NORTHROP GRUMMAN

Value of CMMI High Maturity to Industry

CMMI Technology & User Conference
November 17, 2009

Mike Twyman

Vice President, Integrated C3I Systems
Defense Systems Division
Northrop Grumman Information Systems Sector

Five Operating Sectors

NORTHROP GRUMMAN

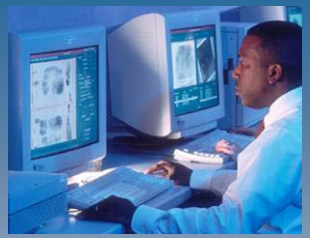
Aerospace Systems

- Large Scale Systems Integration
- C^4ISR
- Unmanned Systems
- Airborne Ground Surveillance / C2
- Naval BMC2
- Global / Theater Strike Systems
- Electronic Combat Operations
- ISR Satellite Systems
- Missile Defense Satellite Systems
- MILSATCOM Systems
- Environmental & Space Science Satellite Systems
- Directed Energy Systems
- Strategic Space Systems

Electronic Systems

- Radar Systems
- C^4ISR
- Electronic Warfare
- Naval & Marine Systems
- Navigation & Guidance
- Military Space
- Government Systems

Information Systems



- Command & Control Systems
- Network Communications
- Intelligence, Surveillance & Reconnaissance Systems
- Enterprise Systems and Security
- IT/Network Outsourcing
- Intelligence
- Federal, State/Local & Commercial
- Homeland Security & Health

Shipbuilding

- Naval Systems Integrator
- Surface Combatants
- Expeditionary Warfare Ships
- Auxiliary Ships
- Marine Composite Technology
- Coast Guard Cutters
- Commercial Ships
- Nuclear Aircraft Carriers
- Nuclear Submarines
- Fleet Maintenance
- Aircraft Carrier Overhaul & Refueling

Technical Services

- Systems Support
- Base and Infrastructure Support
- Range Operations
- Maintenance Support
- Training and Simulations
- Technical and Operational Support
- Live, Virtual and Constructive Domains
- Life Cycle Optimization
- Performance Based Logistics
- Modifications, Repair and Overhaul (MRO)
- Supply Chain Management
- Lead Support Integrator (LSI)

Long Legacy of High Maturity

NORTHROP GRUMMAN

- Northrop Grumman has a long history of embracing High Maturity
  - 1986 First CMM appraisal
  - 1996 Achieved first High Maturity assessment CMM for Software
  - 2002 Early adopter of CMMI High Maturity in 2 appraisals
- Northrop Grumman currently has 12 CMMI High Maturity Appraisals (26% of all US company CMMI Maturity Level 5 appraisals)
  - The Information Systems Sector currently has 9 of 12 Northrop Grumman High Maturity Appraisals (19.6% of US companies at CMMI Level 5)
  - The Defense Systems Division currently holds 5 of them that cover 27 development sites (11% of US appraised organizations at CMMI Level 5)
  - Another DSD High Maturity appraisal is underway as we speak.
- There is a reason
  - Our Division General Manager has managed High Maturity organizations since 1996
  - We firmly believe that we're better at what we do because of our commitment to high maturity processes

High Maturity has been a part of our development life for over a decade

CMMI Benefits – Often Expressed as ROI

2005 (1)

Table 2: CMMI Performance Results Summary

Performance Category	Median Improvement	Number of Data Points
Cost	34%	29
Schedule	50%	22
Productivity	61%	20
Quality	48%	34
Customer Satisfaction	14%	7
Return on Investment	4.0 : 1	22

2007 (2)

Performance Category	Median	Number of Data Points
Cost	20%	21
Schedule	37%	19
Productivity	62%	17
Quality	50%	20
Customer Satisfaction	14%	6
Return on Investment	4.7 : 1	16

(1) Performance Results of CMMI-Based Process Improvement, D. Gibson, D. Goldenson, K. Kost, Aug. 2006 SEI Technical Report

