

## Advanced Measurement and Analysis Techniques in High Maturity Organizations

Dennis R. Goldenson  
Software Engineering Institute

12th Annual PSM Users' Group Conference  
Mystic, Connecticut  
July 2008

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### Today's Talk

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 **Synopsis of Current Work at the SEI**

- *How do we know what we think we know?*

**Measurement and analysis in high maturity organizations**

- *... in 2001*

**Selected results from the 2007 state of the measurement practice survey**

- *Use of Measurement*
- *Data quality & integrity*
- *Organizational perspectives on software measurement*

**A peek at the 2008 high maturity survey**

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## Workshops & Surveys

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Launched a workshop series on measurement & analysis in high maturity organizations

- First workshop held at 2008 SEPG NA conference in Tampa
- Second being planned for next CMMI Technology Conference in Denver
- Both bringing leaders in the field together at a forum focused on the topic
- Series expected to be twice yearly
  - Opened to wider participation over time

High maturity related surveys

- Completed data collection for most recent one
- Part of a continuing yearly series on the state of the measurement practice



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## Focus of 1<sup>st</sup> Two Workshops & Current Survey

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CMMI process performance baselines & models

- Lessons learned in their deployment, training, adoption & institutionalization
- Best practices & examples of valid, practical methods for implementing these process performance models & baselines

Empirical study of common performance outcomes

- & the associated controllable & uncontrollable drivers of those outcomes

Data quality & integrity issues

Barriers that organizations face in establishing & maintaining first-rate measurement & analysis practices



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## Current Survey Status

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Initial results not yet ready for public release

- Contrary to expectations when I submitted the abstract...

Surveys fielded later than anticipated

- Closed 30 June

Initial data analysis ongoing

- Data integrity & review necessary prior to publication
- Come to Denver in November for the CMMI Technology Conference



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## Research & Collaborative Work

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A track at the next CMMI Technology Conference in November

- Focused on high maturity measurement & analysis practices
  - Particularly process performance models & their outcomes
- Presentations will be reasonably thorough case studies on the performance effects of CMMI-based process improvement
  - Presented in quantitative terms ... albeit normalized or sanitized as necessary
  - With practice descriptions presented in sufficient detail to be meaningful to the conference attendees
- 31 high quality submissions on process performance modeling!
  - With another 32 on other analytic approaches &/or performance results!

Developing a Measurement & Analysis Infrastructure Diagnostic (MAID)

- Focus on production of high quality data and information for project and organizational use



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## Training & Coaching

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### Courses

- Improving Process Performance Using Six Sigma (IPPSS)
- Designing Products and Processes Using Six Sigma (DPPSS)
- Courses for candidate SEI-Certified Instructors with Partner licensing

### Workforce Certifications

- CMMI-Six Sigma Belts



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7

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## Learning From the Past

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Will show a few selected results from the 2007 survey momentarily

But first ...

- A sense of how things looked closer to the turn of the century
- Surveys associated with the SEI's old High Maturity Workshops
- Slides lifted from PSM 2004 ...



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## What Changes as Organizations Mature?

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Measurement definitions & procedures improve

- Measures get more finely grained, e.g., defect classification, insertion, find, fix and repair costs
- Project performance & quality measures are coupled explicitly with separate measures of process adherence & performance

Processes become better defined

- Sometimes influenced by being measured
- Routine reliance on quantitative management, causal analysis & piloting enhance process discipline

But...

- Serious attention to measurement *and especially analysis* often is delayed ... if ever considered at the lower maturity levels



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## There Was Still Room for Improvement

Quantitative Process Management still emphasized statistical process control (SPC)

- That can be a good thing after all!
- But there's a lot more out there too

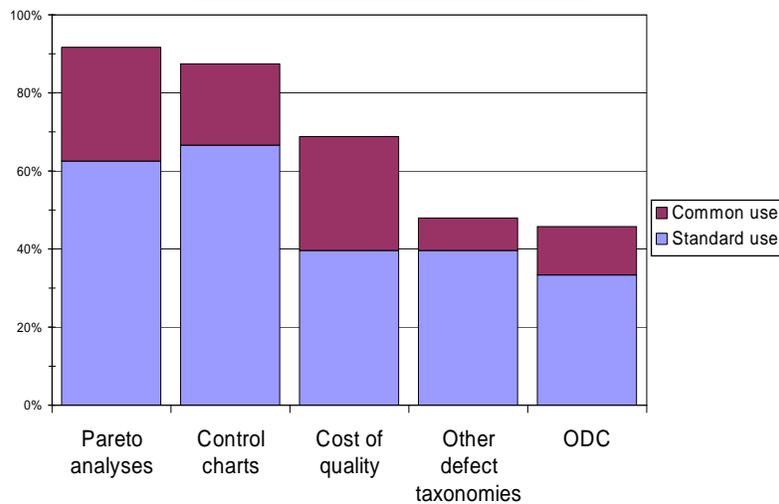
Non SPC techniques *were* used

- Six Sigma
- Orthogonal Defect Classification
- Regression
- ANOVA

Yet higher maturity organizations often didn't have a particularly broad analytic tool kit

