



# The Need for a Measurement and Analysis Process: Focusing on Guidance for Process Improvement

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As software and systems engineering disciplines continue to evolve and become more integrated, *measurement and analysis* as a support function becomes a basic practice. It is

required by management activities, such as project planning, monitoring, and control. As an organization matures, objective management becomes a common practice. Basic project management indicators—cost, milestone completion, defects, etc.—are augmented by process management indicators, such as process change impact and process performance. Measurement and analysis (M&A) supports these management activities. M&A has been important for organizations striving for higher levels of maturity and continuous improvement of processes, products, and projects. Measurement has been recognized as a key enabler for performance-based management. Indeed, to become more competitive and to strengthen their ability to more quickly achieve higher maturity, some organizations have created an additional process area for measurement when using existing models to guide their process improvement efforts at lower levels.

Measurement helps organizations and decision makers by providing meaningful information regarding the quality, adequacy, and evolutionary progress of processes, products, and projects. Measurement offers the insight needed to plan, control, manage, and improve:

- the product technical adequacy and performance.
- its schedule and progress.
- resources and cost.
- growth and stability.
- product quality.
- lifecycle process performance.

*Capability Maturity Model is a service mark of Carnegie Mellon University. The Capability Maturity Model and CMM are registered in the U.S. Patent and Trademark Office.*

- technical effectiveness.
- customer satisfaction.

In today's Department of Defense (DoD) "acquisition reform and outsourcing" environment, defense organizations and project offices are encountering more complex risk management responsibilities, diminishing organic resources, and more reliance on commercial products and processes. Information technology legal requirements demand results-based mission improvement and process improvement. Integrated program management is needed, and it is best supported by a measurement program shared by the acquiring and delivering organizations.

How measurement and analysis is represented in any Capability Maturity Model® (CMM®) that guides process improvement is of vital concern. The Federal Aviation Administration (FAA), working with the Software Engineering Institute to integrate software, systems engineering, and acquisition disciplines into a single model (dubbed iCMM), has specified M&A as a separate process area. The Office of the Secretary of Defense-sponsored effort to integrate software, systems engineering, and integrated process and product development (IPPD) into a single model (dubbed CMMI) has also adopted M&A as a distinct process area in the draft released for stakeholder review. This is significant because historically, the measurement process was not explicitly defined in single-discipline models. Many assessors have indicated that M&A is a common problem among assessment findings for those organizations that do not have a measurement program in place.

To provide appropriate guidance to incorporate M&A into any model that supports process improvement efforts, four enablers need to be considered:

- Provide high visibility of the M&A process. In the absence of overt guidance, M&A activities are independently created. This lack of coherence significantly

impedes an organization's move to higher maturity practices. As organizational processes are developed, earlier M&A processes must be rewritten if no coherent guidance was provided in earlier phases of organizational evolution.

- Provide a simple process with a sequential set of specific practices that focus upon providing indicators that satisfy information needs, which have been derived from business goals and objectives.

- Provide guidance for the growth of the M&A program. As an organization matures, the nature of the M&A process evolves. The nature of the goals changes from simple visibility into what is happening to visibility into the impact of process changes. Analysis methods change from simple fish-bone charts to detailed root-cause analysis. The nature of the data available from the collection process changes from major milestone visibility into detailed subprocess performance. The collection process may change from manual collection and simple spreadsheets to more complex automated data collection tools.

- Clarify the relationships—cause-effect, output-input, terms-definitions, etc.—among the various process areas. Practices in the M&A process support other processes in that they require M&A to be effective. As a separate process area in a CMM, M&A creates a tremendous opportunity for clarification, and it supports conformance with ISO 15504, which requires assessment of M&A.