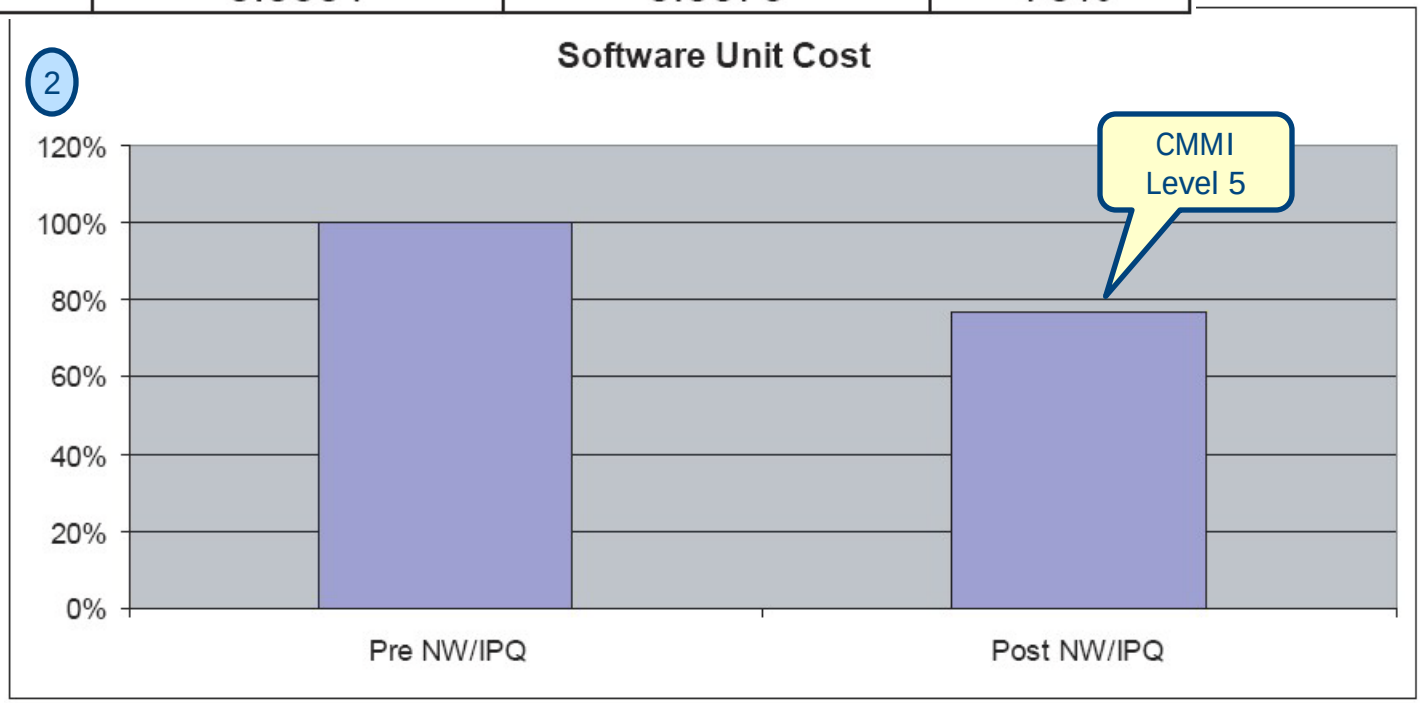
(2) Performance Results From Process Improvement, SEI and DACS, March 2007, Software Tech News

Benefits – Often Increased Productivity

NORTHROP GRUMMAN

1	Baseline Productivity	CMMI® Productivity Improvements	Impact
Average Project Size	133	133	
Average FP/EM	10.7	24.8	+132%
Average project duration (months)	6.9	3.5	-50%
Average effort/FP	$939.	$467.	-50%
Defect Density	0.0301	0.0075	-75%

2



1 Performance Outcomes of CMMI Based Processess, P. McNoone & S. Rohde, Lockheed Martin

2 Improved Performance Should be Expected from Process Improvement, D. Garmus & S. Iwaniki, David Consulting Group

Everybody Does Defect Analysis ...BUT..

