

V&V Principles

Verification and Validation Summit 2010

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SEI Background

Funded by the U.S. government as a research & development lab; (FFRDC)

Created in 1984 and administered by Carnegie Mellon University

Headquartered in Pittsburgh, Pennsylvania; offices and support worldwide



My Background....

Performed developmental testing for USAF

Planned and then managed testing for B-2

Managed CMMI since 2000

Led development of CMMI for Acquisition

Currently on F-22 Team for “sustaining modernization”

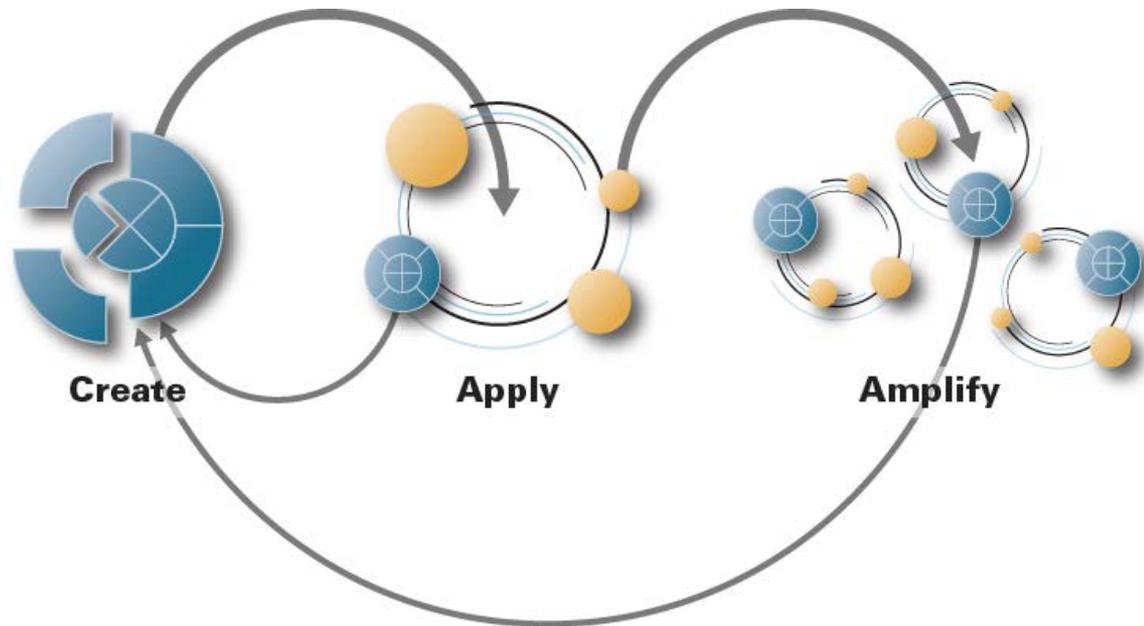


SEI Mission and Strategy

Mission

The SEI advances software engineering and related disciplines to ensure systems with predictable and improved quality, cost, and schedule.

Strategy



How Do You Want to Work?



- Random motion – lots of energy, not much progress
- No teamwork – individual effort
- Frequent conflict
- You never know where you'll end up

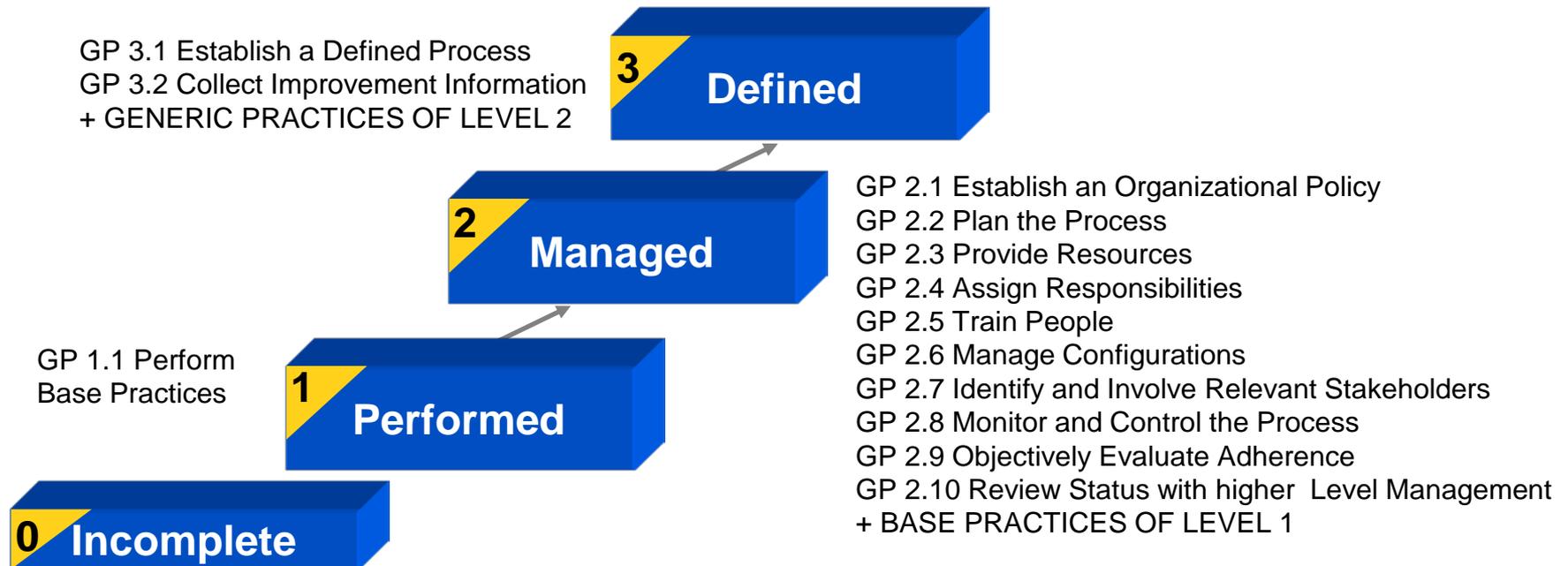


- Directed motion – every step brings you closer to the goal
- Coordinated efforts
- Cooperation
- Predictable results

Processes can make the difference!

