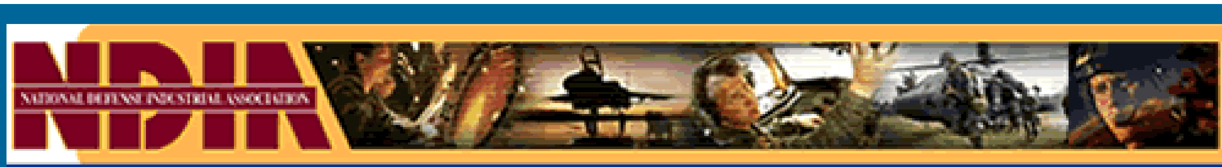


7th Annual CMMI Technology Conference & User Group

"Investigation, Measures and Lessons Learned about the Relationship between CMMI® Process Capability and Project or Program Performance"

Denver, Colorado

November 12 - 15, 2007

MONDAY, NOVEMBER 12, 2007

- CMMI V1.2 -- An Overview Mr. David Phillips, SEI

TUESDAY, NOVEMBER 13, 2007

State of CMMI®

- Mr. Clyde Chittister, Chief Operating Officer, SEI

Executive Panel

Panelists:

Ms. Kristen Baldwin, Office of the Secretary of Defense
Mr. Tom Neff, Defense Threat Reduction Agency
Mr. Rich Frost, General Motors

Lunch with Guest Speaker

- Mr. Mark Schaffer, Director, Systems & Software Engineering, OSD (AT&L)

Technical Sessions

TRACK 1

- When the Only Tool You Have is a Hammer, Every Problem Begins to Look Like a Nail, Mr. Sam Fogle, ACE Guides, LLC
- The Journey to CMMI Level , Mr. Andrew Lay, Lockheed Martin Aeronautics Company
- Visualizing Improvement with Capability Waypoints, Mr. Robert Jacob,
  Naval Air Systems CommandInstitutionalization Measures: Key to Improved Process Monitoring, Dr. John Rusnak, Lockheed Martin Space Systems Company

TRACK 3

- Assuring Quality for Efficient & Sufficient Testing Mr. Pramod Varma, Wipro Technologies

TRACK 4

- Bridging Process Improvement During Program Management Evolution: An Experience Report Capt DeWitt Latimer, USAF
- An "Embedded SCAMPI-C" Appraisal at the National Security Agency. Mr. Joseph Wickless, SEI

TRACK 5

- Linking Project Performance to CMMI Process Capability through Lean Measurements, Mr. Jeffrey Dutton, Jacobs Technology
- Quantitative Models for Predicting Project Success, Dr. Rick Hefner, Northrop Grumman Corporation

TRACK 6

- How to Kick Start a Process Improvement Effort to Achieve a CMMI Rating, Ms. Brenda Hall, Computer Sciences Corporation
- SEI Appraisal Program Quality Report, Mr. William Hayes, SEI
- The Process In-execution Review (PIER) After Three Years, Mr. Dale Swanson, The MITRE Corporation
- I'm Preparing My Organization for an Appraisal, but I'm Not Really Sure I Understand this PIID Thing. Should I Worry?, Mr. Sam Fogle, ACE Guides, LLC

TRACK 7

- Aligning CMMI and ITIL – Where Am I and Which Way Should I Go, Mr. Pat Mitryk, Cognence, Inc
- Integrated System Framework: A Way Out of the Multi-Model Madness, Mr. Paul Byrnes, Integrated System Diagnostics

WEDNESDAY, NOVEMBER 14, 2007

Lunch with Guest Speaker

- Ms. Mary Poppendieck, President, Poppendieck, LLC

Technical Sessions

TRACK 1

- CMMI Contenders, CMMI Pretenders, Dr. Rick Hefner, Northrop Grumman Corporation
- Initial Fears of CMMI Introduction and How Things Really Played Out, Dr. Paul Nugent, General Dynamics Advanced Information Systems
- Software Firm + CMMI Level 2 Initiative + 15 months = Dramatic Quality Improvements, Mr. Jeff Simpson, Campus Management Corporation
- How to Explain the Value of Every CMMI Practice, Dr. Rick Hefner, Northrop Grumman Corporation
- Mrs. Doubtfire Answers Your Questions about Process Improvement, Dr. Rick Hefner, Northrop Grumman Corporation
- Developing a Second Generation Directive System Architecture, Mr. Kenneth Weinberg, Raytheon Company
- Whose Processes Are These, Anyway, Ms. Judith Tejan, AAI Services Corporation
- Scientific Breakthroughs in Process Improvement, Ms. Cheryl White, Change Delivery Group

TRACK 2

- The What, When, Why and How for CMMI Training, Mr. Tom Bragg, AVISTA Incorporated
- Transitioning to the CMMI: What They Never Told You, Mr. Steve Fried, The Boeing Company
- CMMI Implementation: Overcoming the PPQA Challenge, Mr. Pat Mitryk, Cognence, Inc.
- How to Measurably Improve Your Requirements, Mr. Timothy Olson, Lean Solutions Institute, Inc. (QIC)

TRACK 3

- Using Lean Six Sigma to Implement CMMI High Maturity Practices, Ms. Beth Clark, Lockheed Martin
- The Potential for Lean Acquisition of Software Intensive Systems, Mr. Jeffrey Dutton, Jacobs Technology
- Lean, CMMI and Six Sigma Working Together to Achieve High Success, Ms. Susan Bassham, US Army Aviation and Missle Command
- Comparing and Contrasting the PP & PMC Process Areas of CMMI v 1.2 and SCRUM, Dr. Aldo Dagnino ABB, Inc. - US Corporate Research
- Effective Systems Engineering: What's the Payoff for Program Performance?, NDIA Systems EngineeringsEffectiveness
- What's All this 'churn' in Systems Engineering Standards and Models!?, Mr. Donald Gantzer, SAIC

TRACK 4

- Driving Process Improvement Using the CMMI-ACQ at General Motors, Dr. Richard Frost, General Motors
- Leading Indicators for Acquisition Programs, Mr. Robert Ferguson, SEI
- CMMI High Maturity Misconceptions, Mr. William Hayes, SEI
- High Maturity: How Do We Know?, Dr. Mike Konrad, SEI
- High Maturity System/Software Cost Estimation, Dr. Richard Welch, Northrop Grumman Corporation
- ADVANCE - Implementing a Defect Model for Performance Prediction, Mr. Stanley Martin, L-3 Communications/IS
- Statistically Managing a Critical Logistics Schedule Using CMMI, Mr. Robert Tuthill, Northrop Grumman Corporation
- A More Practical Set of High Maturity Practices, Dr. Rick Hefner, Northrop Grumman Corporation

TRACK 5

- Program Level Return on Investment for CMMI® Process Improvement, Mr. J Perry, BAE Systems
- How Do We Get on the Road to Maturity?, Mrs. Debra Perry, Harris Corporation
- Understanding CMMI Measurement Capabilities Performance & Outcomes: Results from the 2007 SEI State of Measurement Practices Survey, Dr. Dennis Goldenson, SEI
- Using Predicted Delivered Defects as a Management Tool, Mr. Dustin Sims, BAE Systems
- Calibrating the Project Planning Process, Mr. Donald Corpron, Northrop Grumman Corporation
- All Others Bring Data, Ms. Charlene Gross, SEI

TRACK 6

- Executing a Successful CMMI Maturity Level 3 Scampi for Spawar Systems Center Charleston, Mr. Michael Kutch, SPAWAR Systems Center Charleston

- CMMI SCAMPI Appraisals – The People/The Process/The Results-United Space Alliance, LLC Lessons Learned, Ms. Robin Hurst, United Space Alliance, LLC
- Proposed Approach to Heterogeneous CMMI Appraisals, Mr. Joseph Vandeville, Northrop Grumman Corporation
- Selecting a Representative Sample for CMMI Enterprise Appraisals, Ms. Kathryn Kirby, Raytheon Company
- Logistics and Lessons Learned in Conducting an CMMI® Maturity Level 3 Full-Model Scope Enteprise-level Appraisal
  Ms. Kathryn Kirby, Raytheon Company

TRACK 7

- Excellence at the Organization, Team and Individual levels; CMMI, TSP and PSP - Experience, Lessons Learned and Why all Three are Needed, Mr. Girish Seshagiri, Advanced Information Services, Inc.
- IEEE Life Cycle Standards and the CMMI® – Implementation Considerations, Dr. Peter Hantos, The Aerospace Corporation
- Using CMMI and OPM3 to Improve Performance, Mr. Thomas Keuten, Pariveda Solutions
- Complementary or Competing? Achieving Synergy with OPM3®, CMMI®, and ISO 9001-2000, Mr. Mark Scott, Harris Corporation
- Formal Process Definition with Industry Standards, Mr. Chris Armstrong, Armstrong Process Group, Inc.
- Project Management Architecture Design as a Critical Success Factor in CMMI Model Implementation, Mr. Christen MacMillan, L-3 Communications

THURSDAY, NOVEMBER 15, 2007

Lunch and Award Presentation

TRACK 1

- Fast Track to Higher CMMI Maturity Levels: Lessons Learned from Five Initiatives, Ms. Cheryl White, Change Delivery
- Seven Success Factors for CMMI Based Process Improvement, Mr. Orhan Kalayci, XPI - eXtreme Process Improvement
- CMMI Process Improvement: It's Not a Technical Problem, It's a People Problem!, Mr. Rolf Reitzig, Cognence
- Improving Project Proposal Quality via CMMI, Mr. Chen Wang, Institute for Information Industry

TRACK 2

- A Framework to Manage and Evaluate Remote Software Testing Using CMMI, Dr. Aldo Dagnino, ABB, Inc. - US Corporate Research
- CMMI, Configuration Management, and Baseball – How to Score, Ms. Julie Schmarje, Raytheon Company
- Automated Systems for Project Portfolio Management - Project Success and Outstanding Earned Value, Mr. Pothiraj Selvaraj,
  Global Computer Enterprises

TRACK 3

- Project Management by Functional Capability, Mr. Fred Schenker, SEI
- Software Architecture Development Leveraging the Attribute Driven Design and CMMI Methodologies, Dr. Aldo Dagnino,
  ABB, Inc. US Corporate Research
- Systems Assurance – Practices Make Perfect – How Your Engineering and Management Practices Can Help Meet the Assurance Challenge, Mr. Paul Croll, Computer Sciences Corporation
- Tools and Resources to Enable Systems Engineering Improvement, Mr. Michael Kutch, SPAWAR Systems Center Charleston
- Applying CMMI Principles to Certification Process of Legacy Aircraft, Ms. Michele Bruno, The Boeing Company
- Accreditation of Undergraduate Programs in Computing, Software Engineering, Systems Engineering and the Ties to CMMI-based Improvement, Mr. Dan Nash, Raytheon Company
- How Future Trends in Systems and Software Engineering Bode Well for Enabling the Rapid Adoption of CMMI, Dr. Ken Nidiffer, SEI

TRACK 4

- Thought Before Action: A High Maturity Roadmap for the Lower Maturity Organization, Mr. James McHale, SEI
- Integrated Implementation of Advanced Maturity Practices, Mr. Dale Childs, DFAS
- Process Performance Baselines and Models: Duh, I Don't Get It, Ms. Diane Mizukami-Williams, Northrop Grumman Mission Systems
- Expanding Statistical Process Control Across All Engineering Disciplines: A Sequence of Practical Case Studies, Dr. Richard Welch, Northrop Grumman Corporation
- Statistical Process Control Applied to Specification Requirements Process, Mr. Al Florence, The MITRE Corporation
- Implementing High Maturity in a Production Support Environment, Ms. Virginia Slavin, SSCI
- Using the Scientific Method at Levels 4-5, Dr. Jeff Ricketts, Raytheon Company

TRACK 5

- The Productivity Puzzle, Mrs. Jill Brooks, Raytheon Company
- Using Metrics to Develop a Software Project Strategy, Mr. Donald Beckett, Quantitative Software Management
- Lessons Learned in the Implementation of Measurement Techniques for CMMI GP 2.8, Dr. Susanna Schwab, L-3 Communications
- Optimizing the Measurement Process, Mr. Gary Natwick, Harris Corporation
- Measurement Strategies in the CMMI, Dr. Rick Hefner, Northrop Grumman Corporation
- 5 Major Sites, 4 Separate Disciplines, 11,500 Engineers, 1 Data Repository: Having Data You Can Actually Use – Priceless!
  Mrs. Jill Brooks, Raytheon Company

TRACK 6

- Cutting Appraisal Costs in Half, Dr. Rick Hefner, Northrop Grumman Corporation
- Experiences Implementing Very Large High Confidence Enterprise Appraisals, Mr. Paul Byrnes, Integrated System Diagnostics
- Process Compliance the Smart Way, Mr. Gary Natwick, Harris Corporation
- Judging the Suitability of Alternative Practices, Dr. Rick Hefner, Northrop Grumman Corporation
- Lessons Learned Conducting High Maturity SCAMPIs, Mr. Paul Byrnes, Integrated System Diagnostics
- Benefits of SCAMPI Class C in Small Settings, Dr. Mary Anne Herndon, Transdyne Corporation
- Lower Cost, More Effective Alternatives to SCAMPIs, Dr. Rick Hefner, Northrop Grumman Corporation
- Using Workshops to Speed CMMI Adoption and Evidence Gathering, Dr. Rick Hefner, Northrop Grumman Corporation

TRACK 7

- Quality Maturity Model – Foundation for Process Institutionalization, Mr. Sumit Gupta, Royal Bank of Scotland - India Development Center
- Not Just for Software Anymore: Lessons Learned From a CMMI™ Appraisal on Projects in a Nonnuclear Weapons Facility,
  Mr. Daniel Fritts, Honeywell
- CMMI for Services Overview, Mr. Craig Hollenbach, Northrop Grumman Corporation
- Defining Lean Service and Maintenance Processes that are CMMI Compliant, Mr. Timothy Olson, Lean Solutions Institute, Inc. (QIC)
- Implementing Acquisition and System Engineering Processes in a Maintenance Organization, Mr. Bill Fetech, The MITRE Corporation

7th Annual

CMMI® Technology Conference and User Group

"Investigation, Measures and Lessons Learned about the Relationship between CMMI® Process Capability and Project or Program Performance"

Sponsored by:
National Defense Industrial Association,
Systems Engineering Division
in conjunction with
Software Engineering Institute,
Carnegie Mellon University

NDIA
NATIONAL DEFENSE INDUSTRIAL ASSOCIATION
STRENGTH THROUGH INDUSTRY & TECHNOLOGY

Software Engineering Institute
Carnegie Mellon

Event #8110
November 12-15, 2007
Hyatt Regency Tech Center ◆ Denver, CO

Conference Agenda

SUNDAY, NOVEMBER 11, 2007

3:00 PM - 6:00 PM	Conference Registration Open	Grand Mesa Foyer

MONDAY, NOVEMBER 12, 2007

The Tutorial sessions require a $275 registration fee which is in addition to the Conference registration fee.

7:00 AM - 7:00 PM	Conference Registration Open	Grand Mesa Foyer
7:00 AM - 8:00 AM	Continental Breakfast	Grand Mesa Foyer
8:00 AM - 5:30 PM	Tutorial Sessions (must be registered)	Refer to Following Page
9:45 AM - 10:15 AM	Break (Tutorial Attendees Only)	Grand Mesa Foyer
12:00 PM - 1:00 PM	Lunch (Tutorial Attendees Only)	Grand Mesa ABC Corridor
2:45 PM - 3:15 PM	Break (Tutorial Attendees Only)	Grand Mesa Foyer
5:30 PM - 7:00 PM	Reception (Open to all Attendees)	Atrium Display Area

TUESDAY, NOVEMBER 13, 2007

7:15 AM - 7:00 PM	Conference Registration Open	Grand Mesa Foyer
7:15 AM - 8:15 AM	Continental Breakfast	Grand Mesa Foyer
8:15 AM - 8:30 AM	Welcome & Opening Remarks	Grand Mesa DEF
	◆ *Mr. Sam Campagna, Director, Operations, NDIA*	
	◆ *Mr. Bob Rassa, Director, Systems Support, Raytheon Company*	
8:30 AM - 9:15 AM	State of CMMI®	Grand Mesa DEF
	◆ *Mr. Bob Rassa, Director, Systems Support, Raytheon Company*	
	◆ *Mr. Clyde Chittister, Chief Operating Officer, SEI*	
9:15 AM - 10:00 AM	CMMI® Into the Future	Grand Mesa DEF
	◆ *Mr. Bob Rassa, Director, Systems Support, Raytheon Company*	
10:00 AM - 10:15 AM	Break	Grand Mesa Foyer
10:15 AM - 11:45 AM	Executive Panel	Grand Mesa DEF
	Moderator:	
	Mr. Bob Rassa, Raytheon Company	
	Panelists:	
	Ms. Kristen Baldwin, Office of the Secretary of Defense	
	Mr. Tom Neff, Defense Threat Reduction Agency	
	Mr. Rich Frost, General Motors	
	Mr. Mike Phillips, Software Engineering Institute	
12:00 PM - 1:30 PM	Lunch with Guest Speaker	Grand Mesa ABC Corridor
	◆ *Mr. Mark Schaffer, Director, Systems & Software Engineering, OSD (AT&L)*	
1:30 PM - 5:00 PM	Technical Sessions	Refer to Following Pages
3:00 PM - 3:30 PM	Break	Grand Mesa Foyer
5:00 PM - 6:30 PM	CMMI-ACQ Rollout Reception	Atrium Display Area

WEDNESDAY, NOVEMBER 14, 2007

7:15 AM - 5:00 PM	Conference Registration Open	Grand Mesa Foyer
7:15 AM - 8:15 AM	Continental Breakfast	Grand Mesa Foyer
8:15 AM - 11:45 AM	Technical Sessions	Refer to Following Pages
9:45 AM - 10:15 AM	Break	Grand Mesa Foyer
12:00 PM - 1:30 PM	Lunch with Guest Speaker	Grand Mesa ABC Corridor
	◆ *Ms. Mary Poppendieck, President, Poppendieck, LLC*	
1:30 PM - 5:00 PM	Technical Sessions	Refer to Following Pages
3:00 PM - 3:30 PM	Break	Grand Mesa Foyer

THURSDAY, NOVEMBER 15, 2007

7:15 AM - 5:00 PM	Conference Registration Open	Grand Mesa Foyer
7:15 AM - 8:15 AM	Continental Breakfast	Grand Mesa Foyer
8:15 AM - 11:45 AM	Technical Sessions	Refer to Following Pages
9:45 AM - 10:15 AM	Break	Grand Mesa Foyer
12:00 PM - 1:30 PM	Lunch and Award Presentation	Grand Mesa ABC Corridor
1:30 PM - 5:00 PM	Technical Sessions	Refer to Following Pages
3:00 PM - 3:30 PM	Break	Grand Mesa Foyer

Tutorial Sessions - Monday, November 12, 2007

	Session A 8:00 AM		Session A (con't) 10:15 AM		Session B 1:00 PM		Session B (con't) 3 :15 PM	
Track 1 Grand Mesa D/E	1A1 Tutorial What Do Process Performance Baselines and Models Look Like? ***Dr. Rick Hefner,*** ***Northrop Grumman Corporation***	**BREAK (9:45 AM - 10:15 AM) (TUTORIAL ATTENDEES ONLY)**	1A1 Tutorial What Do Process Performance Baselines and Models Look Like? (con't) ***Dr. Rick Hefner,*** ***Northrop Grumman Corporation***	**LUNCH (12:00 PM - 1:00 PM) (TUTORIAL ATTENDEES ONLY)**	1B1 Tutorial Best-In-Class Early Defect Detection and Defect Prevention ***Mr. Timothy Olson,*** ***Lean Solutions Institute, Inc. (QIC)***	**BREAK (2:45 PM - 3:15 PM) (TUTORIAL ATTENDEES ONLY)**	1B1 Tutorial Best-In-Class Early Defect Detection and Defect Prevention (con't) ***Mr. Timothy Olson,*** ***Lean Solutions Institute, Inc. (QIC)***	**RECEPTION (5:30 PM - 7:00 PM) (ALL ATTENDEES)**
Track 2 Grand Mesa F	1A2 Tutorial How to Define Practical Systems Engineering Metrics ***Mr. Timothy Olson,*** ***Lean Solutions Institute, Inc. (QIC)***		1A2 Tutorial How to Define Practical Systems Engineering Metrics (con't) ***Mr. Timothy Olson,*** ***Lean Solutions Institute, Inc. (QIC)***		1B2 Tutorial Applying CMMI in Small Settings ***Dr. Rick Hefner,*** ***Northrop Grumman Corporation***		1B2 Tutorial Applying CMMI in Small Settings (con't) ***Mr. Rick Hefner,*** ***Northrop Grumman Corporation***	
Track 3 Highlands	1A3 Tutorial Requirements Development and Management ***Mr. Al Florence,*** ***The MITRE Corporation***		1A3 Tutorial Requirements Development and Management (con't) ***Mr. Al Florence,*** ***The MITRE Corporation***		1B3 Tutorial Systems/Software/Hardware Quality Assurance ***Mr. Al Florence,*** ***The MITRE Corporation***		1B3 Tutorial Systems/Software/Hardware Quality Assurance (con't) ***Mr. Al Florence,*** ***The MITRE Corporation***	
Track 4 Chasm Creek A	1A4 Tutorial Preparing for and Surviving a SCAMPI Appraisal – A PIID Workshop ***Mr. Raymond Kile,*** ***The Center for Systems Management***		1A4 Tutorial Preparing for and Surviving a SCAMPI Appraisal – A PIID Workshop (con't) ***Mr. Raymond Kile,*** ***The Center for Systems Management***		1B4 Tutorial A Survival Primer for New Process Improvement Explorers ***Dr. Richard Turner,*** ***Systems and Software Consortium***		1B4 Tutorial A Survival Primer for New Process Improvement Explorers (con't) ***Dr. Richard Turner,*** ***Systems and Software Consortium***	
Track 5 Mesa Verde	1A5 Tutorial Integrating CMMI, Lean and Six Sigma ***Mr. Robert Ferguson,*** ***SEI***		1A5 Tutorial Integrating CMMI, Lean and Six Sigma (con't) ***Mr. Robert Ferguson,*** ***SEI***		1B5 Tutorial ROI from CMMI and Other Process Improvements ***Mr. Thomas McGibbon,*** ***ITT AES***		1B5 Tutorial ROI from CMMI and Other Process Improvements (con't) ***Mr. Thomas McGibbon,*** ***ITT AES***	
Track 6 Wind River	1A6 Tutorial CMMI V1.2 -- An Overview ***Mr. David Phillips,*** ***SEI***		1A6 Tutorial CMMI V1.2 -- An Overview (con't) ***Mr. David Phillips,*** ***SEI***		1B6 Tutorial CMMI Crash Course: What the SEI Won't Teach You (Updated and Improved!) ***Mr. Hillel Glazer,*** ***Entinex, Inc.***		1B6 Tutorial CMMI Crash Course: What the SEI Won't Teach You (Updated and Improved!) (con't) ***Mr. Hillel Glazer,*** ***Entinex, Inc.***	
Track 7 Wind Star	1A7 Tutorial Maturity Level 6! Automating Software Engineering Processes with IBM Rational's Suite of Integrated Automation ***Mr. Rolf Reitzig,*** ***Cognence, Inc.***		1A7 Tutorial Maturity Level 6! Automating Software Engineering Processes with IBM Rational's Suite of Integrated Automation (con't) ***Mr. Rolf Reitzig,*** ***Cognence, Inc.***					

Technical Sessions - Tuesday, November 13, 2007

	Session/Chair	Session C 1:30 PM	Session C 2:15 PM		Session/Chair	Session D 3:30 PM	Session D 4:15 PM	
Track 1 Grand Mesa D/E	**CMMI and Process Improvement** ***Mr. Brian Gallagher, SEI***	2C1 When the Only Tool You Have is a Hammer, Every Problem Begins to Look Like a Nail ***Mr. Sam Fogle, ACE Guides, LLC***	2C1 The Journey to CMMI Level 3 ***Mr. Andrew Lay, Lockheed Martin Aeronautics Company***	**BREAK (3:00 PM - 3:30 PM)**	**CMMI and Process Improvement** ***Mr. Brian Gallagher, SEI***	2D1 Visualizing Improvement with Capability Waypoints ***Mr. Robert Jacob, Naval Air Systems Command***	2D1 Institutionalization Measures: Key to Improved Process Monitoring ***Dr. John Rusnak, Lockheed Martin Space Systems Company***	**RECEPTION (5:00 PM - 6:30 PM)**
Track 2 Grand Mesa F	**Practical Guidance** ***Dr. Rich Turner, The Stevens Institute***	2C2 How Not to be a CMMI Horror Story: A Simple, Scalable Process Architecture for CMMI that Works for Agile Teams, in Small Settings, and Everywhere Else. Prove Me Wrong. Please!! ***Mr. Hillel Glazer, Entinex, Inc.***	2C2 High Performance versus High Maturity ***Ms. Anita Carleton, SEI***		**Practical Guidance** ***Dr. Rich Turner, The Stevens Institute***	2D2 Jump Starting Multi-Organizational Teams for High Process Capability ***Ms. Joan Weszka, Lockheed Martin Corporate Engineering & Technology***	2D2	
Track 3 Highlands	**Lean, Six Sigma Agile and CMMI** ***Ms. Susan Bassham, US Army***	2C3 Assuring Quality for Efficient & Sufficient Testing ***Mr. Pramod Varma, Wipro Technologies***	2C3		**Lean, Six Sigma Agile and CMMI** ***Ms. Susan Bassham, US Army***	2D3	2D3	
Track 4 Chasm Creek	**Acquisition** ***Ms. Lorraine Adams, SEI***	2C4 Bridging Process Improvement During Program Management Evolution: An Experience Report ***Capt DeWitt Latimer, USAF***	2C4		**Acquisition** ***Ms. Lorraine Adams, SEI***	2D4	2D4 An "Embedded SCAMPI-C" Appraisal at the National Security Agency ***Mr. Joseph Wickless, SEI***	
Track 5 Mesa Verde	**Performance Results** ***Dr. Dennis Godenson, SEI***	2C5 Linking Project Performance to CMMI Process Capability through Lean Measurements ***Mr. Jeffrey Dutton, Jacobs Technology***	2C5		**Performance Results** ***Dr. Dennis Godenson, SEI***	2D5 Quantitative Models for Predicting Project Success ***Dr. Rick Hefner, Northrop Grumman Corporation***	2D5	
Track 6 Wind River	**Appraisals** ***Mr. Geoff Draper, Harris Corporation***	2C6 How to Kick Start a Process Improvement Effort to Achieve a CMMI Rating ***Ms. Brenda Hall, Computer Sciences Corporation***	2C6 SEI Appraisal Program Quality Report ***Mr. William Hayes, SEI***		**Appraisals** ***Mr. Geoff Draper, Harris Corporation***	2D6 The Process In-execution Review (PIER) After Three Years ***Mr. Dale Swanson, The MITRE Corporation***	2D6 I'm Preparing My Organization for an Appraisal, but I'm Not Really Sure I Understand this PIID Thing. Should I Worry? ***Mr. Sam Fogle, ACE Guides, LLC***	
Track 7 Wind Star	**Multi-Model Implementation** ***Mr. Paul Croll, Computer Sciences Corporation***	2C7 Aligning CMMI and ITIL – Where Am I and Which Way Should I Go ***Mr. Pat Mitryk, Cognence, Inc.***	2C7 Integrated System Framework: A Way Out of the Multi-Model Madness ***Mr. Paul Byrnes, Integrated System Diagnostics***		**Multi-Model Implementation** ***Mr. Paul Croll, Computer Sciences Corporation***	2D7 Combining Multiple Business Lines Under a Single Enterprise Quality Architecture ***Mr. Jeremy Williams, L-3 Communications***	2D7 CMMI Outside the Box: Using Shared Process Architecture to Integrate Control into Process Design ***Mr. Doug Jackson, Robbins-Gioia, LLC***	

Technical Sessions - Wednesday, November 14, 2007

Track	Session/Chair	Session A 8:15 AM	Session A 9:00 AM		Session/Chair	Session B 10:15 AM	Session B 11:00 AM	
Track 1 Grand Mesa D/E	**CMMI and Process Improvement** ***Mr. Brian Gallagher, SEI***	3A1 CMMI Contenders, CMMI Pretenders ***Dr. Rick Hefner, Northrop Grumman Corporation***	3A1 Initial Fears of CMMI Introduction and How Things Really Played Out ***Dr. Paul Nugent, General Dynamics Advanced Information Systems***	BREAK (9:45 AM - 10:15 AM)	**CMMI and Process Improvement** ***Mr. Brian Gallagher, SEI***	3B1 Software Firm + CMMI Level 2 Initiative + 15 months = Dramatic Quality Improvements ***Mr. Jeff Simpson, Campus Management Corporation***	3B1 How to Explain the Value of Every CMMI Practice ***Dr. Rick Hefner, Northrop Grumman Corporation***	LUNCH (12:00 PM - 1:30 PM)
Track 2 Grand Mesa F	**Practical Guidance** ***Dr. Rich Turner, The Stevens Institute***	3A2 The What, When, Why and How for CMMI Training ***Mr. Tom Bragg, AVISTA Incorporated***	3A2 Transitioning to the CMMI: What They Never Told You ***Mr. Steve Fried, The Boeing Company***		**Practical Guidance** ***Dr. Rich Turner, The Stevens Institute***	3B2 CMMI Implementation: Overcoming the PPQA Challenge ***Mr. Pat Mitryk, Cognence, Inc.***	3B2 How to Measurably Improve Your Requirements ***Mr. Timothy Olson, Lean Solutions Institute, Inc. (QIC)***	
Track 3 Highlands	**Lean, Six Sigma, Agile, and CMMI** ***Ms. Susan Bassham, US Army***	3A3 Using Lean Six Sigma to Implement CMMI High Maturity Practices ***Ms. Beth Clark, Lockheed Martin***	3A3 The Potential for Lean Acquisition of Software Intensive Systems ***Mr. Jeffrey Dutton, Jacobs Technology***		**Lean, Six Sigma, Agile, and CMMI** ***Ms. Susan Bassham, US Army***	3B3 Lean, CMMI and Six Sigma Working Together to Achieve High Success ***Ms. Susan Bassham, US Army Aviation and Missle Command***	3B3	
Track 4 Chasm Creek	**Acquisition** ***Ms. Lorraine Adams, SEI***	3A4 Driving Process Improvement Using the CMMI-ACQ at General Motors **Dr. Richard Frost, General Motors**	3A4 Leading Indicators for Acquisition Programs ***Mr. Robert Ferguson, SEI***		**High Maturity** ***Dr. Randy Walters, Northrop Grumman Corporation***	3B4 CMMI High Maturity Misconceptions ***Mr. William Hayes, SEI***	3B4 High Maturity: How Do We Know? ***Dr. Mike Konrad, SEI***	
Track 5 Mesa Verde	**Performance Results** ***Dr. Dennis Goldenson, SEI***	3A5 Program Level Return on Investment for CMMI® Process Improvement ***Mr. J Perry, BAE Systems***	3A5		**Performance Results** ***Dr. Dennis Goldenson, SEI***	3B5 How Do We Get on the Road to Maturity? ***Mrs. Debra Perry, Harris Corporation***	3B5 Understanding CMMI Measurement Capabilities Performance & Outcomes: Results from the 2007 SEI State of Measurement Practices Survey ***Dr. Dennis Goldenson, SEI***	
Track 6 Wind River	**Appraisals** ***Mr. Geoff Draper, Harris Corporation***	3A6 Executing a Successful CMMI Maturity Level 3 Scampi for Spawar Systems Center Charleston ***Mr. Michael Kutch, SPAWAR Systems Center Charleston***	3A6		**Appraisals** ***Mr. Geoff Draper, Harris Corporation***	3B6 CMMI SCAMPI Appraisals – The People/The Process/The Results-United Space Alliance, LLC Lessons Learned ***Ms. Robin Hurst, United Space Alliance, LLC***	3B6 Proposed Approach to Heterogeneous CMMI Appraisals ***Mr. Joseph Vandeville, Northrop Grumman Corporation***	
Track 7 Wind Star	**Multi-Model Implementation,** ***Mr. Paul Croll, Computer Sciences Corporation***	3A7 Excellence at the Organization, Team and Individual levels; CMMI, TSP and PSP - Experience, Lessons Learned and Why all Three are Needed **Mr. Girish Seshagiri, Advanced Information Services, Inc.**	3A7 IEEE Life Cycle Standards and the CMMI® – Implementation Considerations ***Dr. Peter Hantos, The Aerospace Corporation***		**Multi-Model Implementation,** ***Mr. Paul Croll, Computer Sciences Corporation***	3B7 Using CMMI and OPM3 to Improve Performance ***Mr. Thomas Keuten, Pariveda Solutions***	3B7 Complementary or Competing? Achieving Synergy with OPM3®, CMMI®, and ISO 9001-2000 ***Mr. Mark Scott, Harris Corporation***	

Technical Sessions - Wednesday, November 14, 2007

Track	Session/Chair	Session C 1:30 PM	Session C 2:15 PM		Session/Chair	Session D 3:30 PM	Session D 4:15 PM	
Track 1 Grand Mesa D/E	**CMMI and Process Improvement** ***Mr. Brian Gallagher, SEI***	3C1 Mrs. Doubtfire Answers Your Questions about Process Improvement ***Dr. Rick Hefner, Northrop Grumman Corporation***	3C1 Developing a Second Generation Directive System Architecture ***Mr. Kenneth Weinberg, Raytheon Company***	BREAK (3:00 PM - 3:30 PM)	**CMMI and Process Improvement,** ***Mr. Brian Gallagher, SEI***	3D1 Whose Processes Are These, Anyway ***Ms. Judith Tejan, AAI Services Corporation***	3D1 Scientific Breakthroughs in Process Improvement **Ms. Cheryl White, Change Delivery Group**	CONFERENCE ADJOURNS FOR THE DAY (5:00 PM)
Track 2 Grand Mesa F	**Practical Guidance** ***Dr. Rich Turner, The Stevens Institute***	3C2 Defining a Decision Analysis and Resolution (DAR) Process Based on Best Practices ***Mr. Timothy Olson, Lean Solutions Institute, Inc. (QIC)***	3C2 Going from Level 3 to Level 5: Lessons Learned ***Mr. Scott Derby, AVISTA Incorporated***		**Practical Guidance** ***Dr. Rich Turner, The Stevens Institute***	3D2 Relationship Between Risk Management and Project Performance ***Mr. Warren Scheinin, Northrop Grumman Corporation***	3D2 Redefining QA's Role in Process Compliance ***Mr. Dean Wooley, Harris Corporation***	
Track 3 Highlands	**Lean, Six Sigma, Agile and CMMI** ***Ms. Susan Bassham, US Army***	3C3 Comparing and Contrasting the PP & PMC Process Areas of CMMI v 1.2 and SCRUM **Dr. Aldo Dagnino** ***ABB, Inc. - US Corporate Research***	3C3 Applying Lean Principles to Systems Engineering **Mr. Timothy Olson, Lean Solutions Institute, Inc. (QIC)**		**Systems Engineering** ***Mr. Jerry Fisher, Aerospace Corporation***	3D3 Effective Systems Engineering: What's the Payoff for Program Performance? ***NDIA Systems EngineeringsEffectiveness***	3D3 What's All this 'churn' in Systems Engineering Standards and Models!? ***Mr. Donald Gantzer, SAIC***	
Track 4 Chasm Creek	**High Maturity** ***Dr. Randy Walters, Northrop Grumman Corporation***	3C4 High Maturity System/Software Cost Estimation ***Dr. Richard Welch, Northrop Grumman Corporation***	3C4 ADVANCE - Implementing a Defect Model for Performance Prediction ***Mr. Stanley Martin, L-3 Communications/IS***		**High Maturity** ***Dr. Randy Walters, Northrop Grumman Corporation***	3D4 Statistically Managing a Critical Logistics Schedule Using CMMI ***Mr. Robert Tuthill, Northrop Grumman Corporation***	3D4 A More Practical Set of High Maturity Practices ***Dr. Rick Hefner, Northrop Grumman Corporation***	
Track 5 Mesa Verde	**Performance Results** ***Dr. Dennis Goldenson, SEI***	3C5 Using Predicted Delivered Defects as a Management Tool ***Mr. Dustin Sims, BAE Systems***	3C5 Calibrating the Project Planning Process ***Mr. Donald Corpron, Northrop Grumman Corporation***		**Performance Results/ Measurement** ***Dr. Dennis Goldenson, SEI***	3D5 Predicting the Future with CPI ***Mr. Donald Corpron, Northrop Grumman Corporation***	3D5 All Others Bring Data ***Ms. Charlene Gross, SEI***	
Track 6 Wind River	**Appraisals** ***Mr. Geoff Draper, Harris Corporation***	3C6 Selecting a Representative Sample for CMMI Enterprise Appraisals ***Ms. Kathryn Kirby, Raytheon Company***	3C6 Logistics and Lessons Learned in Conducting an CMMI® Maturity Level 3 Full-Model Scope Enteprise-level Appraisal ***Ms. Kathryn Kirby, Raytheon Company***		**Appraisals** ***Mr. Geoff Draper, Harris Corporation***	3D6	3D6	
Track 7 Wind Star	**Multi-Model Implementation** ***Mr. Paul Croll, Computer Sciences Corporation***	3C7 Formal Process Definition with Industry Standards ***Mr. Chris Armstrong, Armstrong Process Group, Inc.***	3C7 Strengthening CMMI Implementation thru PSP Based Bottom-up Approach to Process improvement ***Mr. Ramprasad Tayur Subramahyam, Motorola***		**Non-Development Implementation** ***Mr. Paul Croll, Computer Sciences Corporation***	3D7 Project Management Architecture Design as a Critical Success Factor in CMMI Model Implementation ***Mr. Christen MacMillan, L-3 Communications***	3D7 CMMI—Next Steps ***Ms. Kristen Baldwin, ODUSD (A&T) SSE/SSA***	

Technical Sessions - Thursday, November 15, 2007

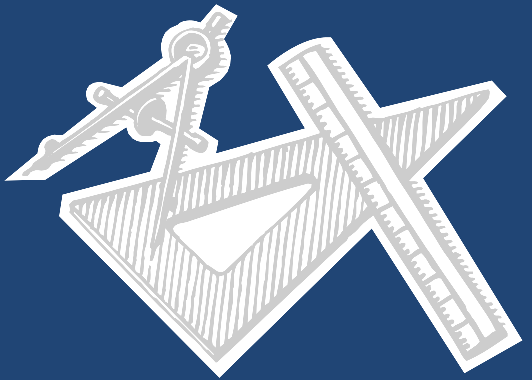
Track	Session/Chair	Session A 8:15 AM	Session A 9:00 AM	Break	Session/Chair	Session B 10:15 AM	Session B 11:00 AM	Lunch
Track 1 Grand Mesa D/E	**CMMI and Process Improvement** ***Mr. Brian Gallagher, SEI***	4A1 Fast Track to Higher CMMI Maturity Levels: Lessons Learned from Five Initiatives ***Ms. Cheryl White, Change Delivery***	4A1 SE Complexity and Project Management ***Mr. Robert W. Ferguson, SEI***	BREAK (9:45 AM - 10:15 AM)	**CMMI and Process Improvement** ***Mr. Brian Gallagher, SEI***	4B1 Seven Success Factors for CMMI Based Process Improvement ***Mr. Orhan Kalayci, XPI - eXtreme Process Improvement***	4B1 CMMI Process Improvement: It's Not a Technical Problem, It's a People Problem! ***Mr. Rolf Reitzig, Cognence, Inc.***	LUNCH & AWARD PRESENTATION (12:00 PM - 1:30 PM)
Track 2 Grand Mesa F	**Practical Guidance** ***Dr. Rich Turner, The Stevens Institute***	4A2 Getting Your Arms Around Stakeholder Involvement ***Ms. Susan Byrnes, Natural SPI, Inc.***	4A2 DAR: Appraisal is Coming,… No Trade Studies Anywhere,… Now What? ***Ms. Diane Mizukami-Williams, Northrop Grumman Mission Systems***		**Practical Guidance** ***Dr. Rich Turner, The Stevens Institute***	4B2 Beating the Odds – A Tale of One Company's Rapid Rise to Maturity Level 5 ***Mr. Henry Schneider, Process and Product Quality Consulting, LLC***	4B2 A Framework to Manage and Evaluate Remote Software Testing Using CMMI ***Dr. Aldo Dagnino, ABB, Inc. - US Corporate Research***	
Track 3 Highlands	**Systems Engineering** ***Mr. Jerry Fisher, Aerospace Corporation***	4A3 Project Management by Functional Capability ***Mr. Fred Schenker, SEI***	4A3 Software Architecture Development Leveraging the Attribute Driven Design and CMMI Methodologies ***Dr. Aldo Dagnino, ABB, Inc. US Corporate Research***		**Systems Engineering** ***Mr. Jerry Fisher, Aerospace Corporation***	4B3 Systems Assurance – Practices Make Perfect – How Your Engineering and Management Practices Can Help Meet the Assurance Challenge ***Mr. Paul Croll, Computer Sciences Corporation***	4B3 Tools and Resources to Enable Systems Engineering Improvement ***Mr. Michael Kutch, SPAWAR Systems Center Charleston***	
Track 4 Chasm Creek	**High Maturity** ***Dr. Randy Walters, Northrop Grumman Corporation***	4A4 Thought Before Action: A High Maturity Roadmap for the Lower Maturity Organization ***Mr. James McHale, SEI***	4A4 Integrated Implementation of Advanced Maturity Practices ***Mr. Dale Childs, DFAS***		**High Maturity** ***Mr. Randy Walters, Northrop Grumman Corporation***	4B4 Process Performance Baselines and Models: Duh, I Don't Get It ***Ms. Diane Mizukami-Williams, Northrop Grumman Mission Systems***	4B4 Expanding Statistical Process Control Across All Engineering Disciplines: A Sequence of Practical Case Studies ***Dr. Richard Welch, Northrop Grumman Corporation***	
Track 5 Mesa Verde	**Measurement** ***Dr. Dennis Goldenson, SEI***	4A5 The Productivity Puzzle ***Mrs. Jill Brooks, Raytheon Company***	4A5 Using Metrics to Develop a Software Project Strategy ***Mr. Donald Beckett, Quantitative Software Management***		**Measurement** ***Dr. Dennis Goldenson, SEI***	4B5 Lessons Learned in the Implementation of Measurement Techniques for CMMI GP 2.8 ***Dr. Susanna Schwab, L-3 Communications***	4B5 Optimizing the Measurement Process ***Mr. Gary Natwick, Harris Corporation***	
Track 6 Wind River	**Appraisals** ***Mr. Geoff Draper, Harris Corporation***	4A6 Cutting Appraisal Costs in Half ***Dr. Rick Hefner, Northrop Grumman Corporation***	4A6 Experiences Implementing Very Large High Confidence Enterprise Appraisals ***Mr. Paul Byrnes, Integrated System Diagnostics***		**Appraisals** ***Mr. Geoff Draper, Harris Corporation***	4B6 Process Compliance the Smart Way ***Mr. Gary Natwick, Harris Corporation***	4B6 Judging the Suitability of Alternative Practices ***Dr. Rick Hefner, Northrop Grumman Corporation***	
Track 7 Wind Star	**Non-Development Implementation** ***Mr. Paul Croll, Computer Sciences Corporation***	4A7 Quality Maturity Model – Foundation for Process Institutionalization ***Mr. Sumit Gupta, Royal Bank of Scotland - India Development Center***	4A7 Not Just for Software Anymore: Lessons Learned From a CMMI™ Appraisal on Projects in a Nonnuclear Weapons Facility ***Mr. Daniel Fritts, Honeywell***		**Non-Development Implementation** ***Mr. Paul Croll, Computer Sciences Corporation Mr. Paul Croll,***	4B7 CMMI for Services Overview ***Mr. Craig Hollenbach, Northrop Grumman Corporation***	4B7 Defining Lean Service and Maintenance Processes that are CMMI Compliant ***Mr. Timothy Olson, Lean Solutions Institute, Inc. (QIC)***	