Regardless of what model might be used, the explicit incorporation of M&A as a distinct process area should provide the management visibility and focus that organizations have needed to guide their process improvement efforts. Use of M&A, as a separate process area with practices emphasized early in project, product, and process evolution, should enable organizations to more quickly achieve quantitatively managed processes and better products. ♦



## Beware the Unacknowledged Source

I recently spoke with Bob Grady, who showed me a letter he had written to you regarding my article "Metrics Problem Solved?" (*CROSSTALK*, December 1997). He pointed out the similarity of the "Codex Metrics" in my article to his Figure 10-3, "Software Metrics Etiquette," *Practical Software Metrics for Project Management and Process Improvement* (Prentice-Hall, Upper Saddle River, N.J., 1992). I acknowledge that his work is undoubtedly the original source of this information and to say that I was extremely embarrassed and shocked is an understatement. I had no idea I had plagiarized his work. By necessity, we build on the work of those who come before. The credit to an author is the insight that they bring to previously published work or words, not in stealing from other authors. The problem is that I am exposed to so much information that

after a while I am not sure how or where a concept originated. But because of the obvious similarity between my words and the original, it appears that I am the perpetrator of metaplagiarism.

My Victorian forebears would call this a cautionary tale, worth repeating for *CROSSTALK* readers and contributors alike. The message is, "beware the unacknowledged source." I concur with Mr. Grady's words (which I paraphrase slightly): An unacknowledged reference, much less a restatement of the essence of any work without proper framing of how such a restatement adds to the original contribution, belittles the original.

I apologize to Mr. Grady for my infraction.

David R. Pitts  
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## Coming Events

### 13th Annual Ada Software Engineering Education Team (ASEET) Symposium

**Theme:** Ada in the 21st Century: Academic, Government, and Industry Perspectives

**Dates:** July 26-29, 1999

**Location:** Colorado Springs, Colo.

Registration and conference information is available at <http://www.acm.org/sigada/aseet/>

### 14th Annual ACM SIGPLAN Conference on Object-Oriented Programming Systems, Languages, and Applications (OOPSLA '99)

**Dates:** Nov. 1-5, 1999

**Location:** Denver, Colo.

**Topic:** OOPSLA offers a collage of technical papers, practitioner reports, topical panels, outstanding invited speakers, exhibits, poster, demonstrations, formal and informal educational symposiums, as well as an exceptional tutorial program, and plenty of social opportunities to mingle.

**Contact:** Brent Hailpern, conference chairman

**Voice:** 503-252-5709

**Fax:** 503-261-0964

**E-mail:** [oopsla99@acm.org](mailto:oopsla99@acm.org)

**Internet:** [www.acm.org/sigplan/oopsla](http://www.acm.org/sigplan/oopsla)

### Software Testing Analysis & Review STAR '99 West

**Theme:** Improving Software Testing and Quality Engineering Practices Worldwide

**Dates:** Nov. 1-5, 1999

**Location:** San Jose, Calif.

**Sponsor:** Software Quality Engineering

**Topics:** Specific ways to improve testing efforts and results.

Field-proven techniques for testing client-server, object-oriented, GUI, and Internet applications.

How to use test engineering to consistently achieve greater software quality. The best Internet/Web testing tools and how to use them effectively. How to lower development costs and boost productivity with test engineering.

**Voice:** 1-800-423-8378 or 904-278-0707

**Fax:** 904-278-4380

**E-mail:** [sqeinfo@sqe.com](mailto:sqeinfo@sqe.com)

### The Sixth International Symposium on Software Metrics

**Dates:** Nov. 5-6, 1999

**Location:** Boca Raton, Fla.

**Theme:** "Taking the Measure of New Technology"

**Topic:** The application of measurement (through empirical studies) to understand and manage new software technologies, including their related tools and processes, such as commercial-off-the-shelf-based development and Web-based applications.

**Contact:** David Card, general chairman, Software Productivity Consortium

**Voice:** 703-742-7199

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On the cover: A fighter pilot preparing a jet for flight, Hill Air Force Base, Utah, circa 1960 illustrates this month's theme of measures and metrics. Turn to pages 4, 8, and 12 for related stories. Photograph courtesy of Dave Kendziora, Ogden Air Logistics Center historian.