investments: A Practical Guide*, Version 1, OMB, Nov. 1995, p. 8.

APPENDIX E—RECOMMENDED READING LIST

This list includes IT and non-IT performance measures. Because the principles are common, much can be learned from non-IT performance measures.

Bishop, Yoes and Hamilton, *Performance Measurement for Information Systems: Industry Perspectives*, University of Houston-Clear Lake, October 30, 1992

Brynjolfsson, "The Productivity Paradox of Information Technology," *Communications of the ACM*, December 1993 (p.67)

Information System Performance Measurement: A Method for Enhancing Accountability in State Information Systems, Joint Committee on Information Technology Resources, The Florida State Legislature, January 1994

Criteria for Developing Performance Measurement Systems in the Public Sector, Department of the Treasury, September 1994

Katz, "Measuring Technology's Business Value," *Information Systems Management*, Winter 1993 (p. 33)

Kaplan and Norton, "The Balanced Scorecard - Measures That Drive Performance," *Harvard Business Review*, January-February 1992 (p.71)

Kaplan and Norton, "Putting The Balanced Scorecard to Work," *Harvard Business Review*, September-October 1993 (p.134)

Kaplan and Norton, "Using the Balanced Scorecard as a Strategic Management System," *Harvard Business Review*, January-February 1996 (p.75)

Kaplan and Norton, *The Balanced Scorecard Translating Strategy Into Action*, Harvard Business School Press, Boston, Massachusetts, 1996

Keen, *Shaping the Future: Business Design through Information Technology*, Cambridge: Harvard University Press

Meyer, "How the Right Measures Help Teams Excel," *Harvard Business Review*, May-June 1994 (p.95)

Nay and Kay, *Government Oversight and Evaluability Assessment*, Lexington Books, 1982

National Academy of Public Administration, "Information Management Performance Measures - Developing Performance Measures and Management Controls for Migration systems, Data Standards, and Process Improvement," Report by a Panel of NAPA for the US Department of Defense, January 1996 (202-347-3190) Cost: approximately $13

Parker and Benson, *Information Economics (Linking Business Performance to Information Technology)*, Prentice Hall, 1988

Performance Measurement Guide, Department of Treasury, Financial Management Service, November 1993 (For copies: contact (202) 874-7074)

Porter, *Competitive Advantage: Creating and Sustaining Superior Performance*, The Free Press, 1985

A Review of the Oregon and Texas Experience in Building Performance Measurement and Reporting Systems - Data Selection, Collection and Reporting, National Institute for Literacy, January 1995, (202-632-1500)

Measuring Business Value of Information Technologies, International Center for Information Technologies, ICIT Press, 1988

Remenyi, Money, and Twite, *A Guide to Measuring and Managing IT Benefits*, Second Edition, NCC Blackwell Limited, Oxford, England, 1992