Technical Sessions - Thursday, November 15, 2007

Track	Session/Chair	Session C 1:30 PM	Session C 2:15 PM	Session/Chair	Session D 3:30 PM	Session D 4:15 PM
Track 1 Grand Mesa D/E	**CMMI and Process Improvement** ***Mr. Brian Gallagher, SEI***	4C1 Untethered Activities - The Real Reason for Schedule Slips ***Mr. Rolf Reitzig, Cognence, Inc.***	4C1 Improving Project Proposal Quality via CMMI ***Mr. Chen Wang, Institute for Information Industry***	**CMMI and Process Improvement** ***Mr. Brian Gallagher, SEI***	4D1	4D1
Track 2 Grand Mesa F	**Practical Guidance** ***Dr. Rich Turner, The Stevens Institute***	4C2 CMMI, Configuration Management, and Baseball – How to Score ***Ms. Julie Schmarje, Raytheon Company***	4C2 Automated Systems for Project Portfolio Management - Project Success and Outstanding Earned Value ***Mr. Pothiraj Selvaraj, Global Computer Enterprises***	**Practical Guidance** ***Dr. Rich Turner, The Stevens Institute***	4D2	4D2
Track 3 Highlands	**Systems Engineering** ***Mr. Jerry Fisher, Aerospace Corporation***	4C3 Applying CMMI Principles to Certification Process of Legacy Aircraft ***Ms. Michele Bruno, The Boeing Company***	4C3 Accreditation of Undergraduate Programs in Computing, Software Engineering, Systems Engineering and the Ties to CMMI-based Improvement ***Mr. Dan Nash, Raytheon Company***	**Systems Engineering** ***Mr. Jerry Fisher, Aerospace Corporation***	4D3 How Future Trends in Systems and Software Engineering Bode Well for Enabling the Rapid Adoption of CMMI ***Dr. Ken Nidiffer, SEI***	4D3
Track 4 Chasm Creek	**High Maturity** ***Dr. Randy Walters, Northrop Grumman Corporation***	4C4 Statistical Process Control Applied to Specification Requirements Process ***Mr. Al Florence, The MITRE Corporation***	4C4 Implementing High Maturity in a Production Support Environment ***Ms. Virginia Slavin, SSCI***	**High Maturity** ***Dr. Randy Walters, Northrop Grumman Corporation***	4D4 Using the Scientific Method at Levels 4-5 ***Dr. Jeff Ricketts, Raytheon Company***	4D4
Track 5 Mesa Verde	**Measurement** ***Dr. Dennis Goldenson, SEI***	4C5	4C5 Measurement Strategies in the CMMI ***Dr. Rick Hefner, Northrop Grumman Corporation***	**Measurement** ***Dr. Dennis Goldenson, SEI***	4D5 5 Major Sites, 4 Separate Disciplines, 11,500 Engineers, 1 Data Repository: Having Data You Can Actually Use – Priceless! ***Mrs. Jill Brooks, Raytheon Company***	4D5
Track 6 Wind River	**Appraisals** ***Mr. Geoff Draper, Harris Corporation***	4C6 Lessons Learned Conducting High Maturity SCAMPIs ***Mr. Paul Byrnes, Integrated System Diagnostics***	4C6 Benefits of SCAMPI Class C in Small Settings ***Dr. Mary Anne Herndon, Transdyne Corporation***	**Appraisals** ***Mr. Geoff Draper, Harris Corporation***	4D6 Lower Cost, More Effective Alternatives to SCAMPIs **Dr. Rick Hefner,** ***Northrop Grumman Corporation***	4D6 Using Workshops to Speed CMMI Adoption and Evidence Gathering **Dr. Rick Hefner,** ***Northrop Grumman Corporation***
Track 7 Wind Star	**Extensions** ***Mr. Paul Croll, Computer Sciences Corporation***	4C7 Achieving CMMI Level 3 in a Consulting-based Environment ***Mr. Jeremy Williams, L-3 Communications Enterprise IT Solutions***	4C7 Implementing Acquisition and System Engineering Processes in a Maintenance Organization ***Mr. Bill Fetech, The MITRE Corporation***	**Extensions** ***Mr. Paul Croll, Computer Sciences Corporation***	4D7	4D7

BREAK (3:00 PM - 3:30 PM)

CONFERENCE ADJOURNS (5:00 PM)



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NDIA 7th Annual CMMI Technology Conference & User Group:12-15 Nov 2007

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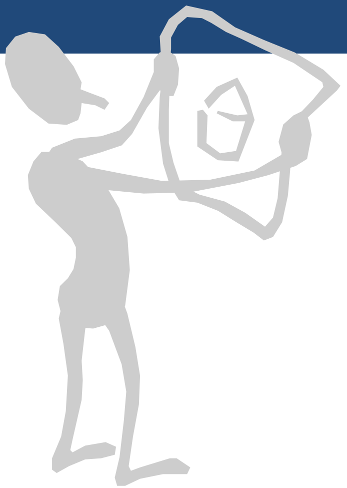

The Presenter

TO

Enterprise Architecture Practice Lead
Responsible for corporate IT Policy definition

Key roles

- *Chief / Lead / Principal*
- *Strategist*
- *Mentor*
- *Auditor*

CMM-CMMI adoption background in high-maturity (3-5) organizations

Worked on / advised resources in

Regular and recognized speaker and writer on Enterprise Architecture and Systems Engineering Strategy

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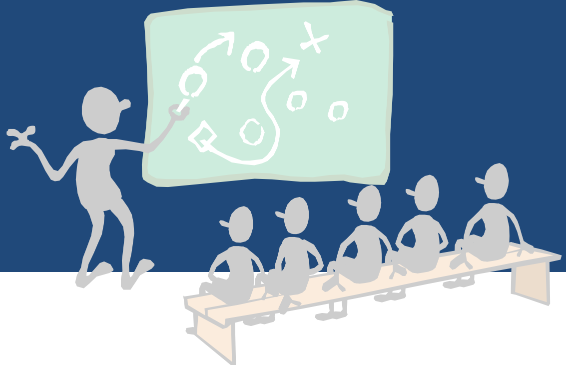

By a leading IT research and strategy consulting firm
In early 2007
As EA strategist, TOGAF expert and auditor aware of the concepts of Capability and Maturity
To plan and lead Architecture Maturity Appraisal in a large UK public sector organization

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Endeavored to follow TOGAF as its EA framework
Had 'heard the sound' of CMM
Was aware of the Architecture-CMM referred in context of US DoC and some state government bodies

The A raisal Team

the Director

the Managing Partner - MP

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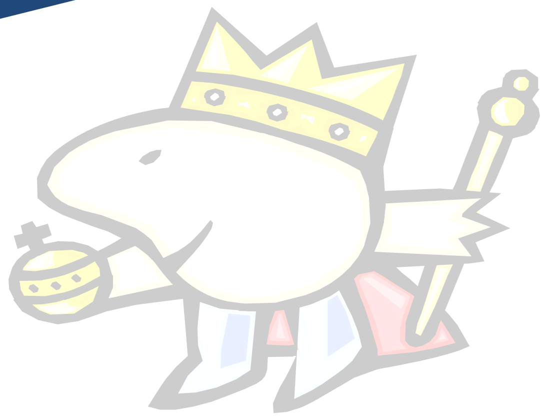

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Had EA-relevant subject list (like Process Areas)
Had a subject-based capability rating scale
Individual ratings were associated with adjectives (like CMMI levels)

H

Ratings were subjective

Concept of Maturity as an 'evolutionary plateau building on characteristics of lower levels' was absent

Dependence of subjects (PAs) on other subjects was not considered, though usually obvious to EA practitioners
Scores (usually being averages) ended up being fractional thus not giving any real meaning or clear adjective, to focus improvement

A raisal Pur ose Sta eholders ie

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Understand strength and weakness across areas of the EA practice
Obtain advice on EA strategy
Plan EA improvement over the next 12 months
Be able to make year-on-year comparison
Gain greater self-confidence in operations and delivery

Be industry-wide exemplar
Serve as prestige point for the stakeholders
Satisfy specific industry assessment framework
Achieve / exhibit credibility in others' eyes

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E.g. Business unit customers groups could be spared providing type A PII on Applications Architecture Development, but not on Architecture Communication

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Typical team size 4 (minimum 2)
Evidence as type A and B or C
All organization units in context covered

Im lementation PAs

TO

Architecture Process

Architecture Development

Business Linkage

Senior Management Involvement

Operating Unit Understanding and Acceptance of EA

EA Consistency, Representativeness, Contribution across Operating Units

Architecture Communication seeded through Process and Framework Documentation

Architecture Communication actuated through Passive Broadcasting Mechanisms

Active diffusion of EA ideas through Education and Communities

IT Security

EA Governance

IT Investment and Acquisition Strategy

IT Transformational Governance - Impact, Change and Migration

Im lementation evels

TO

0 = None
1 = Initial
2 = Under Development
3 = Defined
4 = Managed
5 = Measured (therefore Quantitatively Managed and Predictable – important qualifiers, else Measured can be vague or misinterpreted)
6 = Optimizing

Im lementation

Which statements are true at the moment, provide evidence

What subset of consecutive practice statements would they like (and realistically consider possible) to be true in the next 12 months, how
What priority (on a scale of 0-5, 5 being highest priority) would they give to improvement work on a process area in the next 12 months (this answer was also normalized for relative priority, un-normalized answers gave relative importance across groups)

Procedure

Fully Implemented (FI)

Largely Implemented (LI)

o

Partially Implemented (PI)

o

Not Implemented (NI)

Largely Implemented

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This was presented as indicator of self-discovery
This was emphasized as
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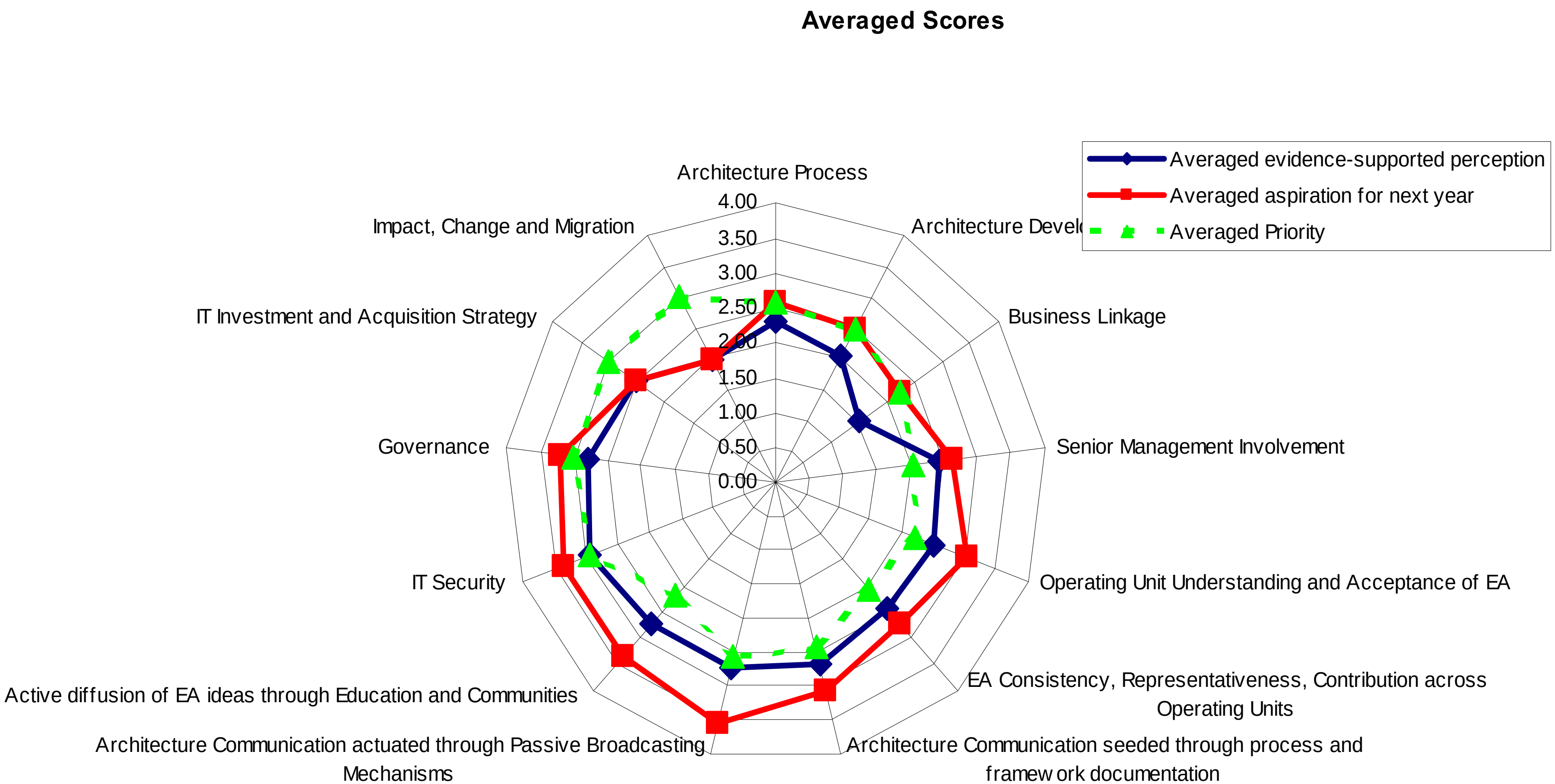
Grou ed PII ac ed avera ed erce tion as iration and riorit illustration not actual



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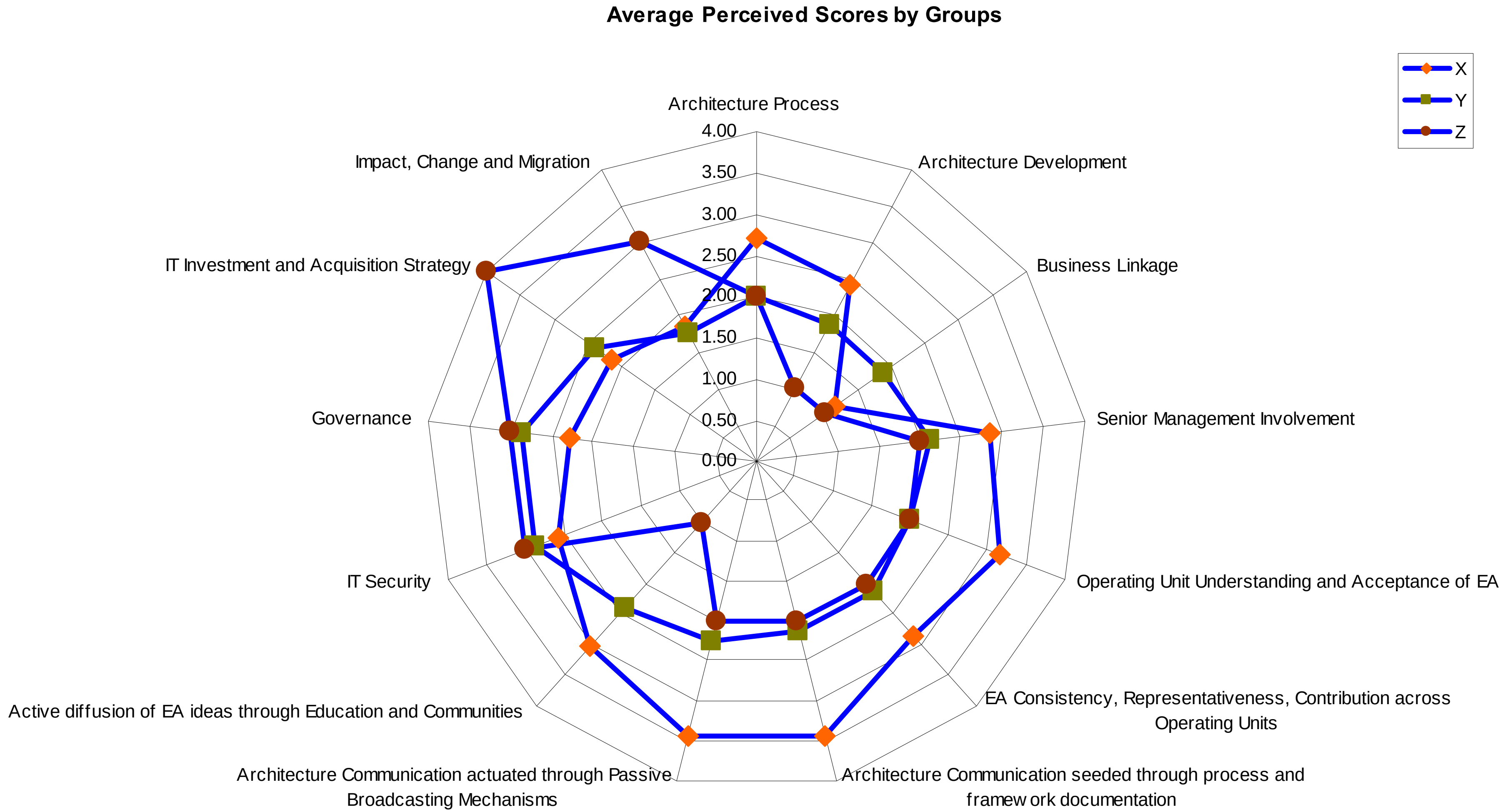

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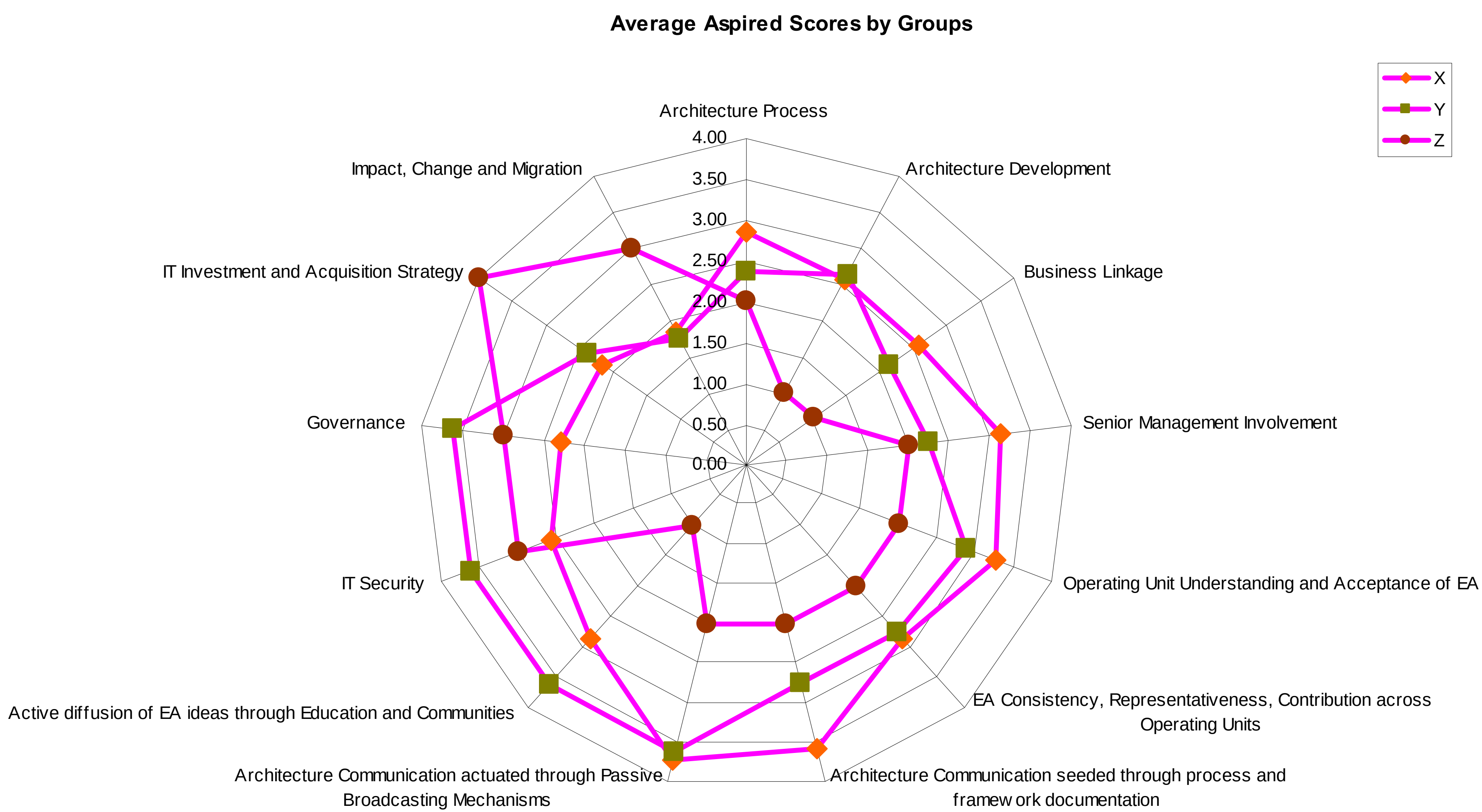

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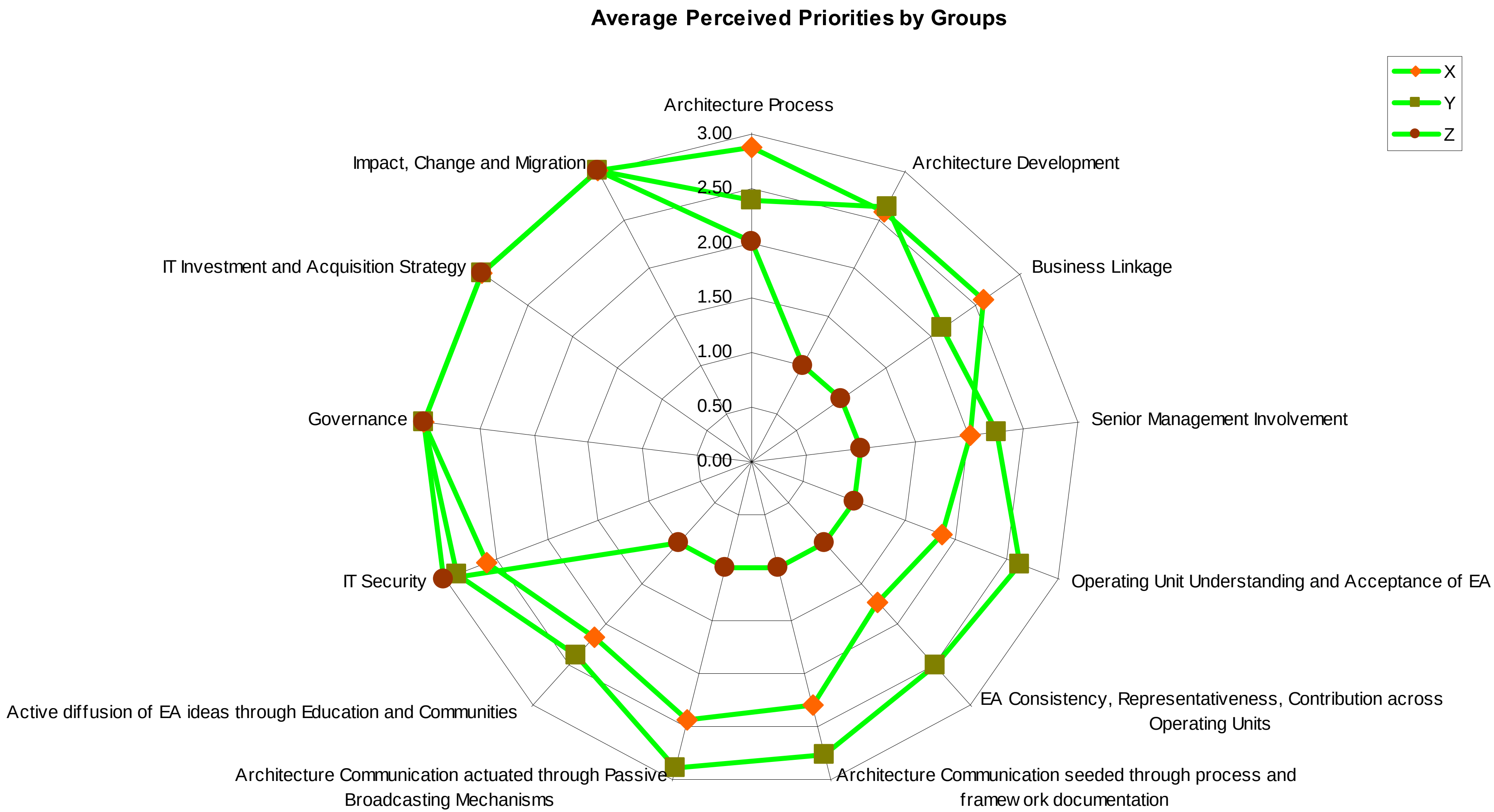
Priorit Grou s illustration not actual



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PIIs Indicate
illustration not actual

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Architecture Process
illustration not actual

Whereas a framework and compliance structure exists, the framework is not necessarily realized / extended into each business unit
Documentation wordy and representations Lego-based, thus limited sense of interaction / process

Go beyond Architecture building block blueprint and try to model functional flows in and across business unit systems
Create more specific checkpoints as part of the compliance regime to help business units deliver on non-functional requirements. Consider developing non-functional specializations (similar to security, already in place though under-resourced)
Work with business and associated client IT groups to model business and identify patterns in business processes
Develop full-fledged architecture process relevant to specific business units while keeping a mapping with the EA framework

Architecture evelo ment
illustration not actual

The axel of the ADM wheel – requirement (definition, management, development) is weak and does not always link to Architecture Development

Requirement Management (granularity, quantification, traceability, hierarchy, dependency)
Requirement to Architecture Linkage

Requirement to Governance Linkage

Im act han e and i ration illustration not actual

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Define roles associated with Configuration and Change Management
Establish Impact assessment (which may involve ADM for architecturally significant changes) and CCM processes
Establish dependable CCM infrastructure
Identify configurable items

esults

oadma illustration not actual

W

E.g.

Understand and engage more closely with the Business

Manage, relate, quantify and develop Requirements

Build Configuration and Change Management capability

Build ADM

Build Non-functional specialities

Attain role consistency / mapping

Broaden governance beyond Consent and Compliance

Build strategic capability within the team and benchmark it periodically

nderstand and n a e more closel ith the Business illustration not actual

O

The assessment indicates significant change in perception across groups (X, Y, Z)
Business is deeply federated and susceptible to changes effected by volatile political will
Architecture groups are thin on business / system behavior engineering and NFRs
Architecture teams are business-enablers, but can lead structured analysis
...

Engage more closely with the business on Architecture Communication, including Education and Communities
...
Look for patterns in business processes and be willing to develop cloned services owned by business units (where budget will come more readily for the α prototype), rather than common services with central ownership

illustration not actual

How the business (or various business lines) is used by its user
What improvements / additional facilities are likely in this usage

Key business abstraction – boundaries, entities, processors
Business scenarios
Business patterns
Business component & services

How what the business is for, maps to how it does what it does

Business Reengineering
Business Automation
Business process Reusability
Improved Governance

onclusion

Clear objectives communicated and owned across the organization being appraised

Clarity, sufficiency of definition and repeatability of the appraisal mechanism

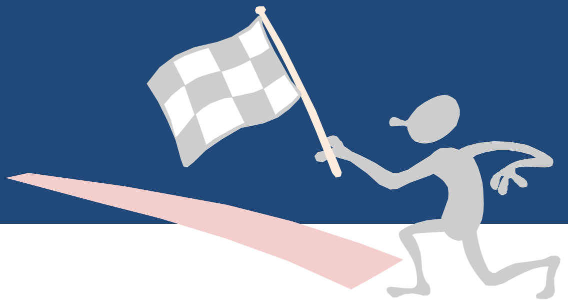
Objectivity coupled with pragmatism

Dependencies across Process Areas and their cumulative effect taken into account

Results presented with different perspectives, purposes and granularity

Results fed into strategy and reflected in improvement roadmap

omments and uestions



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Selection Criteria and Process

Å Criteria:

ï Relevance (to track or CMMI community at large)

ï Freshness (is this new information?)

ï Clarity (is the presentation well organized, does it make itôs points well)

ï Depth (have the seminal ideas been thought or worked through?

Å Process:

ï Initial selection by Track Chair

ï Selection peer reviewed

ï Selection of Conference winner by Technical Chairs

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CMMI and Process Improvement

Dr. Rick Hefner

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DEFINING THE FUTURE

NORTHROP GRUMMAN
DEFINING THE FUTURE

How to Explain the Value of Every CMMI Practice

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Rick Hefner, Ph.D.
Director, Process Management
Northrop Grumman Corporation
rick.hefner@ngc.com

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Practical Guidance

Joan Weszka
Mary Lynn Penn

LOCKHEED MARTIN

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Jump Starting Multi-Organizational Teams for High Process Capability

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Joan Weszka
Lockheed Martin
Corporate Engineering & Technology
SSRC Center for Process Improvement Excellence

Mary Lynn Penn
Lockheed Martin
Information Systems & Global Services

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Lean, Six Sigma, Agile, and CMMI

Dr. Aldo Dagnino

Andrew Cordes

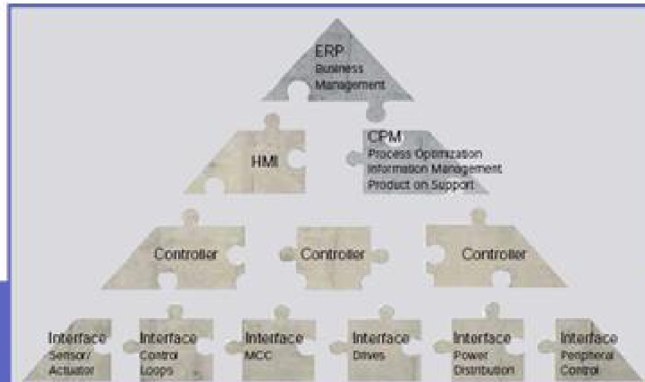
Karen Smiley

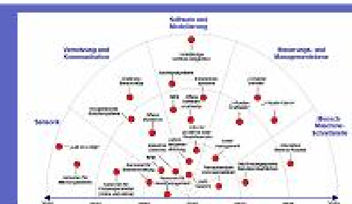
ABB

Comparing and Contrasting the PP and PMC Process Areas of CMMI v 1.2 and Scrum

Aldo Dagnino, Andrew Cordes, and Karen Smiley

ABB Inc. US Corporate Research Center





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Acquisition

Joe Wickless

Software Engineering Institute | Carnegie Mellon

An “Embedded” SCAMPI-C Appraisal at the National Security Agency

Joe Wickless
Software Engineering Institute
Acquisition Support Program

November 13, 2007

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Measurement and Performance Results

Donald M. Beckett

QSM The Intelligence behind Successful Software Projects

Quantitative Software Management

Using Metrics to Develop a Software Project Strategy

Donald M. Beckett

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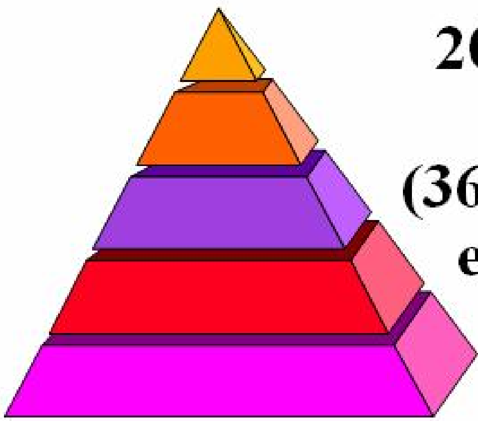

QSM The Intelligence behind Successful Software Projects

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Appraisals

Kathryn Kirby
John Miller
Carolyn Hickey

Raytheon
Customer Success Is Our Mission

Raytheon
Customer Success Is Our Mission

Logistics and Lessons Learned in Conducting a CMMI® ML3 SE/SW/IPPD/SS Enterprise-Level Appraisal

NDIA CMMI Conference 2007: #5371

Raytheon
Intelligence and Information Systems
Enterprise Process Team

Kathryn Kirby
John Miller
Carolyn Hickey

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Multi-Model Implementation

Mark Scott

HARRIS

HARRIS

Complementary or Competing?

Achieving Synergy With

OPM3®, CMMI®, and ISO 9001-2000

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High Maturity

Robert Tuthill

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DEFINING THE FUTURE

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DEFINING THE FUTURE

Statistically Managing a Critical Logistics Schedule Using CMMI ®

November 2007

Robert Tuthill
Northrop Grumman Integrated Systems

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Systems Engineering

Dr. Kenneth E. Nidiffer

Software Engineering Institute | Carnegie Mellon

Systems Engineering
- How Future Trends in Systems and Software Technology Bode Well for the Rapid Adoption of CMMI

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Investigation, Measures and Lessons Learned about the Relationship between CMMI Process Capability and Project or Program Performance
Hyatt Regency Tech Center- Denver, CO
Systems and Software Technology – Enabling the Global Mission

Dr. Kenneth E. Nidiffer
Director of Strategic Plans for Government Programs
nidiffer@sei.cmu.edu
703.908.1117

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Non-Development Implementations

Timothy Olson

Lean Solutions Institute, Inc. (LSI)

World-Class Quality

Defining Lean Service and Maintenance Processes

NDIA CMMI Conference
November 2007

Tim Olson, President
Lean Solutions Institute, Inc. (LSI)
(760) 804-1405 (Office)
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CMMI TECHNOLOGY CONFERENCE AND USER GROUP

Overall Best Presentation

Robert Tuthill

NORTHROP GRUMMAN
DEFINING THE FUTURE

Overall

NORTHROP GRUMMAN
DEFINING THE FUTURE

Statistically Managing a Critical Logistics Schedule Using CMMI ®

November 2007

Robert Tuthill
Northrop Grumman Integrated Systems

ISER-MLB-PR-07-154

CMMI-ACQ Rollout

CMMI Tech Conference 2007

Ms. Kristen Baldwin
Deputy Director, Software Engineering and Systems Assurance
Office of the Under Secretary of Defense
Acquisition, Technology and Logistics

CMMI-ACQ Development Strategy

- General Motors and the SEI developed the initial CMMI-ACQ model
  - Source models included CMMI Acquisition Module (CMMI-AM) and Software Acquisition Capability Maturity Model (SA-CMM)
  - Incorporated attempts by several acquisition organizations to adapt the CMMI-DEV to their organization
  - Best practices contained in the initial CMMI-ACQ went through an extensive review process with over 60 reviewers from 24 industry and government organizations
- Advisory Board and Model Team convened to guide ACQ v1.2
  - Representation from multiple acquisition stakeholders to ensure broad applicability (commercial/defense/IT/weapons)
- Pilots
  - Industry, Government acquisition organizations
  - SCAMPI B and C appraisals
- Final change requests for v1.2 solicited through stakeholder workshop

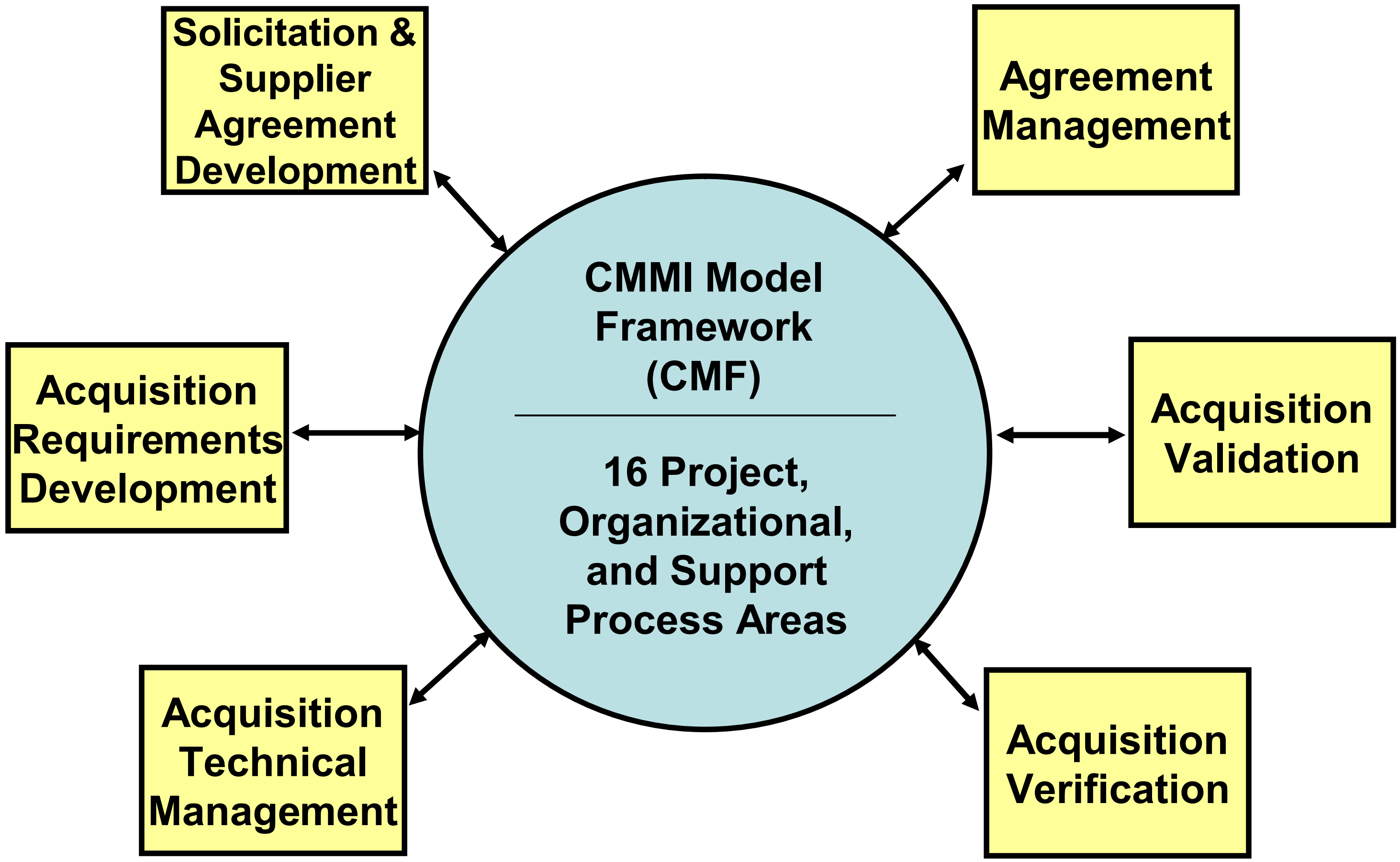
Advisory Board Membership

Organization	Name
Office of the Secretary of Defense	Kristen Baldwin
Navy	Katie Smith
Air Force	Bob Swarz
Army	Larry Osiecki
Defense Contract Management Command	Guy Mercurio
Government Accounting Office	Madhav Panwar
Missile Defense Agency	Mike Smith
General Motors	Rich Frost
National Defense Industry Association	Bob Rassa

Model Team Members

Organization	Name
Department of Homeland Security	Lloyd Anderson
Borland	Debbie Yedlin
GM/Pariveda	Tom Keuten
Defense Materiel Organisation	Brad Doohan
Army	John Scibilia
Defense Acquisition University	George Prosnik, Larry Baker
SEI	Mike Phillips, Mike Konrad, Aaron Clouse, Roger Bate, Sandy Shrum, Keith Kost, Rhonda Brown
Institute for Defense Analyses	Karen Richter, Margaret Porteus

CMMI-ACQ v1.2
Acquisition Category Process Areas



ACQ PAs seamlessly interact with all CMF PAs through ACQ-specific material added to CMF PAs

quisition Specific-Practice Enhancements to CMF PAs

- Measurement and Analysis
  - Includes earned value management material
  - Consistency across the model in measurement terms
- Project Planning
  - Includes establishment and maintenance of a project's acquisition strategy
- Project Planning and Project Monitoring and Control
  - Includes important specific practices on transition to operations and support
- Integrated Project Management and Organizational Process Development
  - Includes expected material on integrated teaming
  - Crucial to stakeholder involvement for acquisitions in a system of system environment

Highlights of Acquisition PAs

- Solicitation and Supplier Agreement Development (SSAD) and Agreement Management (AM)
  - Similar to Supplier Agreement Management in CMMI-DEV but greatly expanded into 2 PAs
  - Covers both legal contracts and other forms of supplier agreements such as interagency MOAs
- Acquisition Requirements Development
  - Similar to Requirements Development in CMMI-DEV, but develops customer and contractual requirements
  - At maturity level 2 due to its importance in acquisition

Highlights of Acquisition PAs

Å Acquisition Technical Management
- ï Emphasizes technical reviews and technical performance measurement for oversight of the supplier
- ï Interface Management included to complement the other kinds of technical management process areas (e.g., Risk Management, Requirements Management)

Å Acquisition Verification
- ï Added peer review specific goal as in CMMI-DEV

Å Acquisition Validation
- ï Applies to both acquirer and supplier activities, similar to CMMI-DEV Validation

Rolling ACQ Out

- ACQ is available at SEI Website
  - http://www.sei.cmu.edu/cmmi/models/index.html
- DoD views CMMI-ACQ as a source of best practices for the Program/Enterprise
  - DoD encourages a *continuous* implementation
  - DoD will not mandate its use for acquiring organizations
- The Acquisition Module (CMMI-AM) is still available
  - SEI in process of updating it to reflect content of the ACQ
- CMMI-ACQ will be available for certified appraisal in May 08
- The model and training will continue to be refined as experience is gained

High Performance versus High Maturity

7th Annual CMMI Technology Conference
November 12-15, 2007

Anita Carleton
Bill Nichols
John Mishler

nd Key Message

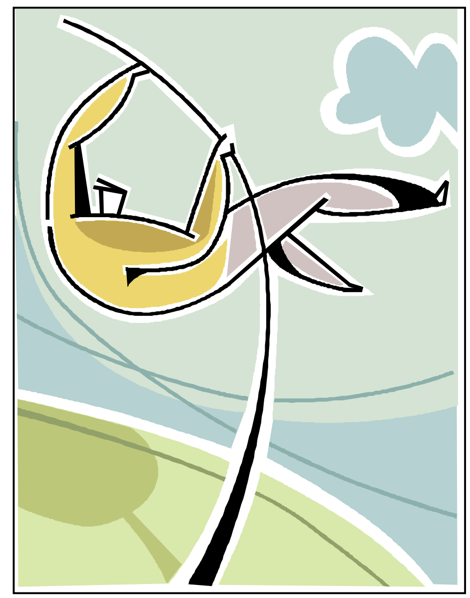
Achieving a high maturity rating doesnôt guarantee high performance

Many people believe that when you achieve a high maturity rating that high performance followsé

It doesnôt always work that wayé

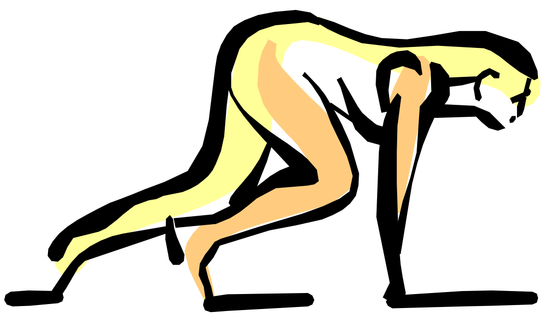
Å To get high performance, you need to build a solid foundation from the beginning

Å You can get high performance before you get to high maturity



cellent Framework

Offers the ñWhatò what needs to be done to create and improve your processes?



Provides a commonly understood framework for improving organizational capability

Does not provide operational processes (doesnõt provide the ñHowò)

the Right Questions?

Are we getting to get more business moving to a higher maturity?

Are we shipping (releasing) higher quality products?

Do we have better performance?

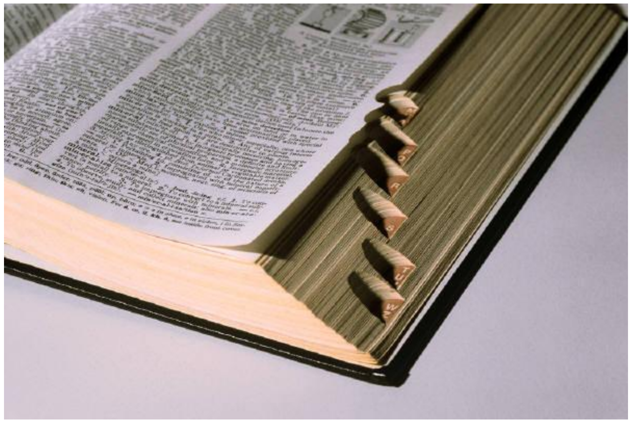
Do our products have more functionality?

Are we reducing our costs?

Are we meeting our schedule?

How do we get high performance from high maturity?

High Performance ï
High performance means obtaining superior outcomes.