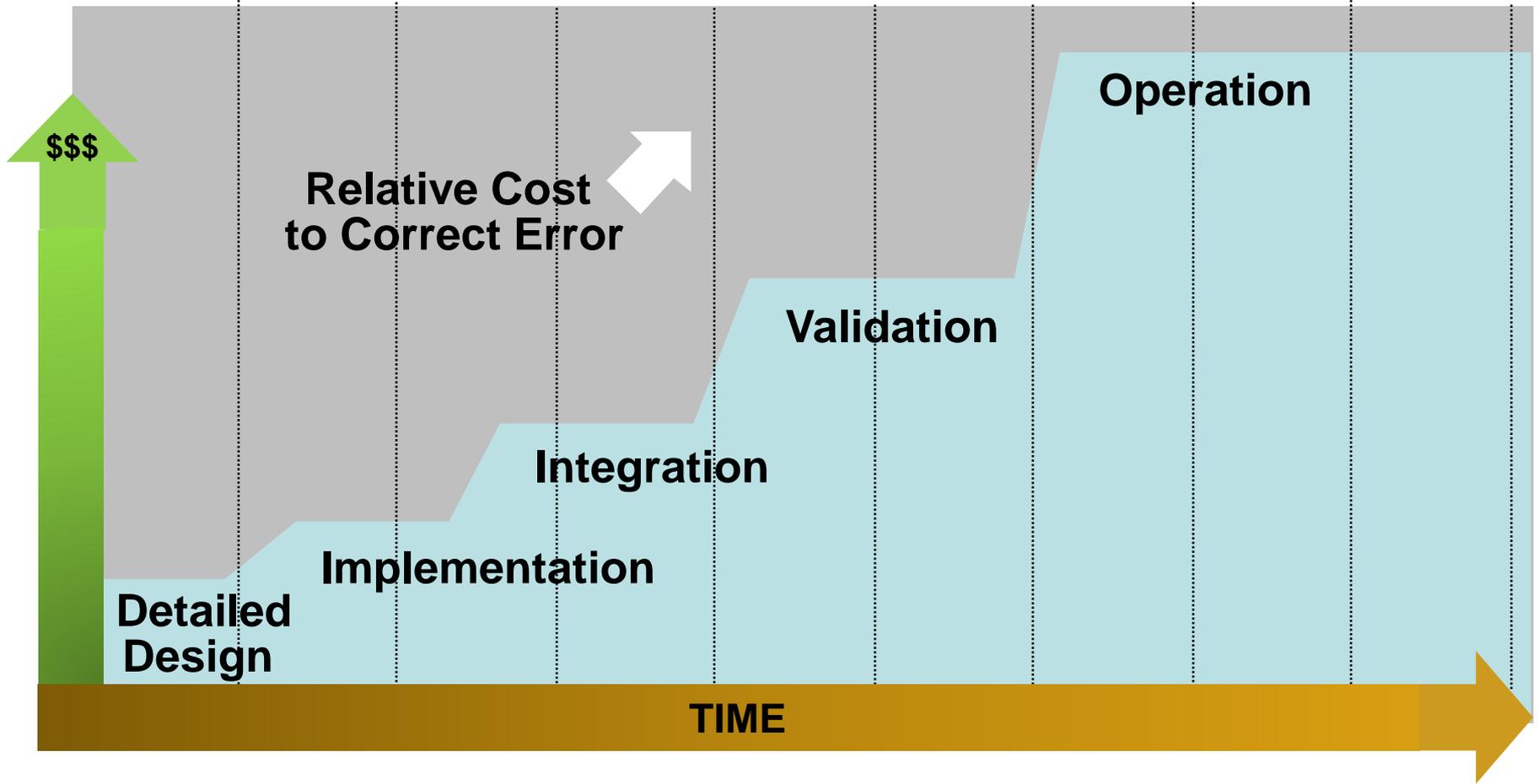


CMMI®: Continuous Representation

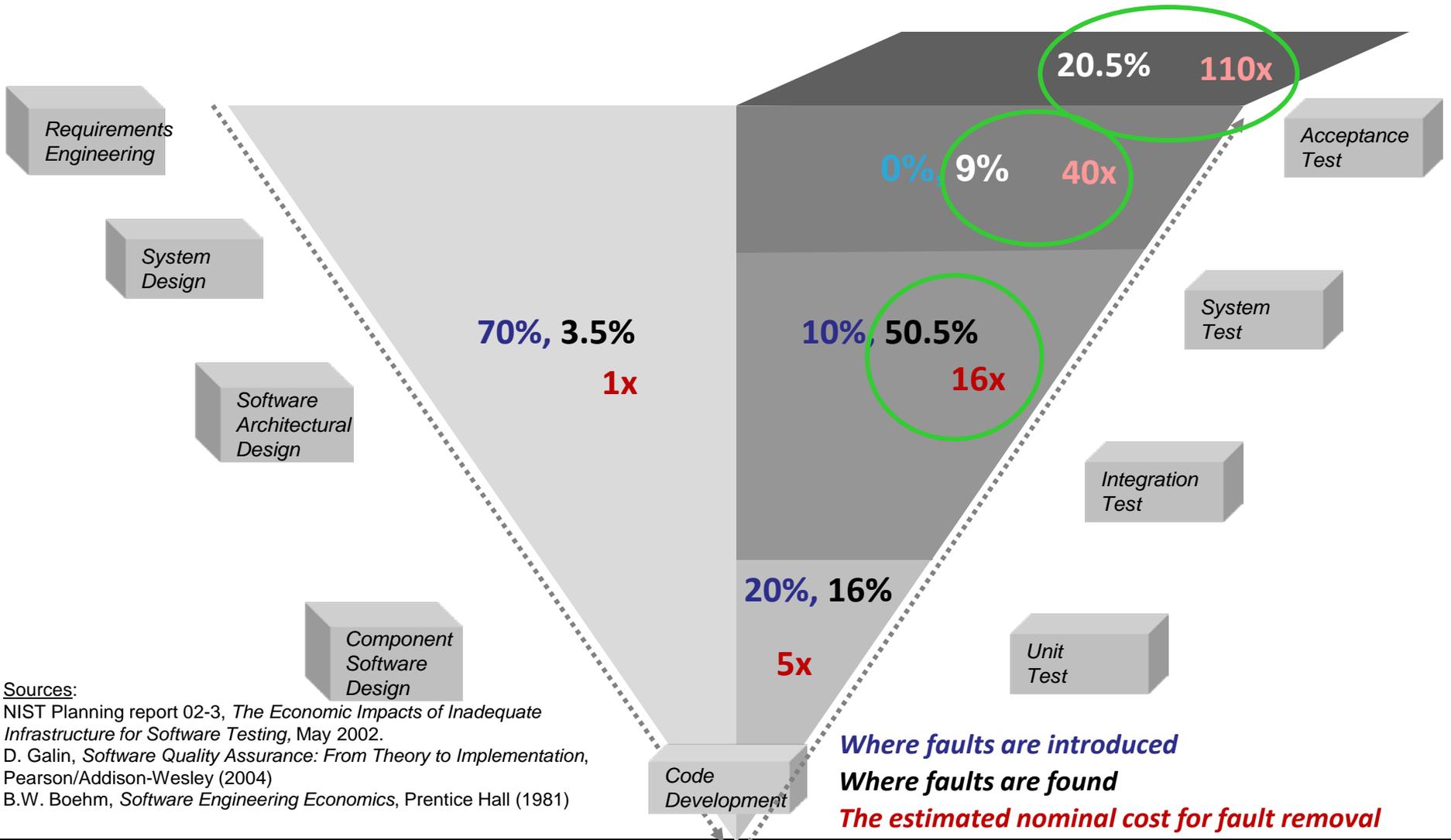


Value of Fixing Defects Early

Error Correction Costs By Phase



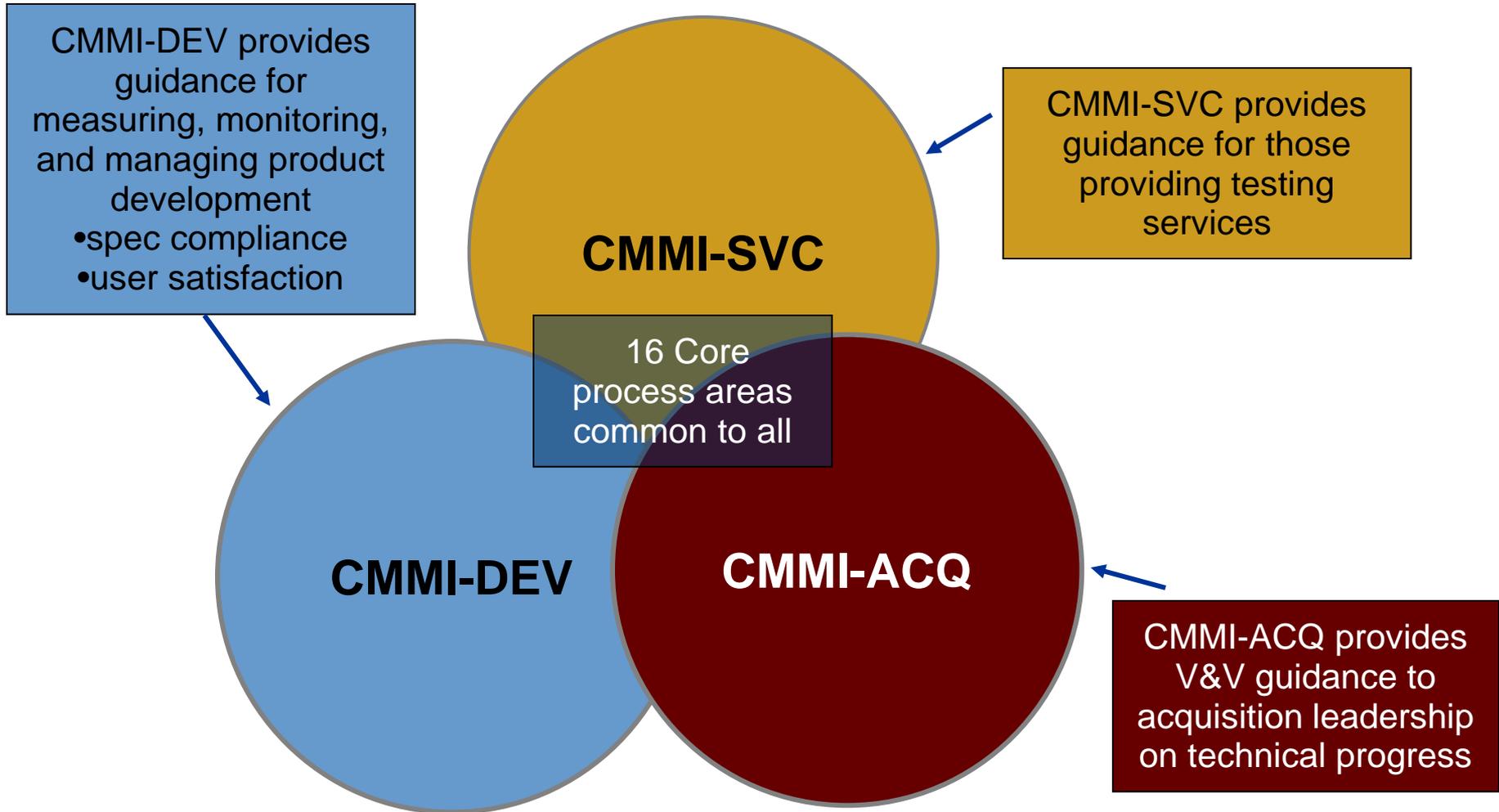
Late Discovery of System-Level Problems



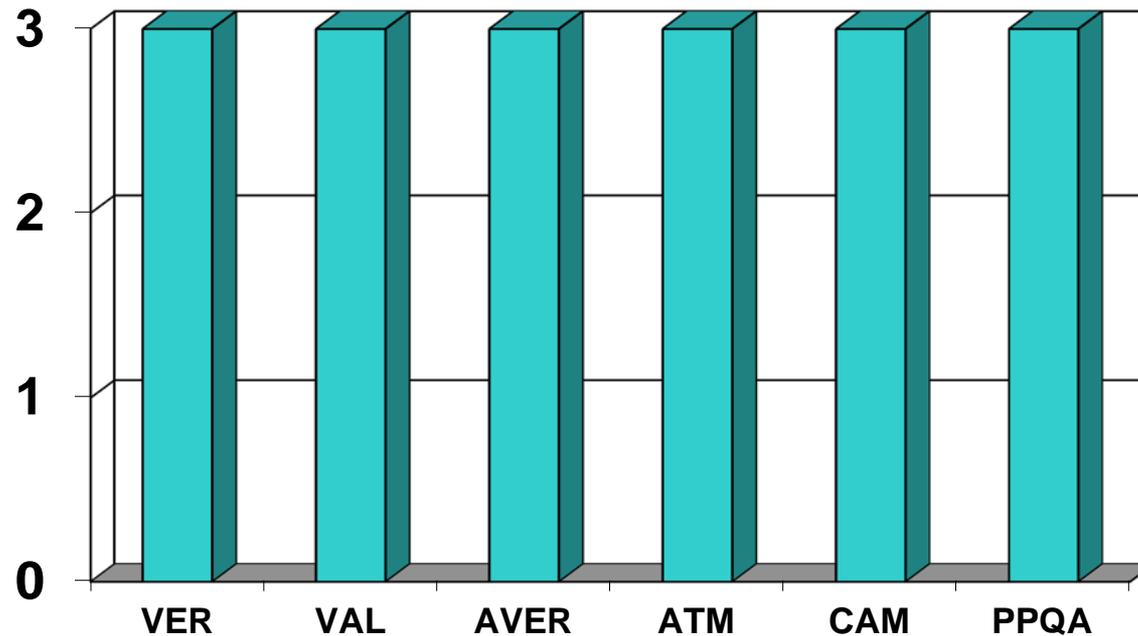
Sources:
 NIST Planning report 02-3, *The Economic Impacts of Inadequate Infrastructure for Software Testing*, May 2002.
 D. Galin, *Software Quality Assurance: From Theory to Implementation*, Pearson/Addison-Wesley (2004)
 B.W. Boehm, *Software Engineering Economics*, Prentice Hall (1981)



