Quantitative Management
A Paradigm Shift

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Before we proceed…

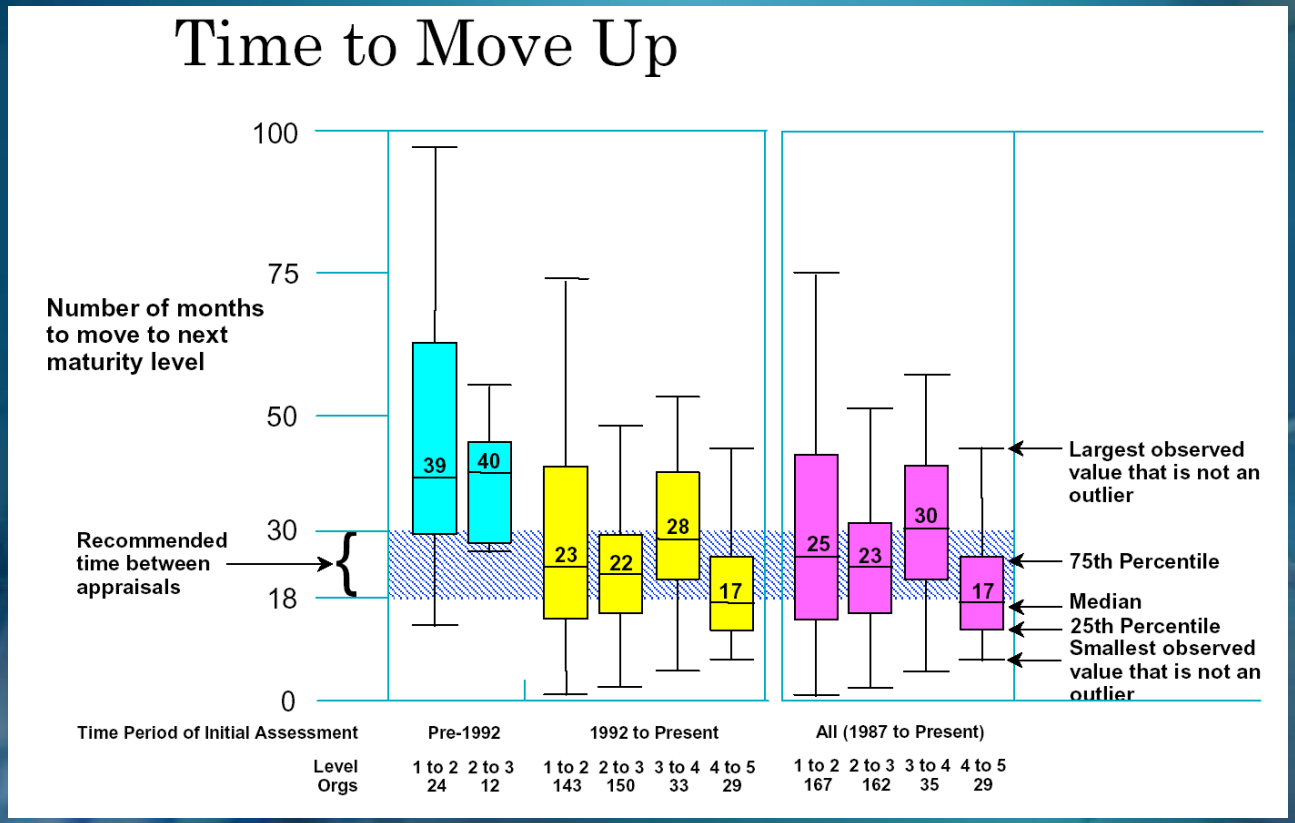
A phenomenon will be said to be controlled when, through the use of past experience, we can predict, at least within limits, how the phenomenon may be expected to vary in the future.

Walter A. Shewhart, 1931

Agenda

- Time to transition from one Maturity Level (ML) to other
- Process at ML 3
- Issues with ML 3 Process
- Variation
- Process and Tools at ML4
- What is different at ML4
- Importance of statistical thinking
- Conclusion

What SEI data shows?