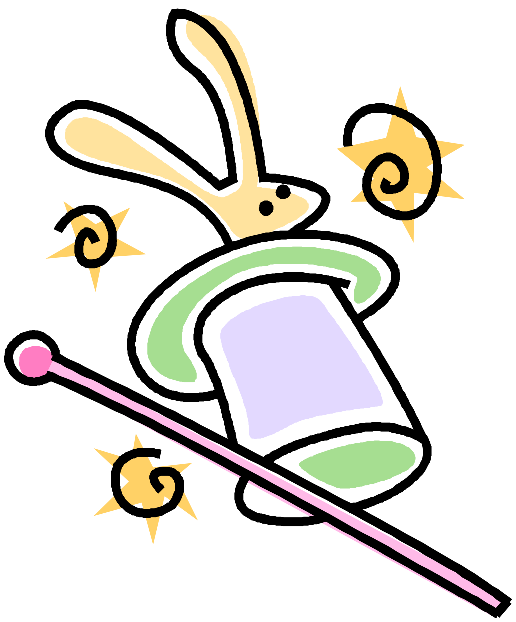
High Maturity ï
Implementing the concepts and practices at levels 4 and 5 of CMMI.

High Maturity Practices ï
The "specific practices" and "generic practices" at levels 4 and 5 of CMMI.

he "WHAT"

CMMI is a model ***not*** a process.

It describes the ***characteristics*** of effective processes.



The trick is to translate the model *into* implementation.

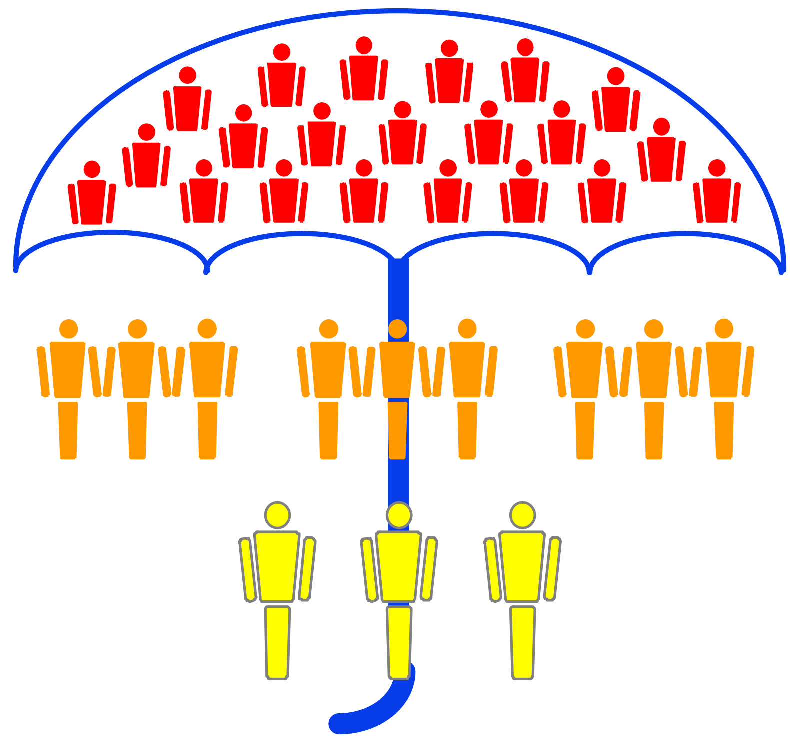
How can you do this *effectively* and *efficiently*?

rformance, Address Team and Individual Discipline

A high-performing ***organization*** must be built of high performing teams.

High performing ***teams*** must be built of high-performing individuals.

High-performing ***individuals*** must be disciplined to gather and use their own data.



For a successful case study showing the integration of CMMI and TSP, please see ñCMMI Level 5 and the Team Software Processòby Webb, Miluk, and Van Buren in CrossTalk April 2007.

to Building High Performance

Many organizations are becoming team-based to achieve high performance.

Å You build high performance capabilities within teams.

Å Then you extend team performance to the organization

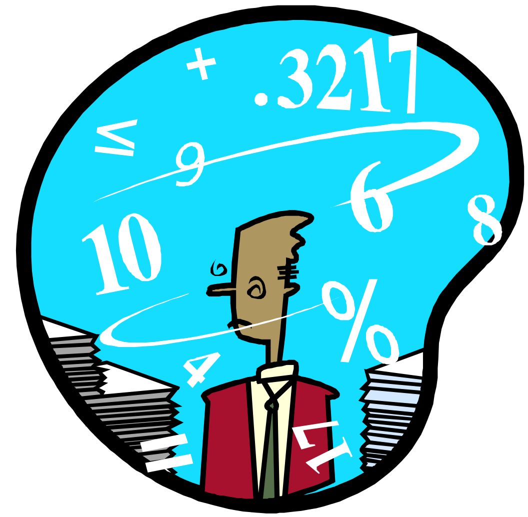
ñI am directing a fundamental changeé through integrated product teamsé the potential value is to reduce cycle time, improve quality, and reduce cost of acquiring quality products and servicesé ò

- William Perry, former U.S. Secretary of Defense

e Data Come From?

"The government are very keen on amassing statistics. They collect them, add them, raise them to the nth power, take the cube Root, and prepare wonderful diagrams. But you must never forget that every one of these figures comes in the first instance from the village watchman, who just puts down what he damn pleases."

(*Sir Josiah Stamp quoting an anonymous English judge*.)



ng CMMI Practices

What does operationalize mean?

Å To put something to use

What are characteristics of an ŏoperationalizedò process?

Å The people who use the process own the process and have the authority to adapt and improve it.

Å The ŏprocess ownersò are in the best position to understand the process strengths and weaknesses.

Å If people ŏown the process,ò they will be more willing to fairly evaluate process changes.

TSP Week Summary - Form WEEK

Name	Consolidation		Date	11/8/2007
Team	Example week			
Status for Week	2	Selected Assembly	Cycle	1
Week Date	7/2/2007	SYSTEM		

Task Hours %Change	
Baseline	1280.1
Current	1332.1
%Change	4.1%

Weekly Data	Plan	Actual	Plan / Actual	Plan - Actual
Schedule hours for this week	45.5	26.9	1.69	18.6
Schedule hours this cycle to date	86.9	48.6	1.79	38.3
Earned value for this week	1.3	0.7	1.86	0.6
Earned value this cycle to date	3.7	3.4	1.10	0.3
To-date hours for tasks completed	44.7	31.9	1.40	
To-date average hours per week	43.4	24.3	1.79	
EV per completed task hour to date	0.075	0.105		

Project End Dates	
Baseline	2/4/2008
Plan	2/4/2008
Predicted	11/16/2009

A team is in week 2 of 7 month plan.

The team is behind 10% in Earned Value but the projected date for project completion is 2 years lateð what is the problem?

The team on average is only getting a little more than half of their planned on-project task hours.

(1) Understand why the predicted project completion is two years late?

(2) Why arenðt team members achieving planned on-project task hours?

Before you analyze this data, how do you get this data?

How Do You Get This Information?

From having operationally, defined processes (e.g., development process)

From basic, measurement data

- Operational measures (size, effort, schedule, quality)
- Measurement Definitions (task hour, defect, é)

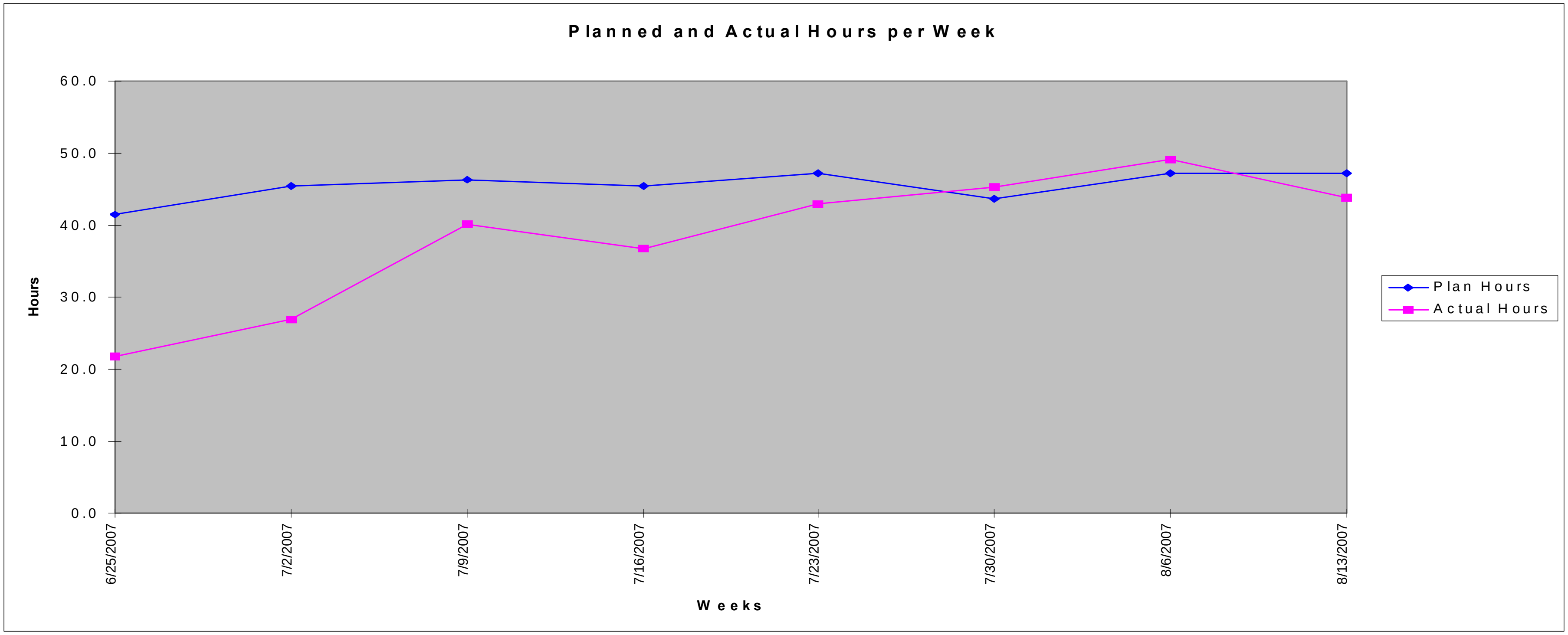
From tools

- To record and analyze data

From having a realistic plan

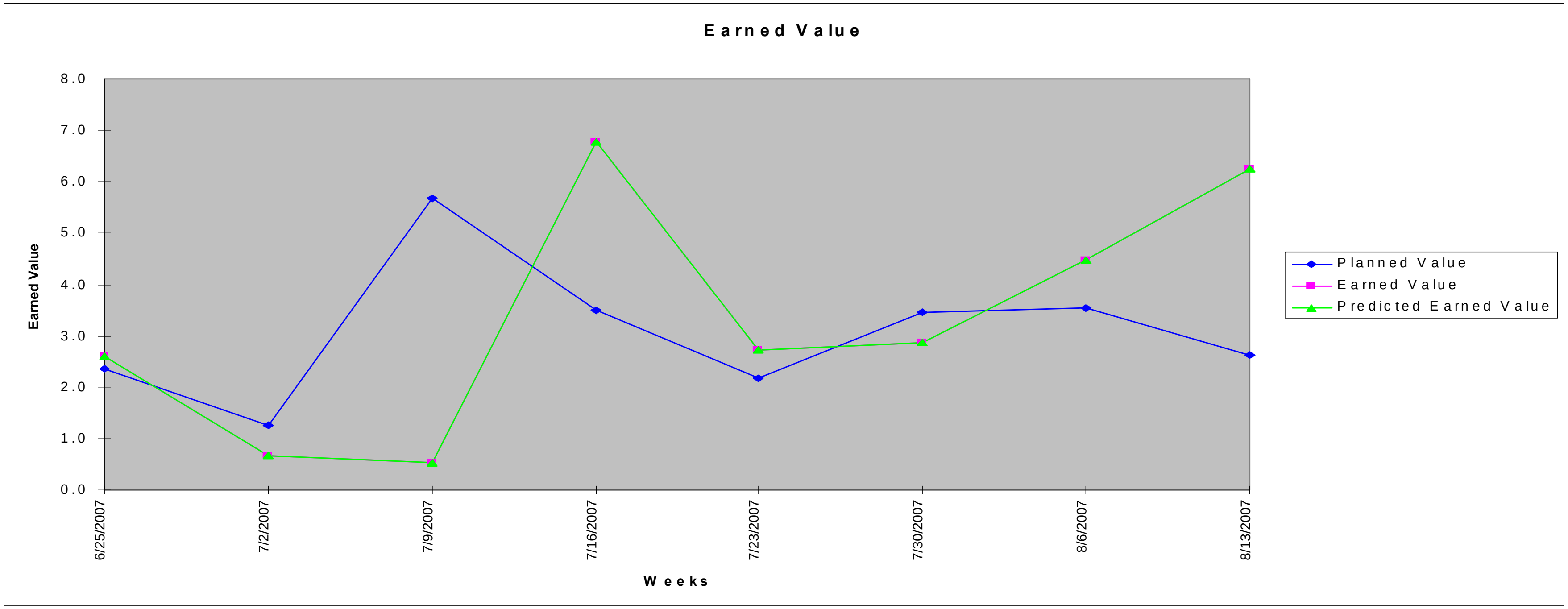
- developed by team members who use their own data for estimating and planning

Hours



The team addressed the project effort problem.

ule Progress (Earned Value)



After initially falling farther behind, weekly progress stabilizes.

Report

TSP Week Summary - Form WEEK

Name	Consolidation		**Date**	11/8/2007
Team	Example week 8			
Status for Week	8	**Selected Assembly**	**Cycle**	1
Week Date	8/13/2007	SYSTEM		

Task Hours %Change	
Baseline	1280.1
Current	1358.8
%Change	6.1%

Weekly Data	**Plan**	**Actual**	**Plan / Actual**	**Plan - Actual**
Schedule hours for this week	47.3	43.8	1.08	3.4
Schedule hours this cycle to date	364.1	306.7	1.19	57.3
Earned value for this week	2.6	6.3	0.42	-3.6
Earned value this cycle to date	24.6	26.9	0.91	-2.3
To-date hours for tasks completed	365.7	293.1	1.25	
To-date average hours per week	45.5	38.3	1.19	
EV per completed task hour to date	0.074	0.092		

Project End Dates	
Baseline	2/4/2008
Plan	2/4/2008
Predicted	4/21/2008

The team actions have been effective:

- Cumulative hours have not caught up
- The team is 9% ahead of schedule
- The predicted end date is now 2 months late rather than 2 years

Build high performance through teams

Enable high maturity capabilities by building a solid foundation

CMMI and TSP are mutually reinforcingð

Å CMMI provides the principles for process improvement and organizational focus

Å TSP can be useful for providing team discipline and operationalizing CMMI practices

CMMI® Current State and Future Plans

Bob Rassa
Industry CMMI Co-Chair
Raytheon

Clyde Chittister
Chief Operating Officer
Software Engineering Institute

13 November 2007

Topics

- Current Status
- Appraisal Results
- Transition Status
- “Beyond V1.2” Workshops
- Summary

CMMI-v1.2 focused on Integrity

- Model improved to require start-up of new projects using appraised processes
- Expanded appraisal requirements
  - Definition of appraised organization
  - More disclosure in ADS
  - Relationship re: business objectives and HiMat subprocesses
  - 3-yr max period of appraisal validity
  - SEI acceptance of appraisal results prior to public disclosure
- High maturity
  - Improved definition & understanding
  - New training available
  - Certified high maturity lead appraisers
- Focus Topics

Current Status -1

- New policies announced and implemented for version 1.2 appraisals.
- Version 1.2 upgrade training for Appraisal Team Members is available online.
- CMMI-ACQ was released on November 1, 2007.
  - Training
    - Currently a 1-day upgrade for those who have previously completed an Intro. to CMMI, V1.2 course
    - Eventually a 3-day and/or an integrated course
  - Appraisals
    - SCAMPI A's beginning in May, 2008
- CMMI adoption continues to grow worldwide.

Current Status -2

- **New policies for version 1.2 appraisals**
  - Three year maximum period of validity
  - Appraisals must be accepted by the SEI before becoming public record
  - High maturity appraisals must be led by a certified high maturity lead appraiser
  - Require that level 4/5 appraised subprocesses map to organizational business objectives
  - Sampling rules and ADS revised and expanded
  - Independence of lead appraiser from the business unit being appraised
  - CMMI V1.1 sunset date of August 31, 2007
  - Eventual certification of all lead appraisers

Current Status -3

- Business Rules for CMMI Focus Topics
  - Term “Extensions” has been changed to Focus Topics
  - “Extensions” was misleading
  - Some expectation that they were appraisable
  - Promoted as accredited in extension
- Focus Topics are:
  - Intended to provide additional guidance
  - Documented as Technical Notes
  - Reviewed and approved prior to release

Topics

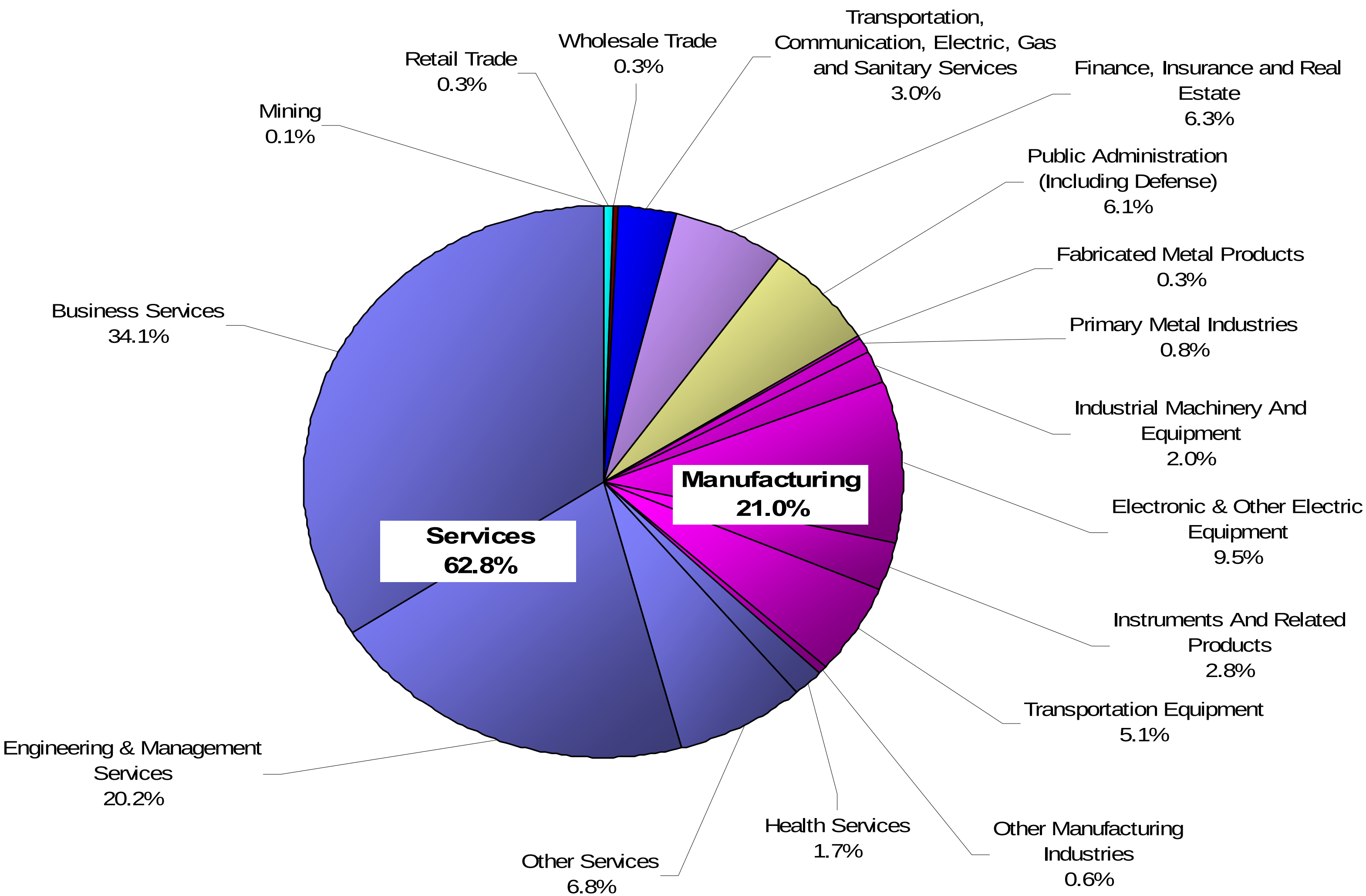
- Current Status
- **Appraisal Results**
- Transition Status
- “Beyond V1.2” Workshops
- Summary

Appraisal Synopsis as of 6/30/07

- **Based on SCAMPI v1.1/v1.2 Class A appraisals conducted since April 2002 release through June 2007 and reported to the SEI by July 2007.**
  - **2,464 appraisals**
  - **2,140 organizations**
  - **1,417 participating companies**
  - **273 reappraised organizations**
  - **10,338 projects**
  - **67.1% non-USA organizations**
- **Please visit http://www.sei.cmu.edu/appraisal-program/profile/pdf/CMMI/2007sepCMMI.pdf, for additional information or to find answers to questions you may have about this briefing.**

Organizational Type as of 6/30/07

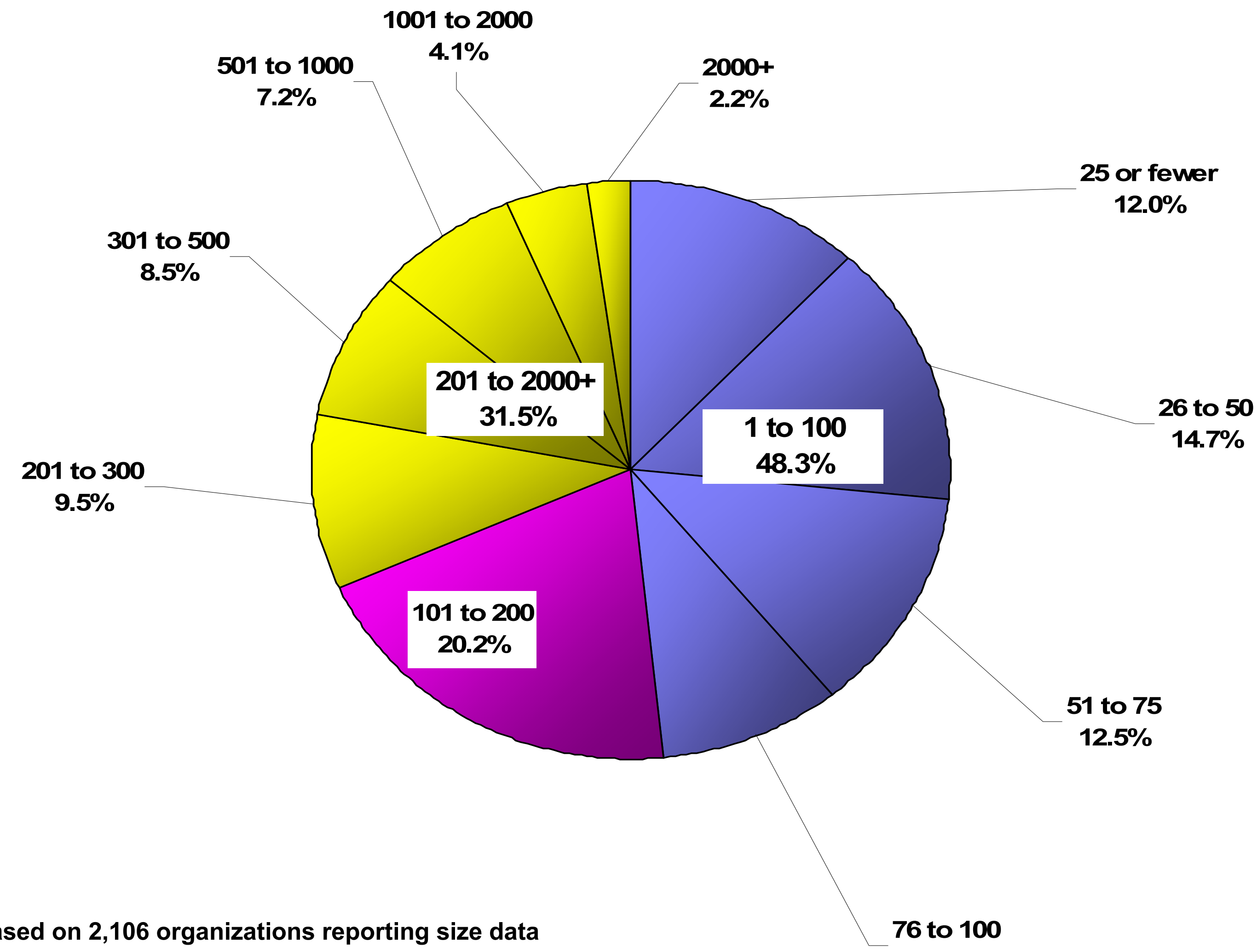
Based on Primary Standard Industrial Classification (SIC) Code



Based on 1190 organizations reporting SIC code. For more information visit: http://www.osha.gov/oshstats/sicser.html

Organizational Size as of 6/30/07

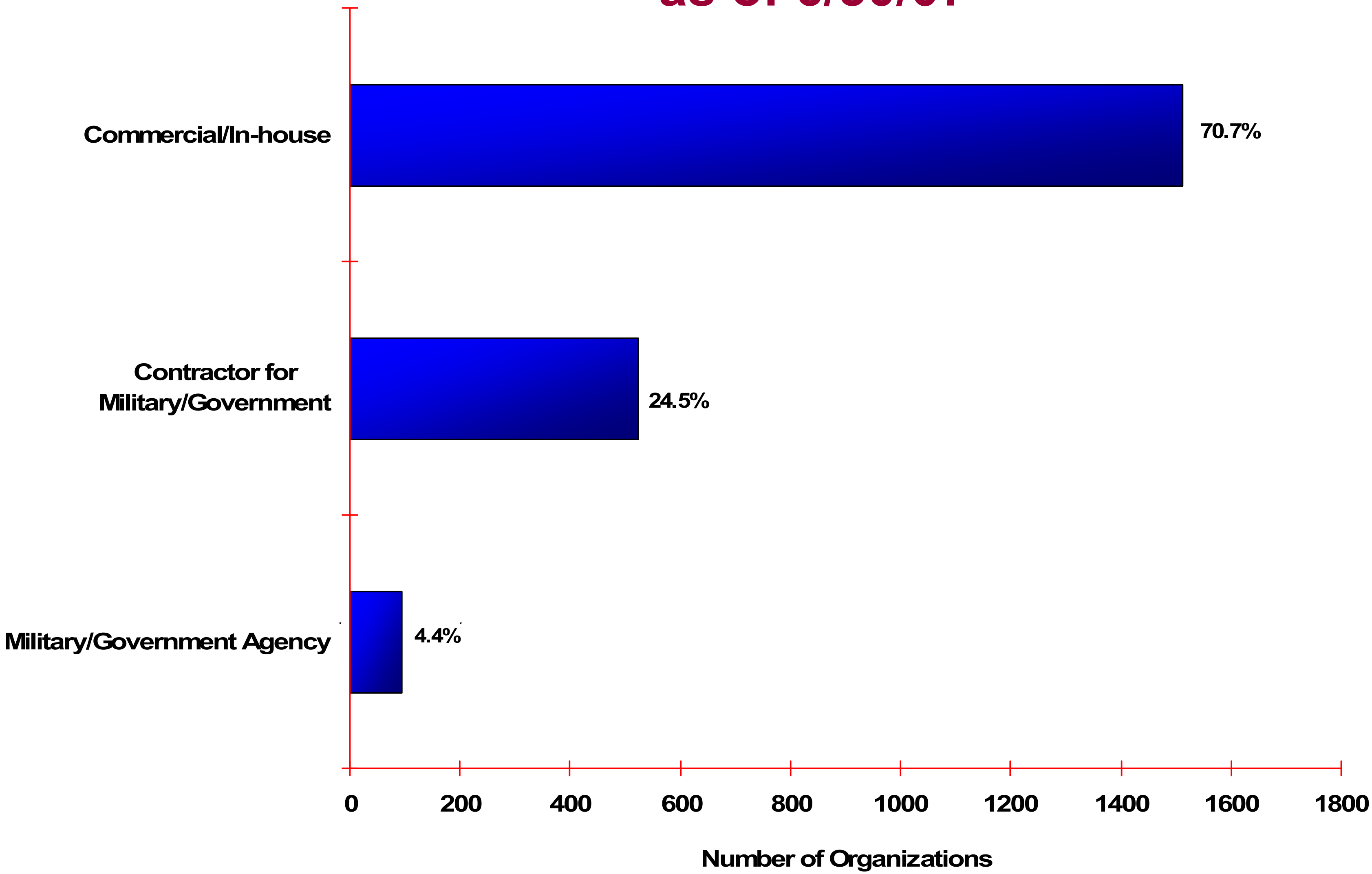
Based on total employees within area of appraised organization



Based on 2,106 organizations reporting size data

Reporting Organizational Types

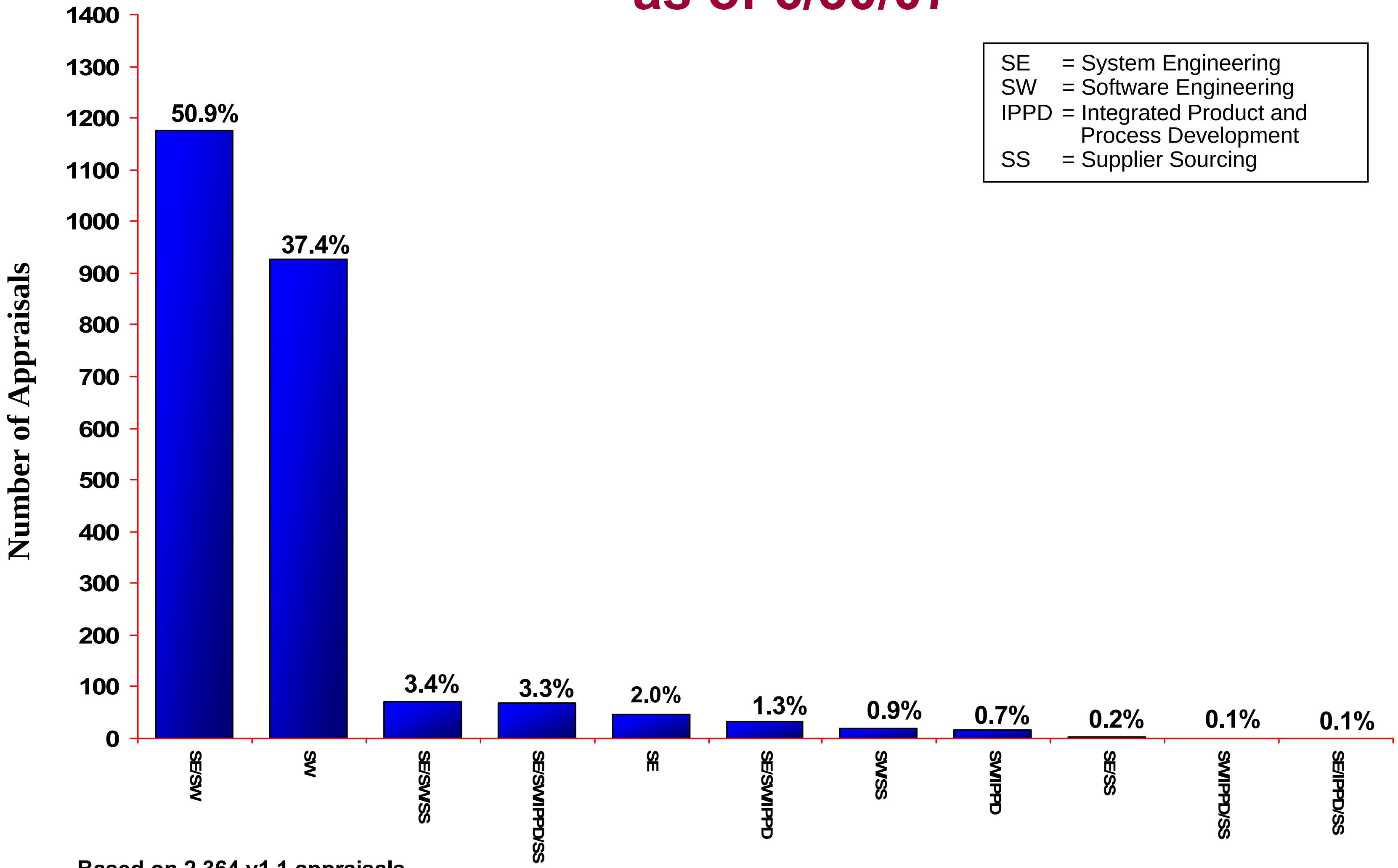
as of 6/30/07



Based on 2131 organizations

Disciplines Selected for Appraisals

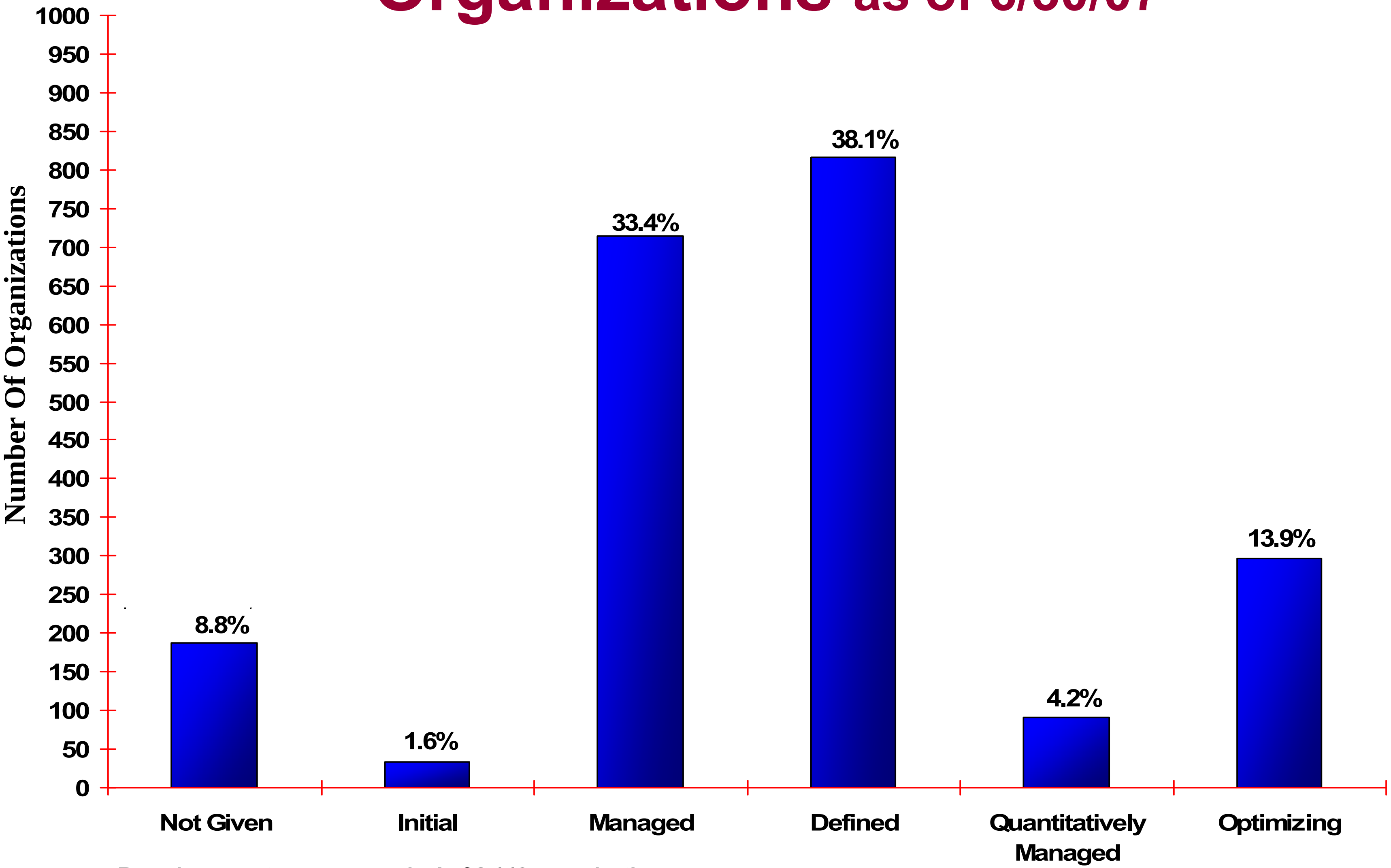
as of 6/30/07



Based on 2,364 v1.1 appraisals

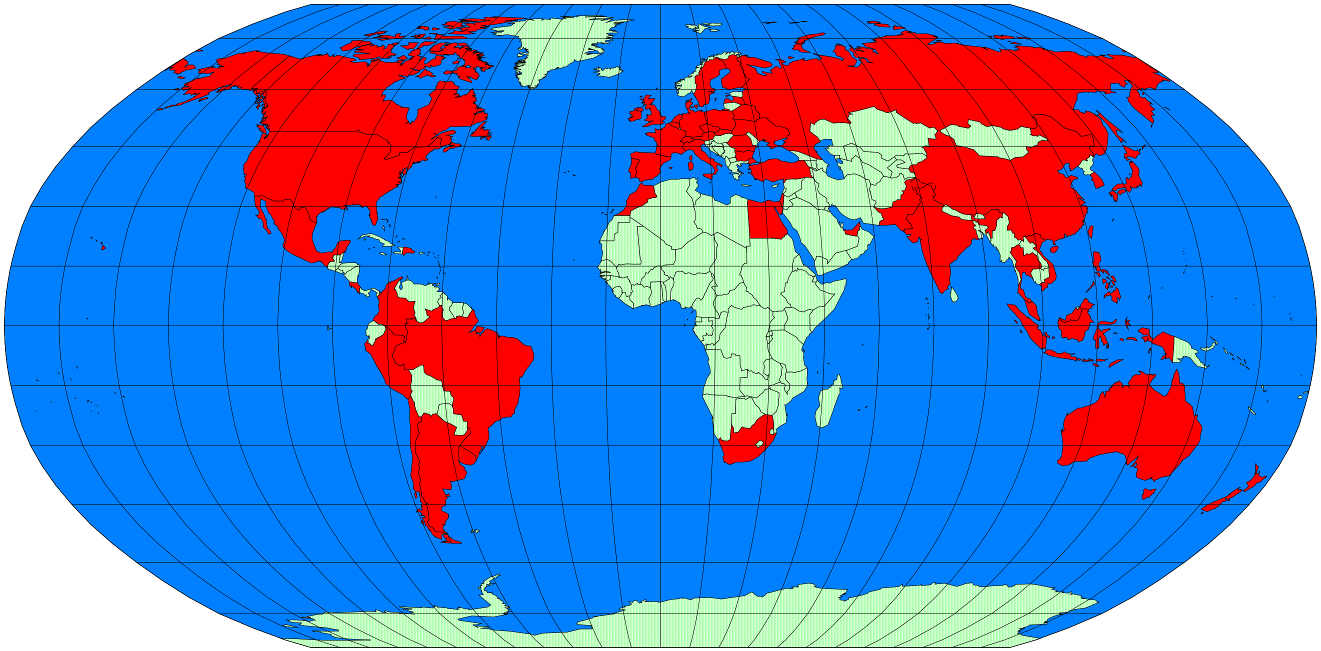
For more information about Allowable Models & Combinations, visit: http://www.sei.cmu.edu/cmmi/background/aspec.html

Maturity Profile by All Reporting Organizations as of 6/30/07



Based on most recent appraisal of 2,140 organizations

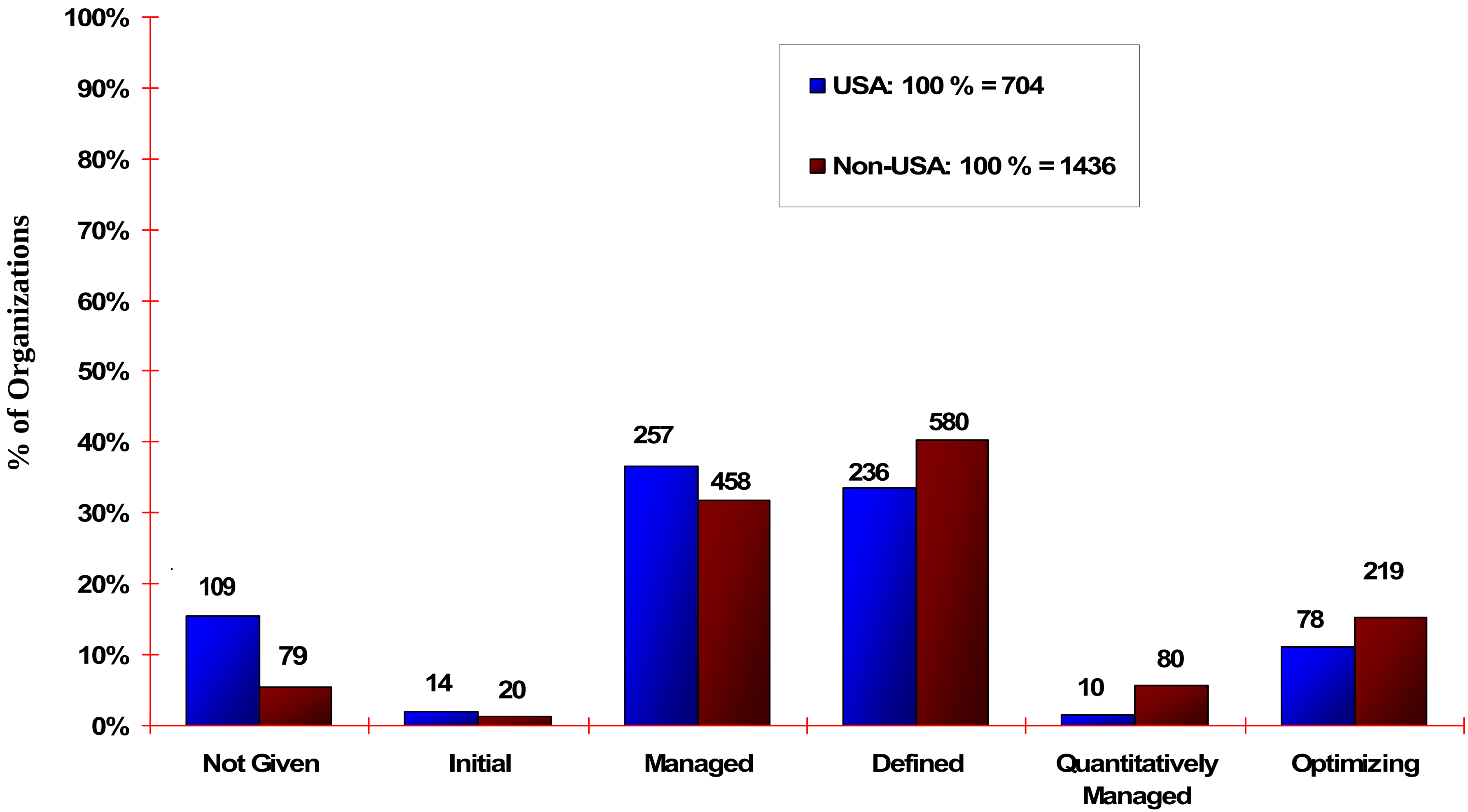
Countries Where Appraisals Have Been Performed and Reported to the SEI as of 6/30/07



Argentina	Australia	Austria	Bahrain	Belarus	Belgium	Brazil	Bulgaria
Canada	Chile	China	Colombia	Costa Rica	Czech Republic	Denmark	Dominican Republic
Egypt	Finland	France	Germany	Hong Kong	India	Indonesia	Ireland
Israel	Italy	Japan	Korea, Republic Of	Latvia	Malaysia	Mauritius	Mexico
Morocco	Netherlands	New Zealand	Pakistan	Peru	Philippines	Poland	Portugal
Romania	Russia	Singapore	Slovakia	South Africa	Spain	Sweden	Switzerland
Taiwan	Thailand	Turkey	United Kingdom	Ukraine	United Arab Emirates	United States	Uruguay
Vietnam							