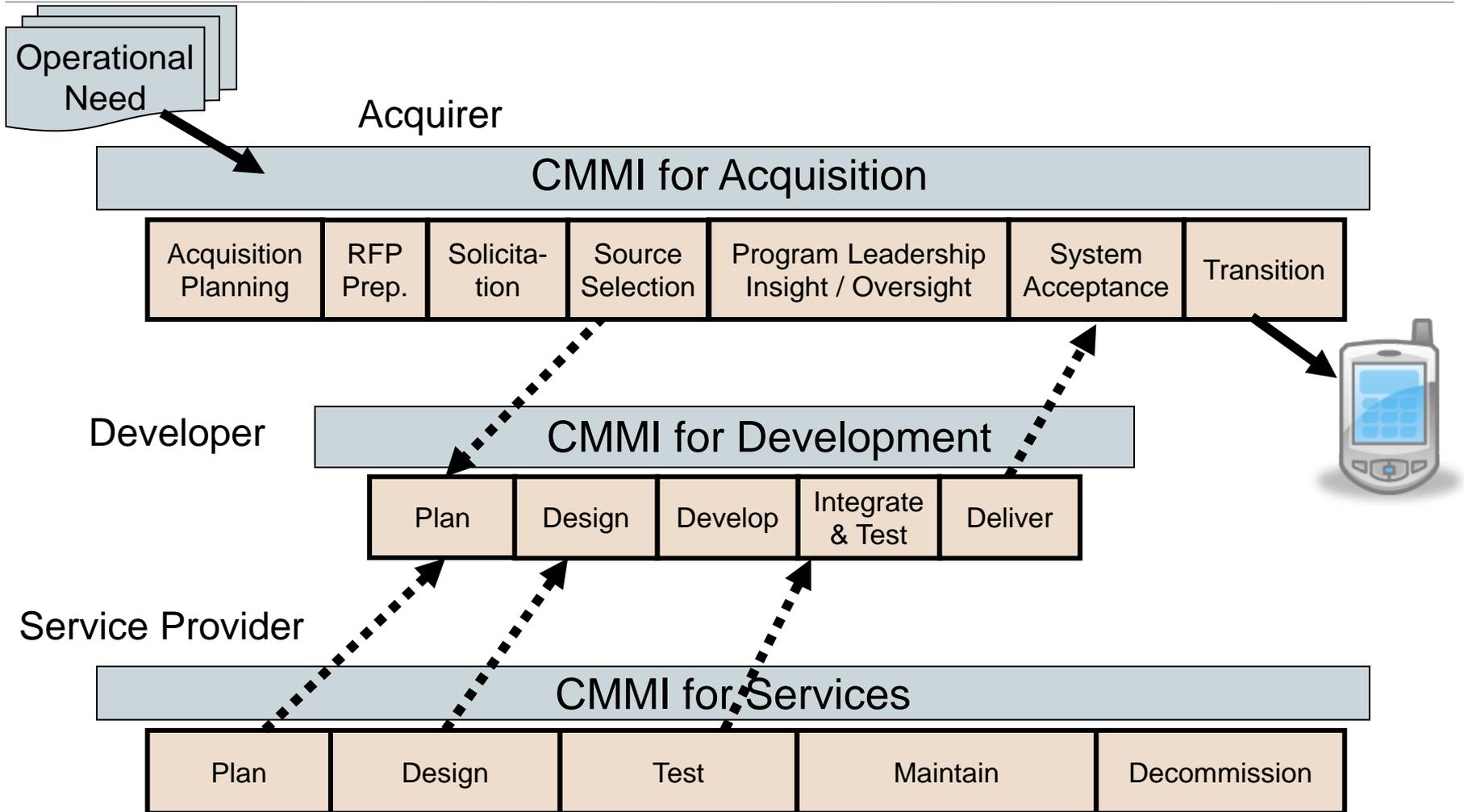
Using the Three CMMI Constellations in V&V