NORTHROP GRUMMAN

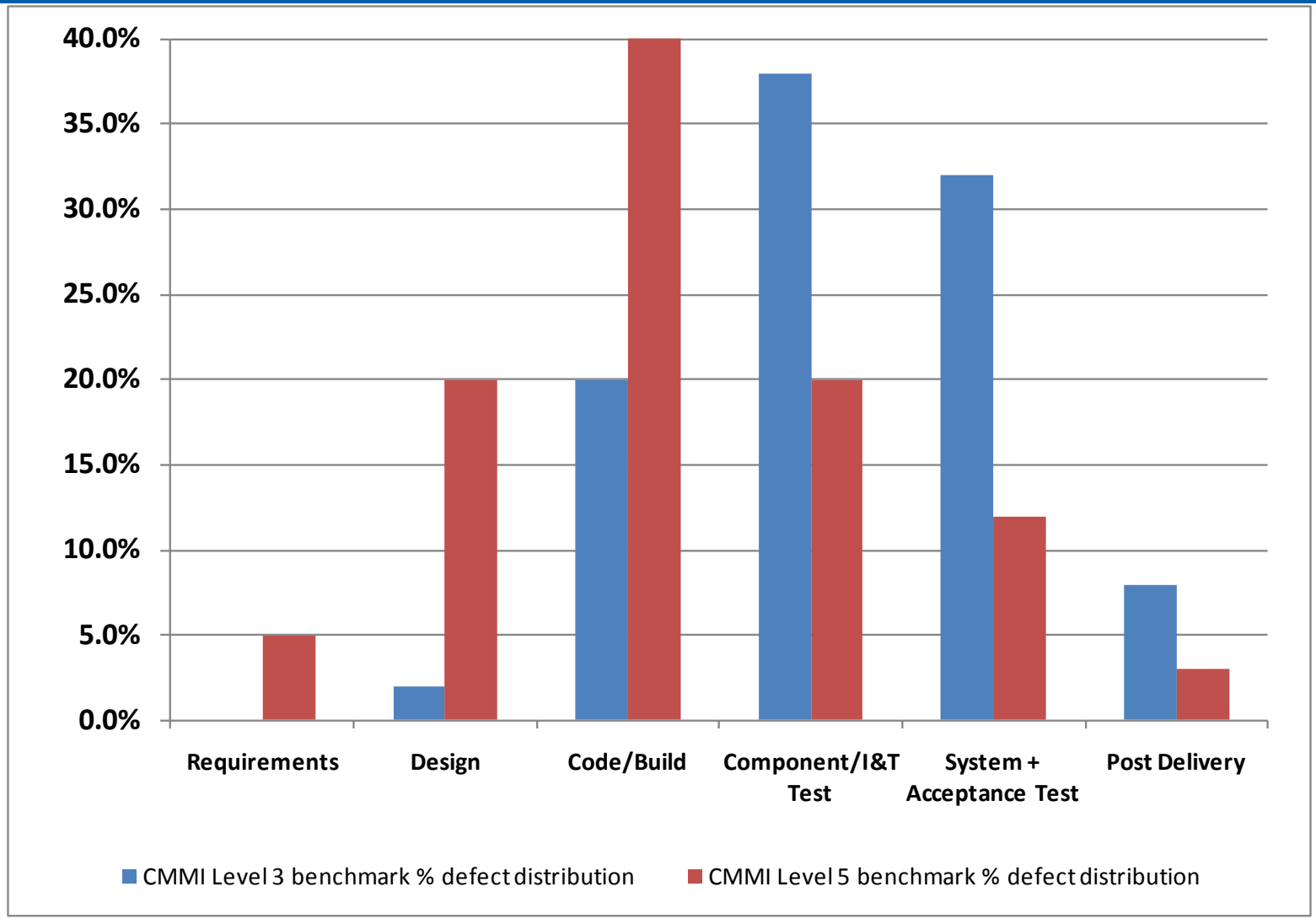
- The cost of correcting defects does vary
- "Cost to correct" depends upon when you find and fix

Phase	Hours to Fix [1]
Requirements through Code / Build	6
Component / I&T Testing	37
System & Acceptance Testing	74
Post Delivery	123

- Level 3 organizations find defects later in the cycle
- Level 5 organizations find defects earlier

[1] Source of Data:
Madachy, Ray. "Quantitative Process Management and Software Quality Management", Department of Computer Science, University of Southern California, February 2000