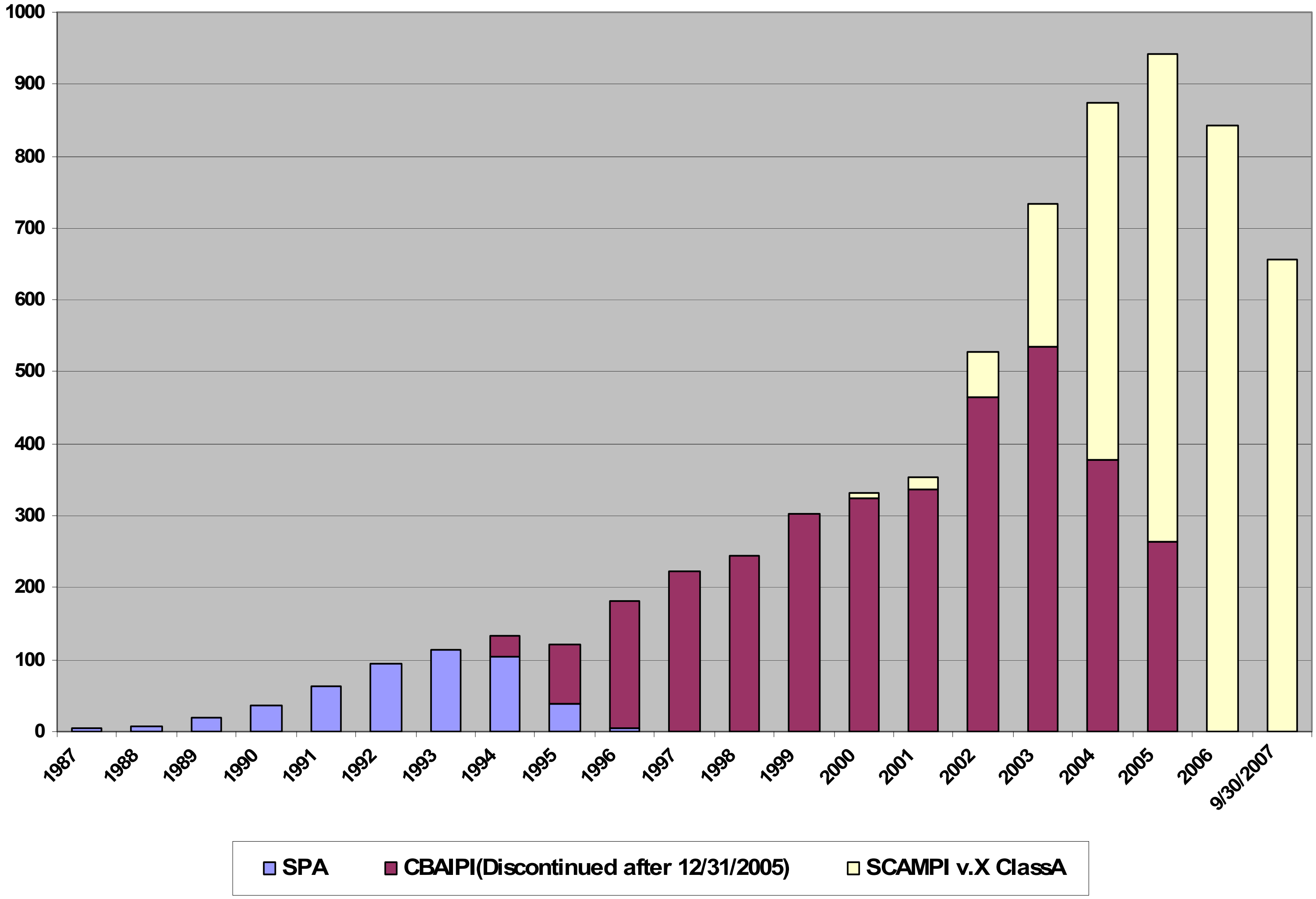
Red country name: New additions with this reporting

Maturity Profile by All Reporting USA and Non-USA Organizations as of 6/30/07

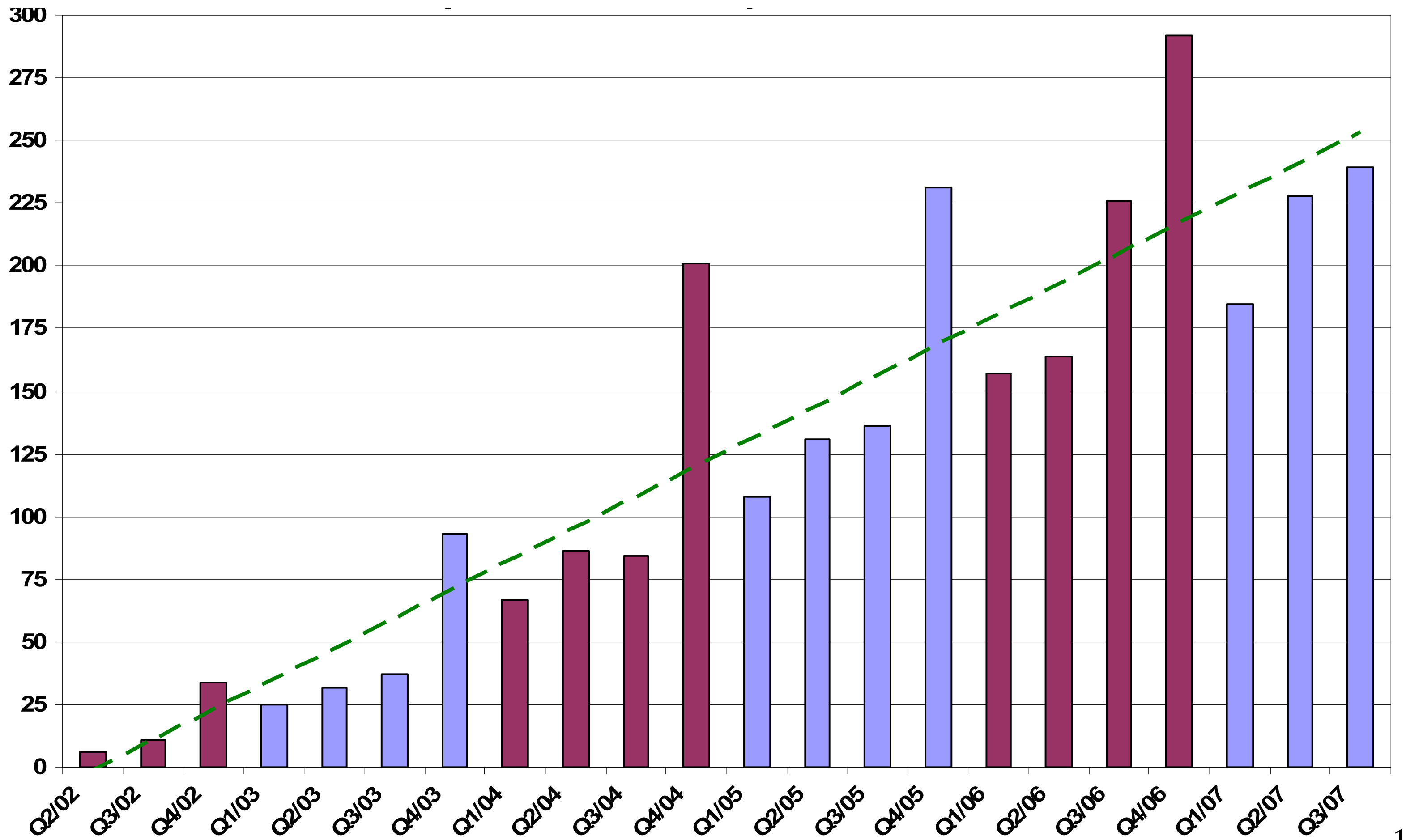


Based on 704 USA organizations and 1436 Non-USA organizations

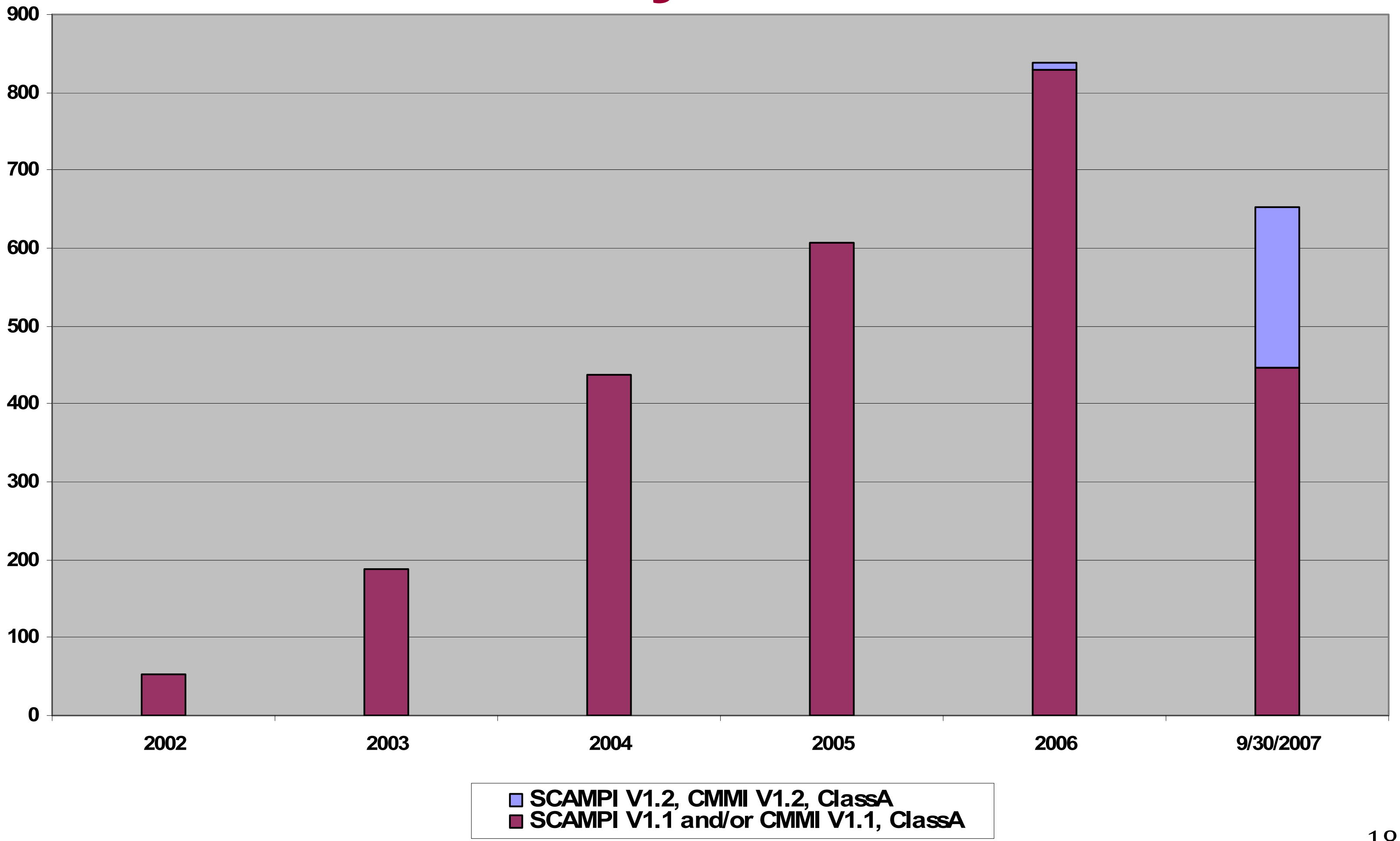
Number of Appraisals Conducted by Year, as of 9/30/07



Number of SCAMPI V1.1/1.2 Class A Appraisals Conducted by Quarter, as of 9/30/07



Number of SCAMPI V1.1/1.2, CMMI V1.1/V1.2, Class A Appraisals Conducted by Year, as of 9/30/07



Appraisal Results Summary

- **2,464 appraisals have been reported to the SEI since the release of V1.1 through June 2007**
  - 883 of these were reported in the 12 months from July 2007 to June 2008
- **Commercial/In-house organizations report more of the appraisals than Military/Government Agency organizations**
  - The highest percentage of Commercial/In-house organizations reporting appraisals is from outside the USA
  - The highest percentage of Military/Government Agency organizations reporting appraisals is from the USA
- **China, India, Spain, France and Malaysia are reporting appraisals at particularly increasing rapid rates**
- **CMMI adoption continues to grow worldwide.**

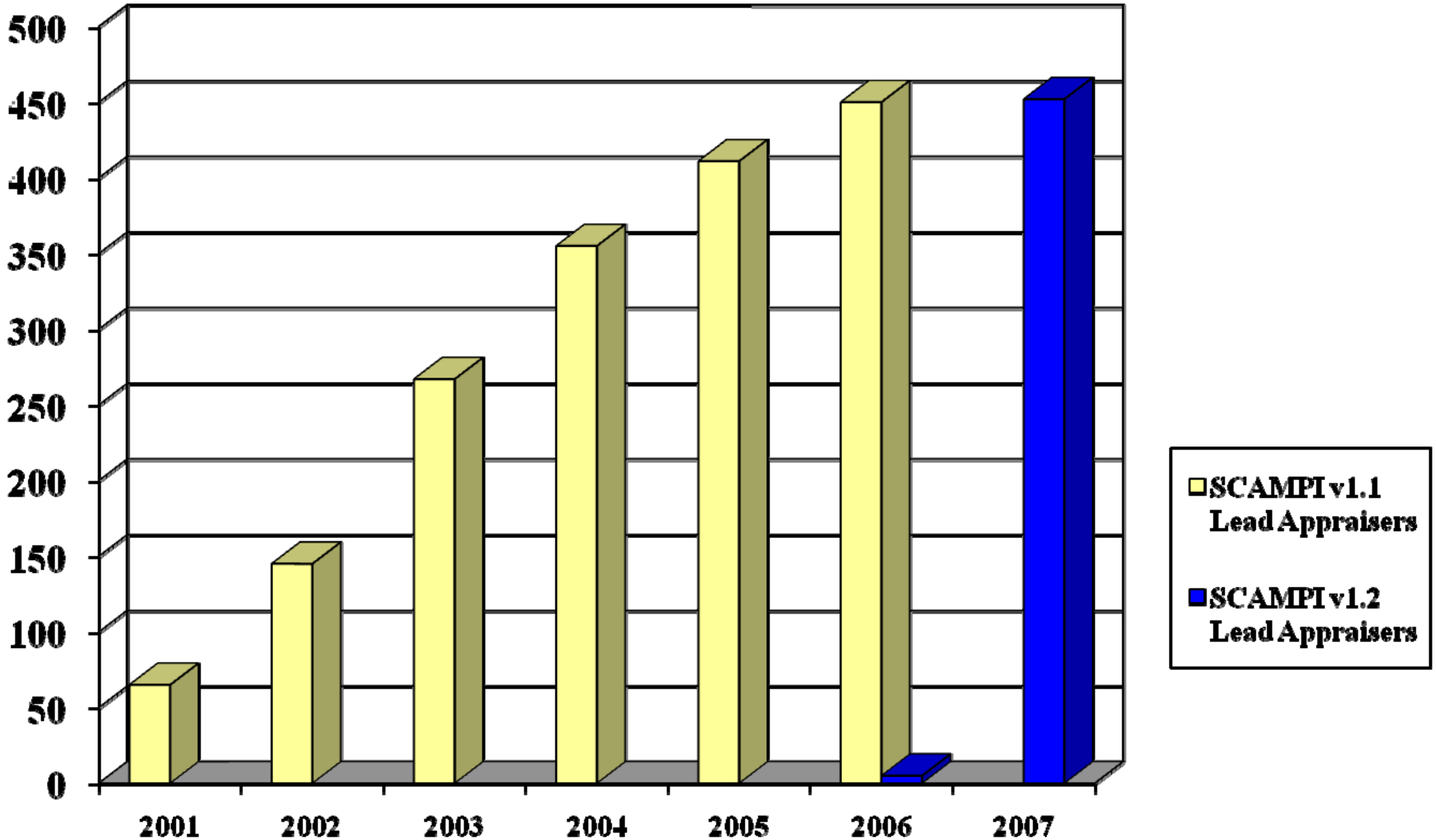
Topics

- Current Status
- Appraisal Results
- **Transition Status**
- “Beyond V1.2” Workshops
- Summary

CMMI Transition Status as of 9/30/07

- Training
  - Introduction to CMMI – 75,279
  - Intermediate CMMI – 2,612
- Authorized
  - Introduction to CMMI Instructors – 428
  - SCAMPI Lead Appraisers – 452
  - SCAMPI B&C Team Leaders – 466
  - SCAMPI High Maturity Lead Appraisers – 115
- Partners
  - Introduction to CMMI Training – 279
  - SCAMPI Appraisal – 285

Number of Lead Appraisers Authorized (Cumulative) as of 9/30/07



Performance Results Summary -1
as of 8/30/06

Improvements	Median	# of data points	Low	High
Cost	34%	29	3%	87%
Schedule	50%	22	2%	95%
Productivity	61%	20	11%	329%
Quality	48%	34	2%	132%
Customer Satisfaction	14%	7	-4%	55%
Return on Investment	4.0 : 1	22	1.7 : 1	27.7 : 1

30 Organizations with results expressed as changes over time

Performance Results Summary -2

- For more information on CMMI performance results, see
  - An August 2006 SEI technical report titled Performance Results of CMMI-Based Process Improvement (CMU/SEI-2006-TR-004)
    - It is available on the SEI Web site at http://www.sei.cmu.edu/publications/documents/06.reports/06tr004.html.
  - The CMMI Performance Results Web site at http://www.sei.cmu.edu/cmmi/results.html
  - The ROI site at DACS is at http://www.thedacs.com/databases/roi/

Topics

- Current Status
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CMMI Beyond-v1.2 Workshops

- **Workshops held during CY 2007**
- **Goals of Workshops were to promote free and open discussion among participants to identify potential new methods to approach Process Improvement and appraisals thereof that can be reflected in CMMI v2.0.**

- **The ultimate goal is to evolve CMMI to a structure that will better support continuous process improvement.**

"Beyond V1.2" Workshops -1

Questions posed to Workshop attendees:

- Can CMMI be harmonized with other standards and continuous process improvement efforts?
- How can we slim down the CMMI models while still preserving integrity?
- Do we need something different or additional to define High Maturity?
- Should CMMI be used in source selection and contract monitoring?
- Can repeatability, coverage (scope) and consistency of the model be improved?
- Can we identify next-generation process improvement methodology? Are there breakthrough concepts that we can apply to overall process improvement?
- Can we achieve one representation?
- Is the CMMI v1.2 Constellation Strategy the right approach?
- How do we make training more efficient and effective?

“Beyond V1.2” Workshops -2

Can CMMI be harmonized with other standards and continuous process improvement efforts?

- Agree that harmonization should be a goal, but should not slow progress too much
- Harmonization efforts take time
  - (This may be the only formal harmonization effort) Currently,15288 being harmonized with 12207 (ongoing several years). Recent work in this area to come out soon.
- Are there “standards” we want to focus on?
  - Standards
  - Process Improvement Methods
  - 9001, 14000 (environmental standard), AS 9100, FAA Standard (Aviation Critical Safety Items), 15288, 12207, 15504, ITIL, COBIT, Sarbanes-Oxley, 632 (Systems Engineering), 1220, Malcolm Baldridge, Six Sigma not all standards here are at the same level of abstraction , PM BOK and OPM3

"Beyond V1.2" Workshops -3

How can we slim down the CMMI models while still preserving integrity?

- How can we make this more user friendly?
- Can we slim down for small projects? Can the model have some scalability according to various factors (e.g., project size, PoP, organization size)?
- How do focus topics fit in with the model?
- Consider options for packaging (remove redundant stuff or repackage better)
- Consider fundamental, intermediate and advanced volumes
- Consider architectural views for appropriate for the different using communities
- Consider streamlining the generic practices and look at measures for institutionalization
  – Consider folding the GPs into PAs note risk of losing integrity

“Beyond V1.2” Workshops -4

Do we need something different or additional to define High Maturity? (Part I)

- Focus on the best practices, not focus on the high maturity aspects
- Consider combining level 4 and 5 into one level because of their close tie
- 4 and 5 are not adequately elaborated for implementation so these may needs more detail to drive proper behavior
  - For example, if we tie level 4 and 5 to business objectives this may need to be a practice
  - If there are additional requirements for the model these can be turned into practices. E.g., High maturity body of knowledge and high maturity training
  - Risk: adds more to the model

“Beyond V1.2” Workshops -5

Do we need something different or additional to define High Maturity? (Part II)

- Consider redistributing practices across the levels to even out effort and expectation
- Atlas study items that impact the model and results
- Consider maturity levels within PAs (e.g., project management PAs for each level)
- Consider better interfacing approaches with other methodologies (e.g., six sigma for high maturity)

“Beyond V1.2” Workshops -6

How can repeatability, coverage (scope) and consistency of the model be improved?

- **Coverage (Scope)**
  - Areas for consideration:
    - Operations, Support, Transition to operations, Deployment, Disposal, Pre-project, Proposal, sustainment, transition to production, production/manufacturing, training
    - Better coverage of maintenance and technical reviews
    - Safety, security, dependability, systems assurance, environmental
    - Strategic planning, enterprise management, finance
    - Work force management and development
    - IR&D, Advanced technology, advanced technology test bed or lab environment
    - Small settings
    - Product lines
    - Business practices
    - Information management (both enterprise and project)

"Beyond V1.2" Workshops -7

What are the next-generation process improvement methodology? Are there breakthrough concepts that we can apply to overall process improvement?

- Consider how CMMI could interface with other process improvement methodologies (e.g. Lean, six sigma, PMBOK, theory of constraints, next generation IDEAL)
- Integration of how people use the various methodologies (same list as above)
  - Agile techniques (extreme programming), TSP/PSP
- When everyone is level 5, then what?
  - Consider optimizing measurements
- Consider an emphasis on process performance effectiveness and efficiency, (e.g., effectiveness 6 sigma, efficiency LEAN)
- How do we measure program health?
  - Need for "leading indicators"

“Beyond V1.2” Workshops -8

What representation should we have (e.g., Staged, Continuous)? (Part I)

- Is the question really level-mania? (root cause?)
  - Level-mania is about doing the minimal work to achieve a level ignoring what you did to achieve the grade
  - Levels are not bad, but we need to get the integrity of the level back up
- Provides a roadmap for projects to break PI into pieces
- Guidance for where improvement is needed
  - Risk: has 5 been around so long that getting rid of it will have unintended consequences?
- Maybe we have a 5 level model that only really has 3. Redesign the model to address this

“Beyond V1.2” Workshops -9

What representation should we have (e.g., Staged, Continuous)? (Part II)

- How can we make two representations fit the same model?
- If the model is expanded to handle additional scope, then we may need to consider changes in the way appraisal results are presented due to sponsor driven time constraints packaging
  - How do we slim at the same time as providing better understanding and cover all the things that are need?
  - As you expand scope, do you need to abstract concepts versus mega model?
  - Scope, slimming Need a vision and plan for model evolution
    - Consider a “fixed size” approach and looking at ways to present the remaining information
- Consider pulling out OPF and coupling it with levels 4 and 5
- Don’t need to cover everything in the same model (packaging)

“Beyond V1.2” Workshops -10

Is the CMMI v1.2 Constellation Strategy the right approach?

- Alternative approach: Start with a CMMI Model Framework (CMF) and add where you need to expand scope (+ concept)
- Are there differentiators for constellations?
- Instead of creating constellations, encourage projects to do what makes sense with respect to what they are doing using the parent model
  - Consider looking at lifecycle and what is needed at each phase
  - Can the unsophisticated tailor the parent model for their perspective?
- How multiple constellations can be used in an organization for improvement and appraisal?

"Beyond V1.2" Workshops -11

How can we slim down the CMMI appraisals while still preserving integrity? How do we eliminate non-value add in appraisal and appraisal preparation? How do we make appraisals more efficient and effective?

- Consider making the appraisal be focused on goals
- Add an appendix for application practices
- Lead Appraiser and the Appraisal Team should have enough experience to review company implementations
- Make some assumptions that some processes are in place (e.g., assume project planning has happened, but don't look at PP specifically unless you see something out of place in PMC; similarly, could start with IPM for a level 3, or QPM for a level 4)
  - Need more guidance on where and how you might be able to do this
- More official or formal mechanisms for sampling coverage
  - Consider cost implications…

“Beyond V1.2” Workshops -12

Can we identify next-generation appraisal methodology? Are there breakthrough concepts that we can apply to overall appraisals?

- Delta appraisal, continuous, incremental, using measures to judge satisfaction, leading indicators, process performance measures, program health (versus process health), 15504 (SPICE), EIA 732 (percentage of practices performed, effectiveness of generic attributes)
- Data reuse from previous appraisals
- Appraisal by parts
  - Example, OSP separate from projects
  - CMF separate from model components unique to constellations
  - Certify processes instead of model (e.g., EV or SEMP)
    - Sponsor commits to ongoing process improvement

“Beyond V1.2” Workshops -13

How do we improve the trust and believability in the results of the appraisals?

- Process enactment tools can help with approval (workflow management)
- Need to define consistent process for OSP tailoring approval
- Requiring the appraisal be redone every three years will help with believability (already in place)
  – Consider notion of visits or interim steps (like ISO surveillance audits)
  – Six month assessments focus on correlation between results and performance (process reviews)
    - Doesn’t interrupt the program and not as expensive
  – What if you could extend the life of your appraisal if you did interim review? What is in it for the organization to provide incentive for the use of reviews?
    - Would the customer accept the results of the interim review?

“Beyond V1.2” Workshops -14

How do we improve the trust and believability in the results of the appraisals?

- What should the results of a bad review be? Should you lose your level? Could you use the delta appraisal here?
- How are organization changes that may impact the process capability tracked?
    - Consider adding a practice to the model for these changes
- Would interim reviews impact the capability profile
    - Might “red flag” the program or organization
- What happens if you miss by one practice in the full appraisal?
    - Do I get rewarded if I fix it? Consider delta approach
- Consider a more formal mechanism to track changes that may impact the process capability or level

Next Steps for you…

- Send us your ideas
  - Form available on-line from SEI
    - http://www.sei.cmu.edu/cmmi
  - Submit like a Change Request
- Watch for further opportunities to participate…
    - NDIA and SEI intend to conduct more Workshops in the near future
    - Announcements will be made by NDIA and SEI

Services Content for CMMI

- **Draft CMMI-SVC started in 2006**
  - Material was sent to stakeholder group for review/comment
  - Work halted in April 2007 to focus on integrity and CMMI-ACQ
- **In June 2007 issues on viability and need for services content were posed**
  - Business case justification
  - Usefulness for small businesses
  - Need within Department of Defense
  - Intended usage
  - Content options
- **Nov 12, 2007 CMMI-SG discussed all issues; voted to proceed to add Services content to CMMI Product Suite**
  - 1st step is to address all review comments provided prior to work halt
  - 2nd step is address options for including the content

Summary

- CMMI has clearly reached far more users than ever envisioned.
- Continuing to focus on appraisal quality and integrity.
- CMMI-ACQ model released
  - 2nd constellation in the CMMI Product Suiite
- CMMI "Beyond v1.2" Planning & Strategy is underway
- Services Content effort is underway

We welcome your feedback

PM Architecture Design as a Critical Success Factor in CMMI Model Implementation

November, 2007

Christen M. MacMillan, PMP

Implementing CMMI into Your Organization

- **Most CMMI efforts begin with noble intentions and senior management support:**
  - Indicates a desire to improve, streamline and standardize how the organization does business and delivers quality

Implementing CMMI into Your Organization

- So why do CMMI initiatives fail after they've been authorized and resources allocated?

- What can you do to avoid the pitfalls?

Reasons Authorized CMMI Efforts Fail

1. **Competing motivators within the organization**

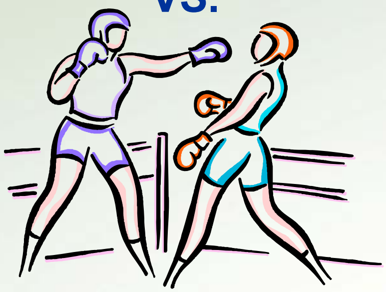
2. **The process implementation design was not well conceived**

Desire to Improve vs. Desire to Win New Business

Competing Motivators

Executives
- Win New Business
- Achieve Rating
- Cost Efficiency
- Realists

vs.



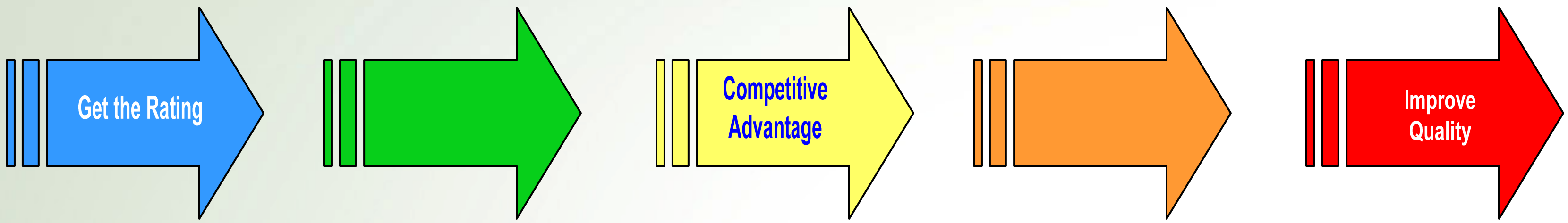
Quality Organization
- Improve Delivery
- Improve Quality
- Mature Org Process
- Idealists

- **Executive sponsorship for CMMI is often initially more greatly influenced by obtaining a maturity level, rather than maturing the organization.**
  - Pressure to obtain a rating
  - Gain competitive advantage
  - Meet customer requirements
  - Shorter time requirements

Moving Beyond the "Maturity Rating Motivator"

Executive Sponsorship Continuum

Motivators



Signed authorization
Some resources assigned

Champion: fully funded & resourced

Characterization

Lacks Champion & Enforcement

Stakeholders held accountable & actively engaged in key decisions

Reasons Authorized CMMI Efforts Fail

1. **Competing motivators exist within the organization**

2. **The process implementation design was not well conceived**

Reasons Implementation Designs Fail

- Do not support business goals or solve business problems
- Do not plan for managing organizational change
- Do not consider other factors influencing the way the organization does business
- Do not factor other quality model process requirements (i.e. ISO registrations, ANSI 748)
- Do not account for customer constraints
- Do not account for cost and resource constraints
- Provide no mechanism to lead the effort or govern and oversee adherence
- The Process Design is bigger or more complicated than the organization needs or can handle

Reasons Implementation Designs Fail (Cont'd)

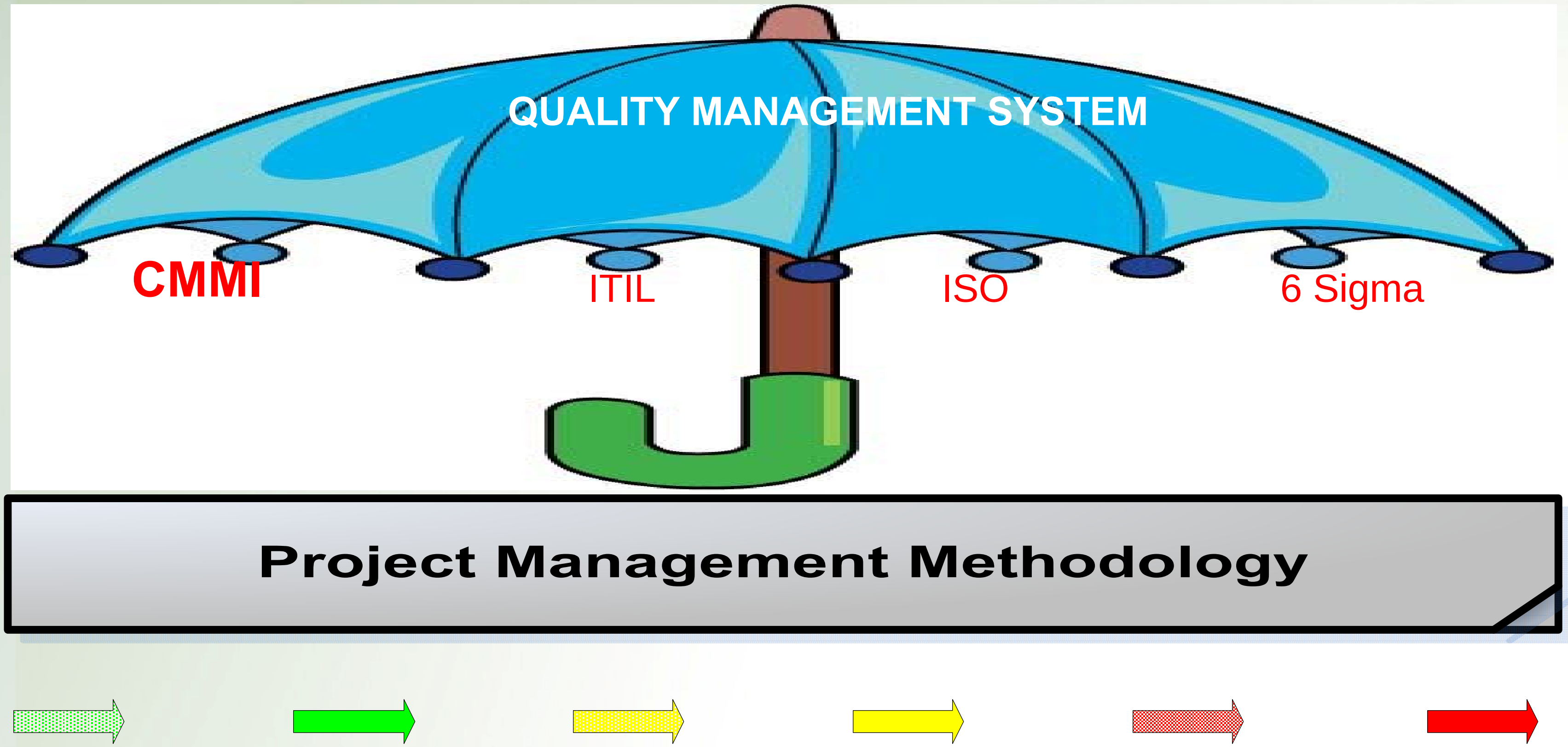
- Do not obtain stakeholder buy-in on approach, methods, and priorities
- Incomplete business requirements
- The design rationale is not fully planned and communicated
- Lack of Planning
- Lose sight of the end goal

What is the End Goal??

communications
Enterprise IT Solutions

To Improve Project Performance, Delivery, and Quality!!

Building Your Solution: Quality Enterprise Architecture



Required process rigor (greater rigor = less allowable tailoring)

Building Your Solution: PM as a Foundation for CMMI

L3 communications
Enterprise IT Solutions

PM practices against CMMI process areas

*note: diagram does not represent complete mapping

PM Practice	CMMI PA
Scope Definition & Management	▪ RQEM (L2) ▪ RD (L3) ▪ VER (L3) ▪ VAL (L3)
Estimation ▪ Cost ▪ LOE (Level of Effort) ▪ Schedule	▪ RQEM (L2) ▪ RD (L3) ▪ TS (L3) ▪ PI (L3) ▪ MA (L2) ▪ PP (L2) ▪ PMC (L2) ▪ ISM(L3)
Communication & Reporting	▪ GP 2.7/ 2.1 ▪ MA (L2) ▪ PMC (L2) ▪ IPM (L3) ▪ RSKM (L3)
Knowledge & Data Management ▪ PM Repository ▪ CM System ▪ InfoRQEMation Security	▪ CM (L2) ▪ OPD (L3) ▪ RD(L3)
Change Management	▪ CM (L2) ▪ PI (L3) ▪ TS (L3)

PM Practice	CMMI PA
Performance Management ▪ Schedule ▪ Budget ▪ Deliverables	▪ RD (L3) ▪ PMC (L2) ▪ TS (L3) ▪ VER (L3) ▪ PI (L3) ▪ VAL (L3) ▪ IT (L3) ▪ ISM (L2)
Quality Management ▪ Audit Management (plan & schedule) ▪ Peer Review ▪ Process Improvement Recommendations/Corrective Actions	▪ PPQA ▪ OPD ▪ OPF
Governance ▪ PMO interface (if applicable) ▪ Corrective Action	▪ PMC (L2) ▪ OPF (L3) ▪ RSKM (L3) ▪ PPQA (L2) ▪ MA(L2)
Resource Management ▪ Staff management ▪ Asset management ▪ Subcontractor Management	▪ OT (L3) ▪ SAM (L2) ▪ ISM (L3) ▪ IT (L3)
Risk Management	▪ RSKM (L3) ▪ PMC (L2) ▪ PP (L2)

Building Your Solution: Solution Steps

- Select & Define Your PM Framework
- Develop Your PM Methodology
- Establish a Governance System
- Ensure Solution Meets Business Needs

Solution Step 1: Select & Define Your PM Framework

A Framework provides the basic architecture for the Project Management Methodology

- **Assess the organizational dynamic and current PM competency and processes**
- **Evaluate known frameworks (i.e. PMBOK, home-grown)**
- **Identify synergies between CMMI PA requirements and other quality best practices and map to your business needs**
- **Weight process attributes and level of rigor desired up front**
- **Assess the characterization of your project portfolio**
  - Short, rapid IT development or long term high risk combination efforts?
  - Solution Buyer or Solution Provider?

Key Attributes of an Effective PM Framework

- **Enables achievement of project objectives and goals**
- **Establishes foundation for monitoring and controlling project performance**
  - Identifies early performance indicators
  - Identifies performance shortfalls
  - Supports methods for corrective and preventative actions
- **Supports implementation of a standardized, but tailorable methodology that facilitates quality and timely development and delivery of products and services.**
- **Is flexible enough to integrate with other quality best practices, models, and most commonly used SDLC's**
  - Build in a way that other quality models, frameworks, and best practices can be "snapped on" and integrated as business needs change and evolve.

Key Attributes of an Effective PM Framework (cont'd)

- **Sets foundation to communicate measures and roles and responsibilities**
- **Supports earlier stakeholder and executive visibility into performance**
- **Establishes or supports requirements for PM repository and PAL**
- **Identifies process interfaces**
- **Defines PM process and procedural requirements, standards and policies that:**
  - Comply with the CMMI Model
  - Comply with Business Requirements
    - Which meet business objectives

Building Your Solution: Solution Steps

- Select & Define Your PM Framework
- Develop Your PM Methodology
- Establish a Governance System
- Ensure Solution Meets Business Needs

Solution Step 2: Develop Your PM Methodology

A PM Methodology is the culmination and elaboration of practices and methods by which project management is executed

- Elaborate on standards and requirements defined in framework/s
- Develop processes, procedures and supporting documents
- Choose a specific PM Practice and follow the logical progression of that thread
- Prioritize PM practice areas and implement in phases
- Begin with a PM practice that helps solve immediate &/or significant problems

Building Your Solution: Solution Steps

- Select & Define Your PM Framework
- Develop Your PM Methodology
- Establish a Governance System
- Ensure Solution Meets Business Needs

Solution Step 3: Establish a Governance System

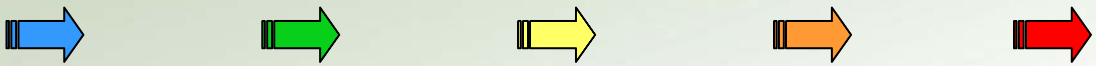
A Governance System Should:

- **Consider authorizing/creating a PMO to:**
  - Facilitate identification of project improvement recommendations
  - Mentor “users”
  - Perform project/program audits to evaluate project/program health (i.e. PfM)
  - Identify corrective and preventative actions
- **Establish Quality Organization to**
  - Perform process quality audits
  - Identify corrective and preventative actions
- **Enable earlier identification and resolution of risks**
- **Help enforce defined process requirements**
- **Establish requirements for process improvements & corrective actions**
- **Provide an independent escalation chain to executive management**
- **Facilitate communication between business operations & line management**

Building Your Solution: Solution Steps

- Select & Define Your PM Framework
- Develop Your PM Methodology
- Establish a Governance System
- Ensure Solution Meets Business Needs

Solution Step 4: Ensure Solution Meets Business Needs



- **Continuously Evaluate the Effectiveness of the Implementation Approach:**
  – Ensure defined goals are being achieved as planned
  – Identify performance variances against plan and take corrective action
  – Ensure resource utilization is still appropriate
  – Let Process Improvement Process work

  Demonstrate Business Value of Solution:
  – Measurably improve overall performance and productivity
  – Standardize business processes
  – Reduce chaos
- **Translate Solution into Business Terms:**
  – Reduce costs
  – Increase the rate of successful projects or business initiatives

Ensure Solution Meets Business Needs Estimating Example

EXAMPLE

- **The Value of Estimation Practices to *Those Who Must Implement***
  - Helps ensure defendable, re-traceable estimates via a standardized method and documented BOE (basis of estimate).
  - Sets and communicates stakeholder expectations, system/performance boundaries, requirements definition
  - Facilitates better scope definition
  - Defines criterion for change

- **The Value of Estimation Practices to *Executives***
  - Reduces financial and legal risk—particularly for FFP contracts or on projects where financial resources are limited
  - Reduces cost & schedule over-runs
  - Increases win rate
  - Produces more timely & better identification of requirements
  - Improves customer satisfaction through quality & timely project delivery

The Value of a PM Focus Up Front

- **Sets foundation for and feeds into CMMI process area requirements**
- **Demonstrates early value by providing business leadership, sponsors, project teams, with measurable, repeatable performance results before committing to full cost**
- **Can be tailored at an organizational level to accommodate other quality process models/best practices/frameworks: ITIL; ISO; 6 Sigma, etc.**
- **Fosters improved communication and defined roles & responsibilities**
- **Trains project teams to work within a defined process framework**
  - Realize value faster: motivate vs. pull
- **Facilitates smoother management of organizational change**

The Value of a PM Focus Up Front (cont'd)

- **Improves performance faster and "motivates" resisting stakeholders to get on board.**
- **Unifies stove piped organizations.**
  - PM impacts or is impacted by business operations
- **Establishes foundation by which your CMMI <u>project</u> can be managed!**
  - Provides opportunity to continuously improve your new PM processes
- **Key driver behind solution and service success or failure**
- **Increases institutionalization success**
- **Reduces risk of process regression after a successful appraisal**
- **CMMI requires other elements be met, but you cannot meet any CMMI required element without executing project management practices**

War Stories…

… on the road to a successful CMMI Level 3 Appraisal

The Challenge:

- Developing a unified architecture that recognized many pre-existing formal and informal processes
- Deciding how to fix gaps identified in SCAMPI B
- Different perspectives on the methods, and level of process rigor needed to meet requirements

War Stories…

The Solution:

- Established a Process Action Team (PAT) to modify existing PM Process Framework
- The PAT included representation from the implementing teams who helped design the solution
- Leverage and build upon existing PM Processes

The Result:

- Resolved most shortfalls
- Achieved a Successful CMMI Level 3 appraisal!

Lessons Learned

- **Develop your PM Framework & Methodology first**
- **Plan your CMMI Implementation with the entire organizational process architecture in mind when possible**
- **Don't try to eat the whole elephant at once:**
  - Implement good enough for now; improve process later
- **Implement a governing organization to oversee both Quality Process Adherence and Project Health**
  - Poor Project Performance could be an indicator that key CMMI requirements have not been appropriately followed
- **Develop user-friendly process assets and repository (PAL)**
- **Understand the dynamics, structure and culture of your organization**
- **Plan continuous improvement activities to ensure your approach is both CMMI compliant and meets business needs**
- **Be prepared for resistance and know its source/s**
- **Balance quick hits with tackling your biggest problem areas**
- **Communicate, educate, listen & be proactive!**

QUESTIONS?

Thank you!

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CMMI ACQUISITION MODEL (CMMI-ACQ):

Global Model Implementation

November 7, 2007

Dr. Richard Frost
Global Director, Systems Process and Program Management
General Motors Corporation

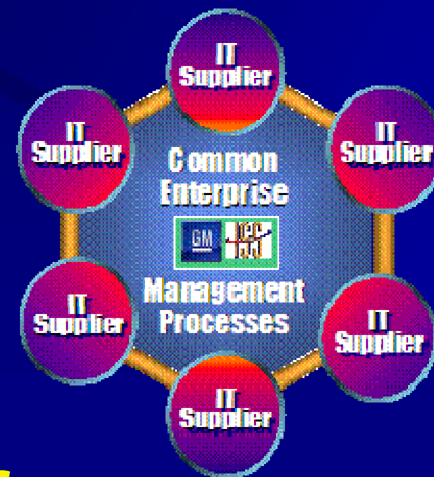
neral Motors Products

6 cars in the world is from the GM

GM

The Challenge:

How should GM structure the supplier relationship for the 3rd generation environment?