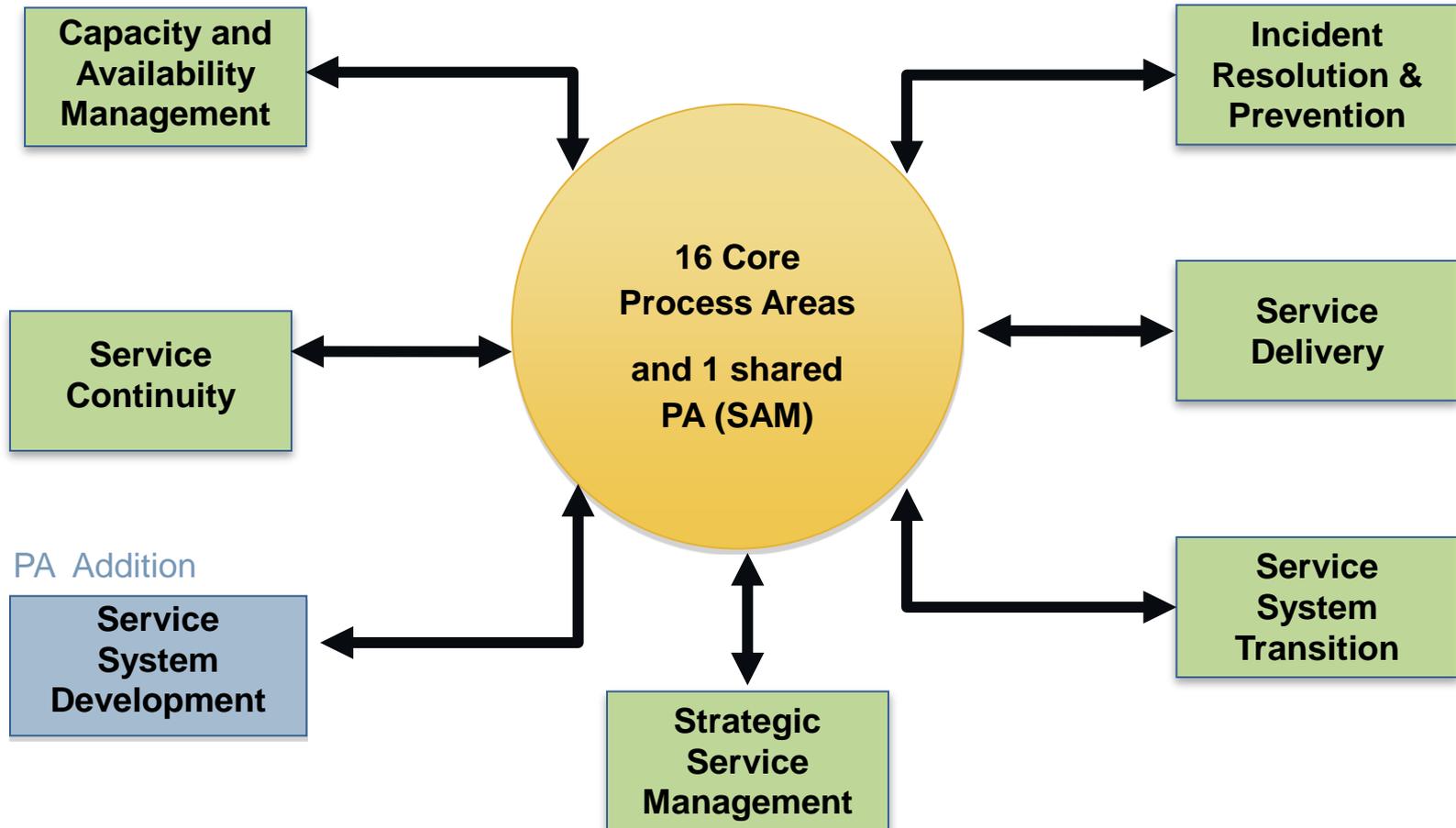
Capability Profiles with Multiple Constellations