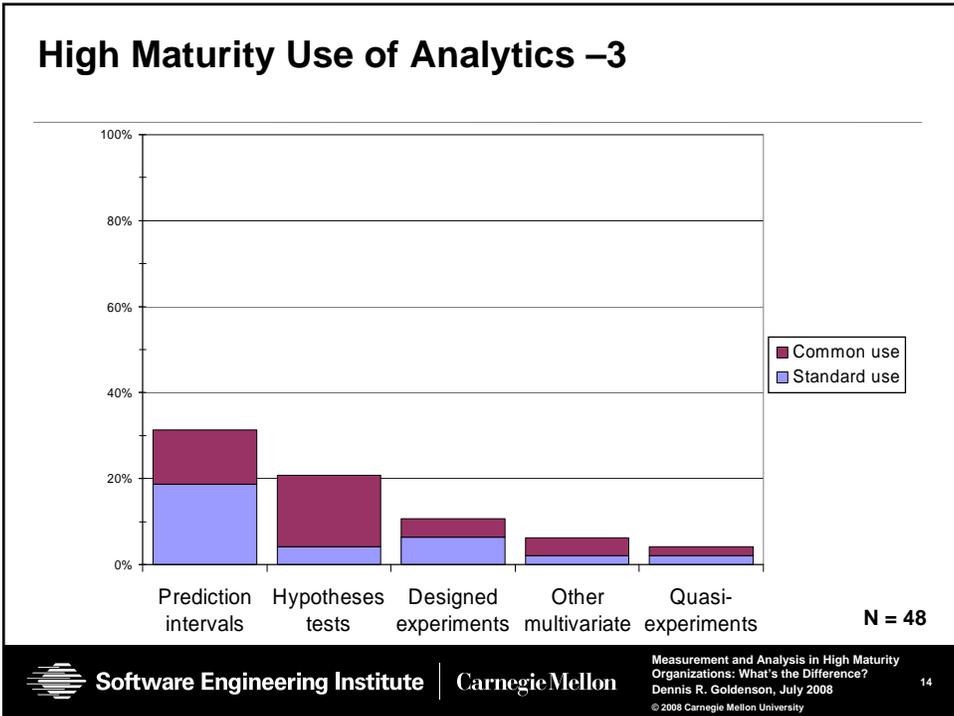
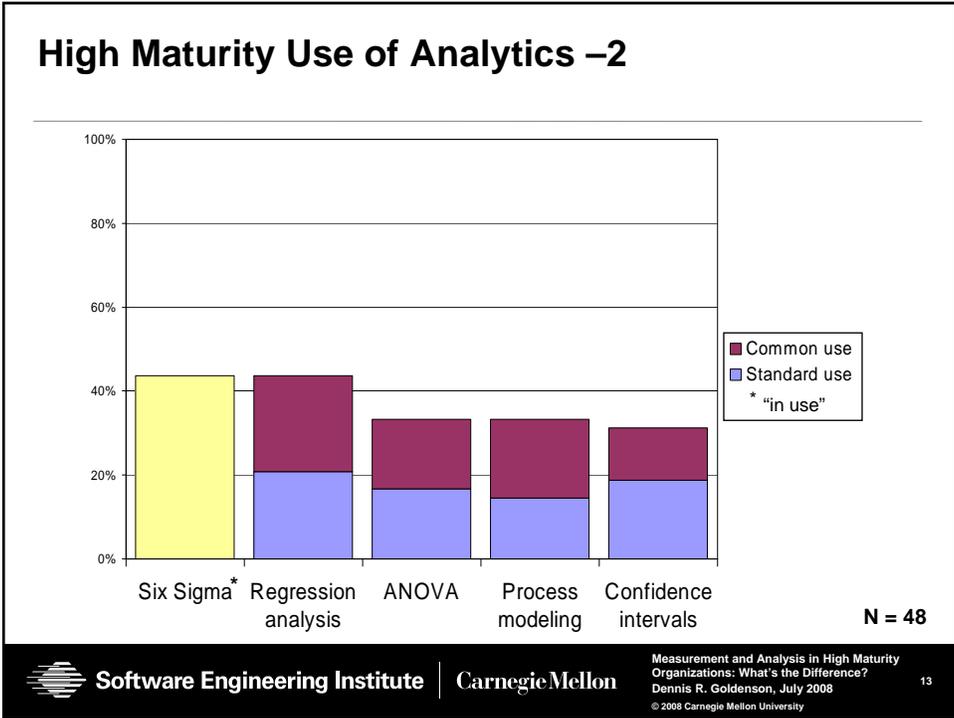


