

**Department of Energy  
(DOE)**

**Basic Performance Measures for  
Information Technology Projects**

**Guidance White Paper**

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**Office of the Chief Information Officer  
Office of the Associate CIO for Architecture, Standards, and Planning  
Software Quality and Systems Engineering Program**

# Basic Performance Measures For Information Technology Projects

## Guidance White Paper

### **Introduction**

The purpose of this "white paper" is to provide guidance for project teams in the identification of performance measures oriented to information technology (IT) projects, which allow for the collection and reporting of project data to help track and assess project progress, product quality, project success, and customer satisfaction.

An effective set of performance measures will provide actionable information, on a focused set of metrics, to provide a balanced view of project performance that can be used to make decisions to improve the project management process. Performance measures also provide for accountability by laying out what is expected, when it is expected, and what action will be taken if planned achievements do not occur.

### **Terms Used in This Paper**

*Performance.* The execution or accomplishment of work.

*Measure.* A measure is the result of the activity involved in determining dimension, i.e., size, etc. through measuring. Measures should be objective, timely, simple, accurate, useful, and cost-effective.

*Metric.* The Institute of Electrical and Electronics Engineers (IEEE) defines metric as a *quantitative measure* of the degree to which a system, component, or process possesses a given attribute.

*Indicator.* An indicator is a metric or combination of metrics that provide insight into a process, a project, or a product, to enable assessment and improvement.

Following is the typical sequence of performance measurements related events for an IT project: performance measures are identified and documented → measurement data is collected → metrics are developed → indicators are obtained.

### **Performance Measures**

The following definition is from the Performance-Based Special Interest Group, Performance-Based Management Handbook, Volume 2, Establishing an Integrated Performance Measurement System, developed for DOE.

“Performance Measurement is the ongoing monitoring and reporting of program accomplishments, particularly progress towards pre-established goals. It is typically conducted by program or agency management. Performance measures may address the type or level of program activities conducted (process), the direct products and services delivered by a program (outputs), and or the results of those products and services (outcomes). A “program” may be any activity, project, function, or policy that has an identifiable purpose or set of objectives.”

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## **OMB Requirement**

OMB Circular A-130 indicates that, as part of an agency's Capital Planning and Investment Process, it must institute performance measures and management processes that monitor actual performance to expected results. Measurements can be reported at the program and project level and include resource and cost goals, schedule and progress goals, trade-offs and risk outcomes, product quality goals, and customer satisfaction goals.

## **Performance Measures - Basic Categories**

*Measures of efforts.* Efforts are the amount of resources, in terms of money, people, materials, etc., applied to a program or project.

Examples: The amount of money spent and the number of person-hours burned on a project.

*Measures of accomplishments.* Accomplishments are milestones achieved with the resources used. There are two types of accomplishments - outputs and outcomes. Outputs relate to the quantity of goods or services produced; outcomes relate to the results of providing those outputs.

Examples - Output: Number of modules coded, number tested, number inspected.

Example - Outcome: Gross salary function of new payroll system completed on schedule.

*Measures that relate efforts to accomplishments.* These measures are associated with resources or cost relative to accomplishments achieved. They provide information about the production of an output at a given level of resource use and demonstrate an entity's capability when compared with previous results, internally established goals and objectives, generally accepted norms or standards, or results achieved by similar entities.

Example: Amount of money expended for the portion of project completed versus the amount of money planned to be expended for the portion of work planned at a set point during the project (e.g., earned value).

## **Performance Measures - Key Objectives**

- Assess project status.
- Develop early warning indicators.
- Monitor product quality.
- Manage schedule, budget, and scope.
- Track the project's alignment with business goals

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### Metrics vs. Requirements

Occasionally, a misunderstanding may arise stemming from the use of the word metrics and requirements interchangeably. Metrics, and indicators derived from them, are typically used by project managers and project teams to assess project status and track project progress. Requirements are the wants and needs of the project's customer(s) and/or the product's users. Requirements are "met" or "satisfied" by the product's functional content or performance under use. Note, however, that a requirement may in fact provide a metric to align the project's progress with the product's quality or business goal. The following is an example:

Metric: Reduce number of duplicate data elements by 20 percent.

Requirement: The system shall capture all data elements and store them in a single database (to reduce/eliminate duplication).

In this example, satisfying the requirement also provides the measurement for developing and reporting the metric.

### Types of Performance Measures

Process Metrics	Increase capability level (i.e., SEI-CMM levels) Do more with less (shorter schedule, less resources) Improve quality (less defects, less re-work)
Project Metrics	Track project progress Assess project status Award contract fees
Product Metrics	Determine product quality Identify defect rates Ensure product performance

### Typical Metric Categories

Schedule	Actual vs. planned: - Schedule and progress
Budget	Actual vs. planned: - Resources and cost
Functionality	Delivered vs. planned: - Product characteristics - Technology effectiveness - Process performance - Customer satisfaction

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## Measures vs. Indicators - Example: Finding defects in products (e.g. a Requirements Document)

Basic Measures: - No. of requirements reviewed - No. of reviewers involved - No. of defects found - Effort expended	Indicators: Efficiency - No. reviewed/effort - No. reviewed/time - No. found per effort, time Indicators: Effectiveness: - % found of those expected - % escaped
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## Examples of Performance Measures

The following table provides examples of performance measures that are typical for many IT projects. While the Category and Metrics columns are fairly representative of those used in IT projects in general, the Measure of Success will vary greatly and should be established for each individual project, as appropriate.