- ✓ Leverage best-in-class suppliers
- ✓ Focus on our core competencies
- ✓ Be positioned to take advantage of new processes and technologies
- ✓ Become more nimble
- ✓ Build stronger business relationships

Proven Throughout GM

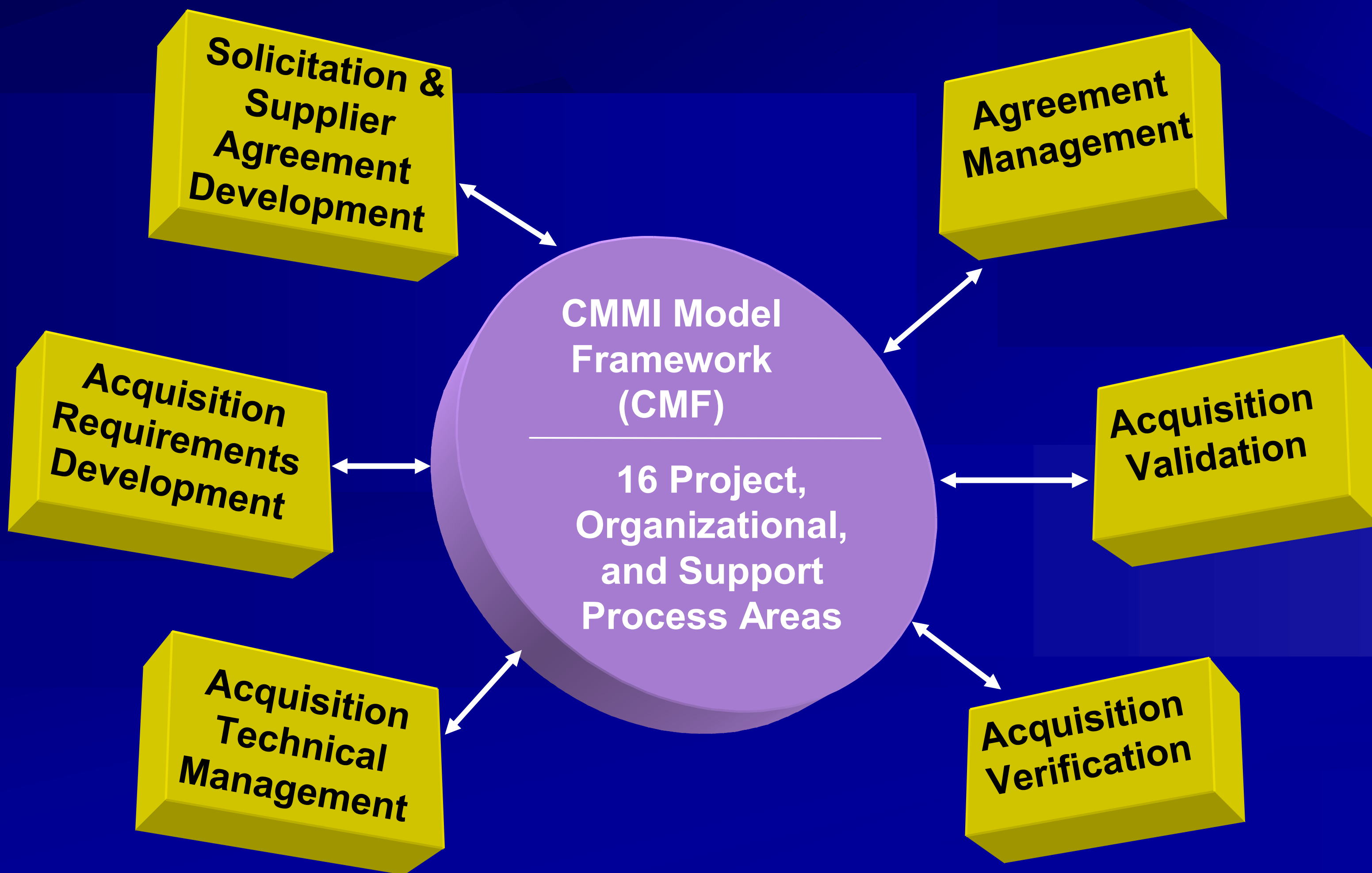
- In the 1990s, CMMI was adopted within GM
  - ÅProcess and Capability Improvement Framework
  - ÅExcellent for development organization
- There are unique challenges in our acquisition goals
  - ÅComplexity
  - ÅScalability
  - ÅGlobalization
- GM, the SEI, and Suppliers partner to expand the CMMI
  - ÅIdentify common organizational processes
  - ÅModels for Acquirer, Developer, and Services
  - ÅAssure applicability for the commercial sector

tegic Hub for Technology

- IS&S leveraged CMMI-ACQ to become the best IT customer - so we can support our business
  - Å Enable global common process
  - Å Leverage Supplier expertise
  - Å Increase agility and responsiveness of IT

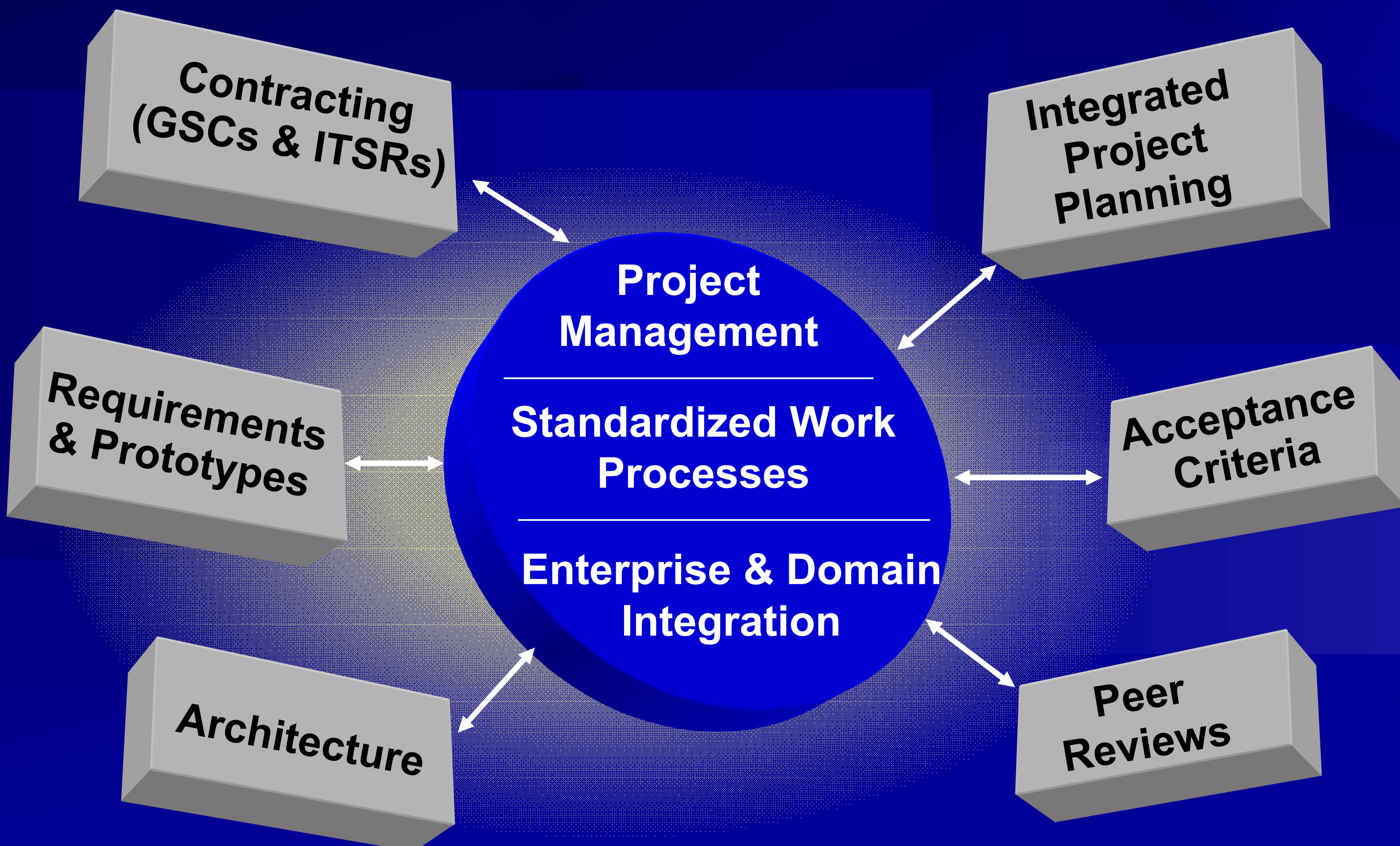
CMMI-ACQ Model

- Model for being a good customer
- Effective implementation requires understanding and correctly applying the model



CMMI-ACQ for GM

- GM analyzed and internalized the CMMI-ACQ model
- We determined the core competencies essential to implementing IS&S goals



SUMMARY

- CMMI-ACQ provides a great model for being a great customer
- Proper implementation necessitates internalizing the model for your organization and culture
- GM recognizes it must excel in Requirements, Architecture, and Project Management
- Partnership, Feedback, and Improvement are essential for our joint success

Thank You!

What's all this 'churn' in Systems Engineering Standards and Models?

[where did they come from?é and where are they going?]

CMMI Technology Conference

November 14 , 2007

Donald J. Gantzer

ODUSD(A&T) Systems and Software Engineering

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Objectives

- To provide an overview summary of key Systems Engineering [SE] process standards and models
- To illustrate a top level comparison of them
- To correlate with the Software Engineering Standard
- To indicate trends and usage
- To relate to ODUSD(A&T) System & Software Engineering Directotorate acquisition Initiatives
- To briefly address one key process activity ï Technical Planning - as an example

Disclaimer: The views and opinions presented here are the author's and do not necessarily represent SAIC or DoD views.

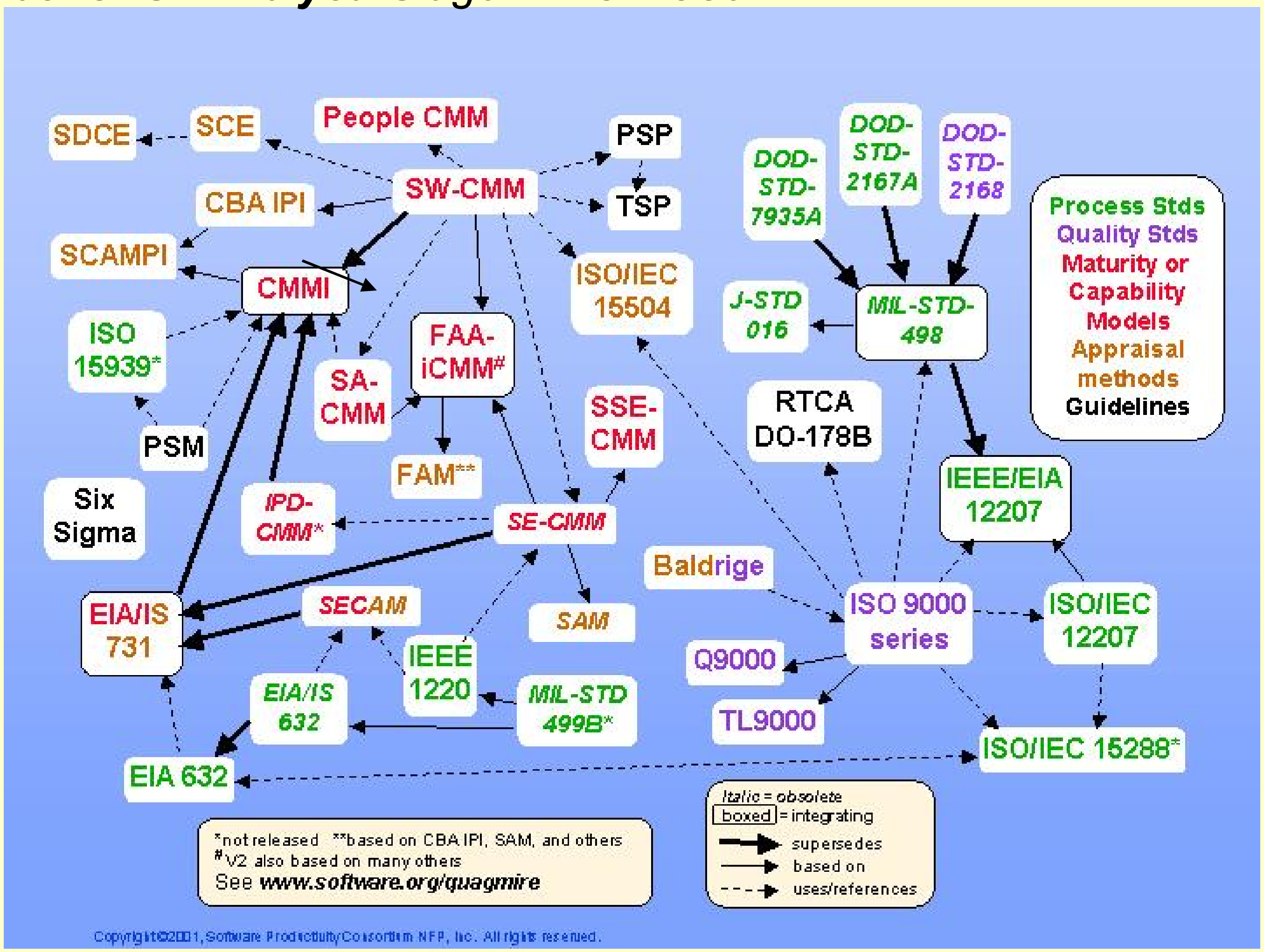
Agenda

- Introduction
- Systems Engineering Standards and Models
  - Å Evolution of Standards & Models
  - Å Summary of Standards & Models
    - \- ISO/IEC 15288: **System life Cycle Processes**
    - \- ANSI/EIA ï 632: **Processes for Engineering a System**
    - \- IEEE 1220: **Standard for Application and Management of the System Engineering Process**
    - \- CMMI® - DEV: **Capability Maturity Model Integrated for Development**
    - \- DAG/SE; **Defense Acquisition Guide/Systems Engineering**
    - \- INCOSE **Systems Engineering Handbook**
  - Å A Mapping across standards and models
  - Å Harmonization of ISO/IEC 12207(Standard for Information Technology - Software Life Cycle Processes) & ISO/IEC15288
- ODUSD(A&T) Systems and Software Engineering issues in Acquisitions
- Summary
- Some Key References and Links
- Appendix: Example - Summary for Technical Planning activities

Note: Every effort is made to credit sources of material presented here

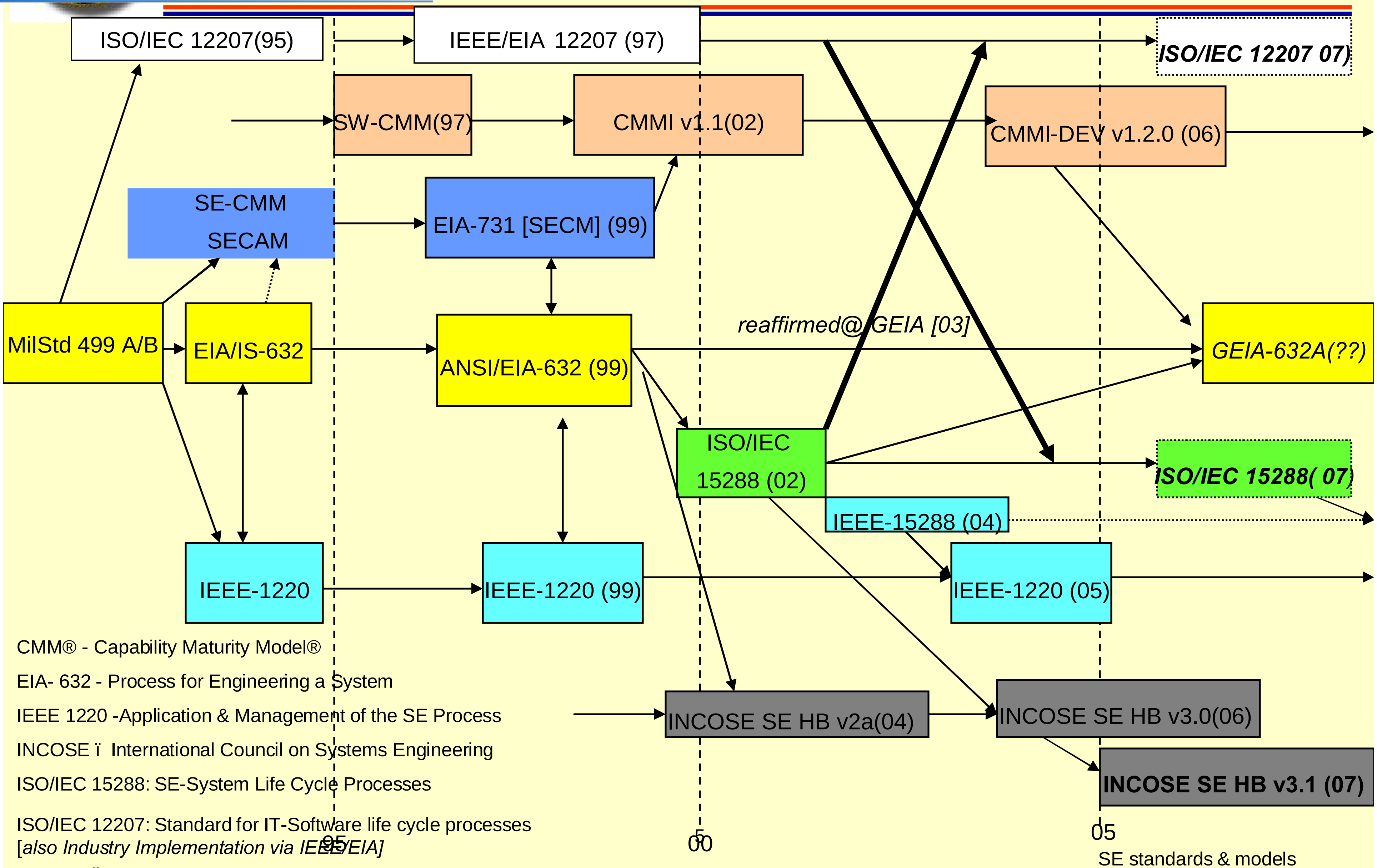
…cess Standards / Models Quagmire"

Remember this? ~10 years** ago! – **now ood!



Source: Systems and Software Consortium [SSCI]

...tandards and Models Trends



CMM® - Capability Maturity Model®

EIA- 632 - Process for Engineering a System

IEEE 1220 -Application & Management of the SE Process

INCOSE ï International Council on Systems Engineering

ISO/IEC 15288: SE-System Life Cycle Processes

ISO/IEC 12207: Standard for IT-Software life cycle processes
[*also Industry Implementation via IEEE/EIA]*

djGantzer

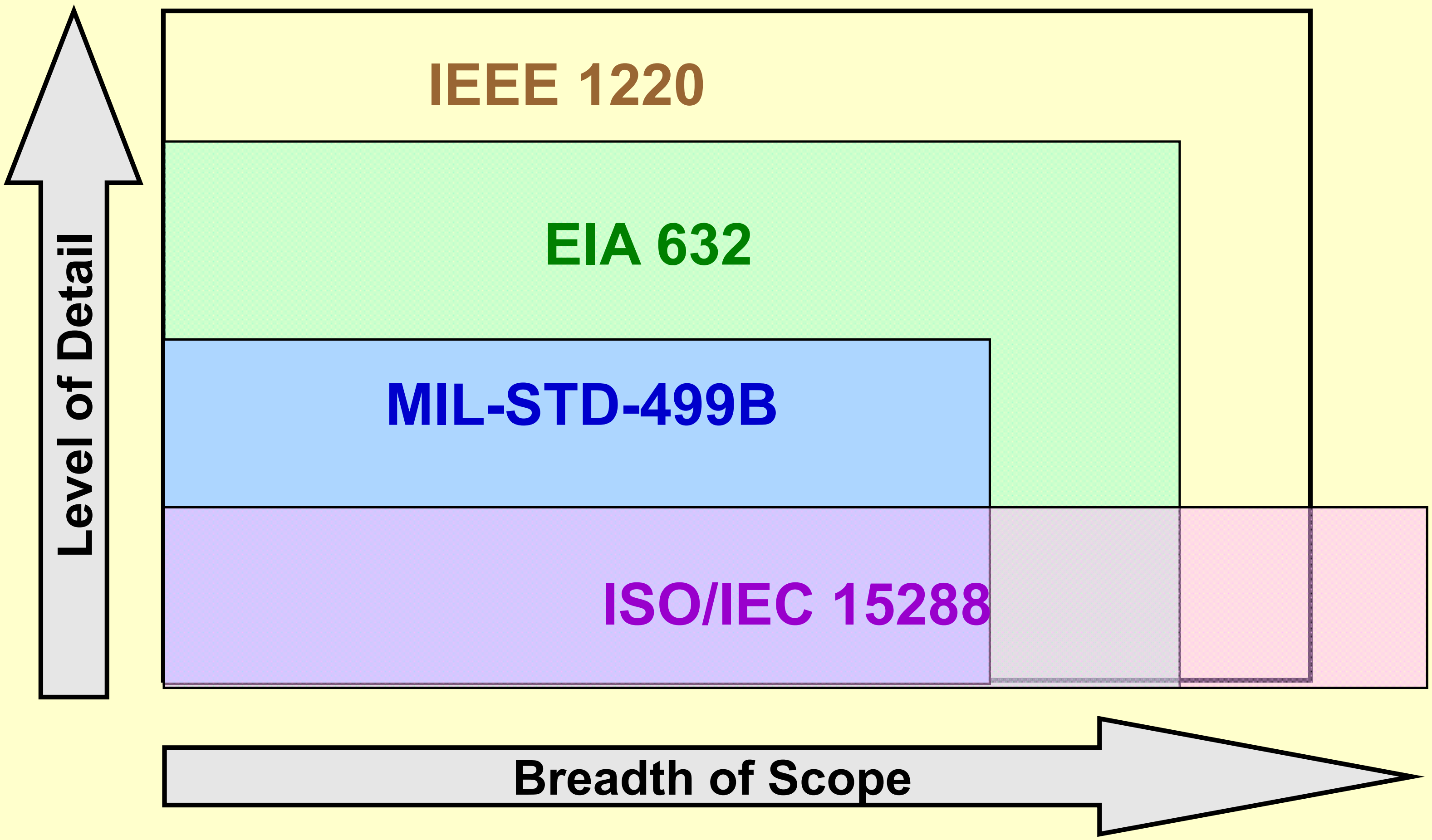
ew of SE related Standards

Standards / items	ISO/IEC 15288	EIA - 632	IEEE 1220	CMMI®-DEV
Purpose	Establish a common framework for describing the life cycle of systemsò	Provide an integrated set of fundamental processes to aid a developer in the engineering or re-engineering of a systemò	Defines the requirements for an enterpriseõs total technical effort related to the development of products and processes that will provide life cycle support for the products	CMMI®) is a process improvement maturity model for the development of products and services. It consists of best practices that address development and maintenance activities.
Activities	25 processes: 7 Project 11 Technical 7 Agreement and Enterprise	33 Requirements in 5 groupings of 13 processes	28 requirements: 14 General 6 by Life Cycle Stages 8 in SE Process	27 process areas: Continuous model : 11 Project Management 6 Engineering 5 Support 5 Process Management
Other	~60 pgs [plus separate guide for application] - a hi-level framework [descriptive].	~120 pgs - in between 1220 and 15288 in scope and details.	~85 pgs - less scope but more detailed [prescriptive].	~575 pgs - focus mainly on development; much supplemental info.

lards & Models Life Cycle Phases

ISO/IEC 15288	**EIA - 632**	**IEEE 1220**	**CMMI®-DEV*** **inferred*	***DoD/DAG*** ***[& DoDI 5000.2]***
Concept	Pre-system Definition	Concept	concept, exploration, vision	Concept Development
Development	System Definition, Subsystem Design, Detailed Design	System Def., Subsystem design, Detailed design; FAIT	feasibility, design, development	Technology Development; System Development; Demonstration
Production	End Product, Physical Integration, Test & Evaluation	Production	production, manufacturing, delivery	Production & Deployment: LRIP
Utilization		Utilization	operations	Operations & Support [O&S]: FRIP
Support		Support	support, maintenance, sustainment	O&S: Sustainment
Retirement		Retirement	disposal, phase out	O&S; Disposal

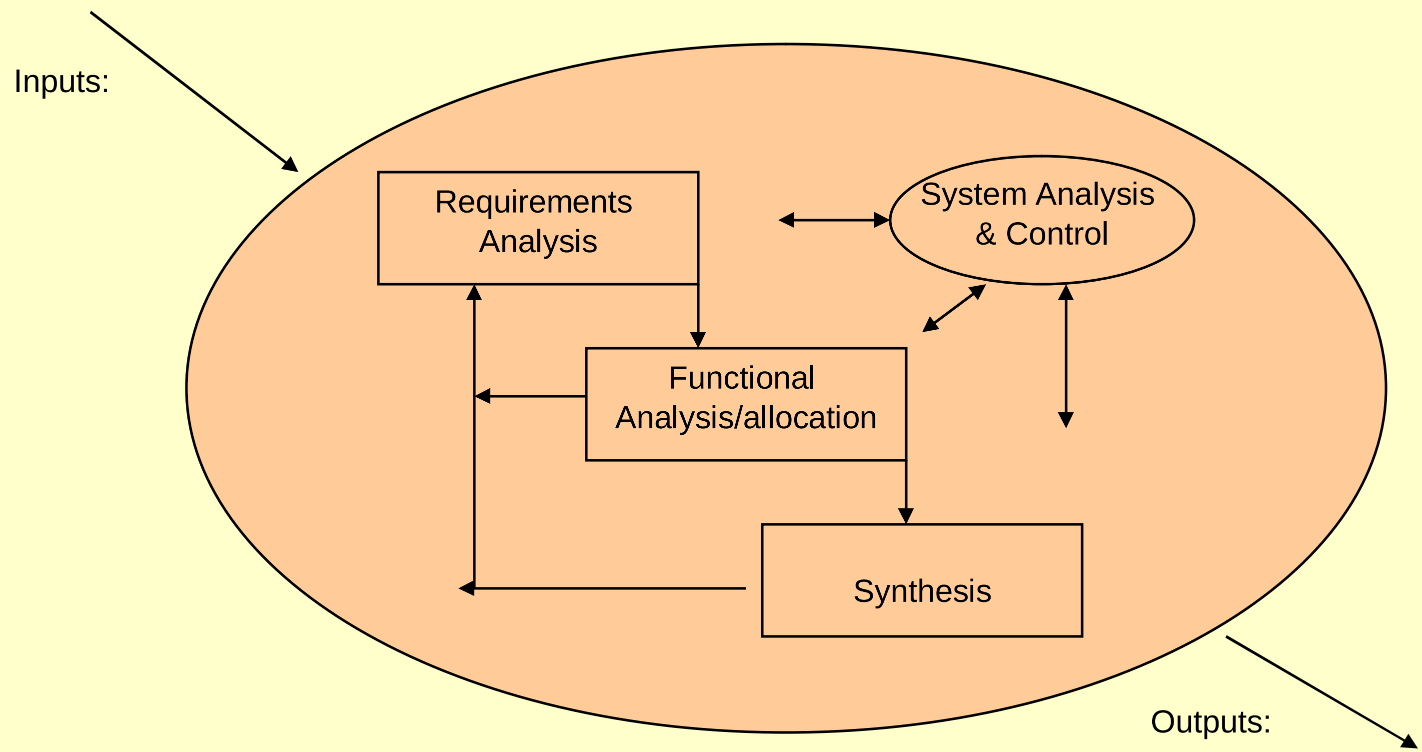
# of SE Standards



Source: S. Sheard, SPC and J. Lake, SMi; 2004

mple Generic SE Process

Note: Applied to Air Force IT/CSE SE Case Studies; http://www.afit.edu/cse/



Sources: Mil Std 499A/B and early DAU/DAG guidance

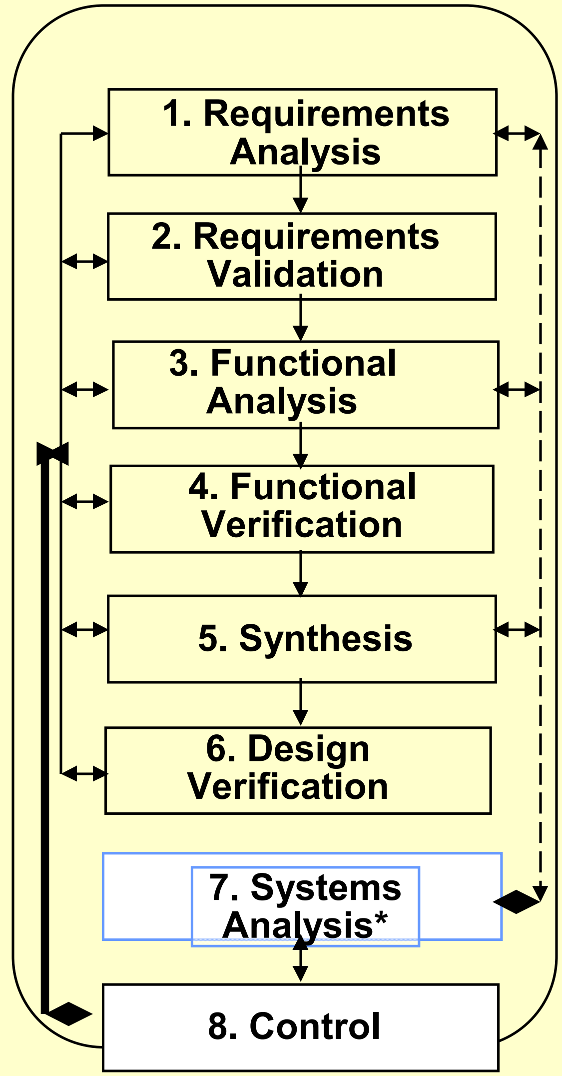
IEEE 1220: SE Process – 2005

Clause 4 - General Requirements

1. **SE process**
2. **Polices & procedures for SE**
3. **Planning the technical effort:** Prepare/update engineering plan; schedule; tech plans.
4. **Development strategies**
5. **Modeling & prototyping**
6. **Integrated repository:** data, tools.
7. **Integrated data package:** HW, SW, LC processes, human.
8. **Specification tree**
9. **Drawing tree**
10. **System breakdown structure**
11. **Integration of the SE effort:** concurrent engr., Int. teams.
12. **Technical reviews**
13. **Quality management**
14. **Product and process improvement:** re-engineering, self-assessment, LL.

Note: Standard includes detailed flows for each activity; and an example SEMP table of contents

Clause 6 – The SE Process



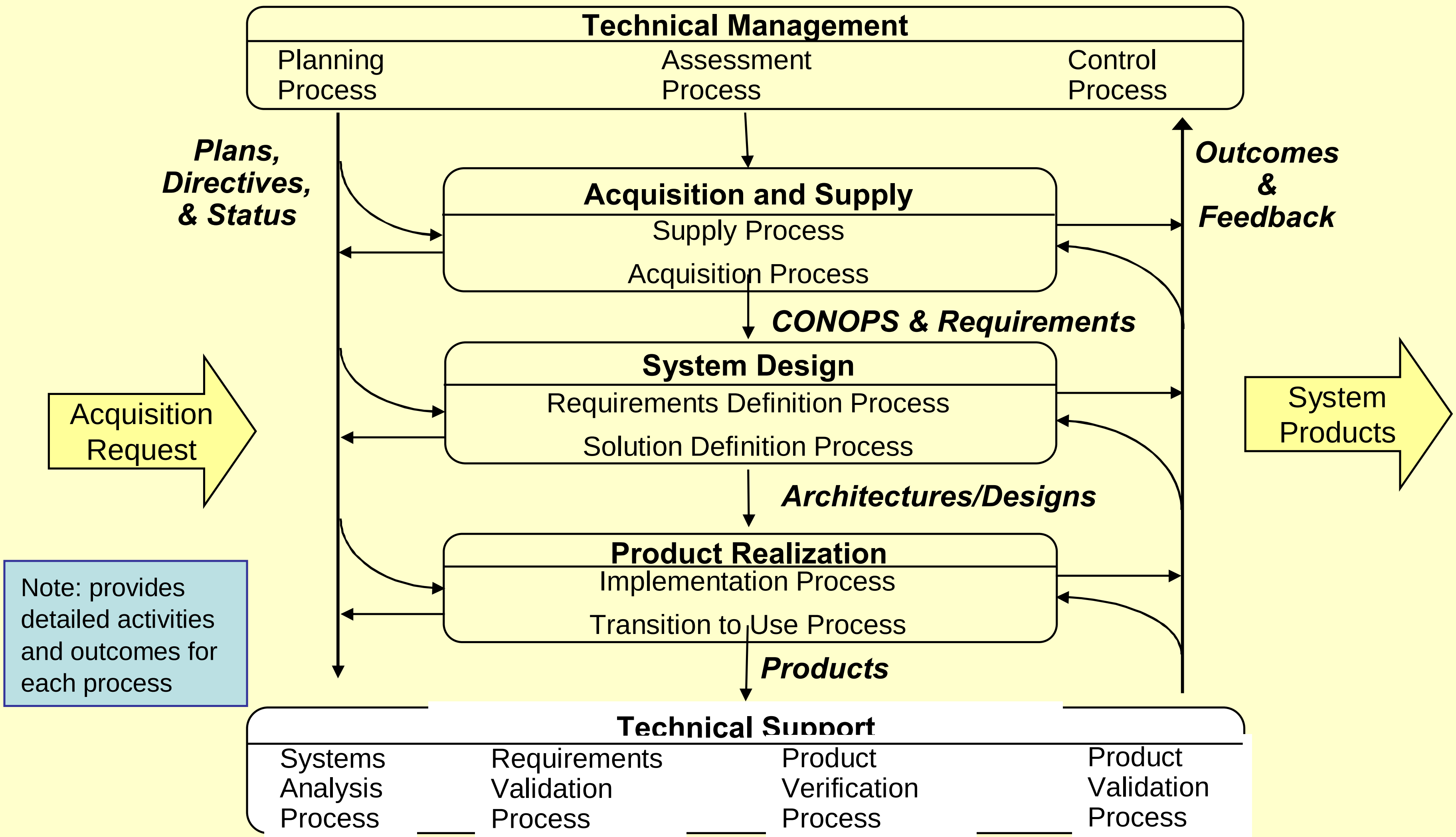
* Requirements/Functional/Design trade studies & assessments

Sources: SSCI + mods from IEEE 1220 - 1998

rocesses for Engineering a System

(1999; reaffirmed 2003)

(Source: INCOSE SE Handbook v2)



5288: System Life-Cycle Processes (2002)

ENTERPRISE & AGREEMENT PROCESSES

- Enterprise Environment Management
- Investment Management
- System Life Cycle Processes Management
- Resource Management
- Quality Management
- Acquisition
- Supply

SYSTEM LIFE CYCLE PROCESSES

PROJECT PROCESSES

- Planning
- Assessment
- Control
- Decision-making
- Risk Management
- Configuration Management
- Information Management

TECHNICAL PROCESSES

- Stakeholder Requirements Definition
- Requirements Analysis
- Architectural Design
- Implementation
- Integration
- Verification
- Transition
- Validation
- Operation
- Maintenance
- Disposal

Figure1-1 System Life Cycle Process Overview per ISO/IEC 15288

Note: Each process has purpose, outcomes, and activities

Source: INCOSE SE Handbook, v3.0

DEV v1.2 Process Areas - 2006

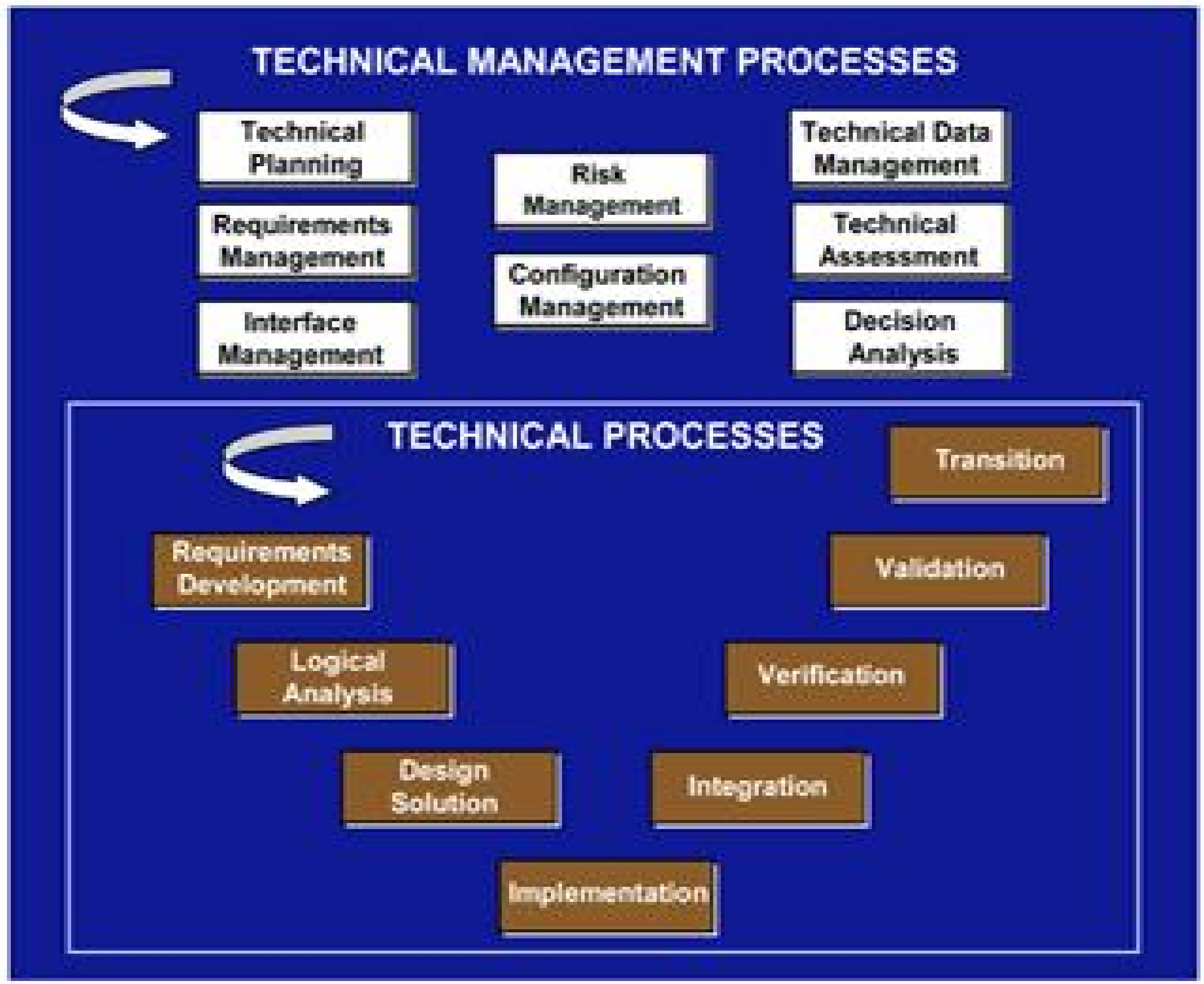
l 3 only; grouped per Continuous model)

Category	Process Area
Project Management	**Project Planning** **Project Monitoring and Control** **Supplier Agreement Management** Integrated Project Management Risk Management
Support	**Configuration Management** **Process and Product Quality Assurance** **Measurement and Analysis** Decision Analysis and Resolution
Engineering	**Requirements Management** Requirements Development Technical Solution Product Integration Verification Validation
Process Management	Organizational Process Definition Organizational Process Focus Organizational Training

Source: SEI/CMU

nse Acquisition Guide (DAG)

[*Source:* Chapter 4 on SE; 11/04]



[Note: DAG/SE 'derived ' from ISO/IEC 15288, EIA-632, IEEE 1220, and DAU 2001 SE Handbook]

s/Models Example Mapping - Management

15288	632	IEEE 1220	CMMI®-DEV	*DAG/SE*
Project Planning	Planning	Planning tech effort; Integration of SE effort; Development strategies	Project Planning; Integrated PM; Product QA	Technical Planning; *Technical Data Mngt.*
Project Assessment	Assessment	Control	Measurement & Analysis [M&A]	Technical Assessment
Project Control	Control	Control; System breakdown structure	Project Monitoring & Control	Technical Assessment; CM; Interface Mngt.
Decision Making	Systems Analysis (SA)	Systems Analysis	Decision Analysis & Resolution; M&A	Decision Analysis
Risk Management	Systems Analysis	Systems Analysis	Risk Management	Risk Management
Configuration Management (CM)	CM	CM; Integrated repository and data package	CM; *Requirements Management*	CM; Requirements Mngt.; Interface Mngt.
Information Management	*info dissemination*	*Integrated DB/pkg.*	*Project Planning*	Technical Data Management
Agreement: Acquisition & Supply	Acquisition & Supply		Supplier Agreement Management [see also **CMMI-ACQ**]	*see other DAG chapters [e.g., Affordability & LC Resource Estimates]*
Enterprise: Environment, Life Cycle, Resource; Quality Mngt.	Environment & Enterprise Support [e.g., resource, process mngt.]	Quality Management; Product & Process Improvement	Process Management processes; Process & Product QA	*see other DAG Chapters [e.g., life cycle logistics]*

ard/Models Example Mapping - Technical

ISO/IEC 15288	EIA – 632	IEEE 1220	CMMI®-DEV	DAG/SE
Stakeholder Requirements Definition	Requirements Definition	Requirements Analysis	Requirements Development & Management	Requirements Development; Logical Analysis
Requirements Analysis	Systems Analysis (SA)	Requirements and Functional Analysis; SA; Modeling	Requirements Development	Logical Analysis
Architectural Design	Solution Definition	Functional Analysis; Synthesis; SA; Modeling, Specs/drawings	Technical Solution	Logical Analysis; Design Solution
Implementation	Implementation; production	*prototyping; fabrication, assembly, production*	Technical Solution	Implementation
Integration			Product Integration	Integration;
Verification	System Verification	Functional & Design Verification; Tech reviews	Verification	Verification; [+Chap 9 - IT&E]
Validation	Requirements & End Products Validation	Requirements Validation; Tech reviews	Validation	Validation; [+Chap 9 - IT&E]
Transition	Transition to Use		*Product Integration*	Transition
Operation; Maintenance; & Disposal	*field support*	*support stage*		*See other DAG chapters [e.g., Life Cycle Logistics]*

Imminent Changes

- Following is a quick overview of anticipated changes iné

  Å ISO/IEC 15288

  Å ISO/IEC 12207

  Å EIA-632

ation of Key Standards Underway

- Why?
  - Å Differing concepts, structure, and audience
  - Å First óalignôusing a common nomenclature structure for ISO/IEC 15288 & 12207
  - Å Later a general life cycle process to provide a baseline; focus on interoperability and integration
  - Å Goal is a single vocabulary, process set, uniform architecture, shared level of prescription, and suitable across audiences

Sources: Garry Roedler, Lockheed Martin, notes from SC7 subcommittee of ISO/IEC Joint Technical Committee; James W. Moore, Mitre; Harmonization of Systems & Software Engineering Processes; 6/07; brief to ASQ-DC [IEEE and INCOSE supporting]

C 12207:1995 List of Processes

Processes, Activities, and Tasks

Primary Life Cycle Processes
Acquisition Process*
Supply Process*
Development Process [to be addressed]
Operation Process*
Maintenance Process*

Organizational Life Cycle Processes
Management Process**
Infrastructure Process*
Improvement Process**
Training Process**

Supporting Life Cycle Processes
Documentation Process
Configuration Management Process*
Quality Assurance Process**
Verification Process*
Validation Process*
Review process
Audit Process
Problem Resolution Process

**Maps directly to 15288:2007*
*** maps indirectly to 15288:2007*

Sources: Anatol Kark, Canadian National Research Center via Karen Richter, IDA, in support of DUSD(A&T) SSE/SSA; 10/07

…e Cycle Processes
…7

**Changes are highlighted*

Agreement Processes

- Acquisition Process (Clause 6.1.1)
- Supply Process (Clause 6.1.2)

Project-Enabling Processes

- Life Cycle Model Management Process (Clause 6.2.1)
- Infrastructure Management Process (Clause 6.2.2)
- Project Portfolio Management Process (Clause 6.2.3)
- Human Resource Management Process (Clause 6.2.4)
- Quality Management Process (Clause 6.2.5)

Project Processes

- Project Planning Process (Clause 6.3.1)
- Project Assessment and Control Process (Clause 6.3.2)
- Decision Management Process (Clause 6.3.3)
- Risk Management Process (Clause 6.3.4)
- Configuration Management Process (Clause 6.3.5)
- Information Management Process (Clause 6.3.6)
- Measurement Process (Clause 6.3.7)

Technical Processes

- Stakeholder Requirements Definition Process (Clause 6.4.1)
- Requirements Analysis Process (Clause 6.4.2)
- Architectural Design Process (Clause 6.4.3)
- Implementation Process (Clause 6.4.4)
- Integration Process (Clause 6.4.5)
- Verification Process (Clause 6.4.6)
- Transition Process (Clause 6.4.7)
- Validation Process (Clause 6.4.8)
- Operation Process (Clause 6.4.9)
- Maintenance Process (Clause 6.4.10)
- Disposal Process (Clause 6.4.11)

Source: Anatol Kark, Canadian National Research Center via Karen Richter, IDA, in support of DUSD(A&T) SSE/SSA; 10/07

2207: *2007* Development Process

07:1995]

System Context Activities:

* Maps to ISO/IEC 15288:2007 Technical processes

➢ System Requirements Analysis*
➢ System Architectural Design*

Software SW Activities:

Å SW Implementation
Å SW Requirements Analysis
Å SW Architecture Analysis
Å SW Detailed Design
Å SW Coding & Testing
Å SW Integration
Å SW Qualification Testing

➢ System Integration*
➢ System Qualification Testing
➢ Software Installation
➢ Software Acceptance Support

Note: SW Reuse processes added*:*

Å Domain Engineering
Å Reuse Asset Management
Å Reuse Program Management

*Sources: Anatol Kark, Canadian National Research Center via Karen Richter, IDA, in support of DUSD(A&T) SSE/SSA;10/07***;** *James W. Moore, Mitre; Harmonization of Systems & Software Engineering Processes; 6/07; brief to ASQ –DC.*

Draft proposal for EIA-632A

[Source: GEIA report; R. Harwell, 11/05 – ood?]