## High Maturity Use of Analytics –1



N = 48





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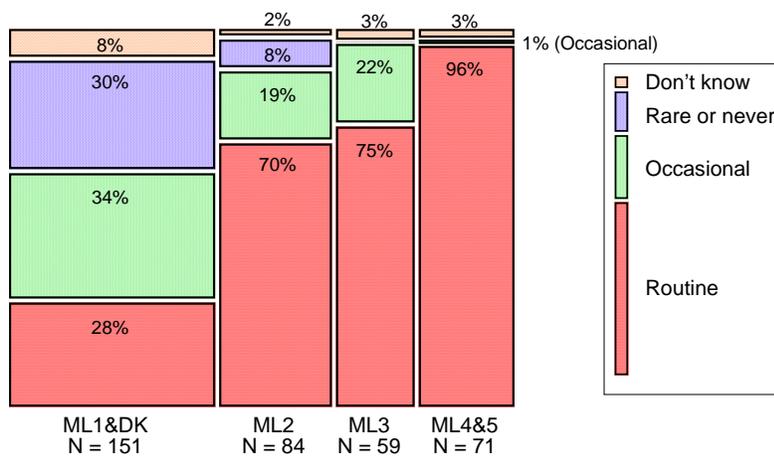
### Selected results from the 2007 state of the measurement practice survey

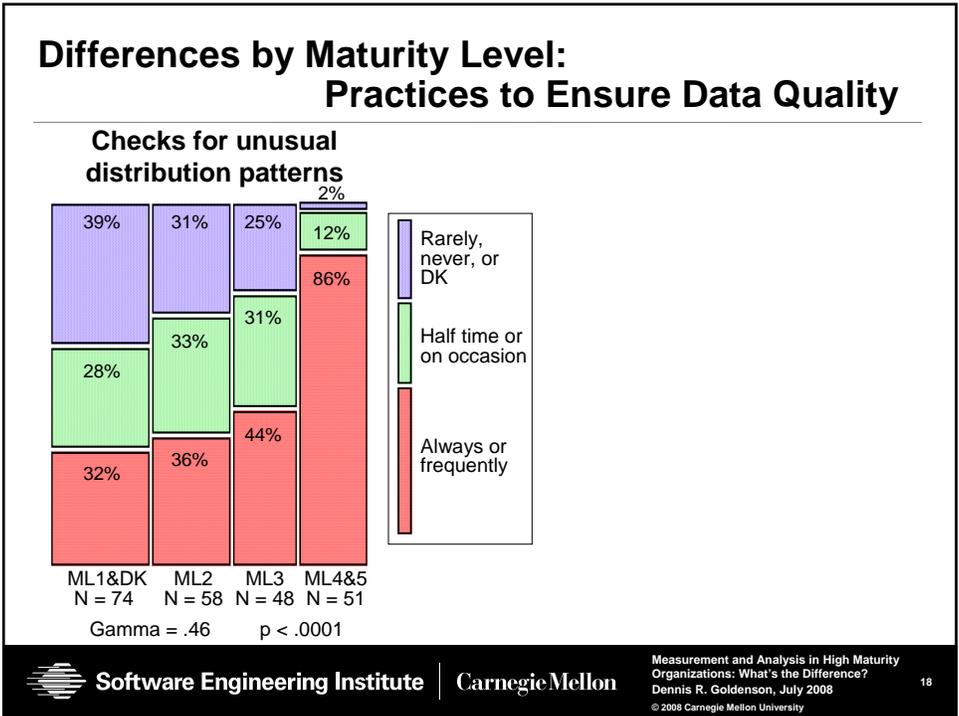
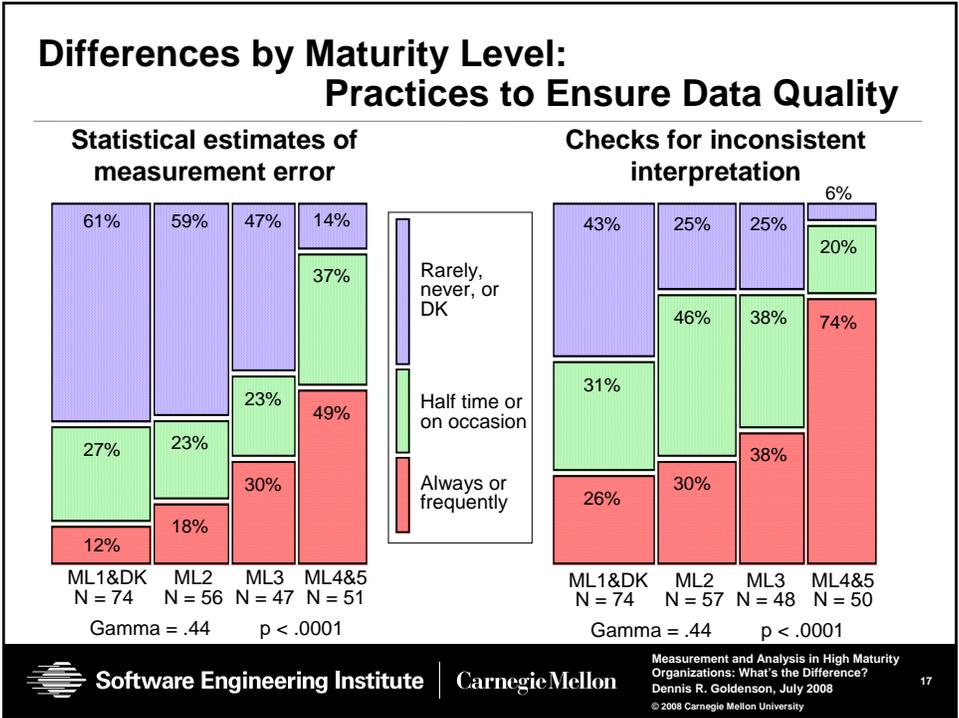
- Use of Measurement
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### A peek at the 2008 high maturity survey