Distribution – When Defects Found



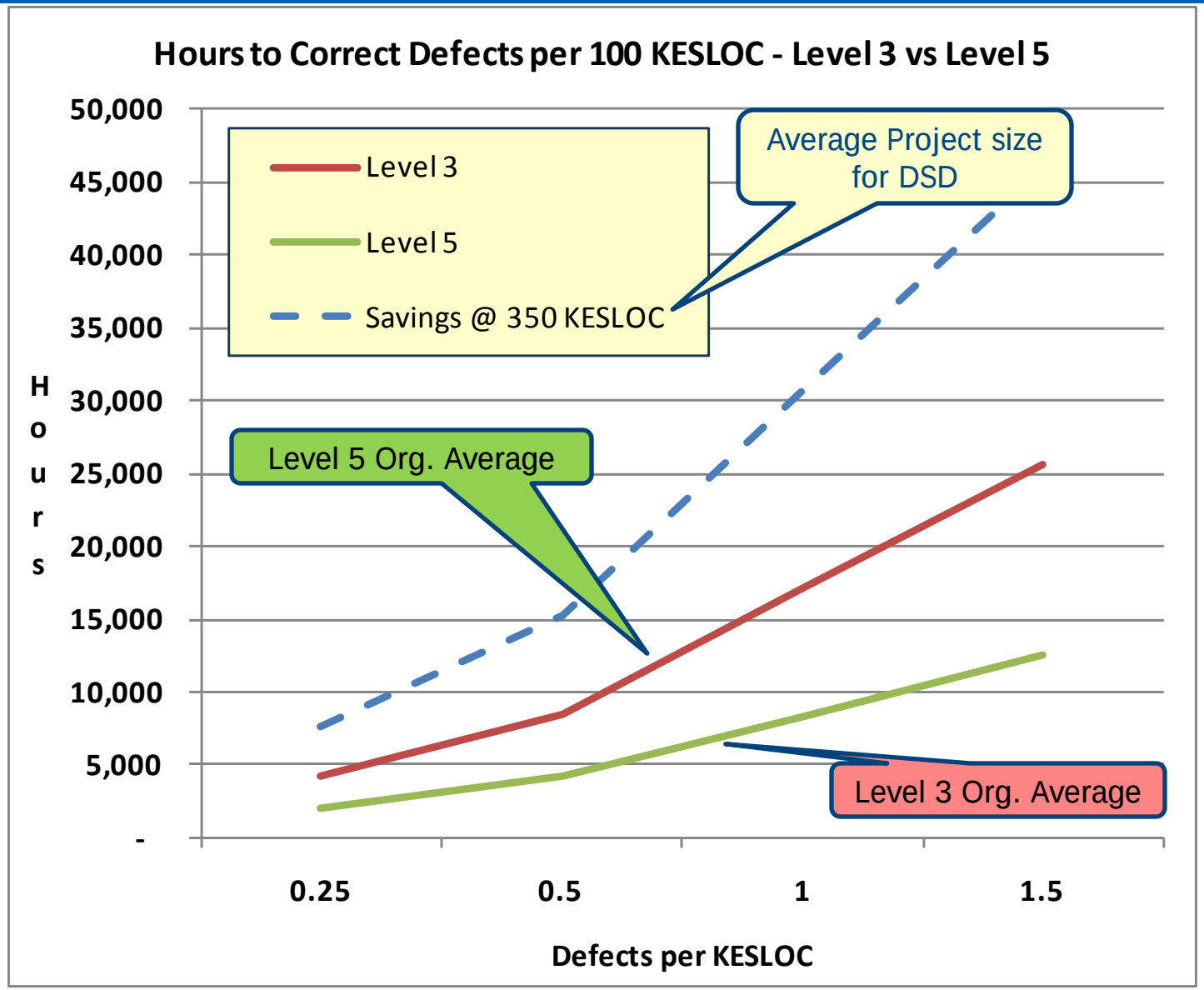
Real Value of CMMI High Maturity

NORTHROP GRUMMAN

Cost of 100 Defects Found & Fixed						
Phase	Level 3 Org		Level 5 Org		Value of HiMAT	
	%	Fix Hrs	%	Fix Hrs	Delta Hrs	% Savings
Reqs thru Code Build (6 hrs)	22%	132	65%	390	(258)	(5%)
Component / I&T (37 hrs)	38%	1406	20%	740	666	14%
System & Acceptance Test (74 hrs)	32%	2368	12%	888	1480	30%
Post Delivery (123 hrs)	8%	984	3%	369	615	13%
Total		4890		2387	2503	51%

50 % Savings and Fewer Defects Delivered to Your Customers - Priceless

Value Received Varies by Defect Rate



High Maturity Benefits

NORTHROP GRUMMAN

Benefit	Result
• Improved Productivity	Reduced Development Cost
	Shorter Development Schedule
• Fewer Delivered Defects	Better Acceptance Test Results
	Better User Satisfaction
• Lower Cost of Defect Correction	Reduced Development Cost
	Fewer Development Delays


NORTHROP GRUMMAN