EIA – 632 1999	**EIA – 632A *[date?]***
Planning	Planning
Assessment	***Progress*** Assessment
Control	Control
Requirements Definition	***Concept*** Definition
Solution Definition	***System*** Definition
Product Realization [Implementation/Transition]	***System*** Realization
Systems Analysis	***Mission*** & Systems Analysis
Requirements & End products Validation; System Verification	***System*** V&V
Supply & Acquisition	***Customer*** & Supplier ***Relationship Management***
Enterprise Support	***Resources & Infrastructure***
Enterprise Support	***Governance***
Enterprise support	***Life Cycle Portfolio Management***

n ODUSD(A&T) Systems & Software g (SSE) Directorate Related Activities

Recent Issues identified as they relate to SE activities:

Å NDIA-SE Workshop on SE issues

Å DoD SW Engineering Workshop [via NDIA-SE]

Å ODUSD(A&T) / SSE *Assessment & Support* - Program Support Reviews observations

E Top 5 SE Issues

Source: NDIA SE Conference 10/06; M. Schaffer DUSD(A&T) SSE

2003	2006
Lack of awareness of SE importance	Inconsistent SE practices across all life cycle phases
Lack of adequate qualified resources	Insufficient quantity and quality of SE expertise
Insufficient SE tools and environments	Inadequate tools and collaborative environments
Inconsistent requirements definition	Requirements not well managed or translated
Poor initial program formulation	Insufficient SE early in the life cycle

A-SE Top Software Issues

1. The impact of **requirements** upon software is **not consistently quantified and managed** in development or sustainment.
2. **Fundamental system engineering decisions** are made **without full participation of software engineering.**
3. Software **life-cycle planning** and management by acquirers and suppliers is **ineffective**.
4. The quantity and quality of **software engineering expertise** is **insufficient** to meet the demands of government and the defense industry.
5. Traditional **software verification techniques** are **costly** and **ineffective** for dealing with the scale and complexity of modern systems.
6. There is a **failure to assure correct, predictable, safe, secure execution of complex software** in distributed environments.
7. **Inadequate** attention is given to total lifecycle issues for **COTS/NDI** impacts on lifecycle cost and risk.

Source: NDIA Top Software Issues Workshop August 2006; K Baldwin, DUSD(A&T) SSE/SSA

10 Emerging Systemic Issues

[from ODUSD(A&T) SSE/AS Program Support Reviews]

1. Management	Å IPT roles, responsibilities, authority, poor communication Å Inexperienced staff, lack of technical expertise
2. Requirements	Å Creep/stability Å Tangible, measurable, testable
3. Systems Engineering	Å Lack of a rigorous approach, technical expertise Å Process compliance
4. Staffing	Å Inadequate Government program office staff
5. Reliability	Å Ambitious growth curves, unrealistic requirements Å Inadequate ñtest timeò for statistical calculations
6. Acquisition Strategy	Å Competing budget priorities, schedule-driven Å Contracting issues, poor technical assumptions
7. Schedule	Å Realism, compression
8. Test Planning	Å Breadth, depth, resources
9. Software	Å Architecture, design/development discipline Å Staffing/skill levels, organizational competency (process)
10. Maintainability/Logistics	Å Sustainment costs not fully considered (short-sighted) Å Supportability considerations traded

Source: DUSD(A&T) SSE; M Schaeffer, 8/07

Major contributors to poor program performance

2007 – What a Year!

- INCOSE SE Handbook v 3.1
- Understanding & Leveraging a Supplierôs CMMI Efforts; A Guidebook for Acquirers
- CMMI for Acquisition [CMMI-ACQ]
- ISO/IEC 15288:2007
- ISO/IEC 12207:2007

…and yet to come…

- EIA-632?
- IEEE-1220? [and óadoptionô of latest ISO/IEC 15288, 12207]
- ISO/IEC 24748 - Life Cycle Management Process Standard
- Further óHarmonizationô of ISO/IEC 15288 and12207
- CMMI®-DEV v2?

...y

- **ISO/IEC 15288 is becoming a SE process 'reference' model**
  - **IEEE – 1220; 2005** updated per ISO/IEC 15288**;** IEEE óadoptedôthe 15288 w elaboration; further updates anticipated
  - **CMMI-DEV v1.2** uses SE standards and models as sources
  - **ISO/IEC 12207** (SW Engineering processes) is being óharmonizedôwith 15288; additionally a **ISO/IEC 24748** Guide for LC Mngt. in draft
  - **INCOSE SE Handbook v3.1, 2007** [applies ISO/IEC 15288**;** SE Certification will be based on it.
  - Coordination also underway with the **ISO 9001**
- **DoD supported SE & SWE in Acquisition revitalization activities**
  - **DAG/ SE & T&E are under revision; one area of expansion is Software Engineering**
  - **DAU has implemented a series of SE courses**
  - **DoD Guides:**
    - **'Integrating SE into DoD Acquisition Contracts'**
    - **'System of Systems (SoS) Engineering 'Guide being piloted**
    - **'SE Plan Preparation Guide' revised**
  - **NDIA-SE draft Systems Assurance Guide**

Acronyms/Definitions

- A&T ï Acquisition and Technology [@ODUSD]
- ANSI ï American National Standards Institute
- DAU ï Defense Acquisition University
- DoD ï U.S. Department of Defense
- DoDI ï DoD Instruction
- EIA ï Electronic Industries Alliance
- GEIA ï Government Electronics and Information Technology Association
- IEC ï International Electrotechnical Commission
- IEEE ï Institute for Electrical and Electronics Engineers
- INCOSE ï International Council on Systems Engineering
- ISO ï International Standards Organization
- IT ï Information Technology
- NDIA ï National Defense Industries Association [SE division]
- PMI ï Project Management Institute
- SE ï Systems Engineering
- SEI ï Software Engineering Institute [@Carnegie Mellon U.]
- SEMP ï SE Management Plan
- SEP ï Systems Engineering Plan
- SSCI ï Systems and Software Consortium
- SSA ï Software Engineering and Systems Assurance
- SSE ï Systems & Software Engineering Directorate [ODUSD (A&T]
- SWE ï Software [SW] Engineering

Related Process References

- **ISO/IEC 15288**: **2002** System Engineering ï System Life Cycle Processes *[new version released 2007]*
- **EIA/IS - 632**: **1998** - Processes for Engineering a System
- **IEEE 1220**: **2005** Application and Management of the Systems Engineering Process
- **CMMI®-DEV**ï Capability Maturity Model Integration® for Development v**1.2** (*2006) [updating underway]*
- **Defense Acquisition Guide**, Chapter 4 - Systems Engineering; Defense Acquisition University, 2004 *[being updated]*
- **Understanding and Leveraging a Supplier's CMMI Efforts;** DUSD(A&T) SSE; 2007
- **CMMI® – ACQ**: Adapting CMMI® for Acquisition Organizations: A Preliminary Report; 2006 *[new model report released 11/07 by SEI/CMU]*
- **INCOSE** Systems Engineering Handbook, v3.1; 8/2007
- **PMBOK® PMI's Project Management Book of Knowledge**
- **IEEE/EIA 12207** [adopted ISO/IEC 12207]; 1997 *[new version released 2007]*

ces and Links

References:

- ñ*SE Standards & Models Compared*ò, J. Lake (SMi) and S. Sheard (SPC), INCOSE 2004
- ñ*Evolution of a Standard EIA-632*ò, R. Harwell, INCOSE 2006
- ñ*Special Feature: Standards in Systems Engineering*ò, **INCOSE Insight** ; April 2007 (*see particularly K. Crowder, D. Kitterman, T. Doran, R. Harwell, and S. Arnold articles)*
- *CMMI – Next Steps;* Kristen Baldwin, ODUSD(A&T) SSE/SSA; CMMI technology Conference; November, 2007
- ñ*Harmonization of Systems and Software Engineering Processes*ò, James W. Moore; Mitre; June, 2007, brief for ASQ-DC meeting
- *Issue on Systems Engineering*; **CROSSTALK**, STSC; October 2007

Links:

- ANSI/EIA-632: http://www.geia.org/index.asp?bid=552
- CMMI: http://www.sei.cmu.edu/cmmi/
- DAU-DAG: http://akss.dau.mil/dag/
- IEEE -1220: http://www.techstreet.com/cgi-bin/detail?product_id=1260785
- IEEE Standards: http://www.ieee.org/web/standards/home/index.html
- INCOSE ï Standards site: http://www.incose.org/practice/techactivities/standards.aspx
- INCOSE Guide to SE BoK: http://g2sebok.incose.org/
- ISO: http://www.iso.org/iso/home.htm
- ISO/IEC 15288: http://www.15288.com/
- NDIA-SE: http://www.ndia.org/Template.cfm?Section=Divisions [then select SE]
- ODUSD (A&T) SSE: http://www.acq.osd.mil/sse/
- Systems & Software Consortium: http://www.systemsandsoftware.org/

Note: If you have problems locating references, contact me at gantzerd@saic.com

e:
Practices to *Technical Planning*

It was found very difficult to 'map' planning activities from the various standards & models at this level of detail – so decision was made to just summarize each for your own consideration

.

However, it is concluded that some very basic activities that need to be accomplished for planning are…

– ***the what, why, who, when and how!***

ISO/IEC 15288
EIA - 632
IEEE 1220
CMMI®-DEV
PM BoK
INCOSE SE Handbook
ODUSD(A&T) SSE Technical Planning considerations

5288 - Project Planning Activities

Purpose: to produce and communicate effective and workable project plans

- **Identify the project** objectives **and** constraints
- **Define the project** scope **as established in the agreement**
- **Establish a** WBS **based on evolving system** architecture
- **Define and maintain a project** schedule **based on project objectives and** work estimates
- **Project** achievement criteria **for the life cycle stage** decision **gates, delivery dates and major** dependencies **on external inputs or outputs**
- **Define the project** costs **and plan a** budget
- **Establish the structure of** authorities **and** responsibilities **for project work**
- **Define the** infrastructure **and** services **required by the project**
- **Plan the** acquisition **of materials, goods and enabling system services supplied from outside the project**
- **Generate and** communicate **a plan for technical mgmt. of the project, including the** reviews
- **Define the project** measures **to be generated and the associated data to be collected, validated and analyzed**
- **Generate a project** quality **plan**

Source: ISO /IEC 15288

32 – Technical Planning

- Process Implementation Strategy
  - **stakeholders, applicable docs, process approaches, LC phases, integration, reporting requirements, implementation**
- Technical Effort Definition
  - **Requirement types, db, risk mngt. process metrics, metrics/quality, cost objectives, TPMs, tasks, methods & tools, technology**
- Schedule & Organization
  - **Event& calendar based schedules, resources, staffing/disciplines, team/ org structure**
- Technical Plans
  - **Engineering, Risk mngt., Tech Review, V &V, *other***
- Work Directives
  - **Work packages, work authorizations**

Source: EIA-632
SE standards & models

20 - Planning the Technical Effort

"Prepare and Implement the technical plans and schedules to guide the project toward accomplishment of its objectives and proper conclusion."

- **Engineering Plan *[****example SEMP content****]***
- **Master and Detail Schedules**
- **Technical Plans**
- **Developmental Strategies**
- **Modeling & Prototyping**
- **Integrated Repository, Data, Tools, and Integrated Data Package**
- **Hw, SW, Humans**
- **Life Cycle Processes**
- **Specifications and Drawing Trees; SBS**
- **Integration the SE Effort**
- **Tech Reviews**
- **Quality Management**
- **Product & Process Improvement**

Source: IEEE - 1220

– DEV - Project Planning

Purpose: to supply and maintain plans that define project activities.

- Establish Estimates
  - **Estimate** scope
  - **Establish Estimates of** work products/attributes
  - **Define** life cycle
  - **Determine** effort **&** cost **estimates**
- Develop Project Plan
  - **Establish** budget **&** schedule
  - **Identify** risks
  - **Plan for** data **management,**
  - **Plan for** resources**; Needed** knowledge **&** skills
  - **Plan** stakeholder **involvement**
  - **Establish the** Plan
- Obtain commitment to the Plan
  - Review **plans that affect project**
  - Reconcile **work & resource levels**
  - **Obtain** commitment

- *Other key process area relationships: – Requirements Development, Project Monitoring & Control, Supplier Agreement Mngt. , Integrated PM, Risk Mngt., Measurement & Analysis, …*

Source: CMMI®-DEV

V: Generic Practices for all process areas

- Perform the planning process
- Establish & maintain an Org policy for planning process
- ***Plan the planning process***
- Provide resources
- Assign responsibility
- Train people
- Manage configurations
- Identify and involve relevant stakeholders
- Monitor and control the planning process
- Objectively evaluate adherence to the planning process
- Review status with higher level management

Source: CMMI®-DEV

SE Handbook - Planning Process

Controls
-Enterprise Strategic Plan
-Enterprise Policies & Standards

Inputs
-Proposals
-Project Constraints
- Roles & Responsibilities
- Resource Requirements Forecast

Activities
- Define Scope, Objectives, and Constraints
- Define WBS, Work Packages, Schedules & Budgets
-Prepare Project Plans
-Establish Project Structure, Roles & Responsibilities

Outputs
- Project WBS & Data Dictionary
- SEP, tailored CMP, IMP, RMP & QMP
- Key Personnel & Resources
- Project Performance Measures

Enablers
- Enterprise Project Procedures & Processes
-Enterprise Infrastructure

Figure 5-2 Context Diagram for the Project Planning Process

Source: INCOSE SE Handbook v3.1

agement – Book of Knowledge (PMBOK)
agement area)

- Scope*
- Integration
  (charter, scope statement, PMP)
- Communication*
- Risk*
- Quality*
- Human Resources*
- Time **(definition, sequencing, estimation)**
- Cost **(estimation, budgeting)**
- Procurement **(purchase, acquisition, contracting)**

**** Apply** Planning**, Execution & Control to each area***

*** Note: DoD PMBoK Extension (2003 also covers**
SE, SW Acquisition, Logistics, T&E, Manufacturing

Source: www.PMI.org ; 3rd Edition, 2004

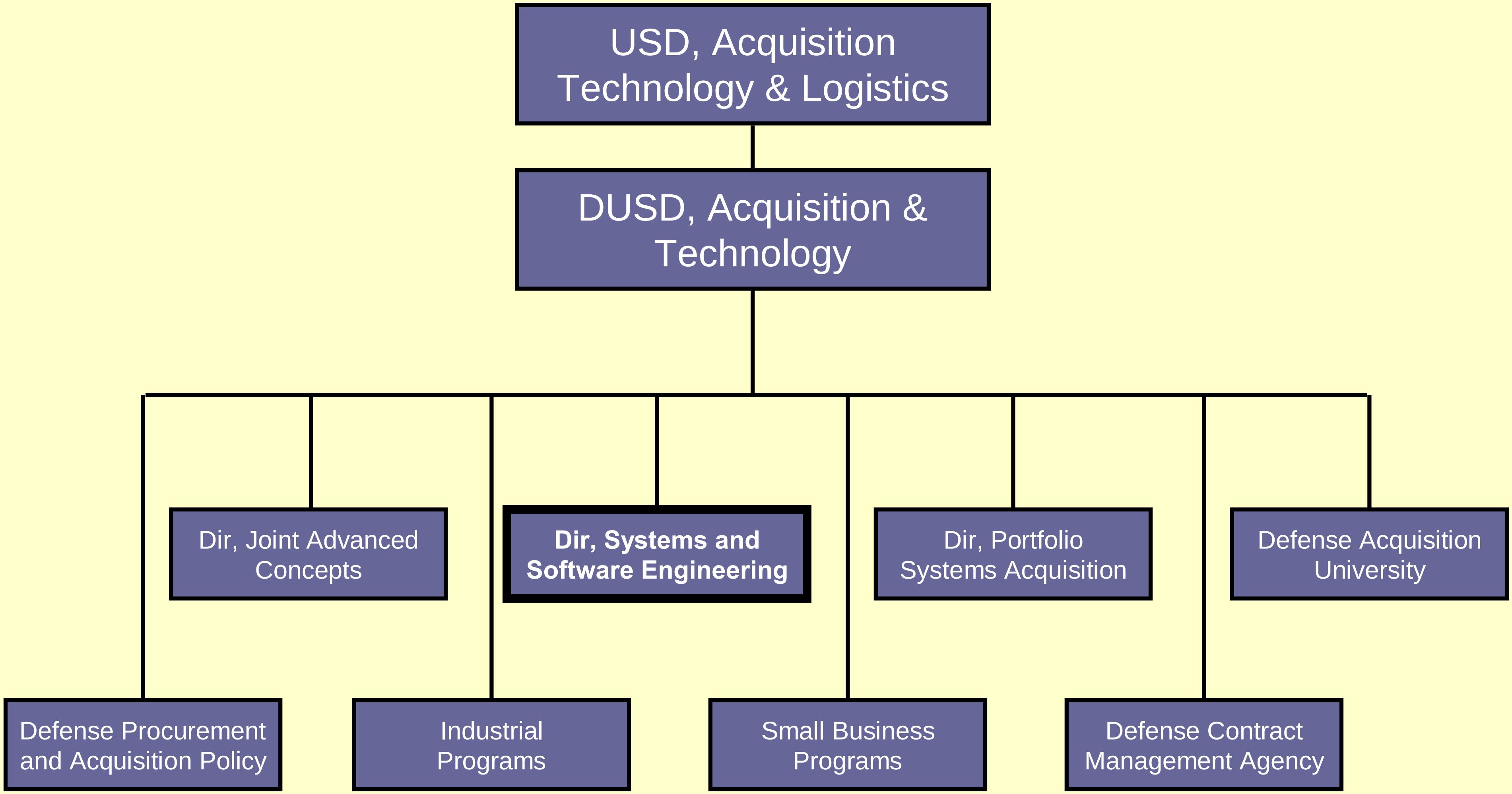
&T) SSE - Technical Planning Emphasis

- Manage a Comprehensive Set of Requirements
  - Å **Define project scope w key stakeholders** [FoS, SoS]
  - Å **Formulate, assess, select the preferred system concept**
  - Å **Develop explicit and testable system/project requirements**
  - Å **Develop a WBS** [products & process]
- Resource & Staffing to the Technical Plan
  - Å **Organize and staff the project team** [PM, Lead SE, IPTs]
  - Å **Estimate the time and resource requirements** [IMS, EVMS
  - Å **Develop a project critical path**
  - Å **Develop a project budget**
- Develop and Managing Technical Baselines
  - Å **Identify, manage, and mitigate project risks** [technical]
  - Å **Manage project changes and customer expectations**
- Managing Event-based Technical Reviews
- Integrating Tech Planning into overall Program Planning & Management Context [IMP/IMS, EVMS, program Risks]

Note: DoD is updating DAG/SE, DoDI 5000.2, and SEP Prep Guide just updated

Source: SE Plan Preparation Guide; 1/06

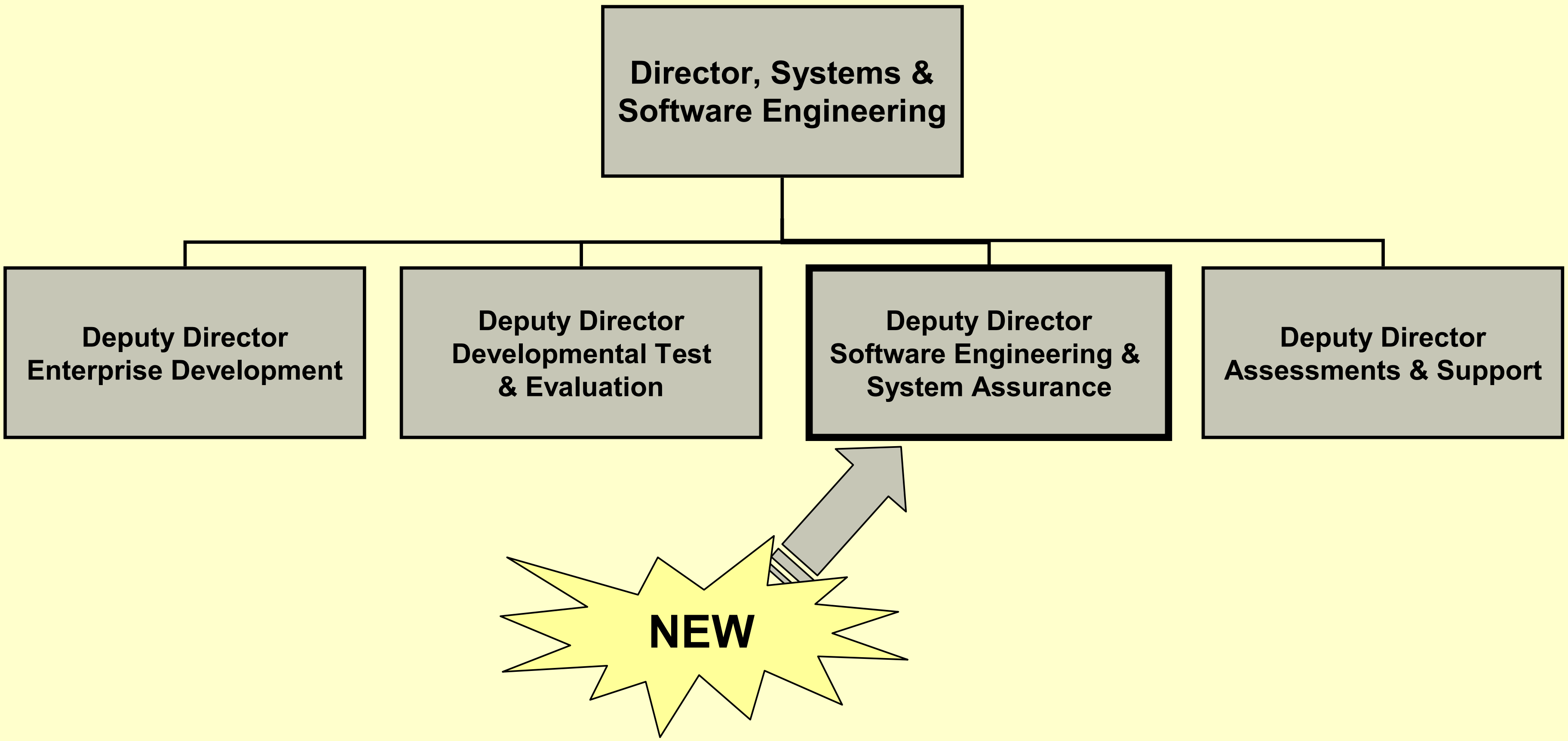
USD (AT&L) Organization



Flatter, Leaner, Empowered!

s and Software Engineering

An Organizational Construct



Management Visibility – Best Practices – Acquisition Excellence

) Systems and Software ring Mission Statement

- Shape acquisition solutions and promote early technical planning
- Promote the application of sound systems and software engineering, developmental test and evaluation, and related technical disciplines across the Department's acquisition community and programs
- Raise awareness of the importance of effective systems engineering and drive the state-of-the-practice into program planning and execution
- Establish policy, guidance, best practices, education, and training in collaboration with academia, industry, and government communities
- Provide technical insight to program managers and leadership to support decision making

Source: DOD(A&T) SSE; M Schaeffer, 8/07

We continue to evolve as the challenges change

Using the CMM-ACQ to Improve Acquisition Processes

GAO
Accountability * Integrity * Reliability

Madhav Panwar

Keith Rhodes

Background

Å Software quality is governed largely by the quality of the processes involved in developing or acquiring, and maintaining it.

Å Carnegie Mellon Universityôs Software Engineering Institute (SEI) has developed models and methods that define and determine organizationsô software process maturity.

Å These provide a logical framework for baselining an organizationôs current process capabilities (i.e., strengths and weaknesses) and providing a structured plan for incremental process improvement.

CMMI at GAO

- Lead Appraiser
- Approximately 150 individuals trained in various models primarily CMMI and others over the years (SW-CMM, SA-CMM, and P-CMM)

CMMI ACQ Users

- Organizations that acquire products or services that include software
- Organizations that contract for systems solutions which contain software
- Integrated product teams assisting in acquisition management

CMMI-ACQ & Federal Agencies

- Agencies are
  - Increasingly contracting out significant portions of IT development.
  - óPartneringô with contractors
  - Under the impression that the contractorôs processes are meet their needs
  - Letting contractors manage themselves

Contracting Requires Discipline

- Federal agencies assume contracting
  - absolves them of acquisition-related responsibilities
    - e.g. no need to define requirements, needs minimal tracking and oversight, ...
  - alleviates them from risk
  - addresses development immaturity
  - coupled with COTS produces immediate results

Acquisition Misconceptions

- Use commercial methodology to guide systems prioritization
- Partnering with Prime to jointly ðbuildô
- Transferring all risk to the contractor

Acquisition Issues Discovered

Å Agencies

- ï Do not grasp difference between acquisition and development
- ï Believe that by hiring contractors they are acquiring a system
- ï Let contractors define requirements
- ï Assume a lifecycle methodology solves all problems

Other Issues Discovered

- Agencies
  - Do not fully understand what they "want"
  - Unable to articulate what they do "want"
  - Do not have a "roadmap"

CMMI-ACQ Facilitates Discipline

Å The CMMI-ACQ

ï Provides the ðbuyerô a roadmap for acquisition process improvement

ï Enables the ðbuyerô to measure and improve selected areas

ï Facilitates management and control of the acquisition

GAO Methodology

Å GAO audits assess every specific and generic practice for Class A.

Å GAO has also conducted various Class B and C appraisals.

Å GAO works with the audited agency to identify specific process areas that are applicable and may pull from multiple models (CMMI-DEV and CMMI-ACQ)

GAO Methodology

Å Details findings provided by GAO audits

ï assist in process improvement

ï provide a way to prioritize improvement

ï enable building on areas of strength

Conclusion

- Contracting out is not a panacea for lack of acquisition processes
- GAO's use of CMMI-ACQ pinpoints specific areas for improvement

NTE's Choice of the CMMI-ACQ

Thomas Neff
MTC Technologies, supporting
DTRA/RD-NTE

13 Nov 2007

ve are

Å Defense Agency

Å Acquire software

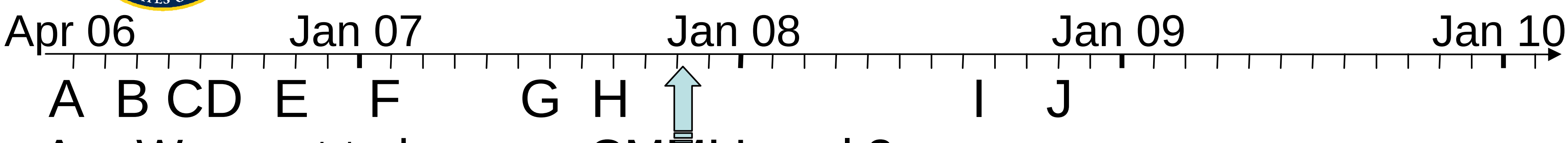
Å Fund studies

Å Integrate DoD tools

Å Integrate U.S. Government data

Å Provide toolset to DoD customers

ve chose CMMI-ACQ



A. ~~We want to become CMMI Level 3~~
B. We want to institutionalize continuous process improvement (CPI)
C. Chose SA-CMM and P-CMM
D. Learned of the CMMI-ACQ
E. Chose CMMI-ACQ because of core process areas included in ACQ & DEV
F. Started using CMMI-ACQ
G. Started CMMI-ACQ pilot project
H. Implemented all policy ñrequiredò by CMMI-ACQ
I. Phase-In beginsé òAll projects started after todayé ò
J. Pilot ñcompleteò

By 2012, ALL projects will be *operating at* CMMI-ACQ Level 5 & weõll be figuring out what Level 6 looks like.

on suppliers/vendors/contractor

<u>We will not</u>:
Å Do business as usual
Å Say, ñYou must be Level X by <u>(date)</u>ò
Å Mandate any specific CPI paradigm

Å Be vague about requirements
Å Manage by seat of our pants
Å Fix retroactively

<u>We will</u>:
Å *Ensure* best value
Å Say, ñShow me your CPI plan *and progress*ò
Å Require *some* CPI paradigm but encourage CMMI-DEV
Å Give me a WBS w/ costs for each item
Å Manage via EVMS

Å Start w/ new contracts

ct

Å Tom Neff
MTC Technologies, supporting
The Defense Threat Reduction Agency
Nuclear Weapons Effects Division
www.dtra.mil
Ft Belvoir, VA
Thomas.Neff_contractor@dtra.mil

CMMI® Version 1.2 and Beyond

CMMI Technology Conference
November 12, 2007

Mike Phillips
Software Engineering Institute
Carnegie Mellon University

® CMMI is registered in the U.S. Patent and Trademark Office by Carnegie Mellon University.

With thanks to Denise Cattan, Sandra Cepeda, Pascal Rabbath, and Gary Wolf for contributions.

CMMI Today

…n Status As reported to the SEI as of 10-31-07

Training

Introduction to CMMI ï 76,794

Intermediate CMMI ï 2,622

Understanding CMMI High Maturity Practices ï 243

Authorized

Introduction to CMMI V1.2 Instructors ï 433

SCAMPI V1.2 Lead Appraisers ï 455

SCAMPI B&C V1.2Team Leads ï 21

SCAMPI High Maturity Lead Appraisers -- 127

n, Web Views

CMMI

421K views/month in Q4 2006; over 24K views on 27 Sep 2006

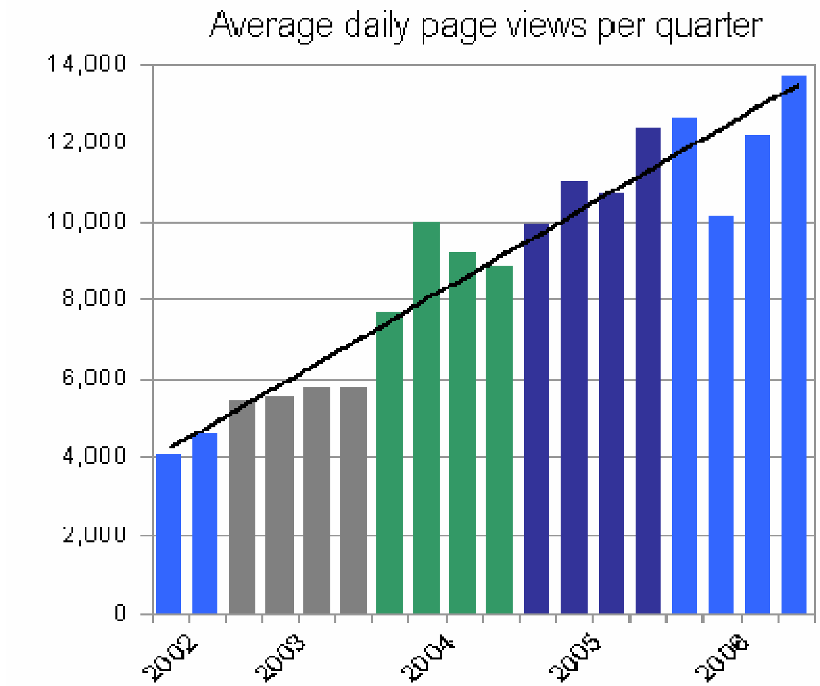
Most downloaded files in Q4 2006

Å CMMI-DEV, V1.2

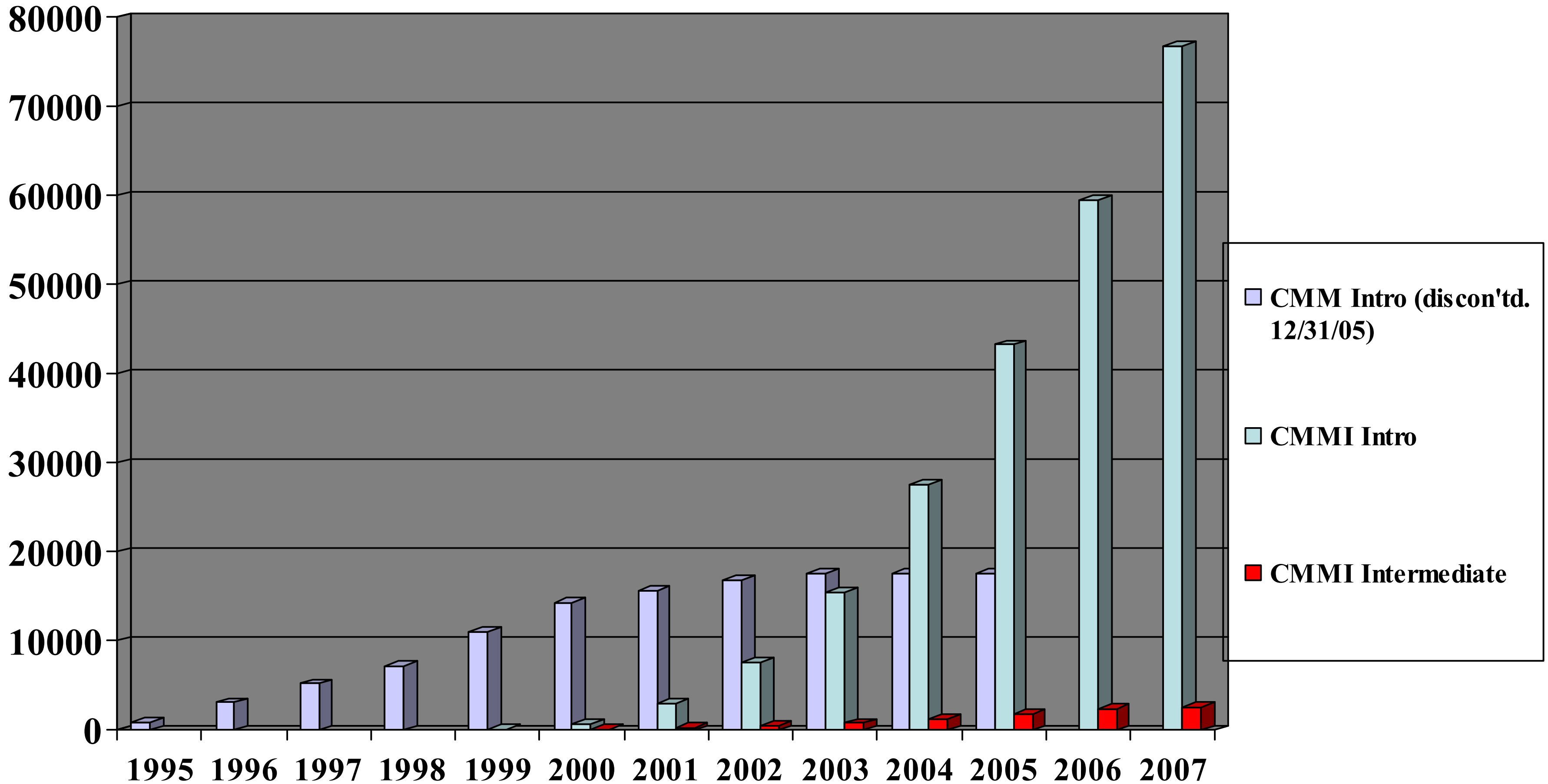
Å CMMI V1.2 Overview Presentation

Å ñExtreme Programming (XP), Six Sigma, & CMMI: How They Can Work Togetherò

Å ñCMMI V1.2 Model Changesò Presentation

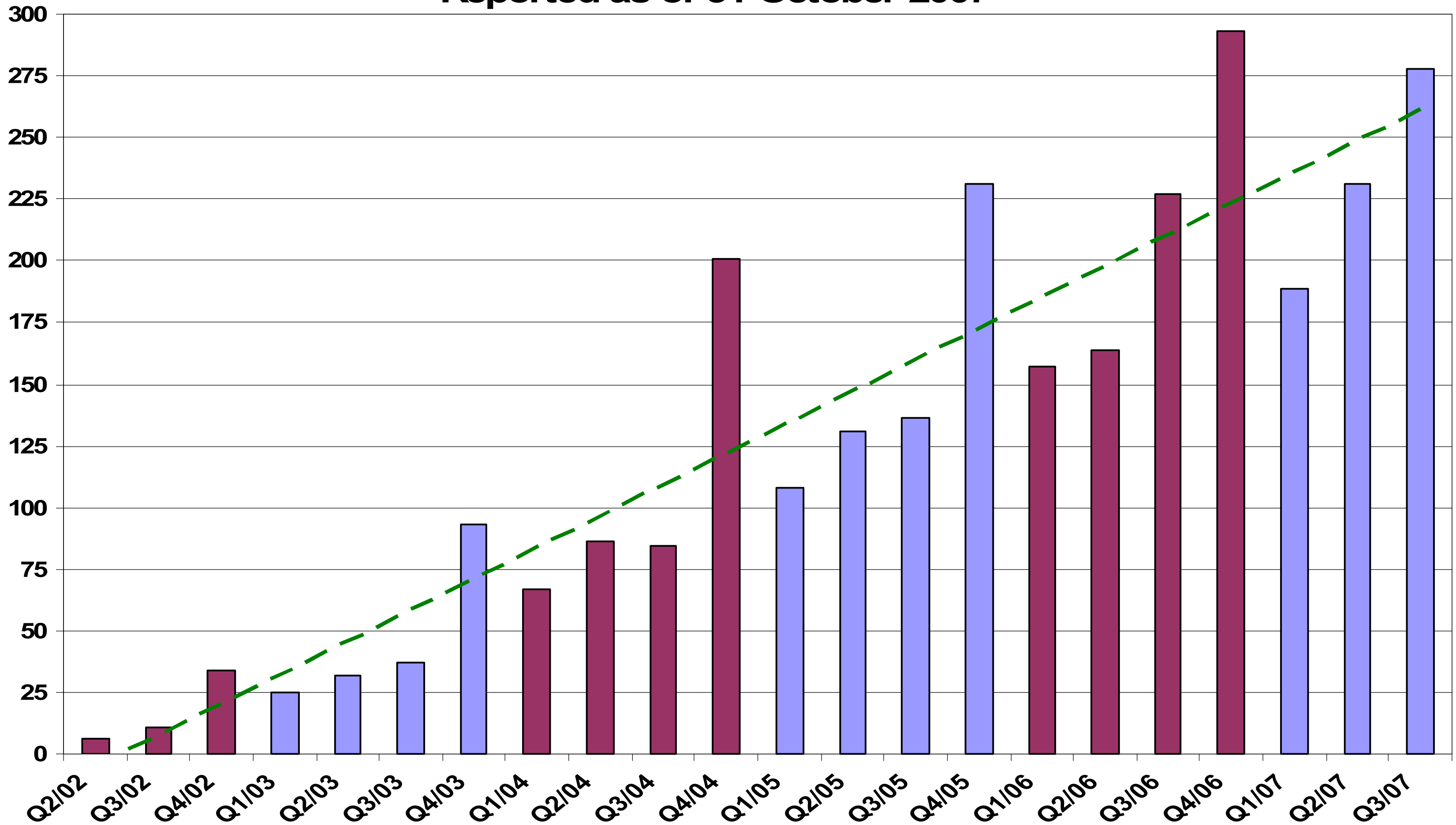


the CMM and CMMI Attendees (Cumulative)



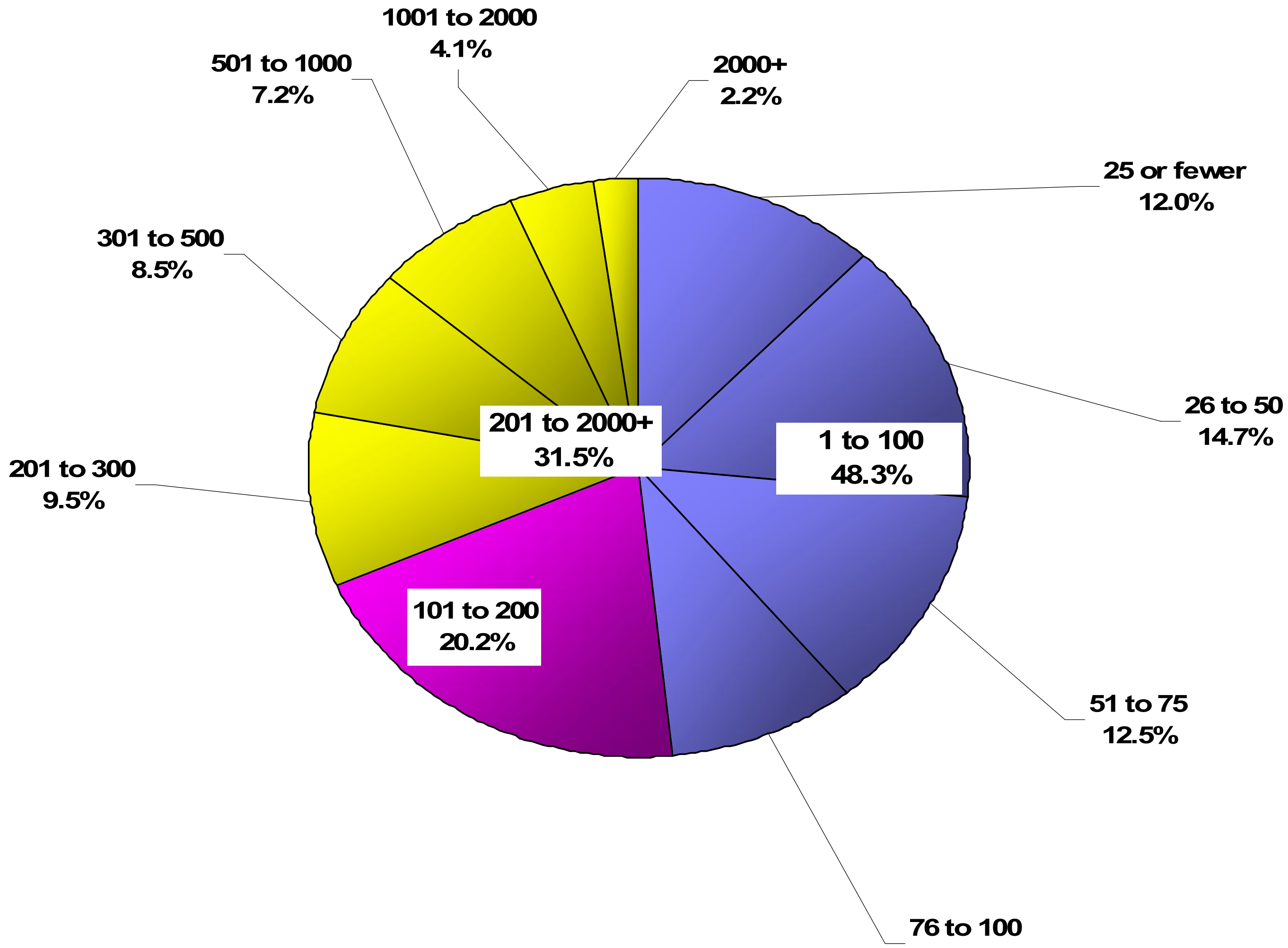
10-31-07

Number of SCAMPI v1.1/v1.2 Class A Appraisals Conducted by Quarter Reported as of 31 October 2007

