

Practical Software Measurement

A Foundation for Objective Project Management



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Practical Software Measurement
A Foundation for Objective Project Management

In Memory of Sharyn Tolochko
1965 - 1997

Foreword

One of the most challenging tasks in developing and maintaining a software-intensive system is to meet critical project cost, schedule, and technical objectives. An increasing amount of the capability in today's information, communications, and weapons systems is implemented in software. Effective management of software development and sustaining engineering efforts has therefore become a key factor in project success.

The changing software engineering and acquisition environments in both the government and commercial sectors requires more effective software management techniques. More than ever, project and technical managers need objective information to make day to day decisions to identify project issues, correct existing problems, and manage prospective risks. This same information must also provide a basis for evaluating organizational and enterprise level performance, and assessing the impact of policy and investment decisions.

Practical Software Measurement: A Foundation for Objective Project Management, was developed to help meet today's software management challenges. Practical Software Measurement describes how to provide objective information to address project issues by integrating software measurement with existing risk management and financial performance management disciplines.

The guidance in *Practical Software Measurement* is based on actual software measurement experience on government and industry software-intensive projects. It represents the best practices used by measurement professionals within the software acquisition and engineering communities.

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U.S. Air Force Strategic Command

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U.S. Army Information Systems Software
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U.S. Army Material Command

U.S. Army Operational Test and Evaluation
Command

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U.S. Marine Corps Tactical Systems
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Software Measurement Principles

Project issues and objectives drive the measurement requirements

The developer's software process defines how the software is actually measured

Collect and analyze data at a level of detail sufficient to identify and isolate software problems

Implement an independent analysis capability

Use a systematic analysis process to trace the measures to the decisions

Interpret the measurement results in the context of other project information

Integrate software measurement into the project management process throughout the life cycle

Use the measurement process as a basis for objective communications

Focus initially on project level analysis

SCOPE AND STRUCTURE OF THE GUIDE

Practical Software Measurement: A Foundation for Objective Project Management, describes how to define and implement a software measurement process to support the information needs of software-intensive acquisition and development organizations. The Practical Software Measurement (PSM) Guide is intended for use by:

- **Project and technical managers** - to gain a better understanding of the use of measurement to manage their software-intensive systems
- **Project technical staff** - to help implement a software measurement process in a project environment
- **Enterprise managers** - to understand the requirements associated with implementing measurement within their organizations

The Guide is written for both government and commercial organizations responsible for acquiring, developing, and maintaining software-intensive systems. In particular, it provides guidance to implement a two-party measurement process between a software acquirer and a software developer, or between different project organizations.

Although primarily focused on the project level, the issue-driven measurement process described in the Guide can be extended to address performance measurement requirements at the organization and enterprise levels. As depicted in Figure 1, the PSM measurement process is the basis for defining and selecting specific measurement practices and tools in each of these areas.