Moving to ML 4 from ML 3 takes longest time

Source: CMMI Maturity Profile, SEPG 2003

Peer Reviews at Maturity Level 3

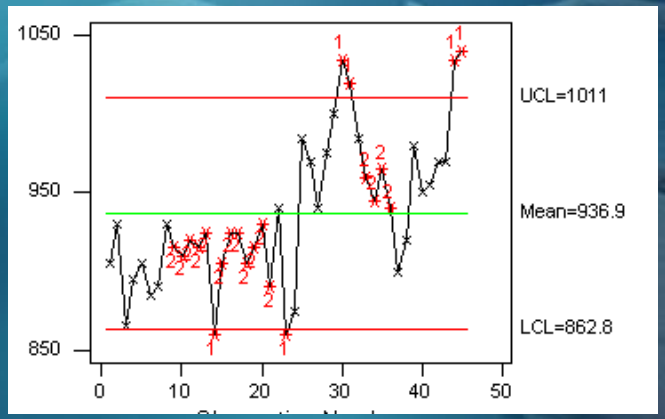
- Peer Review process at level 3
  - Identify work products for peer review
  - Prepare for peer review
  - Identify peer review team
  - Conduct peer review
  - Track and close action items
  - Analyze peer review data
- Effectiveness of the peer review process-unknown
- Process capability of peer review process is based on intuition, judgment

Peer Reviews at Maturity Level 3

- If the peer review speed is
  - 10 pages/hour
  - 30 pages/hour
- Which is an effective peer review? The one with 10 pages/hour or the one with 30 pages/hour ?
- How to find the reasonable peer review speed ?

Peer Review data at Maturity Level 3

- Data not available from all peer reviews
- Available data forms are not complete
- Unable to reach any conclusions on process capability
- Measures
  - Code review speed
  - Document review speed
- Wide variation in data



Why Quantitative Management?

- If all the projects are following the same organizational processes, why the huge variation in the process performance parameters?
- Causes of Variation?
- How do we know that the process is improving?
- How do we arrive at the process capability?

Understanding Variation

Quantitative Measurement

Quantitative Management

Quantitative Improvement

Issues that Contribute to Variation

- The range of tailoring of peer review process: from almost no tailoring (taking organization process as is) to development of detailed peer review procedure
- Size and complexity of work products reviewed
- Issues like knowledge and skill level of reviewers

Issues that contribute to Variation

Duration of peer review

New/Reusable code

Specify standard measures

Training and competence

Recording of defects

Peer Reviews

Completeness of data

Preparation for peer review

Definition of a defect

Complexity

Team size

Reference Standards

Tools

- Most of the seven Quality Control (QC) tools
  - Run Chart
  - Pareto Chart
  - Flow Chart
  - Histogram
  - Cause and Effect Diagram
  - Scatter Diagram
  - Control Chart
- Control Chart is widely used tool

Peer Review Process at ML 4

- Organization peer review process was updated based on the issues identified
- Peer review process was further divided into
  - Document review (Complexity Level 3)
  - Code review (Complexity Level 2)
  - Design review (Complexity Level 1)
- Special causes of variation are eliminated there by bringing the process under statistical control
- The process capability was established for all sub processes

How maturity level 4 differ..

- Maturity levels 2 and 3 are about implementation of processes
- Level 4 is understanding the effectiveness and efficiency of the processes
  - Effectiveness measures the extent to which the process produces intended results
  - Efficiency measures how well we use our process to produce results
- At Level 4 understand, measure and control variation in a process

How maturity level 4 differ..

- At maturity level 4 the processes are aimed towards a goal, thereby setting a benchmark for process performance
- The process interactions has impact on the variation
- A prescriptive approach may not help beyond maturity level 3
- Use of past data for predictive models development

Importance of statistical thinking

- The underlying principles are:
  - All work occurs in a system of interconnected processes
  - Variation exists in all processes
  - Understanding and reducing variation are the keys to success
- Holistic process approach and key to quantitative management

Conclusion

- An organization at maturity levels 2 and 3 focus on milestones
- When the same processes are quantitatively managed, the organization shifts the focus to variation or exceptions in the process performance
- Quantitative Management is a key for the organizational transformation from ‘Management by milestones’ to ‘Management by exceptions’