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PTI

A Short, Annotated Bibliography on Software Process Improvement

by

Ken Dymond

Kelley L. Butler. "Process Lessons Learned While Reaching Level 4." *CrossTalk, Software Technology Support Center, Hill Air Force Base, Utah, Vol. 10, No. 5, May 1997, 4-8.*

Retrospective lessons by the SEPG (Software Engineering Process Group) leader of a site that started at Level 1 in 1990, went to Level 2 by 1993, and reached Level 4 (close to Level 5) in 1996 and keeps on going. (See reference to Lipke and Butler 1992 elsewhere.)

Carnegie Mellon University/Software Engineering Institute. *The Capability Maturity Model: Guidelines for Improving the Software Process.* Addison-Wesley, Reading, Mass., 1995. ISBN 0-201-54664-7

The book version of the CMM, easier to obtain and in a more convenient size than the 2 large technical reports in which the CMM first appeared. (See below, Paulk et al., 1993).

Philip B. Crosby. *Quality Is Free: The Art of Making Quality Certain.* New American Library, New York, 1979.

The notion of five maturity levels for the software process came from Crosby's book. (See reference to Humphrey 1989 elsewhere.) Read especially chapter 3 and the "Quality Management Maturity Grid."

Jean-Claude Derian. *America's Struggle for Leadership in Technology.* MIT Press, Cambridge, Mass., 1990.

This book develops the insight, especially in chap. 4, that there are two business cultures in the high-tech arena: a sheltered market in which there is only one or a very few large customers, often governments; and the open market in which there are many suppliers and customers. Derian came to this concept while observing the American scene as scientific attaché to the French embassy. The relevance for process improvement lies in picturing how each culture might justify and carry out process improvement.

Raymond Dion. "Process Improvement and the Corporate Balance Sheet," *IEEE Software*, July 1993, 28-35.

A case study by the SEPG (Software Engineering Process Group) leader at a major aerospace company. Raytheon's success was measured using Phil Crosby's cost of quality approach. (See reference to Crosby 1979 elsewhere.) The result was an ROI (Return on Investment) of more than 7-to-1.

Ken Dymond. *A Guide to the CMM: Understanding the Capability Maturity Model for Software.* Process Transition International, Inc., Annapolis, Maryland, 1995. ISBN 0-9646008-0-3

An illustrated handbook designed and written by a PTI author to make it easier for users of the CMM -- assessment teams, process action teams, instructors in CMM seminars -- to interpret the CMM's key practices for application in real organizations

Ken Dymond. *Assessment Coordinator's Handbook: Planning a Well-Orchestrated Software Appraisal.* Process Transition International, Inc., Annapolis, Maryland, 1997. ISBN 0-9646008-1-1. (Available from PTI)

This 41-page handbook provides a set of checklists covering all the items that could go wrong and that must be planned well to conduct a successful SEI assessment.

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Ken Dymond. "Essence and Accidents in SEI-style Assessments or 'Maybe This Time the Voice of the Engineer Will Be Heard'," *Proceedings, Second Conference, International Software Consulting Network (ISCN), Vienna, Austria, September, 1995, 17 pp.* (Available from PTI)

Successful assessments depend, in the opinion of this PTI author, on the statement quoted in the title of the article -- assessments are the voice of the working level in software companies. This article explains how assessment provides that voice, the context for which assessment was designed, and some of the ways assessment accidents have been mistaken for essentials.

Kenneth M. Dymond. "The Level 4 Software Process from the Assessor's Viewpoint," *Proceedings Conference of the International Software Consulting Network, Brighton, U.K., Dec. 1996, 11 pp.* (Available from PTI)

Case study of what Level 4 software processes look like to an assessment team. The reality goes beyond the CMM, written before any Level 4 companies had been encountered by assessment teams.