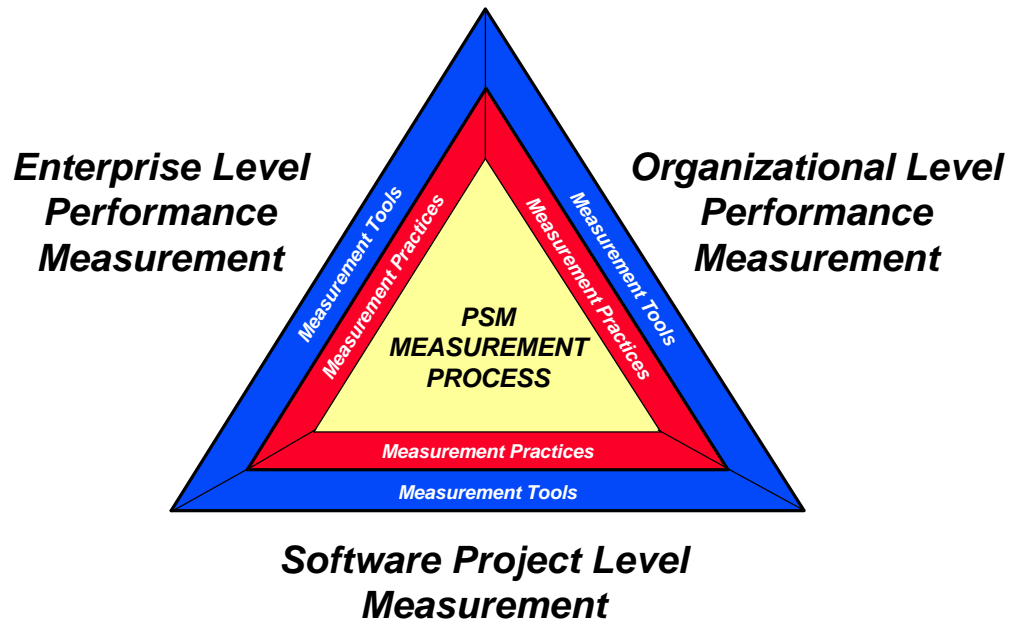


Figure 1. PSM defines a multi-level measurement process

Objective project management includes the disciplines of software measurement, risk management, and financial performance management. The software measurement process is central to each of these disciplines. PSM focuses on the software measurement process and the key interfaces with risk and financial management. The Guide addresses three major topics in the software measurement process:

- **Tailoring** the software measures to address specific project issues
- **Applying** software measures to convert the measurement data into useable information
- **Implementing** a measurement process within an organization

The Guide is intended for different types of users, and the information is structured accordingly. Some information is repeated: this enables references to different parts of the Guide to address a particular reader's information needs. The Guide is organized into eight parts that provide increasingly detailed treatments of the three key measurement topics of tailoring, applying, and implementing.

The eight parts of the Guide are as follows:

- **Part 1, The Software Measurement Process** - describes the software measurement process at a summary level, and provides an overview of measurement tailoring, application, and implementation. Part 1 explains what is required to implement the measurement process on a software-intensive project.
- **Part 2, Tailoring Software Measures** - expands on the description of measurement tailoring introduced in Part 1. Part 2 describes how to identify project issues, select appropriate measures, and define a project software measurement plan.
- **Part 3, Measurement Selection and Specification Tables** - provides a series of information tables that help the user select the measures that best address the project's issues. These tables support the detailed tailoring guidance of Part 2.
- **Part 4, Applying Software Measures** - expands on the description of measurement application from Part 1. Part 4 describes how to collect and process data, analyze the measurement results, and use the information to make informed project decisions.
- **Part 5, Measurement Analysis and Indicator Examples** - provides examples of measurement indicators and associated interpretations for the three types of analysis defined in Part 4: estimation, feasibility analysis, and performance analysis.
- **Part 6, Software Measurement Case Studies** - provides three different project case studies that illustrate many of the key points made throughout the Guide. The case studies address the implementation of a measurement process on a DoD weapons system, a government information system, and a government system in the sustaining engineering life-cycle phase.
- **Part 7, Supplemental Information** - contains a glossary, list of acronyms, bibliography, project description, document comment form, and an index for the Guide.
- **Department of Defense Implementation Guide** - this addendum provides information specific to implementing the PSM guidance on Department of Defense programs. It addresses implementation issues of particular concern to DoD acquisition organizations.

HOW TO USE THE GUIDE

Figure 2 shows how the various parts of the Guide work together to address the software measurement process. Part 1 introduces the basic concepts, principles, and terminology of PSM. Everyone should read this part of the Guide.

Parts 2 through 5 serve as detailed references to help project personnel implement the measurement process. Parts 2 and 3 provide a more detailed description of measurement tailoring and provide detailed tabular information to help select and specify project measures. Parts 4 and 5 provide more detailed information on measurement application. Part 5 provides examples of measurement indicators that support estimation, feasibility analysis, and performance analysis. Readers may become familiar with the contents and organization of these sections, but need not read them in detail until performing the corresponding function.

Part 6 illustrates the applying of PSM in three typical project scenarios. Readers should review the case study that most closely approximates their type of project.

Part 7 provides clarification and additional details to support the information presented in the Guide.