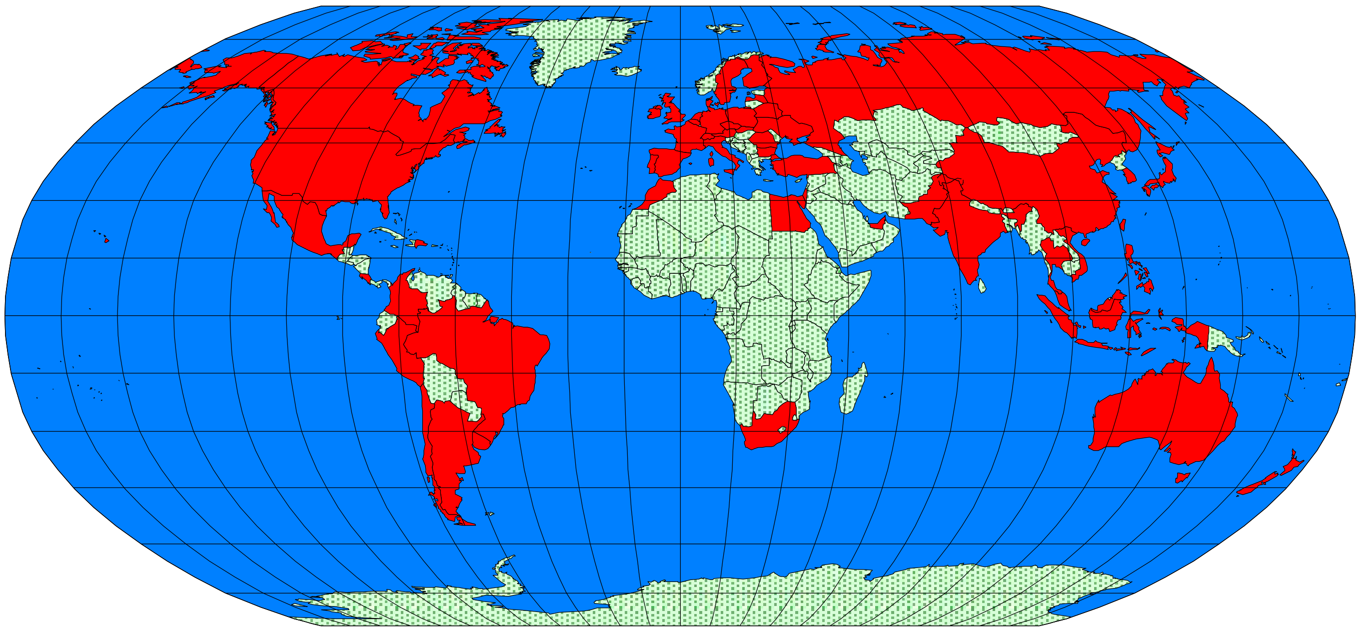


n Size

Based on the total number of employees within the area of the organization that was appraised



re Appraisals have been Performed and Reported to the SEI

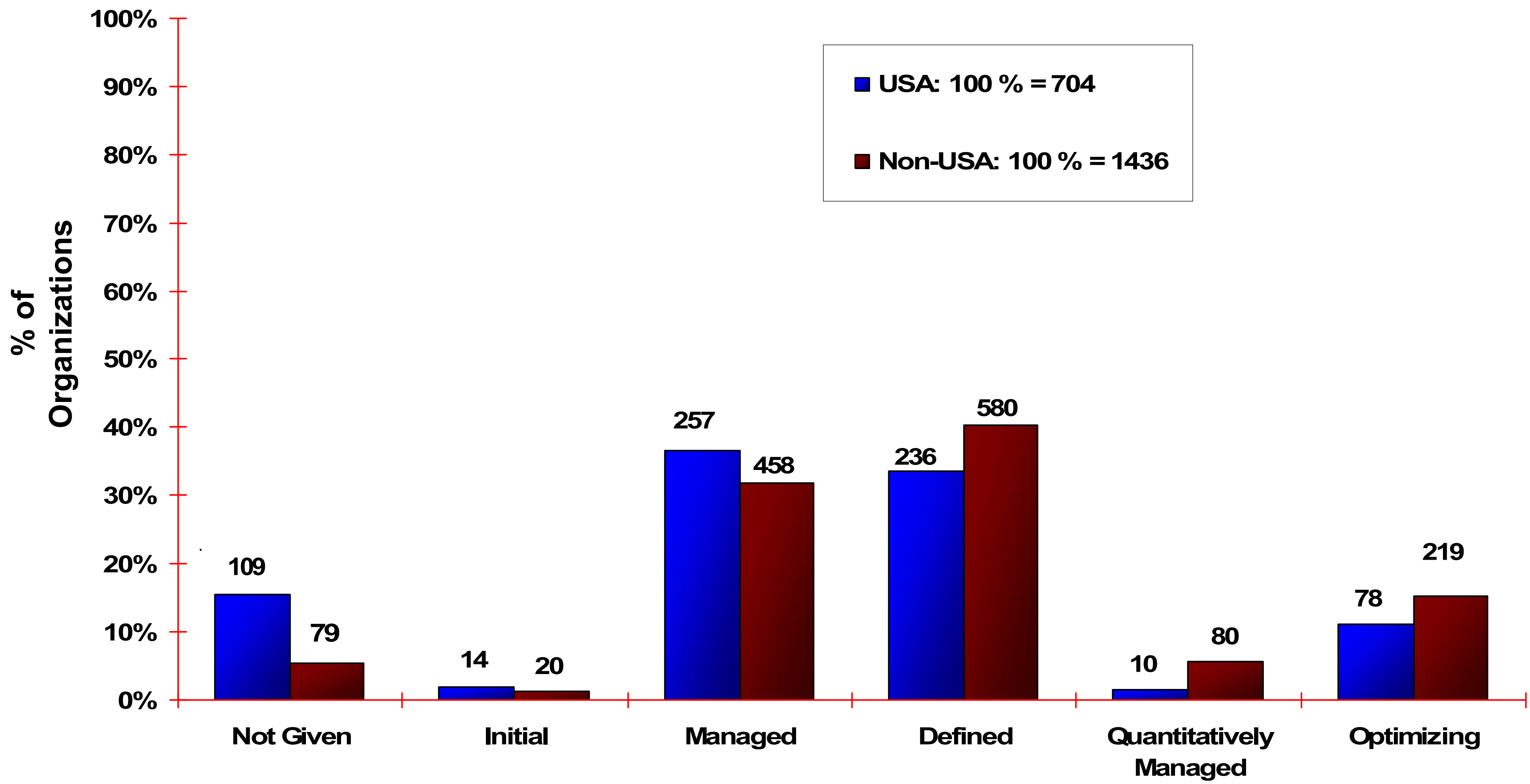


Argentina	Australia	Austria	Bahrain	Belarus	Belgium	Brazil	Bulgaria
Canada	Chile	China	Colombia	Costa Rica	Czech Republic	Denmark	Dominican Republic
Egypt	Finland	France	Germany	Hong Kong	India	Indonesia	Ireland
Israel	Italy	Japan	Korea, Republic Of	Latvia	Malaysia	Mauritius	Mexico
Morocco	Netherlands	New Zealand	Pakistan	Peru	Philippines	Poland	Portugal
Romania	Russia	Singapore	Slovakia	South Africa	Spain	Sweden	Switzerland
Taiwan	Thailand	Turkey	United Kingdom	Ukraine	United Arab Emirates	United States	Uruguay

isals and Maturity Levels Reported to the SEI by Country

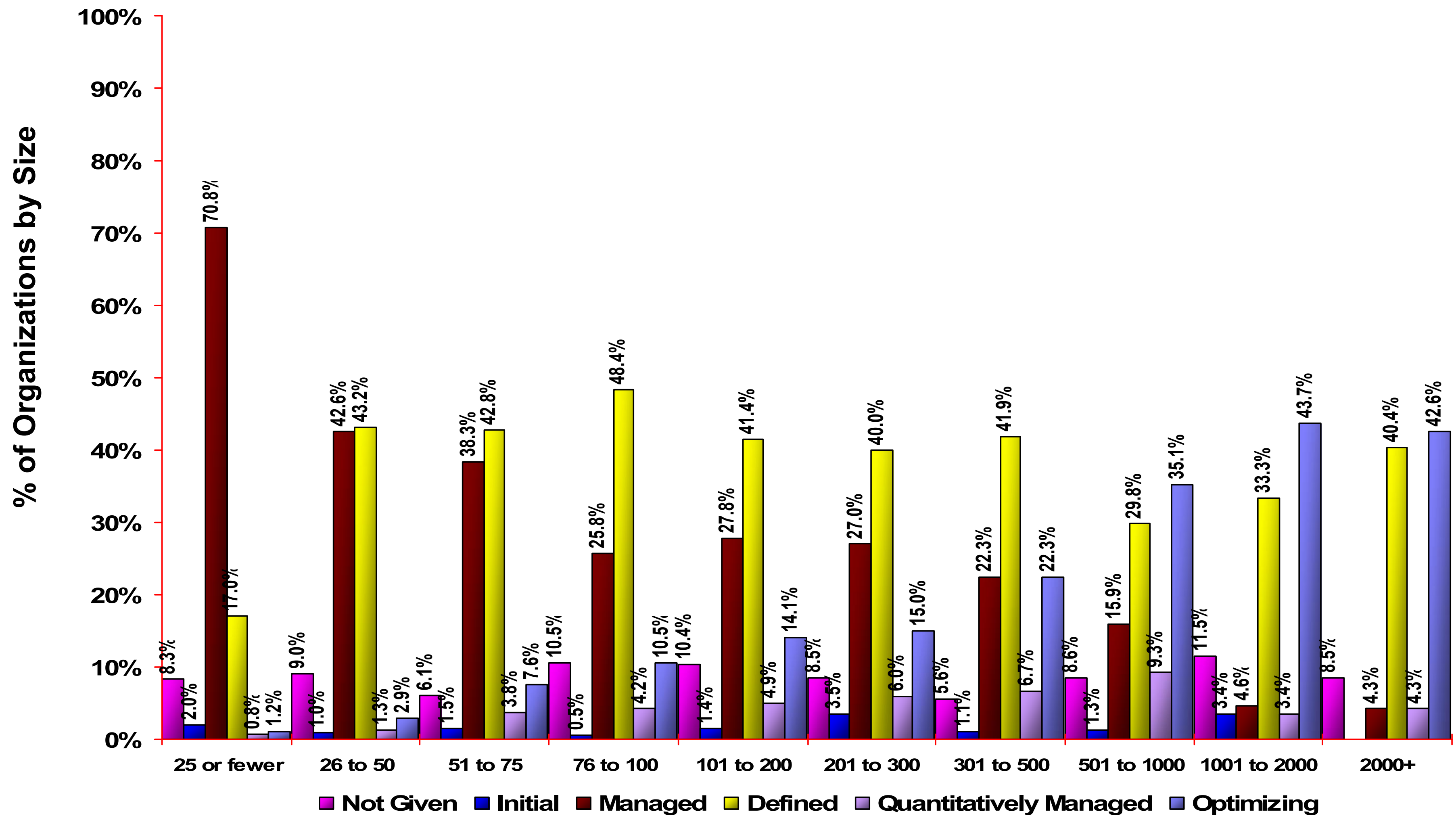
Country	Number of Appraisals	Maturity Level 1 Reported	Maturity Level 2 Reported	Maturity Level 3 Reported	Maturity Level 4 Reported	Maturity Level 5 Reported	Country	Number of Appraisals	Maturity Level 1 Reported	Maturity Level 2 Reported	Maturity Level 3 Reported	Maturity Level 4 Reported	Maturity Level 5 Reported
Argentina	26	No	Yes	Yes	Yes	Yes	Malaysia	29	No	Yes	Yes	No	Yes
Australia	26	Yes	Yes	Yes	Yes	Yes	Mauritius	10 or fewer					
Austria	10 or fewer						Mexico	29	Yes	Yes	Yes	Yes	Yes
Bahrain	10 or fewer						Morocco	10 or fewer					
Belarus	10 or fewer						Netherlands	10 or fewer					
Belgium	10 or fewer						New Zealand	10 or fewer					
Brazil	58	No	Yes	Yes	Yes	Yes	Pakistan	10 or fewer					
Bulgaria	10 or fewer						Peru	10 or fewer					
Canada	38	No	Yes	Yes	Yes	Yes	Philippines	17	No	Yes	Yes	No	Yes
Chile	17	No	Yes	Yes	No	Yes	Poland	10 or fewer					
China	321	Yes	Yes	Yes	Yes	Yes	Portugal	10 or fewer					
Colombia	16	No	Yes	Yes	Yes	Yes	Romania	10 or fewer					
Costa Rica	10 or fewer						Russia	10 or fewer					
Czech Republic	10 or fewer						Singapore	10					
Denmark	10 or fewer						Slovakia	10 or fewer					
Dominican Republic	10 or fewer						South Africa	10 or fewer					
Egypt	25	No	Yes	Yes	Yes	Yes	Spain	55	No	Yes	Yes	Yes	Yes
Finland	10 or fewer						Sweden	10 or fewer					
France	94	Yes	Yes	Yes	Yes	Yes	Switzerland	10 or fewer					
Germany	41	Yes	Yes	Yes	Yes	Yes	Taiwan	71	No	Yes	Yes	No	Yes
Hong Kong	10						Thailand	10 or fewer					
India	256	No	Yes	Yes	Yes	Yes	Turkey	10 or fewer					
Indonesia	10 or fewer						Ukraine	10 or fewer					
Ireland	10 or fewer						United Arab Emi	10 or fewer					
Israel	12	No	Yes	Yes	No	Yes	United Kingdom	57	Yes	Yes	Yes	Yes	Yes
Italy	12	No	Yes	Yes	No	No	United States	859	Yes	Yes	Yes	Yes	Yes
Japan	197	Yes	Yes	Yes	Yes	Yes	Uruguay	10 or fewer					
Korea, Republic Of	87	Yes	Yes	Yes	Yes	Yes	Viet Nam	10 or fewer					
Latvia	10 or fewer												

file by All Reporting USA and Non-USA Organizations

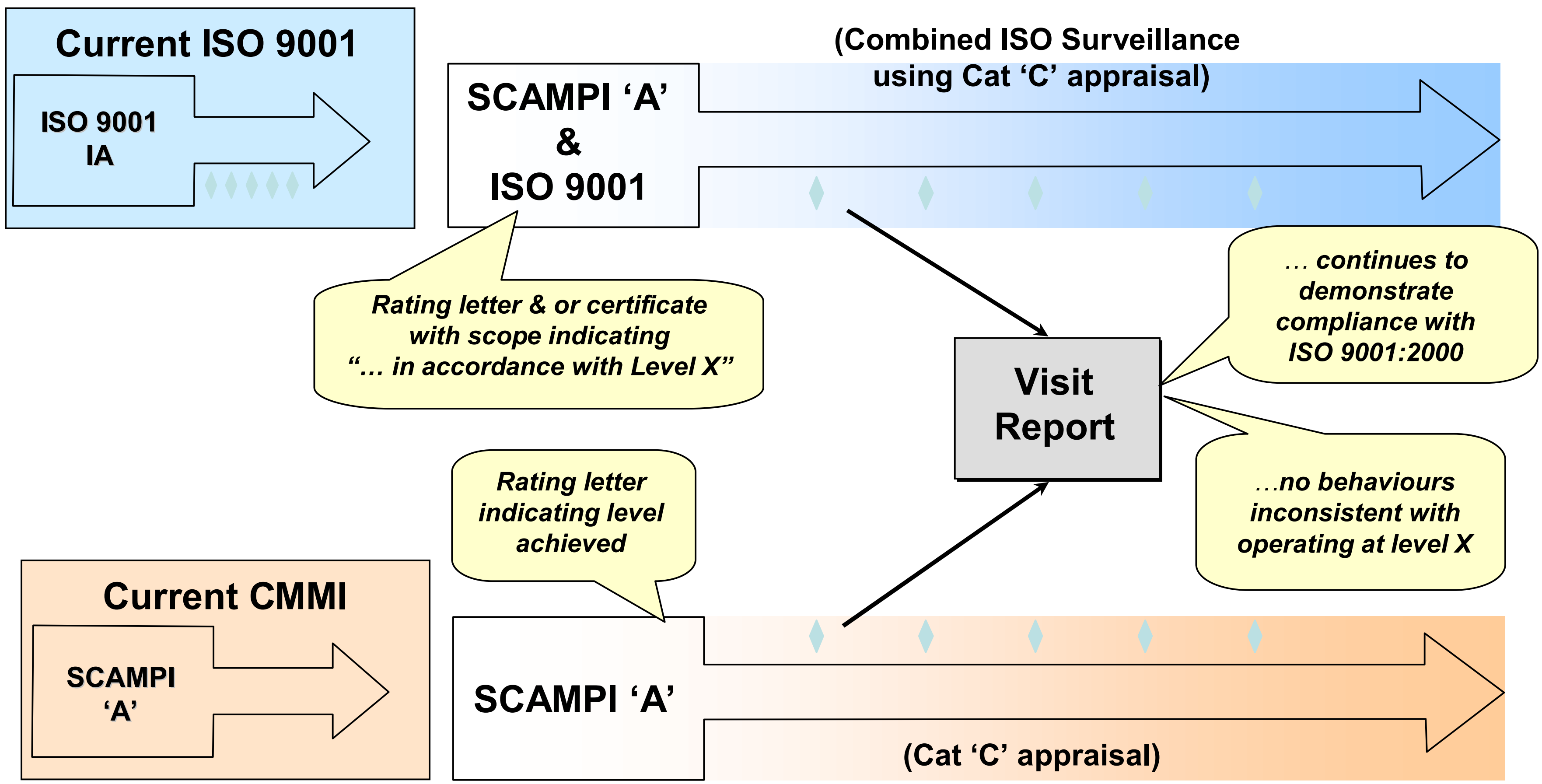


e by Organization Size

ees within the area of the organization that was appraised



raisal Opportunities

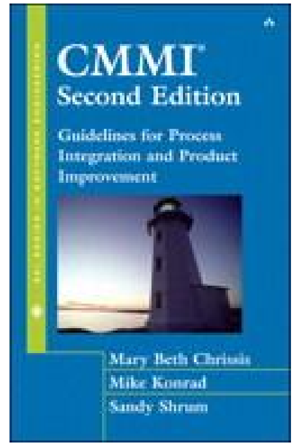


The possible options for assessment and surveillance

t Else Is Happening?

The Addison-Wesley SEI Series Book and

- A Guide to the CMMI
- CMMI: A Frameworké
- CMMI Assessments
- CMMI Distilled: Second Edition
- CMMI SCAMPI Distilled
- CMMI Survival Guide
- CMMI: Un Itinéraire Fléché
- De kleine CMMI
- Interpreting the CMMI
- Making Process Improvement Work
- Practical Insight into CMMI
- Real Process Improvement Using the CMMI
- Systematic Process Improvement Using ISO 9001:2000 and CMMI
- Balancing Agility and Discipline



Publications?

Technical notes and special reports

- Using CMMI-DEV for sourcing
- Interpreting CMMI:
  - for Operational Organizations
  - for COTS Based Systems
  - for Service Organizations
  - for Marketing
- Using CMMI with:
  - TSP/PSP
  - Earned Value Management
  - Product Line Practices
  - Lean Six Sigma
- Supplementing CMMI for Safety Critical Development
- Demonstrating the Impact and Benefits of CMMI (and Web pages – www.sei.cmu.edu/cmmi/results)

esults Summary

Improvements	Median	# of data points	Low	High
Cost	34%	29	3%	87%
Schedule	50%	22	2%	95%
Productivity	61%	20	11%	329%
Quality	48%	34	2%	132%
Customer Satisfaction	14%	7	-4%	55%
Return on Investment	4.0 : 1	22	1.7 : 1	27.7 : 1

Å N = 30, as of August 2006
Å Organizations with results expressed as change over time

Version 1.1 CMMI Product Suite was released January 2002.

Å CMMI Web site visits average over 20,000/day

Å Over 75,000 people have been trained

Å Over 2500 ñclass Aò appraisals have been reported to the SEI

Now we want to continuously improveé

CMMI V1.2 and Beyond

for V1.2

Reduce complexity & size

Increase coverage

Increase confidence in appraisal results

l Complexity & Size

Eliminated the concepts of advanced practices and common features

Incorporated ISM into SAM; eliminated Supplier Sourcing (SS) addition

Consolidated and simplified the IPPD material

All definitions consolidated in the glossary

Adopted a single book approach (i.e., will no longer provide separate development models)

Report size reduced 15% from either predecessor; PAs reduced 12%

...el Coverage

Added hardware amplifications

Added two work environment practices (i.e., one in OPD and one in IPM)

Added goal and two practices in OPF to emphasize importance of project startup

Updated notes (including examples) where appropriate so that they also address service development and acquisition of critical elements

Updated name to CMMI for Development (CMMI-DEV) to reflect the expanded coverage

s - Other

Improved the Overview section (Part One)

Improved clarity of how GPs are used

- Moved generic goals and practices to Part Two
- Added explanation of how process areas support the implementation of GPs
- Added GP elaborations for GP 3.2

Improved the glossary (e.g., higher level management, bidirectional traceability, subprocess)

Limited the process areas that can be considered "not applicable" to SAM.

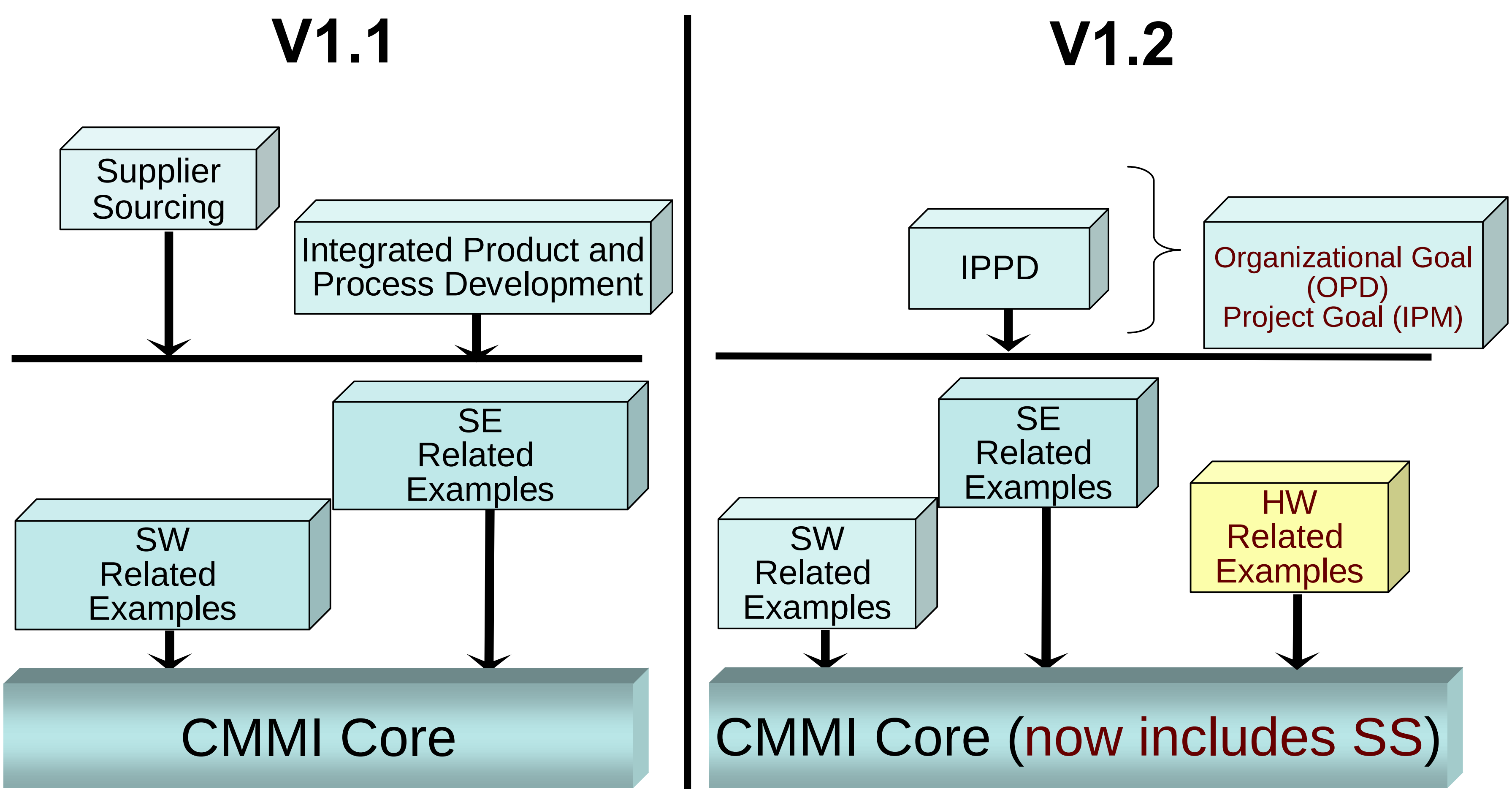
Clarified material throughout the model based on over 1000 change requests

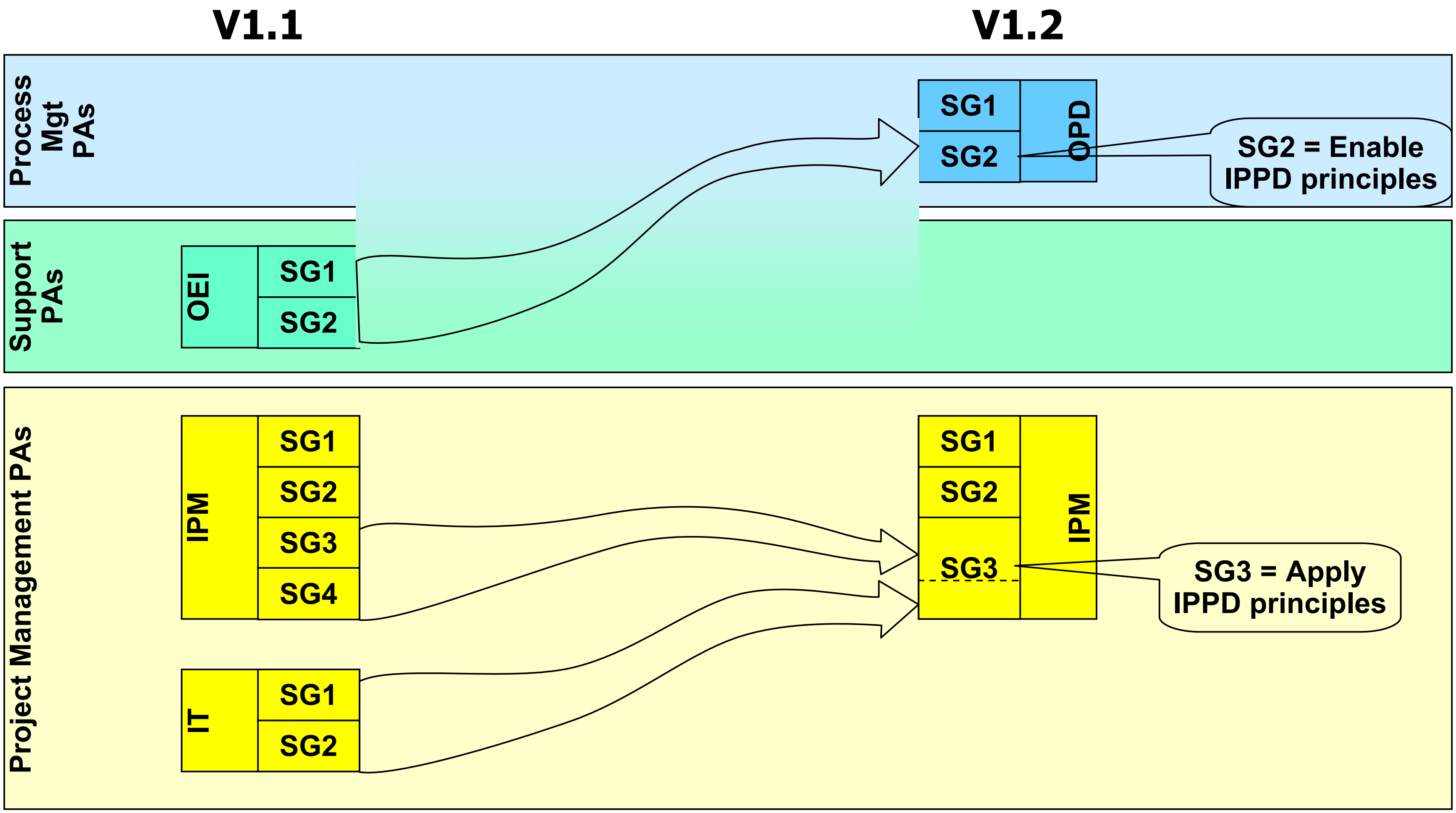
duct and Process Development (IPPD) Changes

IPPD material is being revised significantly.

- Organization Environment for Integration PA removed and material moved to Organizational Process Definition (OPD) PA.
- Integrated Teaming PA removed and material moved to Integrated Project Management (IPM) PA.
- IPPD goals have been consolidated.
  - ñEnable IPPD Managementò in OPD
  - ñApply IPPD Principlesò in IPM
- Overall material condensed and revised to be more consistent with other PAs.

ombinations




V1.1
V1.2
Process Mgt PAs
Support PAs
Project Management PAs
OEI
SG1
SG2
OPD
SG1
SG2
SG2 = Enable IPPD principles
IPM
SG1
SG2
SG3
SG4
IT
SG1
SG2
IPM
SG1
SG2
SG3
SG3 = Apply IPPD principles

ment Management

Specific Goal	Specific Practice
Establish Supplier Agreements	**1.1 – Determine Acquisition Type** **1.2 – Select Suppliers** **1.3 – Establish Supplier Agreements**
Satisfy Supplier Agreements	**2.1 – Execute the Supplier Agreement** **2.2 – Monitor Selected Supplier Processes** **2.3 – Evaluate Selected Supplier Work Products** **2.4 – Accept the Acquired Product** **2.5 – Transition Products**

V1.1 SP2.1 ñReview COTS Products,òwas eliminated. ñIdentify candidate COTS products that satisfy requirementsòis a new subpractice under the Technical Solutions Process Area SP1.1, ñDevelop Alternative Solutions and Selection Criteria.ò

ocess Focus

V1.1	V1.2
SG 1 – Determine Process Improvement Opportunities	**SG 1 – Determine Process Improvement Opportunities**
1.1 – Establish Organizational Process Needs	1.1 – Establish Organizational Process Needs
1.2 – Appraise the Organization's Processes	1.2 – Appraise the Organization's Processes
1.3 – Identify the Organization's Process Improvements	1.3 – Identify the Organization's Process Improvements
SG 2 – Plan and Implement Process Improvement Activities	**SG 2 – Plan and Implement Process Improvement**
2.1 – Establish Process Action Plans	2.1 – Establish Process Action Plans
2.2 – Implement Process Action Plans	2.2 – Implement Process Action Plans
2.3 – Deploy Organizational Process Assets	**SG 3 – Deploy Organizational Process Assets and Incorporate Lessons Learned** (New)
2.4 – Incorporate Process-Related Experiences into the Organizational Process Assets	3.1 – Deploy Organizational Process Assets
	3.2 – Deploy Standard Processes
	3.3 – Monitor Implementation
	3.4 – Incorporate Process Related Experiences into the Organizational Process Assets

nges for V1.2

Method implementation clarifications

- interviews in ñvirtualò organizations
- practice characterization rules
- organizational unit sampling options

Appraisal Disclosure Statement (ADS) improvements

- reduce redundancy with other appraisal documents
- improve usability for sponsor and government
- Level 4,5 mapping to business objectives
- require sponsorõs signature on the ADS
- require all team members to show agreement on findings
- Both V1,1 and V1.2 ADS reflect these today

Appraisal team will have responsibility for determination of ñapplicabilityò for SAM

Maturity level and capability level validity period ï 3 years, given 1 year of V1.2 availability

raisal Results

Carnegie Mellon Software Engineering Institute

List of Published SCAMPI Appraisal Results

ORGANIZATION NAME:	Satyam Computer Services Ltd.
SPONSOR NAME:	Nagaraj Chevour
LEAD APPRAISER NAME:	Raghavan Nandyal
SEI PARTNER:	SITARA Technologies Pvt. Ltd.
APPRAISAL END DATE:	4/3/2004
MATURITY LEVEL ASSIGNED:	5
APPRAISED ORGANIZATIONAL UNIT:	
Entity Name:	SRU GE-GDC
Location(s):	Secunderabad, AP, India
CMMI MODEL USED:	CMMI-SW/IPPD, V1.1, Continuous
APPRAISAL METHOD USED:	SCAMPI v1.1

MODEL SCOPE & CAPABILITY RATINGS ASSIGNED:

Process Management		Project Management		Engineering		Support	
OPF	Capability Level 3	PP	Capability Level 4	REQM	Capability Level 3	CM	Capability Level 3
OPD	Capability Level 3	PMC	Capability Level 4	RD	Capability Level 4	PPQA	Capability Level 3
OT	Capability Level 3	SAM	Not Applicable	TS	Capability Level 5	MA	Capability Level 3
OPP	Capability Level 3	IPM	Capability Level 3	PI	Capability Level 3	DAR	Capability Level 3
OID	Capability Level 3	RSKM	Capability Level 4	VER	Capability Level 5	OEI	Capability Level 3
		IT	Capability Level 3	VAL	Capability Level 3	CAR	Capability Level 3
		ISM	Not Rated				
		QPM	Capability Level 3				

Major Themes

Reduce complexity and ambiguity

Provide additional guidance where needed

Strengthen appraisal planning and conduct

Strengthen appraisal reporting

Define appraisal validity period

Strengthen lead appraiser requirements

exity -1

The requirement for instruments (e.g., questionnaires) was removed.

Only two types of objective evidence are now required:

- documents
- interviews

The following sections in MDD were revised:

- switched 2.2 Verify and Validate Objective Evidence and 2.3 Document Objective Evidence so that the order of tasks reflects the natural order of conducting an appraisal
- separated Verify Objective Evidence and Validate Preliminary Findings to better describe each process

exity -2

The use of the term instantiation was changed:

Å Instantiation is now defined as ñthe implementation of a model practice used in the appropriate context within the boundaries of an organizational unit.ò

Å The word ñinstantiationò for project and organizational-wide entities was replaced with ñprojectò or ñsupport group.ò

uity

The rating Not Rated was clarified:

- Process areas outside of the model scope are rated as Out of Scope. For example, for a maturity level 3 appraisal, maturity level 4 and 5 process areas are rated as Out of Scope.
- For process areas that have insufficient data to be rated, the rating is Not Rated.
- Process areas in the model scope, but outside the organizational scope are rated as Not Applicable. The only process area that can be Not Applicable is SAM (as determined by the appraisal team).

The practice characterization tables were revised:

- clarified the use of virtual versus live interviews
- changed ŕface-to-face interviewsòto ŕoral interviewsò

...onal Guidance

Guidance for readiness reviews was revised to include team and logistical readiness.

Additional guidance was provided for using virtual methods (e.g., for interviews and briefings).

Additional guidance was provided for using alternative practices (i.e., Appendix C: Alternative Practice Identification and Characterization Guidance).

praisal Planning and Conduct

Organizational unit sampling was revised to*

- strengthen parameters and limits for organizational sampling (e.g., identifying a minimum number of focus projects)
- include additional criteria for reporting sampling decisions

The Conduct Appraisal Phase must now be complete within 90 days.

Appraisal team members are now required to sign final findings.

*Changes to address sampling were extensive. Refer to the MDD for details.

praisal Reporting

The Appraisal Disclosure Statement (ADS) now requires the following information.

Organizational sampling criteria and decisions (e.g., projects included, projects excluded, percentage of organization represented)

Basis for maturity/capability level 4 and 5 appraisal results

- subprocesses statistically managed
- mapping of these subprocesses to quality and process-performance objectives

Signatures of both the lead appraiser and sponsor

- The lead appraiser affirms that the appraisal scope is representative of the organizational unit.
- The sponsor affirms the accuracy of the ADS and authorizes the SEI to conduct any audits deemed necessary.

al Validity Period

V1.2 appraisal results are valid for a maximum of 3 years from the date of the ADS.

V1.1 appraisals will expire on August 31, 2007 or 3 years after the date the appraisal was conducted, whichever is later.

...d Appraiser Requirements

Prior to conducting a v1.2 SCAMPI appraisal, the following must occur:

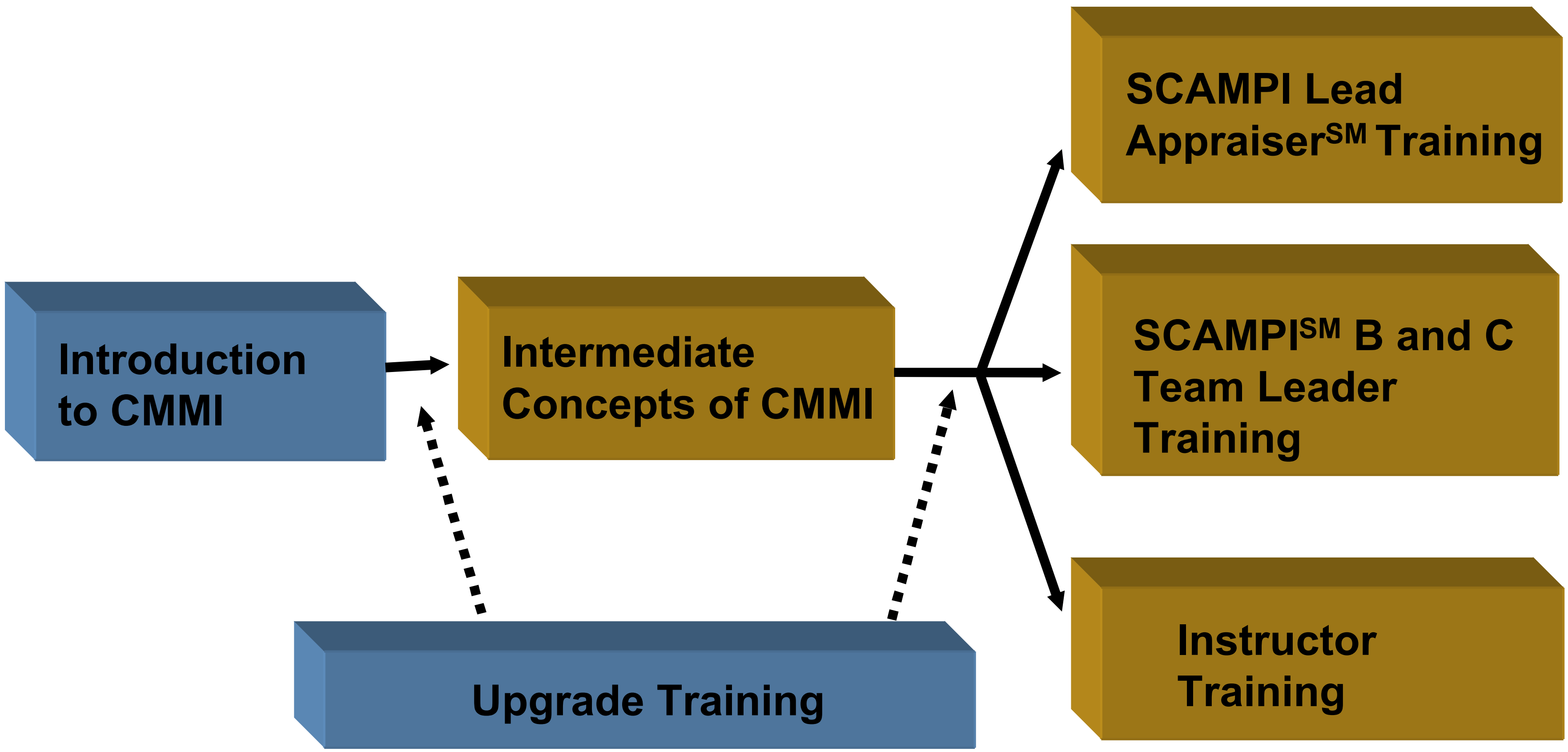
- Current candidate and authorized lead appraisers and team leaders must complete CMMI v1.2 Upgrade Training.
- Candidate and authorized lead appraisers must attend SCAMPI Face-to-Face Training.
- Those who want to conduct v1.2 SCAMPI level 4 or 5 appraisals must be certified. Certification requirements address the following:
  - education, training, and experience in level 4 and 5 concepts
  - completion of an oral exam

The SCAMPI A appraisal method was revised based on change requests received to

- reduce complexity and ambiguity
- provide additional guidance where needed
- strengthen appraisal planning and conduct
- strengthen appraisal reporting
- define the appraisal validity period
- strengthen lead appraiser requirements

The changes are intended to make appraisals more accurate, reliable, and efficient.

r CMMI


Introduction to CMMI
Intermediate Concepts of CMMI
SCAMPI Lead Appraiser^SM Training
SCAMPI^SM B and C Team Leader Training
Instructor Training
Upgrade Training

Changes

The following courses have all been updated to address change requests and CMMI Product Suite v1.2 changes:

- Introduction to CMMI
- Intermediate Concepts of CMMI
- CMMI Instructor Training
- SCAMPI Lead Appraiser Training
- SCAMPI B and C Team Leader Training

CMMI v1.2 Upgrade Training was also developed to help users move from v1.1 to v1.2, an online course with potential SEI Partner assistance

The construction and format of examinations have changed. v1.1 tests were largely short answer tests that were the same for all students.

For v1.2, tests will be generated from an item bank and now will be multiple choice. CMMI v1.2 Upgrade Training for Instructors, Lead Appraisers, and Team Leaders is the first course to use this approach. The Intermediate Concepts of CMMI and Instructor Training will follow.

…e Examinations

This new approach, using an item bank and multiple choice questions, allows multiple versions of examinations that can be constructed more easily:

- The sequence of multiple choice responses can vary from test to test.
- The order of questions can vary from test to test.
- The selection of questions can vary from test to test, but cover the same categories.

This new approach allows the SEI to

- add, modify, and delete questions from the test more easily
- better evaluate the studentôs knowledge

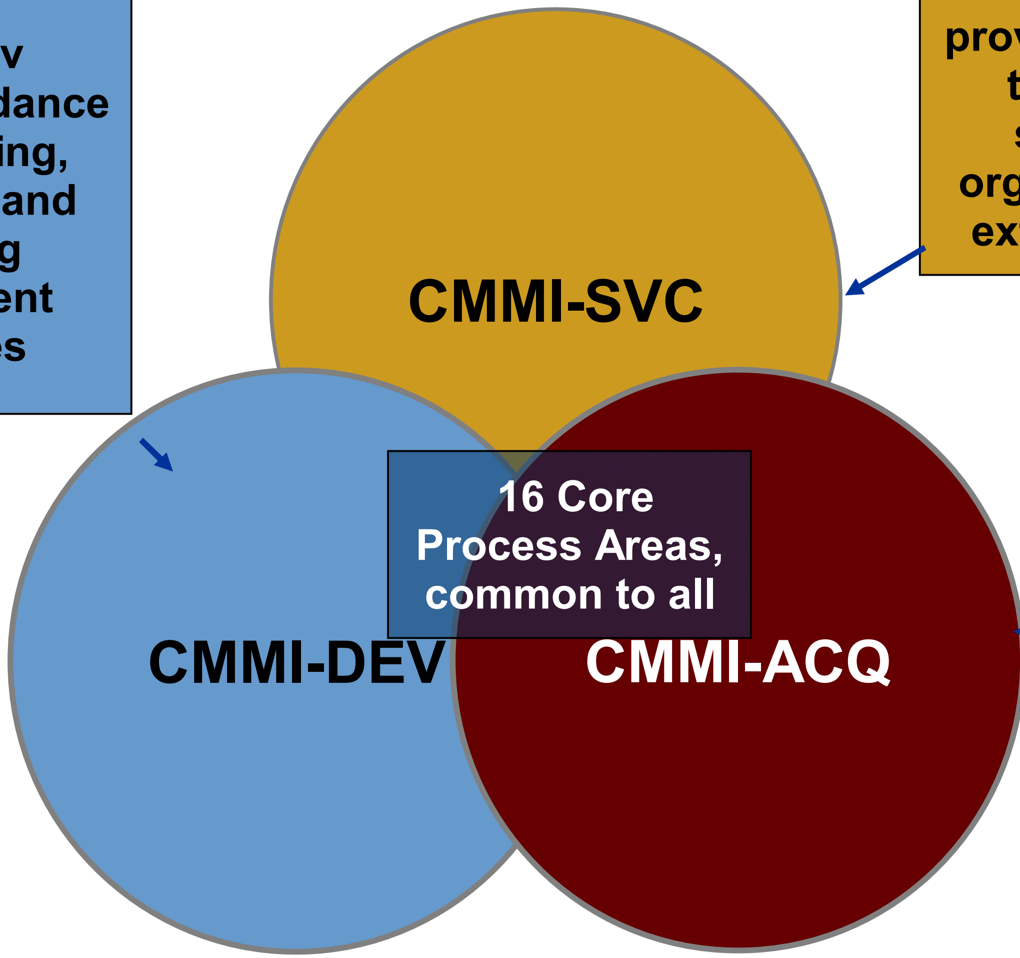
Improved architecture will allow post-V1.2 expansion.