Sylvia Ellison and Ken Dymond. "Management Models for Software Development," *Proceedings, Second International Conference on Software Quality Management, SQM 94, Computational Mechanics Publications, Southampton, UK, ISBN 1-56252-277-9.*

The authors make a case for combining the ISO 9000-3 (TickIT) and SEI CMM approaches to management systems for software development by pointing out the similarities between the approaches as well as anomalies encountered in applying them. This is one of the few articles comparing ISO and the CMM approach by experts in the two areas.

Richard P. Feynman, "Appendix F: Personal Observations on the Reliability of the Shuttle," in *"What Do You Care What Other People Think?": Further Adventures of a Curious Character, as told to Ralph Leighton, New York: W. W. Norton & Co., 1988, pp. 220-237.*

A slightly revised version of Feynman's minority view in Appendix F of the Rogers' Commission report on the *Challenger* shuttle explosion in 1987. The avionics (hardware and software) control system on board the shuttle proved more reliable than the mechanical systems that failed. Feynman, not a software specialist, has some admiring words to say about the software team and their processes, especially testing.

Robert B. Grady. *Practical Software Metrics for Project Management and Process Improvement.* Prentice-Hall, Englewood Cliffs, NJ, 1992.

Discusses the tactical use of software metrics for project management and their strategic use in observing and guiding process improvement in an organization. As the title states, this is a practical book with focused discussions on tasks that every improvement project faces, such as evaluating process changes in terms of measurable ROI. See especially Part II.

James Herbsleb, Anita Carleton, James Rozum, Jane Siegel, and David Zubrow. *Benefits of CMM-Based Software Process Improvement: Initial Results.* Software Engineering Institute, CMU/SEI-94-TR-13, August, 1994.

An overview of cost-benefit data on process improvement reported to the SEI and a description of 5 case studies of successful improvements from the published literature. ROIs ranging from 4-to-1 to more than 7-to-1 are cited.

Watts S. Humphrey. *Managing the Software Process.* Addison-Wesley, Reading, Mass., 1989. ISBN 0-201-54664-7.

This is the ultimate source describing why and how software process improvement occurs according to a model of maturity and evolutionary change. Mr. Humphrey was director of the Software Process Program at the SEI; it was his vision that made process improvement a worldwide trend in software engineering. He wrote this book in response to repeated queries about the basis of process maturity. The book is the precursor of SEI's Capability Maturity Model (see references to Paulk et al. below). The whole book should be read, but a good introduction can be

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gotten from chapters 1-4, 14, and 20, which cover the maturity framework, the principles of process change, assessment, the process at maturity level 1, the SEPG, and managing the resistance to change (a normal, and therefore manageable, side effect of improvement). Appendix A is a handy summary of activities needed at each of the 4 maturity levels above the initial level.

Watts S. Humphrey. "Characterizing the Software Process," IEEE Software, March, 1988, 73-79.

A short description of how assessment is used to identify the maturity level of a software organization.

Walter H. Lipke and Kelley L. Butler. "Software Process Improvement: A Success Story," CrossTalk, Software Technology Support Center, Hill Air Force Base, Utah, Nov. 1992, pp. 29-31 and p. 39.

A case study by the senior manager and the SEPG (Software Engineering Process Group) leader, respectively, of a process improvement effort from assessment and through action plan. They describe lessons learned and report an ROI to process improvement of 6-to-1. An important example in its own right but also as an instance of success by a government organization.

Brian E. Mansir and Nicholas R. Schacht. Total Quality Management: A Guide to Implementation. Logistics Management Institute, 6400 Goldsboro Road, Bethesda, Maryland 20817, 1988.

The U. S. Dept. of Defense commissioned this TQM guide for its own use. However, the guide is useful in commercial contexts as well and is especially strong on how to motivate an improvement program.

Marvin L. Patterson. Accelerating Innovation: Improving the Process of Product Development. New York: Van Nostrand Reinhold, 1993. ISBN 0-442-01378-7.