Category	Focus	Purpose	Measure of Success
<b>Schedule performance</b>	Tasks completed vs. tasks planned at a point in time.	Assess project progress. Apply project resources.	100% completion of tasks on critical path; 90% all others
	Major milestones met vs. planned.	Measure time efficiency.	90% of major milestones met.
	Revisions to approved plan.	Understand and control project "churn."	All revisions reviewed and approved.
	Changes to customer requirements.	Understand and manage scope and schedule.	All changes managed through approved change process.
	Project completion date.	Award / penalize (depending on contract type).	Project completed on schedule (per approved plan).
<b>Budget performance</b>	Revisions to cost estimates.	Assess and manage project cost.	100% of revisions are reviewed and approved.
	Dollars spent vs. dollars budgeted.	Measure cost efficiency.	Project completed within approved cost parameters.
	Return on investment (ROI).	Track and assess performance of project investment portfolio.	ROI (positive cash flow) begins according to plan.
	Acquisition cost control.	Assess and manage acquisition dollars.	All applicable acquisition guidelines followed.
<b>Product Quality</b>	Defects identified through quality activities.	Track progress in, and effectiveness of, defect removal.	90% of expected defects identified (e.g., via peer reviews, inspections).
	Test case failures vs. number of cases planned.	Assess product functionality and absence of defects.	100% of planned test cases execute successfully.

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Category	Focus	Purpose	Measure of Success
	Number of service calls.	Track customer problems.	75% reduction after three months of operation.
	Customer satisfaction index.	Identify trends.	95% positive rating.
	Customer satisfaction trend.	Improve customer satisfaction.	5% improvement each quarter.
	Number of repeat customers.	Determine if customers are using the product multiple times (could indicate satisfaction with the product).	"X"% of customers use the product "X" times during a specified time period.
	Number of problems reported by customers.	Assess quality of project deliverables.	100% of reported problems addressed within 72 hours.
<b>Compliance</b>	Compliance with DOE Enterprise Architecture model requirements.	Track progress towards Department-wide architecture model.	Zero deviations without proper approvals.
	Compliance with Interoperability requirements.	Track progress towards system interoperability.	Product works effectively within system portfolio.
	Compliance with DOE standards.	Alignment, interoperability, consistency.	No significant negative findings during architect assessments.
	For web site projects, compliance with Style Guide.	To ensure standardization of web site.	All web sites have the same "look and feel."
	Compliance with Section 508.	To meet regulatory requirements.	Persons with disabilities may access and utilize the functionality of the system.
<b>Redundancy</b>	Elimination of duplicate or overlapping DOE systems.	Ensure return on investment.	Retirement of 100% of identified systems (as committed in SIM or ABC)
	Decreased number of duplicate data elements.	Reduce input redundancy and increase data integrity.	Data elements are entered once and stored in one database.
	Consolidate help desk functions.	Reduce \$ spent on help desk support.	Approved consolidation plan by June 30, 2002.
<b>Cost Avoidance</b>	System is easily upgraded.	Take advantage of e.g., COTS upgrades.	Subsequent releases do not require major "glue code" project to upgrade.
	Avoid costs of maintaining duplicate systems.	Reduce IT costs.	100% of duplicate systems have been identified and eliminated.
	System is maintainable.	Reduce maintenance costs.	New version (of COTS) does not require "glue code."
<b>Customer Satisfaction</b>	System availability (up time).	Measure system availability.	100% of requirement is met. (e.g., 99% M-F, 8am to 6pm, and 90% S & S, 8am to 5pm).
	System functionality (meets customer's / user's needs).	Measure how well customer needs are being met.	Positive trend in customer satisfaction survey(s).
	Absence of defects (that impact customer).	Number of defects removed during project lifecycle.	90% of defects expected were removed.

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Category	Focus	Purpose	Measure of Success
	Ease of learning and use.	Measure time to becoming productive.	Positive trend in training survey(s).
	Time it takes to answer calls for help.	Manage/reduce response times.	95% of severity one calls answered within 3 hours.
	Rating of training course.	Assess effectiveness and quality of training.	90% of responses of "good" or better.
<b>Business Goals/ Mission</b>	Functionality tracks reportable inventory.	Validate system supports program mission	All reportable inventory is tracked in system.
	Turnaround time in responding to Congressional queries.	Improve customer satisfaction and national interests.	Improve turnaround time from 2 days to 4 hours.
	Maintenance costs.	Track reduction of costs to maintain system.	Reduce maintenance costs by 2/3 over 3-year period.
	Standard desktop platform.	Reduce costs associated with upgrading user's systems.	Reduce upgrade costs by 40%.
<b>Productivity</b>	Time taken to complete tasks.	To evaluate estimates.	Completions are within 90% of estimates.
	Number of deliverables produced.	Assess capability to deliver products.	Improve product delivery 10% in each of the next 3 years.

The following set of questions is intended to assist in stimulating the thought process to determine performance measures that are appropriate for a given project or organization.

### **Project / Process Measurement Questions**

- What options are available if the schedule is accelerated by four months to meet a tight market window?
- How many people must be added to get two months of schedule compression and how much will it cost?
- How many defects are still in the product and when will it be good enough so that I can ship a reliable product and have satisfied customers?
- How much impact does requirements growth have on schedule, cost and reliability?
- Is the current forecast consistent with our company's historical performance?

### **Organizational Measurement Questions**

- What is the current typical cycle time and cost of our organization's development process?
- What is the quality of the products our organization produces?
- Is our organization's development process getting more or less effective and efficient?
- How does our organization stack up against the competition?
- How does our organization's investment in process improvement compare with the benefits we have achieved?

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- What impact are environmental factors such as requirements volatility and staff turnover having on our process productivity?
- What level of process productivity should we assume for our next development project?

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