Visibility into the Team's Performance

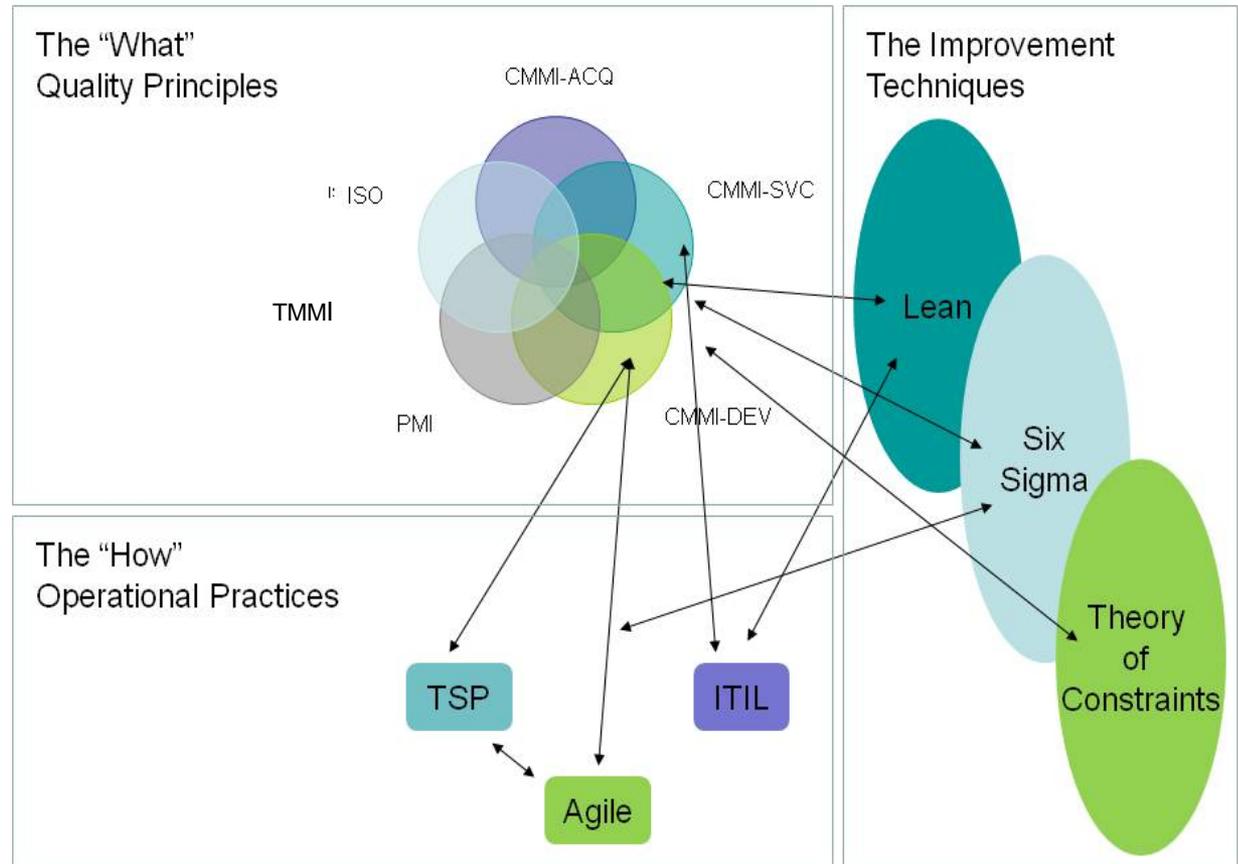


CMMI-SVC content

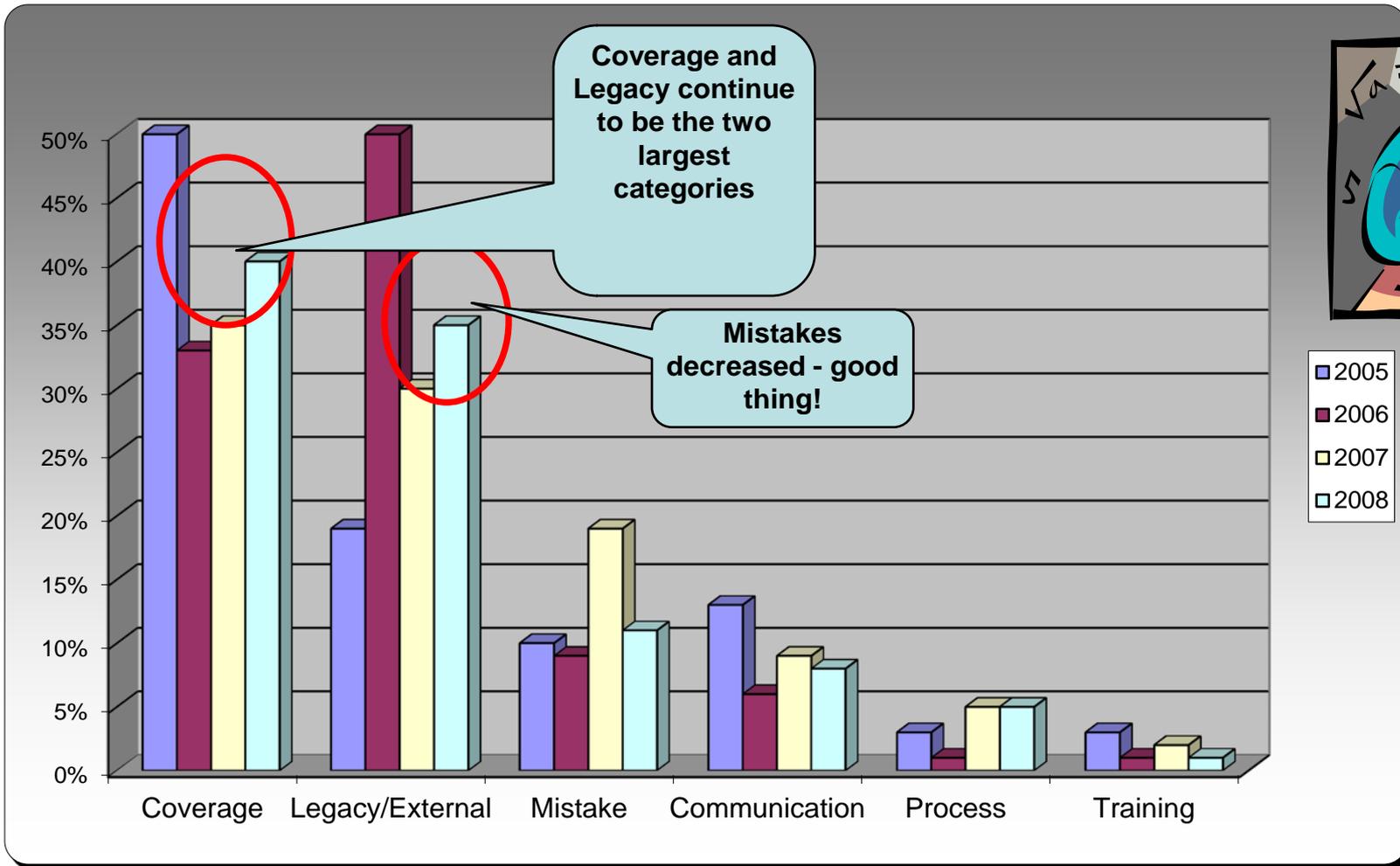


Many Approaches are Synergistic

Improving interfaces is of interest to both government and industry....



Analysis – Test Metrics



- 2005
- 2006
- 2007
- 2008

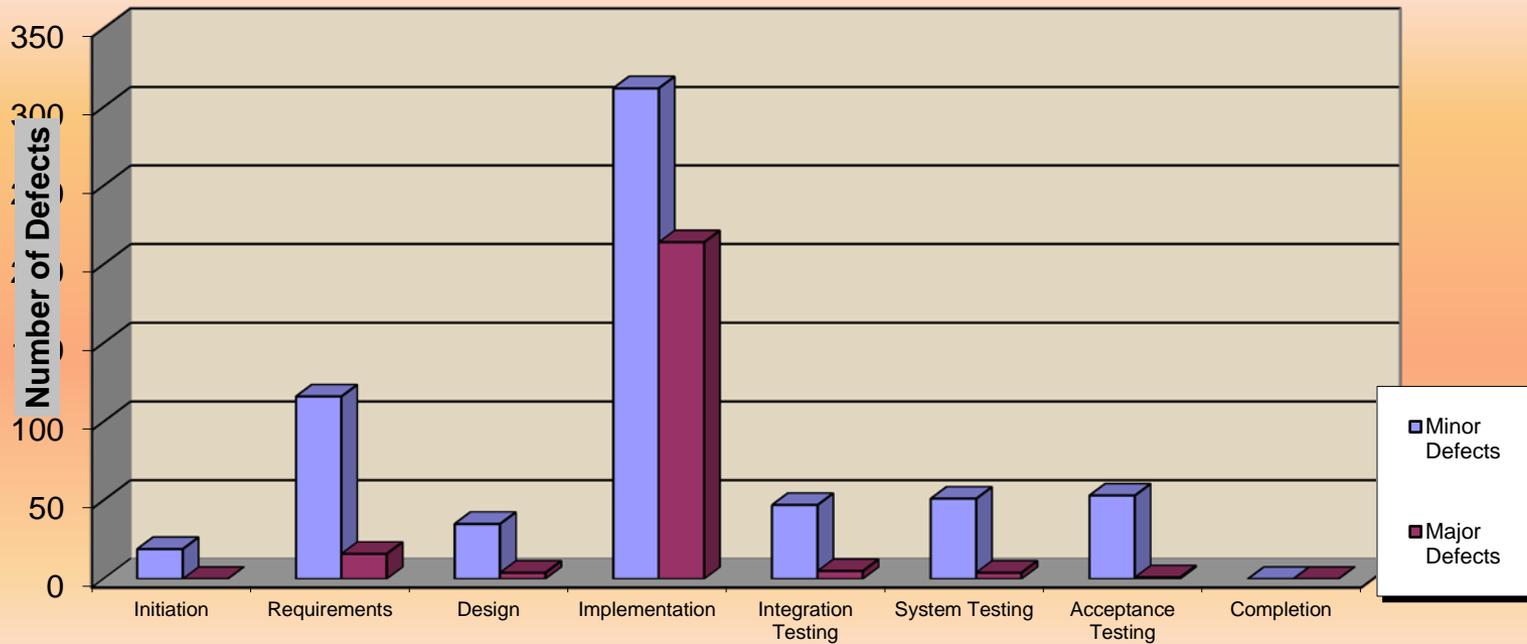
Source: ITEA Annual Symposium 2009
 presented by 46 Test Wing from Eglin Air Force Base, FL