The Additional Implementation Guidance provides detailed implementation guidance to meet the requirements of distinct business sectors. The initial PSM Addendum in this Guide addresses use of the issue-driven PSM measurement process on Department of Defense projects.

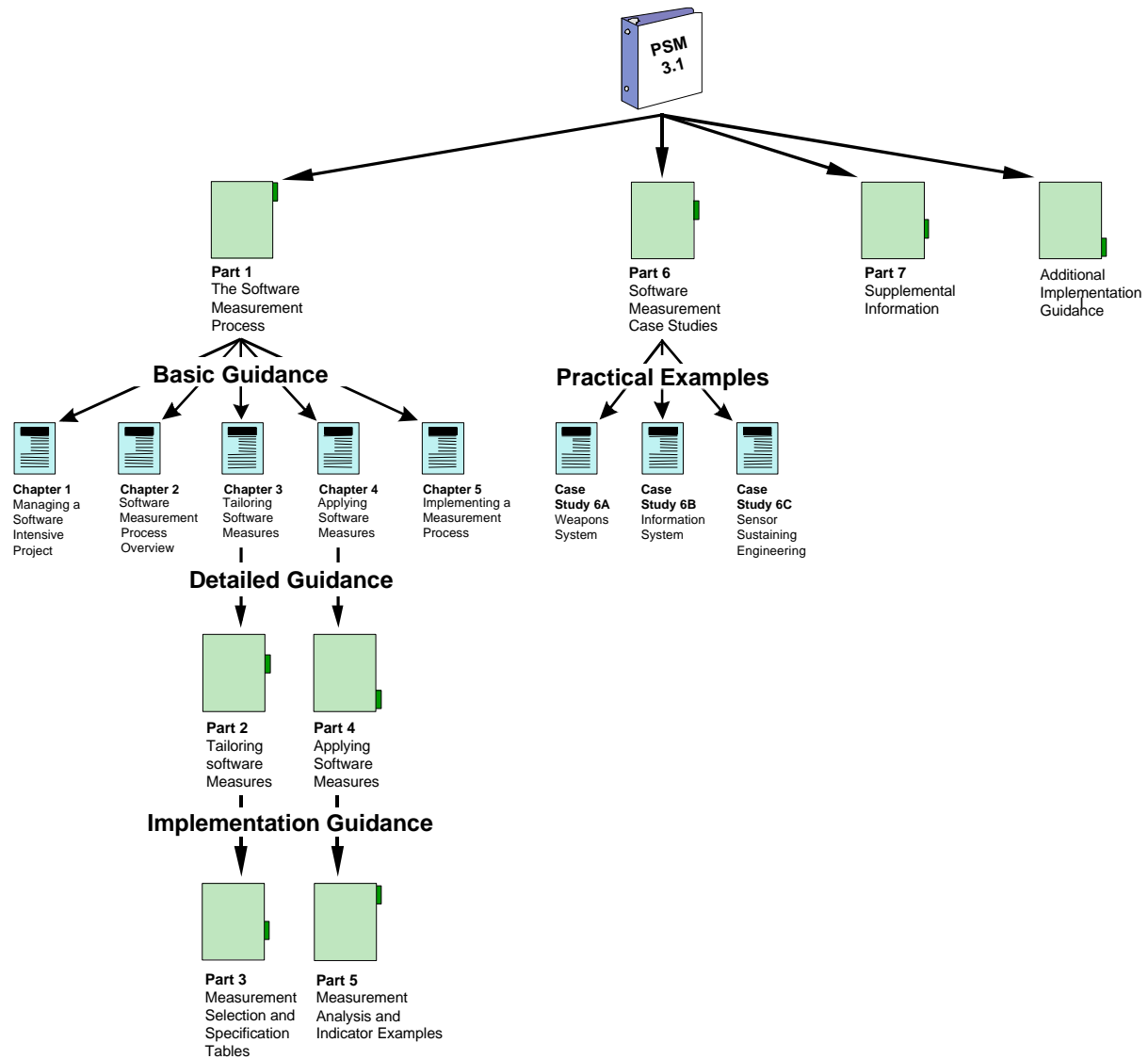


Figure 2. Structure of the PSM Guidance Document

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