## Differences by Maturity Level: Use of Measurement in the Organization





## Similar Results

For:

- Out of range & illegal values ... Number & distribution of missing data
- Missing data not treated as zero ... Precision & accuracy tests
- Other aspects of alignment & coordination of measurement activities
  - Understandable & consistent measurement definitions
  - Understandable & interpretable measurement results
  - Use of “standard” measurement methods
  - Measurable product & service criteria
  - Measurement used to understand product & service quality
  - Documented data collection process
  - Documented process for reporting results
  - Corrective action taken when thresholds exceeded
  - Understands purposes of the data collected/reported

Proportions sometimes vary across the distributions.

But there are consistent differences by maturity level.



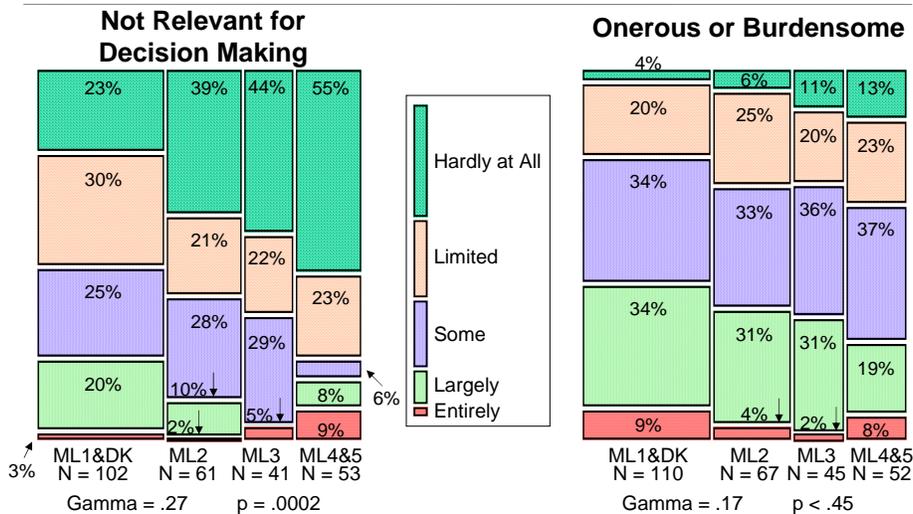
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## Organizational Perspectives: Persistence of Barriers



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## Similar Results

For:

- Stated negatively
  - Inappropriate collection & use of data
  - Resistance to “extra” work
- Stated positively
  - Understandable & interpretable results
  - Data collected are regularly analyzed
  - Measurement an integral part of the business
  - Objective results highly valued

Once again:

- Proportions sometimes vary across the distributions.
- But there are consistent differences by maturity level.

Yet resistance to measurement still exists in our field.

- Even in high maturity organizations



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## Let's take a look...

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### [The State of Measurement & Analysis 2008: Applications in Support of High Maturity Practices](#)

- Work with Bob Stoddard, Jim McCurley & Mike Zuccher

#### See especially...

- Data quality & integrity – Section III, question 4 series
- Use of Process Performance Models & Baselines – Section IV
- Other Analytic Methods & Techniques – Section V
- Challenges & Value Added – Section VI
- Barriers & Facilitators of Effective Measurement & Analysis – Section VII



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## Thank You for Your Attention!

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Dennis R. Goldenson  
[dg@sei.cmu.edu](mailto:dg@sei.cmu.edu)

Software Engineering Institute  
Carnegie Mellon University  
Pittsburgh, PA 15213-3890  
USA



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24