Analysis – Test Metrics

Amount of Minor and Major Defects Saves by Category

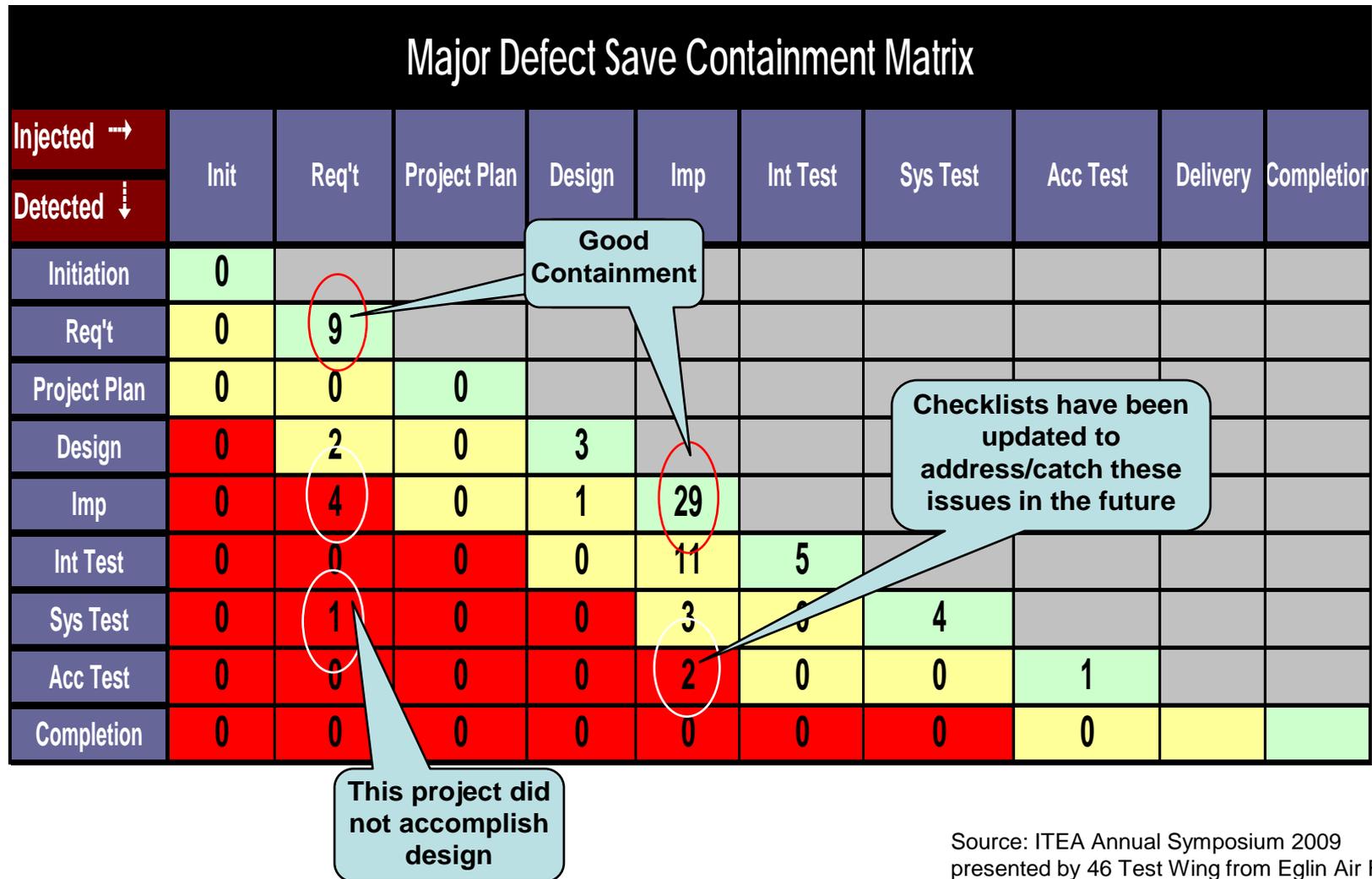
Amount of Defect Saves (Major + Minor) = 1147
778 last year



Source: ITEA Annual Symposium 2009
presented by 46 Test Wing from Eglin Air Force Base, FL



Analysis – Test Metrics



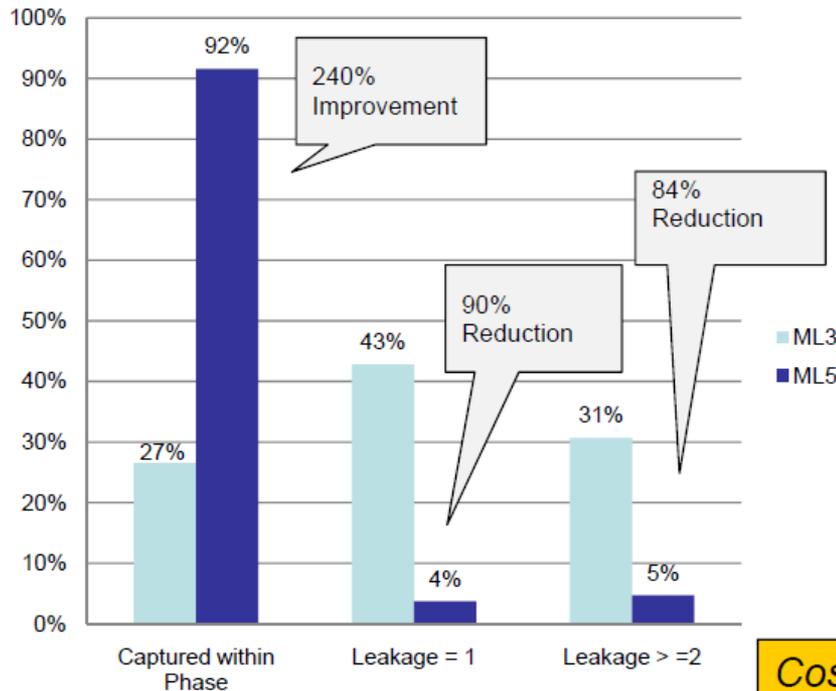
Source: ITEA Annual Symposium 2009
presented by 46 Test Wing from Eglin Air Force Base, FL



