

Statistical Thinking for Software Professionals

One or Two Day Seminar^{*}

Seminar Description

Are you struggling with achieving Level 4 against CMMI or ISO/IEC 15504? Is there broad resistance to the idea of statistical process control in your organization? Do software professionals question the value of measurement and analysis, insisting that innovation or customer relationships are more crucial to success? Are you concerned about the new high maturity qualifications required by the SEI of assessors?

Level 4 of CMMI, and related models, focuses on quantitative management. Quantitative management implies an understanding of variation, so that data can be properly understood when doing measurement-driven decision making. Decision making based on data implies that the data is collected and analyzed frequently enough that "real-time control" of the process is possible and that the comparability of the process and product context for the data is understood. An understanding of variation is grounded in the principles of statistical thinking, and the appropriate use of statistical tools is an integral part of quantitative management.

A common error in "quantitative management" is analyzing data without doing the statistical thinking that supports real insight. For software projects, real-time process control means that the data being used for control is collected, analyzed, and decisions made on the spot. Measurement and analysis on a monthly or longer basis is inadequate for real-time control, but many organizations fail to understand the impact on efficiency of immediate, informed reaction. Those who do not understand the comparability of their data may aggregate dissimilar data together.

Statistical control depends on a profound knowledge of both process and product. Failing to set the product context via product lines, systematic reuse, domain-specific architectures, and similar approaches is a mistake that results in an unacceptable amount of variation in the data. It is important to know when statistical control is feasible and when approaches such as risk management are more appropriate; not every process should be statistically controlled. Organizations that are truly Level 4 understand variation, have simple but fine-grained data, have profound knowledge of their products, and use statistical control where appropriate.

Statistical process control means eliminating special causes of variation, but because the software process is not a repetitive manufacturing or service process, the application of statistical process control, specifically control charts, has been challenged by many in the software community. What CMMI has to say about statistical process control is discussed, along with the issues in applying statistical thinking to the software process, prerequisites for applying statistical control, and the specific techniques that should be considered. Examples from real-

^{*} This seminar can be delivered over either one or two days. Longer seminars involve more case studies, exercises, and role plays, as well as a more in-depth study of the material. Shorter forms of this material can be presented also.

world software projects illustrate the challenges in stabilizing the software process and applying different statistical techniques.

Topics include:

- Principles of quantitative management
- Basic statistical techniques
- Statistical thinking: understanding variation
- The seven basic tools of SPC
- Choosing a control chart
- XmR charts

Who Should Attend

- Managers who need to encourage and use statistical thinking
- Process experts who are developing guidance for using statistical techniques
- Measurement experts who are focusing on the statistical thinking aspects of high maturity
- Software professionals who are collecting data, analyzing it, and driving decisions

Course Prerequisites

There are no pre-requisites for this workshop. Prior exposure to statistics, including statistical process control, regression analysis, ANOVA, and test of hypotheses, is useful.

Course Objectives

After completing this seminar, participants should be able to:

- Understand the basics of evidence-based management
- Understand the concepts of statistical thinking
- Apply some simple statistical techniques, including XmR charts
- Identify common statistical mistakes and misconceptions

Module Description

Module 1 – Fundamental Concepts of High Maturity

- Process thinking, systems thinking, and statistical thinking
- The business value of statistical thinking

Module 4 – Statistical Thinking at the Project Level

- Real-time control
- Core project measures
- Basic SPC tools
- XmR charts

Module 3 – Statistical Thinking at the Organizational Level

- Establishing a measurement program
- Operational definitions
- Organization process performance and capability baselines
- Continual, measurable improvement

Module 6 – Challenges to Statistical Thinking

- Common misconceptions

- The problem of dysfunctional behavior

Activities and Exercises

Activities and exercises include case studies, situational analyses, role playing, and interactive lecturing.