Marvin Patterson, Director of Corporate Engineering for Hewlett-Packard, is interested in shortening the time-to-market in product development. For him, bringing products to market is a process of innovation and how to optimize that process is the theme of the book. Optimizing innovation is not done with silver bullets but by a system of continuous improvement of the steps in bringing new technology to bear on customer needs faster and more effectively than the competition. He makes use of process maturity and the CMM as a framework for improvement and applies it beyond the strictly software domain.

M. C. Paulk, B. Curtis, M. B. Chrissis, and Charles V. Weber. Capability Maturity Model for Software, Version 1.1. Software Engineering Institute, CMU/SEI-93-TR-24, February, 1993.

This SEI Technical Report, together with its companion TR-25 (next reference), constitutes the CMM, version 1.1. TR-24 is a "technical overview" describing the process maturity framework of five levels, how the CMM is structured, and how it is used in assessments and evaluations.

M. C. Paulk, Charles V. Weber, S. Garcia, M. B. Chrissis, and M. Bush. Key Practices of the Capability Maturity Model, Version 1.1. Software Engineering Institute, CMU/SEI-93-TR-25, February, 1993.

The companion to TR-24 described above. This document describes the key practices that exemplify process maturity at each level. It is intended as a guide for software process improvement efforts and for characterizing process maturity in assessments or evaluations.

Kevin Pulford, Annie Kuntzmann-Combelles, Stephen Shirlaw. A Quantitative Approach to Software Management: The ami Handbook. Addison-Wesley, Wokingham, England, 1995. ISBN 0-201-87746-5

The **ami** Handbook sets forth a practical approach to developing and using measurements of process improvement. The approach is the result of a European Community ESPRIT project that was tested on full-scale software projects. In fact **ami** ('assess, metricate, improve') is more -- an entire context for implementing systematic process improvement such as is recommended by the CMM, deciding on business goals, and measuring progress. (This is a revision of the original handbook which had a striking design: a spiral binding, a back cover flap that served as a

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bookmark, and a layout that allowed plenty of space for notes. That design inspired the layout of *A Guide to the CMM*; see above.)

William Pierce. "Surviving an SEI Assessment," *CrossTalk*, Software Technology Support Center, Hill Air Force Base, Utah, June/July 1992, 8-10.

A short account of what an assessment is like, the problems encountered, and results achieved, written by a member of the SEPG at an Air Force software site in Utah.

S. Redwine and W. Riddle. "Software Technology Maturation," *Proceedings, 8th International Conference on Software Engineering (ICSE)*, IEEE Computer Society, 1985, 189-200.

This is the classic paper on the time required for software engineering technologies to become widespread. Sam Redwine and Bill Riddle answered the question by looking at examples such as use of cost models, UNIX, and structured programming. At the 19th ICSE in 1996, this paper was selected as the most influential paper from 8th ICSE on the intervening decade, winning the annual "ICSE (N-10)" award.

Peter R. Scholtes, Brian L. Joiner, and Barbara J. Streibel. *The Team Handbook Second Edition*. Madison, Wisconsin: Joiner Associates, 1996. ISBN 1-884731-11-2.

This book, designed for use and building on practice with the first edition, is a compendium of tools, techniques, and coaching for people who want to be efficient members of effective teams. Indispensable for process improvement practitioners.

Cindi Wise. "Senior Management Actions Critical for Successful Software Process Improvement," *Proceedings*, (CD-ROM) of the 7th Annual Software Technology Conference, Software Technology Support Center, Hill Air Force Base and Utah State University, Salt Lake City, Utah, April, 1995. 11 pp.

Answers to the question senior managers often ask the improvement team: "What do you need from me?" based on this PTI author's field experience, interviews with SEPG members, and a review of the literature.

Harvey Wohlwend and Susan Rosenbaum. "Software Improvements in an International Company," *Proceedings, 15th International Conference on Software Engineering, IEEE Computer Society, 1993, 212-220.*

An example of process improvement based on assessment and the CMM from a commercial company not in the Department of Defense community.