Selected Results: Quality Performance

(Organization 3)

**Defects Phase Containment / Leakage
(High Severity Defects -
Priority 1, 2 & 3)**



Within ML5 projects:

- Defect containment (within phase) is increased by 240%
- Leakage is reduced by 90% for defects discovered "1 phase later"

84% reduction in defects leaked "2 or 2+ Phases"

Optimizing verification activities:

- Peer reviews
- Unit testing
- Integration testing

Cost avoidance realized:

- Less rework late in the life cycle when it is most expensive to repair
- Resulting in reduced schedule risk



Quantitative Measures: Quality Performance Results Summary

Measure Used By The Organization	Performance Result
Defect density by severity, ML5 compared to ML3 (Organization 1)	62.5% fewer high-severity defects with ML5 projects
Defect density in circuit board design (Organization 2a)	65% improvement
Defect containment by phase (Organization 3)	The fix of defects within the phase they were injected increased by 240%
Defect containment, ML5 compared to ML3, by phase per KLOC (thousands of lines of code) (Organization 2b)	Defect containment improved 13%
User acceptance test defects per KLOC (Organization 7)	Less than 0.15 defects per KLOC
% of defects removed prior to system test (Organization 7)	>85%



What Have We Missed?

Now let's chat....

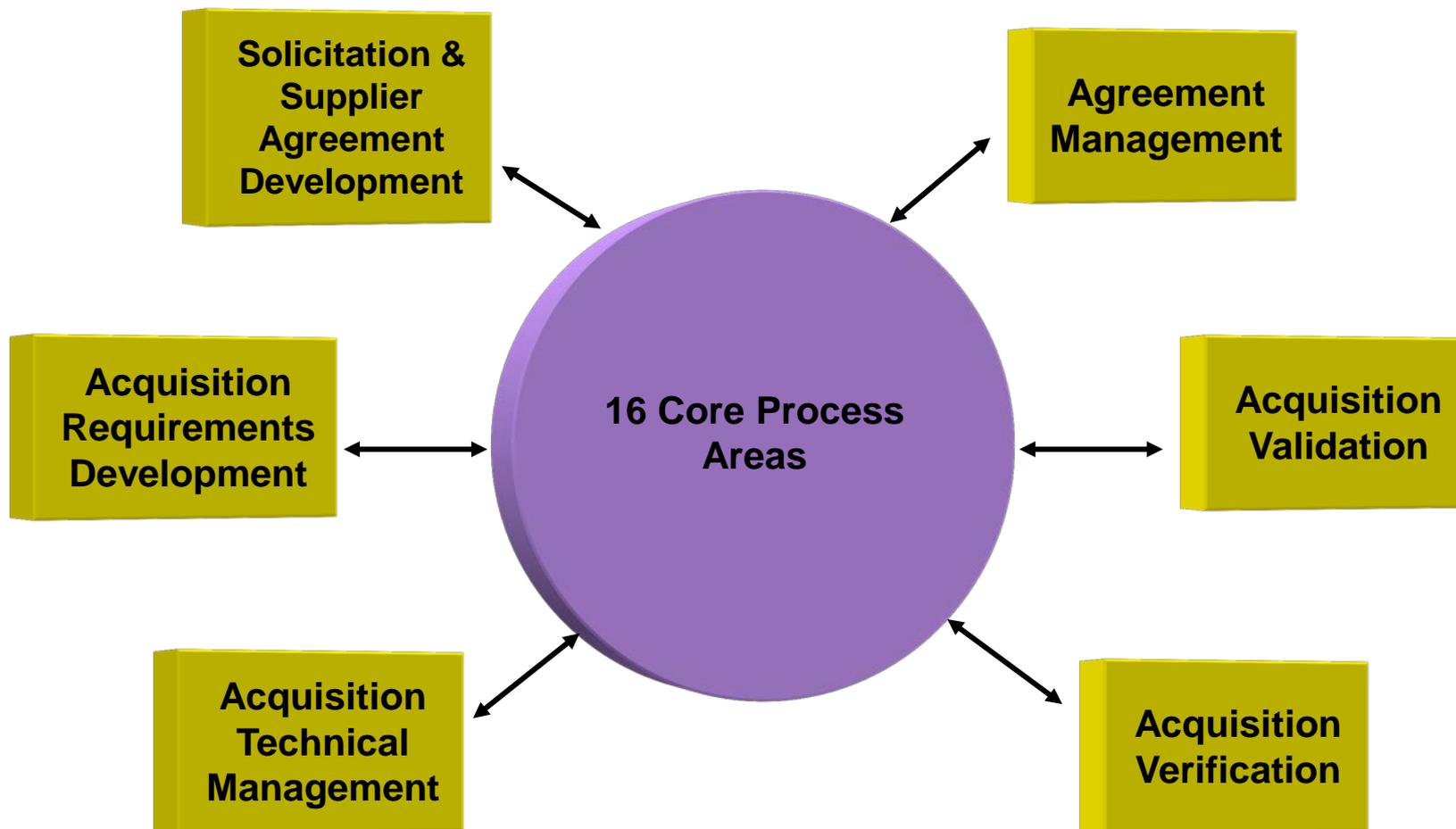


CMMI Backup Charts



CMMI-ACQ v1.2

Acquisition Category Process Areas



Acquisition Technical Management - Goals

SG 1: Evaluate Technical Solutions

Supplier technical solutions are evaluated to confirm that contractual requirements continue to be met.

SG 2: Perform Interface Management

Selected interfaces are managed.



Acquisition Verification - Specific Goals

SG 1: Prepare for Verification

Preparation for verification is conducted.

SG 2: Perform Peer Reviews

Peer reviews are performed on selected work products.

SG 3: Verify Selected Work Products

Selected work products are verified against their specified requirements.



Acquisition Verification - Summary

Verification includes

- Selecting work products for verification
- Establishing a verification environment
- Establishing criteria and procedures
- Preparing for and conducting peer reviews
- Analyzing peer review data
- Performing verification
- Analyzing verification results and identifying corrective actions



Acquisition Validation - Goals

SG 1: Prepare for Validation

Preparation for validation is conducted.

SG 2: Validate Selected Products and Product Components

Selected products and product components are validated to ensure that they are suitable for use in their intended operating environment.



Acknowledgements

Slides noted from the ITEA Annual Symposium 2009 were presented by Ms. Kathy Reid of the 46 Test Wing from Eglin Air Force Base, FL.



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