Preface

Software Engineering Project Management

The purpose of this tutorial is to assemble under one cover a sufficient body of knowledge about managing a successful software engineering project. The following quote from Heinz Weihrich outlines the basic ideas behind this tutorial.

> All managers carry out the functions of *planning, organizing, staffing, leading,* and *controlling,* although the time spent in each function will differ and the skills required by managers at different organizations and organizational levels vary. ... This concept is sometimes called the *universality of management* in which managers perform the same functions regardless of their place in the organizational structure or the type of enterprise in which they are managing.[1]

This tutorial is about the adaptation of this management theory to project management and reflects the practice and methods of software engineering project management. This tutorial is intended for:

- *New managers*—The tutorial delivers the necessary information to manage a software development project.
- *Experienced managers*—The tutorial presents the state of the practice in software engineering management techniques.
- *Software engineers, programmers, analysts, and other computer personnel*—The tutorial contains a general description of—and problems in—software engineering project management, plus a number of methodologies and techniques for managing a software development project. It will also serve as a guide or goal for the future of these specialists in project management.
- *College-level students*—The tutorial offers sufficient background and instructional material to serve as a main or supplementary text for a course in software engineering project management.

This book presents a top-down, practical view of software engineering project management. This top-down structure was used as a framework for selecting appropriate reprints and in assembling original material that will explain as specifically as possible how project managers manage a software project.

One of the major premises of this tutorial is that managing a software development project is no different than managing anything else. The functions are the same—planning, organizing, staffing, directing, and controlling—only the activities to implement these functions differ. Therefore, where a software project paper was not available to address a topic, a paper on general management or management of a hardware project was substituted.

The chapters of this tutorial are arranged into two general groups. The first group contains Chapters 1, 2, and 3 and provides the background for software engineering project management. Chapter 1 is a general introduction to management. Chapter 2 provides a general description of software engineering and software engineering problems for the reader who may be unfamiliar with how large, custom-made, computer systems are built. Also included is a paper on the Software Engineering Institute (SEI) Capability Maturity Model (CMM). Chapter 3 presents a general overview of project management and how it fits into the concept of software engineering, including a paper on process models.

The second group of papers, Chapters 4 through 10, focuses on the five functions of general management: planning, organizing, staffing, directing, and controlling. Each chapter describes one function and the project management activities that support that function. In two cases, the activities of project management were split between two chapters. For example, under planning (Chapters 4 and 5), we describe requirements and goals, policies, decision making, estimating project costs and schedules, and docu-

[1] Weihrich, H., "Management Science, Theory, and Practice," in *Software Engineering Project Management,* 2nd ed., R.H. Thayer, ed., IEEE Computer Society Press, Los Alamitos, Calif., 1997.

menting a project plan. Under organizing (Chapter 6), we describe the various organizational structures, different responsibilities and authority relationships, and project teams that are used to organize a software engineering project.

Chapter 7, on staffing, suggests how to fill the organizational structure with people who are qualified to perform their duties. Training of employees is also discussed. In Chapter 8, we discuss directing (sometimes called leading), which concerns itself with motivation, delegating, conflict resolution, and the leadership of software people. Chapters 9 and 10, on controlling, take into consideration standards, Unit Development Folders (UDFs), reviews, walkthroughs and inspections, configuration management, audits, and other means necessary to ensure that a project is on schedule, within cost, and meets the customer's requirements. Chapter 11 is a wrap-up to the tutorial and was written after the foreword by Edward Yourdon was written.

This tutorial concludes with a glossary of over 250 software engineering project management and software engineering terms.

Every attempt was made to obtain tutorial papers that would provide a basic understanding of the various facets of software engineering project management. Papers selected generally were broad in coverage. When possible, secondary sources were selected—sources that summarized earlier papers or studies.

This tutorial is different. Instead of just collecting and organizing existing project management papers, this tutorial builds a framework of software engineering project management activities based on the planning, organizing, staffing, directing, and controlling model. This framework then had to then be filled with papers or articles on project management. Because of *universality of management theory*, management papers from other disciplines could be used. Despite this broadening of the search area, there were (and still are) management areas and activities that were not covered adequately by existing papers. To make up this deficiency, researchers and authors in the field of software engineering and project management contributed original papers to fill in the holes. Other papers that were written for or used in the tutorial's sister tutorials—*Software Engineering* and *Software Requirements Engineering*—were also used to fill in the gaps (although every attempt was made to keep this to a minimum).

An effort was made to use current papers for every important topic; that is, those published later than 1986. However, in many instances this was not possible, and papers in this tutorial range from 1971 through 1997. Regardless of the year the article was written or published, these papers reflect the latest state of the practice in software engineering project management.

This tutorial is one of a set of tutorials on "software system engineering" published by the IEEE Computer Society Press:

- *Software Engineering*, M. Dorfman and R.H. Thayer, eds., IEEE Computer Society Press, Los Alamitos, Calif., 1997
- *Software Requirements Engineering*, R.H. Thayer and M. Dorfman, eds., IEEE Computer Society Press, Los Alamitos, Calif., 1997
- *Software Engineering*—A European Perspective, R.H. Thayer and A.D. McGettrick, eds., IEEE Computer Society Press, Los Alamitos, Calif., 1993

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