- Extensions of the life cycle (Services, Outsourcing/Acquisition) could expand use of a common organizational framework:
  - allows coverage of more of the enterprise or potential partnering organizations
  - adapts model features to fit non-developmental efforts (e.g., CMMI Services, CMMI Acquisition)

ary "Constellations"

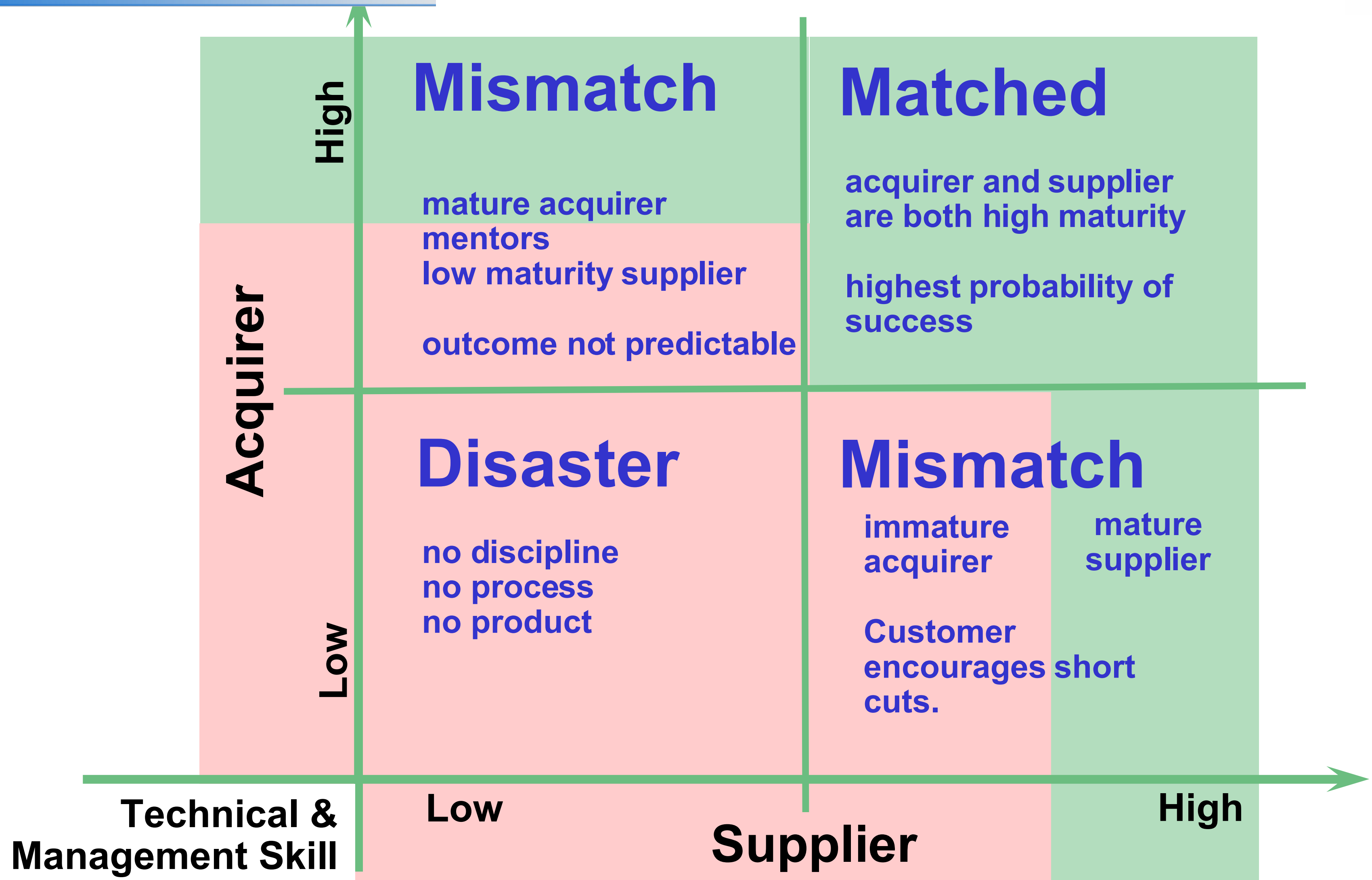
CMMI-Dev provides guidance for measuring, monitoring and managing development processes

CMMI-Services provides guidance for those providing services within organizations and to external customers



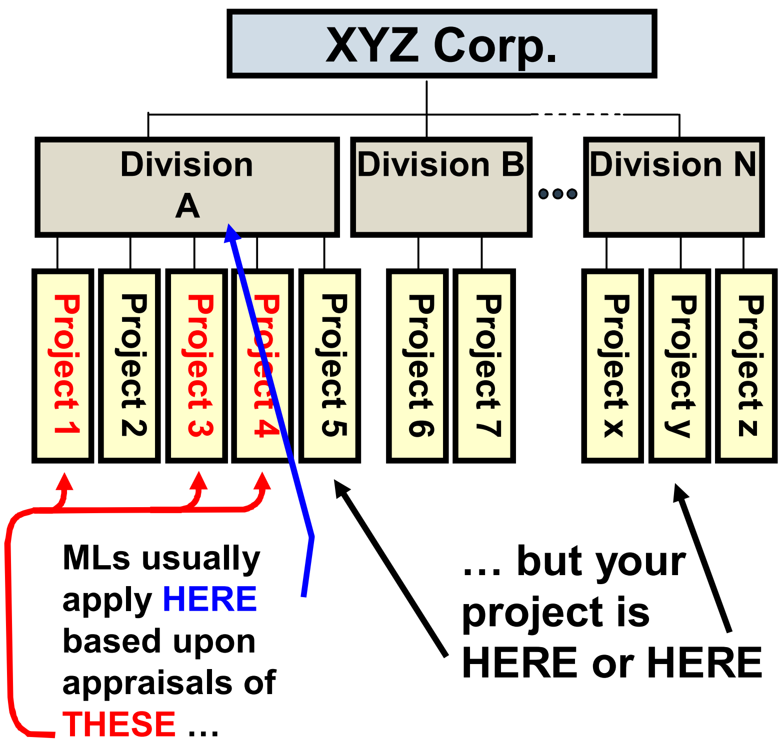
CMMI-ACQ provides guidance to enable informed and decisive acquisition leadership

ier Mismatch

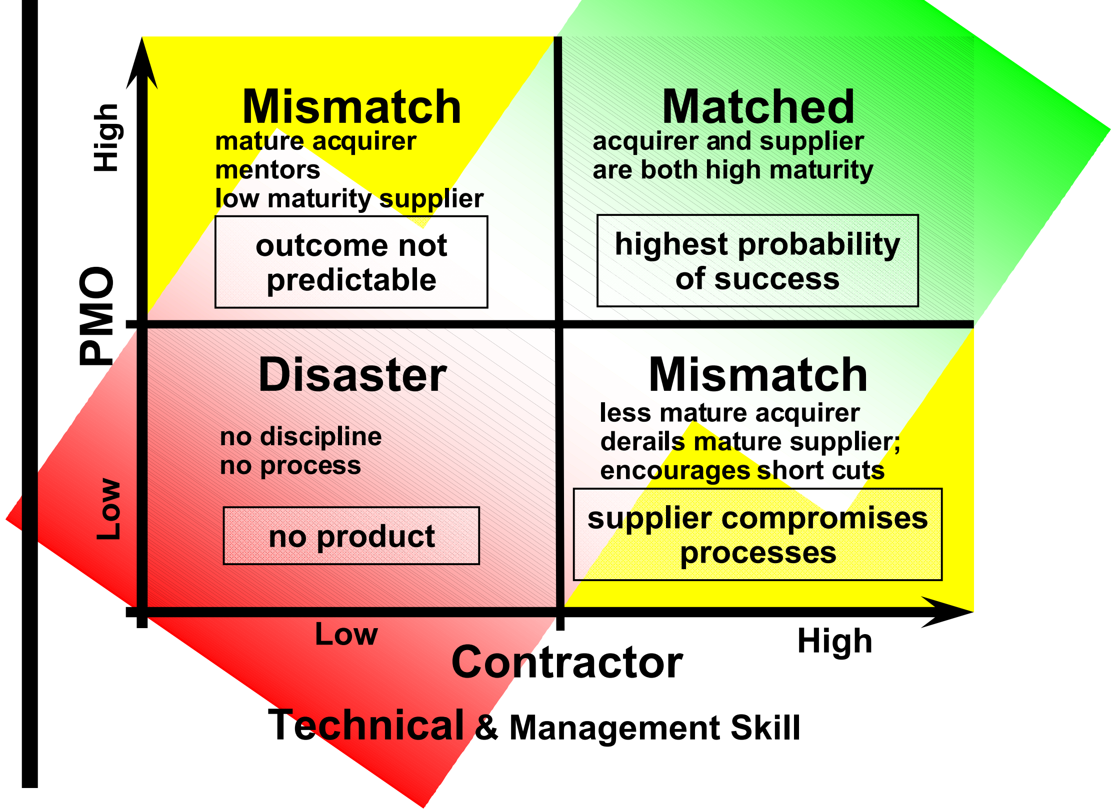


provement is Needed….

Acquirers cannot ensure that mature processes are applied to their programs



Acquirers need more internal process focus



ncept

Provide a ŗprocess toolboxò for the acquirer

- Include practical guidance on how to recognize the real practitionersé
- Encourage the use of capability and maturity profiles vice "single level" approach
- Improve acquisition organizations' understanding of the meaning of high maturity (levels 4 and 5) and equivalent staging
- Include multiple tools and guidance that may be used throughout the acquisition lifecycle

n processes are Important

Improve acquisition office operating practices

- Improve Reviews ï documents, PMRs, PDRs, CDRsé
- Improve specific areas: risk mgt, requirements mgt, configuration control, contracting actions (including source selection)
- Improve communications
- Create a ñstrategic rhythmò
- Facilitate synergy between program segments/organizations, and even among ñsystems of systemsò

Facilitate supplier processes

- Oversight/Insight into supplier processes
- Encourage strategic acquirer-supplier teamwork that may last for years

…rket challenges
Moving Organizations from Chaos to Discipline

Random motion ï lots of energy, not much progress

No teamwork ï individual effort

Frequent conflict

You never know where you'll end up

Directed motion ï every step brings you closer to the goal

Coordinated efforts

Cooperation

Predictable results

Processes can make the difference for Developers *and Acquirers*.

uirer’s Mind

What are my capabilities?

Operational Need

What are the key activities you perform when you acquire systems?

Requirements Management

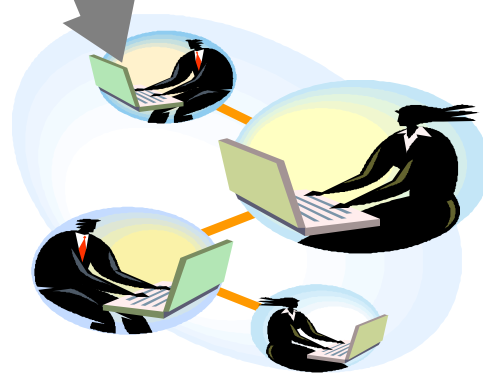
Risk Management

Program Integration

Configuration Management

Verification and Validation

Project Planning



Need to counter these attitudes:

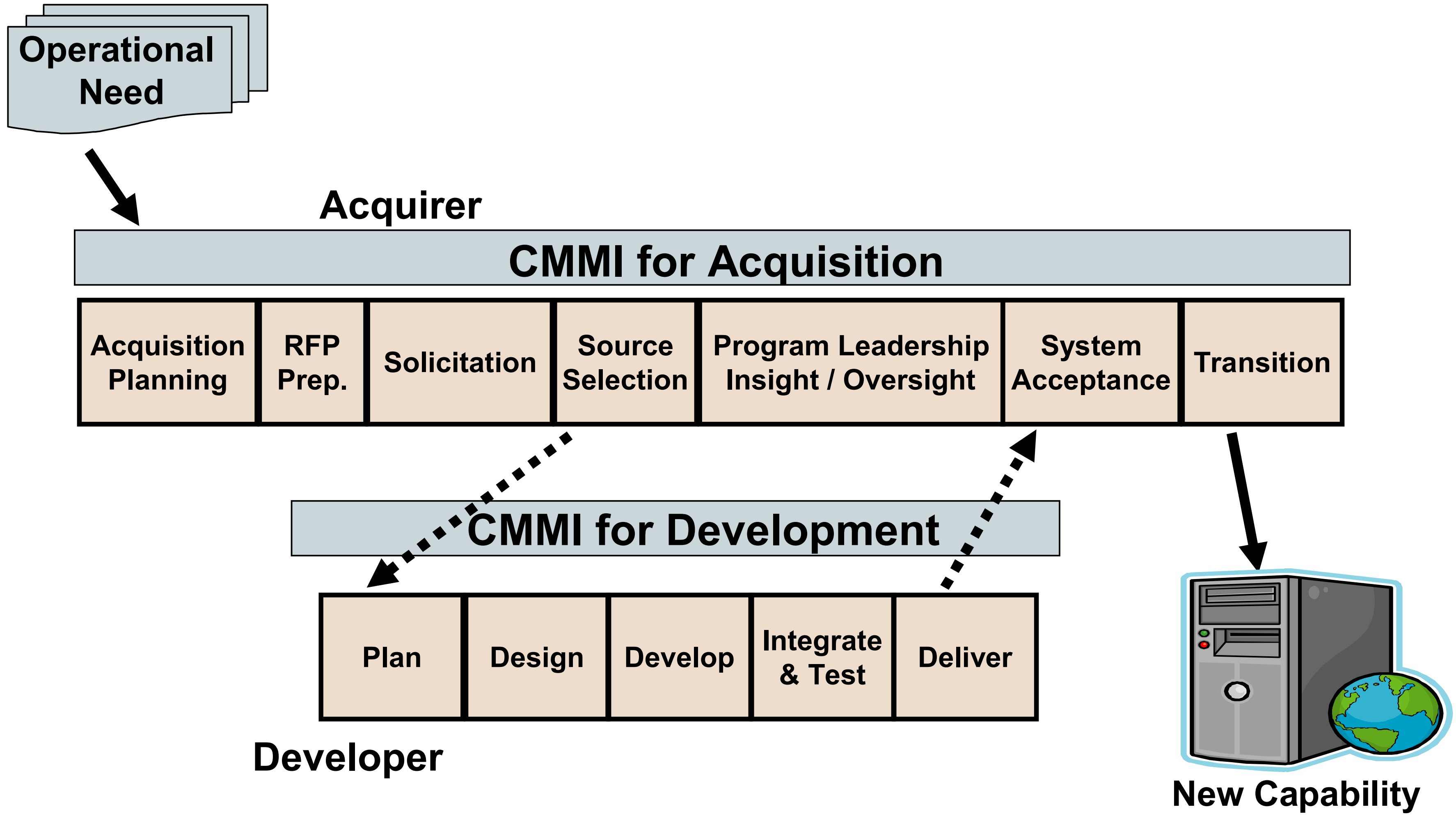
“I'd rather have it wrong than have it late.” – Industry senior manager

“Ad hoc, catch as you can…that’s our motto.”

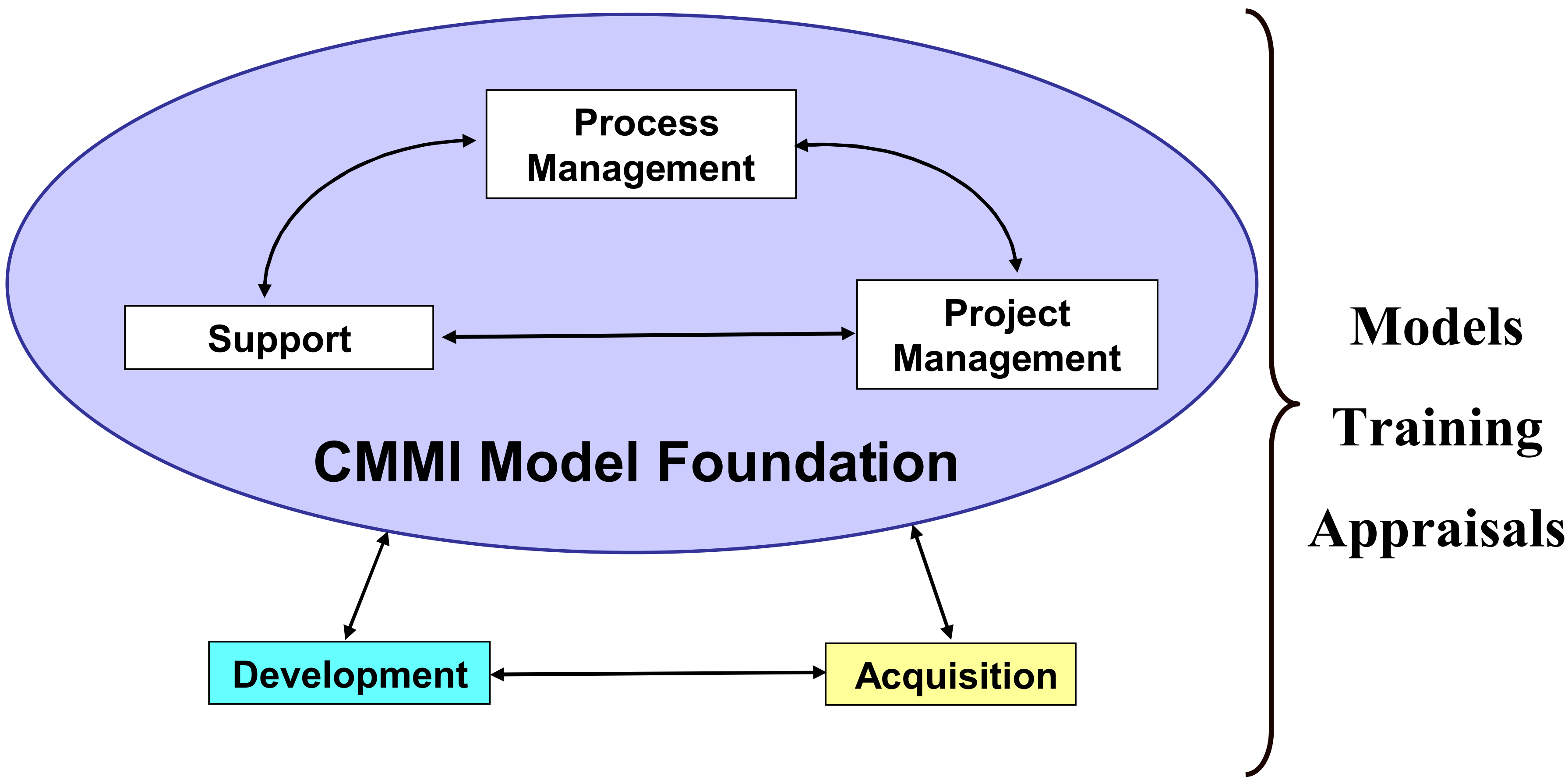
“We do not work problems until they’re unrecoverable.”

...uirer’s Mind - 2

...s capabilities?



rk Content


Process Management
Support
Project Management
CMMI Model Foundation
Development
Acquisition
Models
Training
Appraisals

MI Product Suite? - 2

The Product Suite consists of:

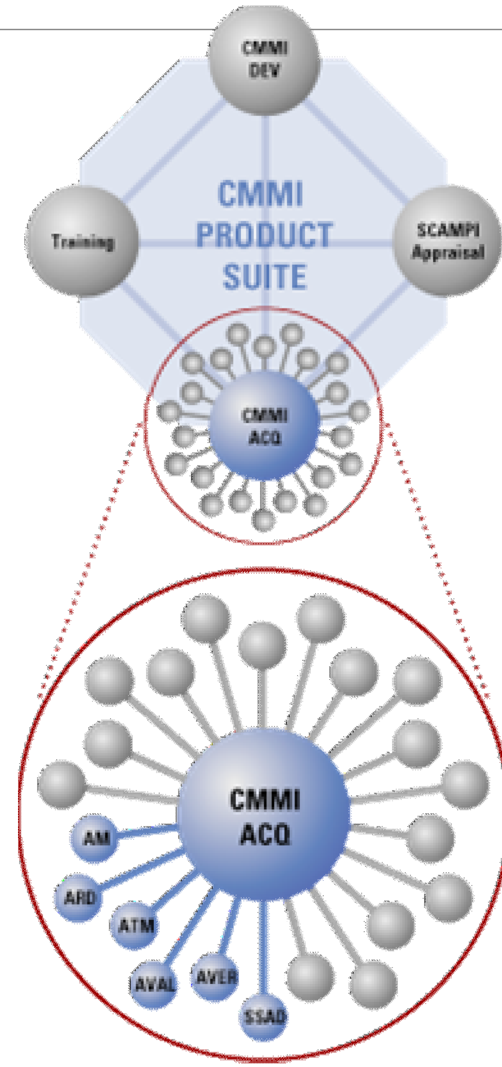
ÅCMMI for Development

ÅStandard CMMI Appraisal Method for Process Improvement^{sm} (SCAMPI^{sm})

ÅTraining and Education

ÅLicensing Opportunities

Åand now CMMI for Acquisition



velopment Challenges

Model must explicitly apply to the acquisition of a wide range of both products and services (From IT outsourcing to DoD acquisition of a weapon system)

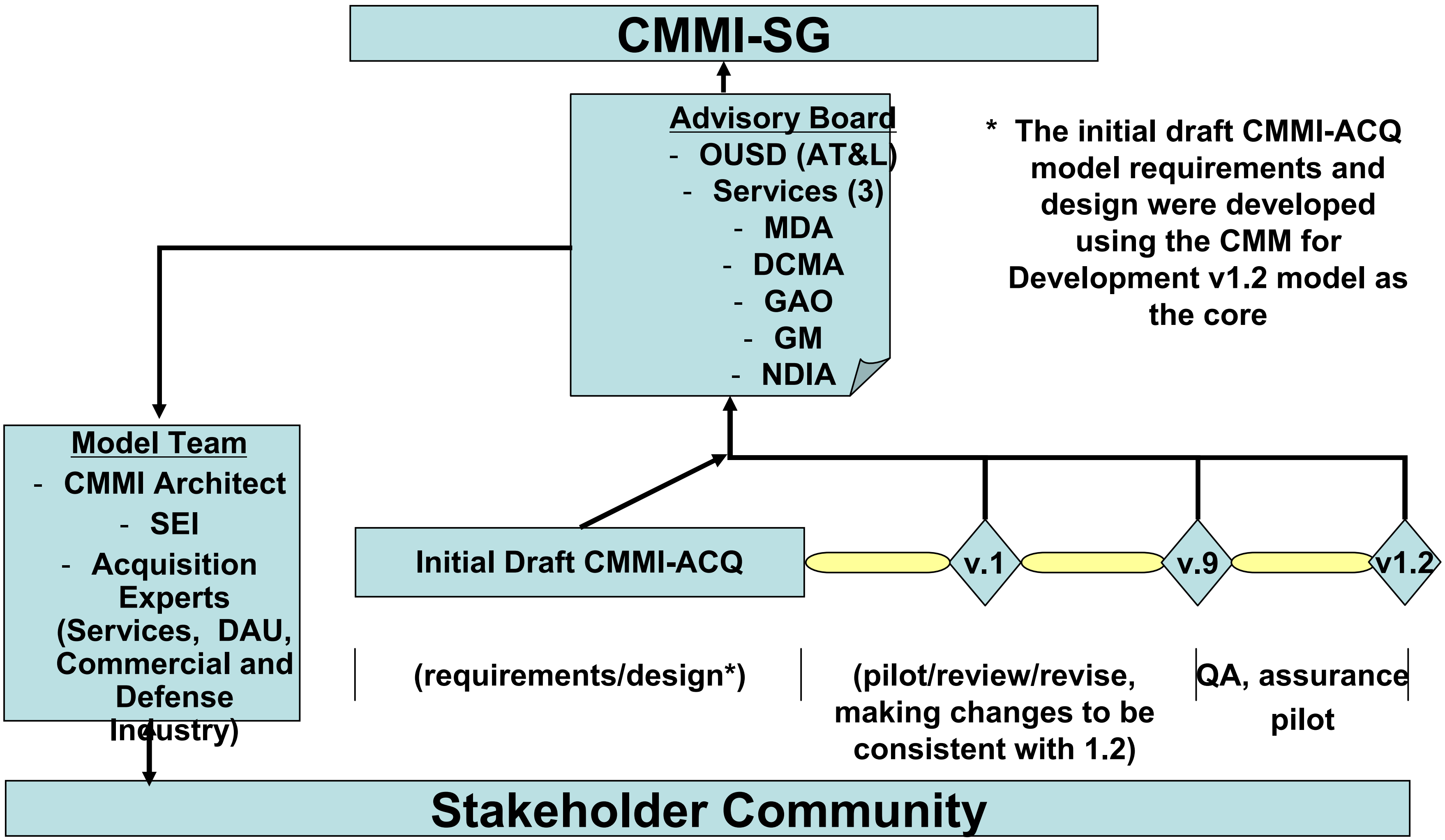
Applicable internationally - recognized references and glossary terms added, e.g., service level measurement

Model must apply to acquisition organizations from commercial industry to government agencies, both large and small

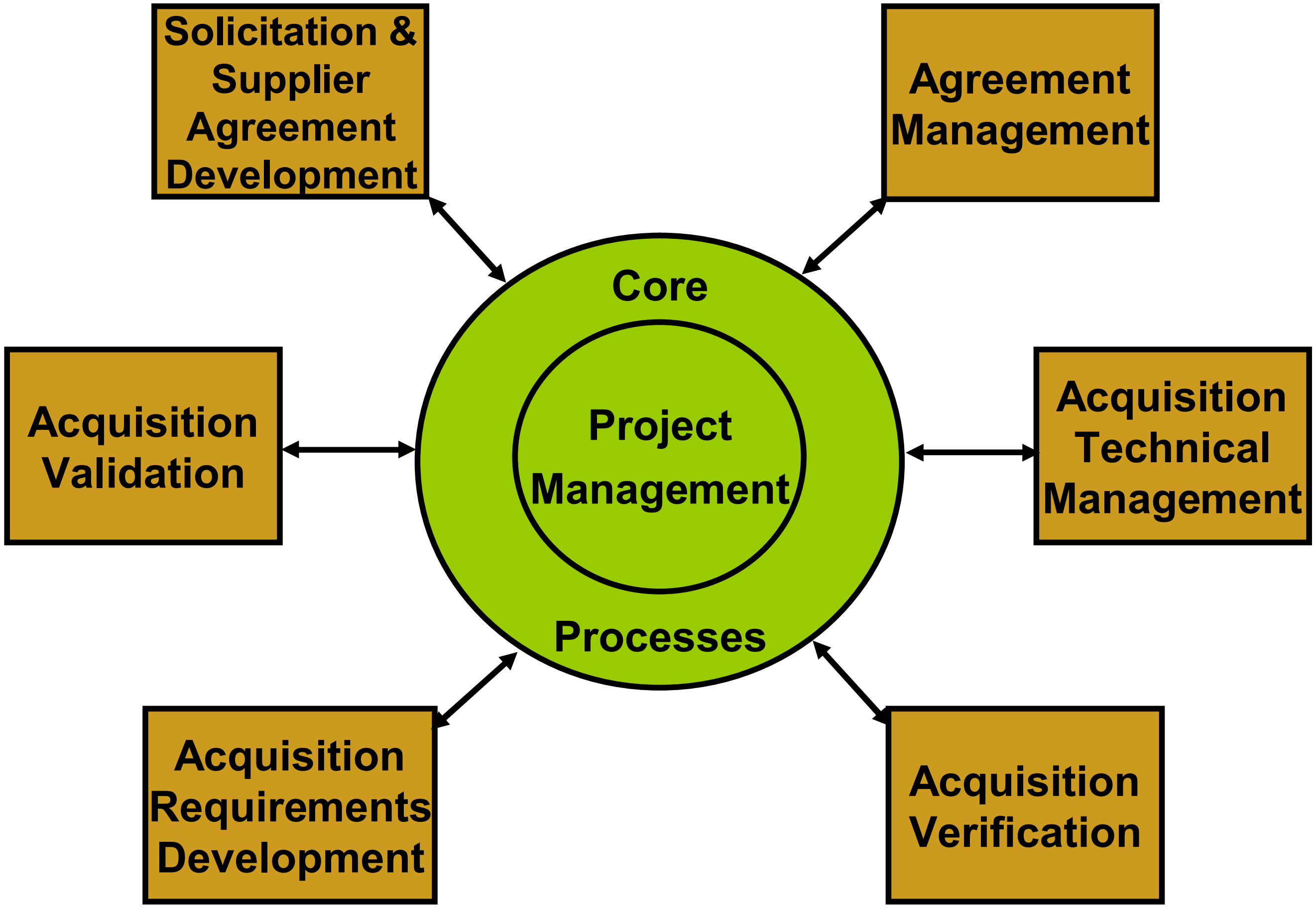
d Membership

Organization	Name
Office of the Secretary of Defense	Kristen Baldwin
Navy	Katie Smith
Air Force	Bob Swarz
Army	Larry Osiecki
Defense Contract Management Command	Guy Mercurio
Missile Defense Agency	Mike Smith
Government Accounting Office	Madhav Panwar
General Motors	Rich Frost
National Defense Industrial Association	Bob Rassa

velopment Approach



CQ Key Acquisition Processes

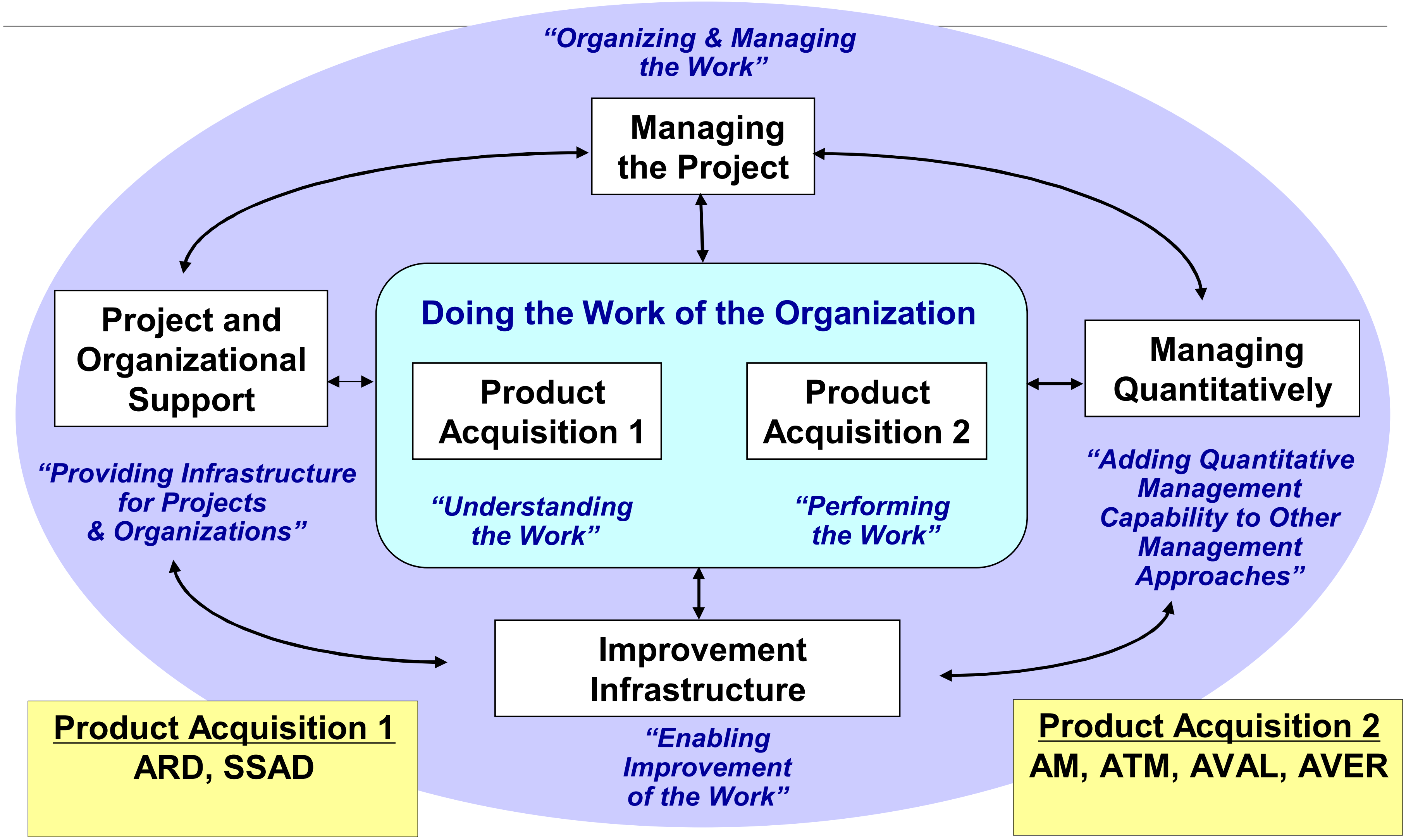


*based on initial CMMI-ACQ model developed by General Motors/SEI

ining

- Phased approach will be used for ACQ training
  - Initial training for CMMI-ACQ will be face-to-face
    - Assumes the completion of existing Introduction to CMMI training
    - One-day course will address ACQ concepts
      - Pilot offering in November
      - First public offering in December
      - Licensing opportunity will be available
  - On-line ACQ upgrade will be developed
  - A 3-day Introduction to CMMI course for Acquisition <u>may</u> be developed.
  - In FY 08, the Introduction to CMMI course will be revised to accommodate the "multiple model" approach:
    - 16 CMMI Model Foundation (CMF) process areas will be taught first
    - Additions for the "areas of interest" (development, acquisition) will be provided to meet audience needs
  - Other CMMI courses (e.g., Intermediate and instructor training) will be updated to include ACQ material

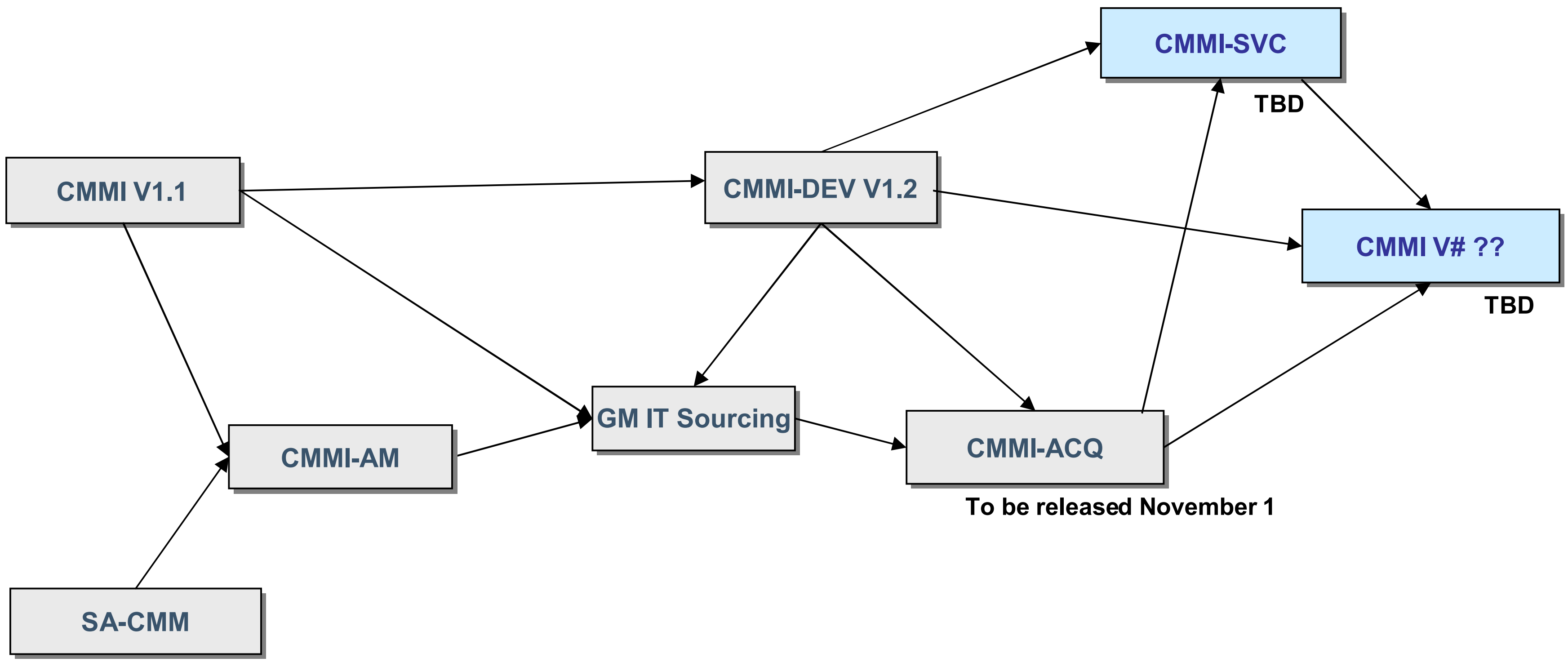
Doing the Work in an Acquisition Organization



roach

- Assure model understanding before allowing benchmark claims
    - Encourage Class B and C appraisals for six months
    - Uncover appraisal issues in a less intense environment
- Allow time to align appraisals with the new certification system for Lead Appraisers (March 08)
- Both Lead Appraisers and Instructors must pass a qualification test for CMMI-ACQ
- CMMI development and governance bodies are considering experience requirements for Lead Appraisers and Instructors

ence of Models



n for V2.0

- V1.2 concentrated on the project or program level acquisition best practices
- V2.0 will add more of the enterprise/organization level best practices for acquisition
  - Address enterprise level acquisition strategies, e.g., preferred supplier strategies
  - Address the Program Executive Office level
  - Address incorporation of lessons learned from acquisition project into acquisition management practices
- V2.0 will also benefit from change requests issued from lessons learned using the model globally

CMMI V1.2 and Beyond
The Details

resentation: PAs by Categories

CMMI

Category	Process Areas
Process Management	Organizational Process Focus Organizational Process Definition +IPPD Organizational Training Organizational Process Performance Organizational Innovation and Deployment
Project Management	Project Planning Project Monitoring and Control Supplier Agreement Management Integrated Project Management +IPPD Risk Management Quantitative Project Management
Engineering	Requirements Management Requirements Development Technical Solution Product Integration Verification Validation
Support	Configuration Management Process and Product Quality Assurance Measurement and Analysis Decision Analysis and Resolution Causal Analysis and Resolution

...entation: PAs by Maturity Level

CMMI

Level	Focus	Process Areas
5 Optimizing	*Continuous Process Improvement*	Organizational Innovation and Deployment Causal Analysis and Resolution
4 Quantitatively Managed	*Quantitative Management*	Organizational Process Performance Quantitative Project Management
3 Defined	*Process Standardization*	Requirements Development Technical Solution Product Integration Verification Validation Organizational Process Focus Organizational Process Definition +IPPD Organizational Training Integrated Project Management +IPPD Risk Management Decision Analysis and Resolution
2 Managed	*Basic Project Management*	Requirements Management Project Planning Project Monitoring and Control Supplier Agreement Management Measurement and Analysis Process and Product Quality Assurance Configuration Management
1 Initial		

Quality
Productivity

Risk
Rework

Staged Representation: PAs by Maturity Level

Maturity Level	Process Areas
Optimizing	Causal Analysis and Resolution Organizational Innovation and Deployment
Quantitatively Managed	Quantitative Project Management Organizational Process Performance
Defined	Organizational Process Focus Organizational Process Definition Organizational Training Integrated Project Management Risk Management Acquisition Technical Management Acquisition Verification Acquisition Validation Decision Analysis and Resolution
Managed	Acquisition Requirements Development Agreement Management Project Planning Project Monitoring and Control Requirements Management Configuration Management Process and Product Quality Assurance Measurement and Analysis Solicitation and Supplier Agreement Development

ns Among Processes

performed vs. managed

the extent to which the process is planned; performance is managed against the plan; corrective actions are taken when needed

managed vs. defined

the scope of application of the process descriptions, standards, and procedures (i.e., project vs. organization)

defined vs. quantitatively managed

the predictability of process performance

quantitatively managed vs. optimizing

whether the process is continually improved by addressing common causes of process variation

Levels

Levels are used in CMMI to describe an evolutionary path for an organization that wants to improve the processes it uses to develop and maintain its products and services.

CMMI supports two improvement paths:

- continuous - enabling an organization to incrementally improve processes corresponding to an individual process area (or set of process areas) selected by the organization
- staged - enabling the organization to improve a set of related processes by incrementally addressing successive predefined sets of process areas

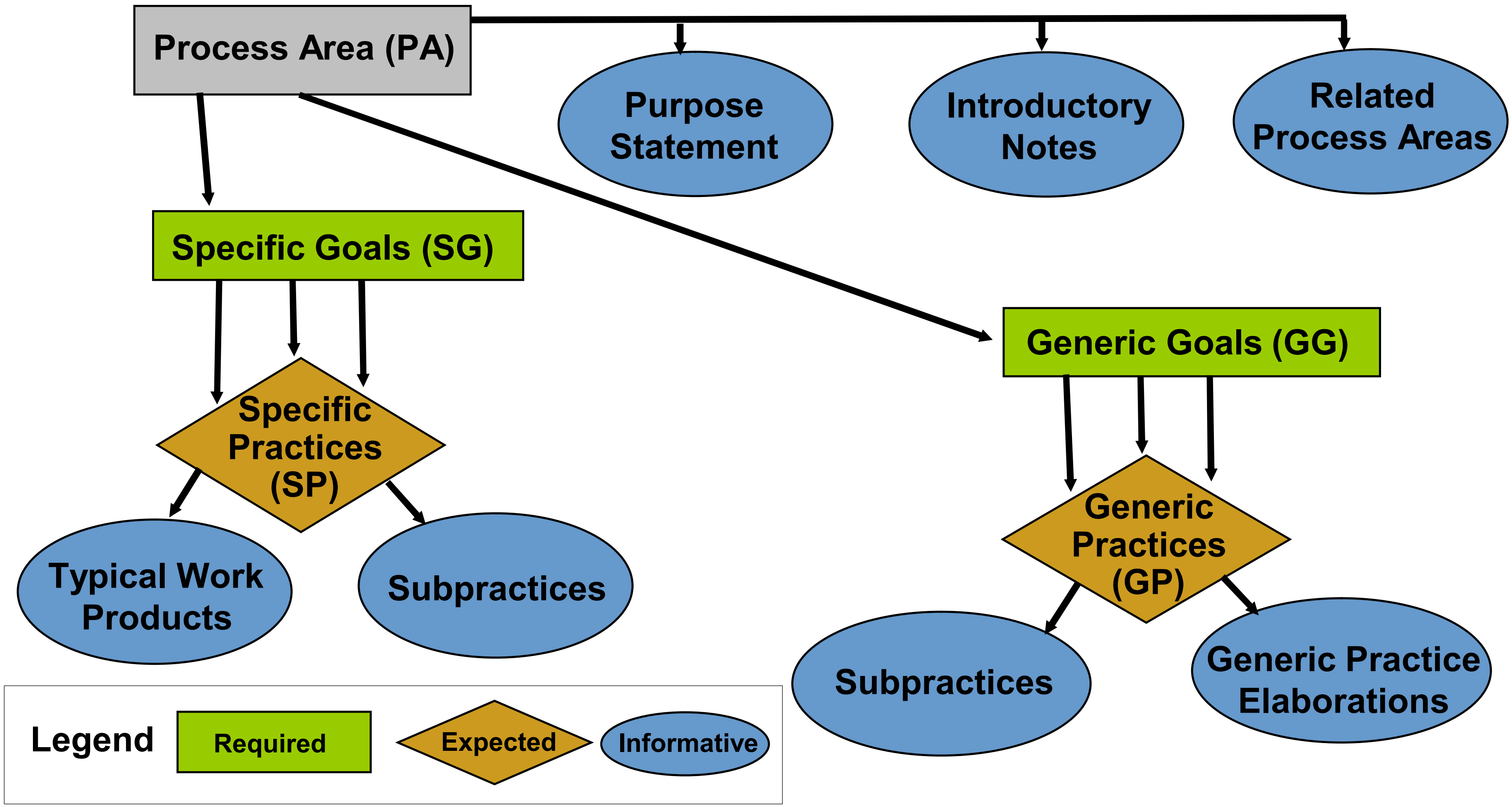
ability Levels (CL) for a Process Area

GP1.1 through GP5.2 All SPs	CL5 Optimizing	Defect prevention, proactive improvement, innovative technology insertion and deployment
GP1.1 through GP4.2 All SPs	CL4 Quantitatively Managed	Measure process performance, stabilize process, control charts, deal with causes of special variations
GP1.1 through GP3.2 All SPs	CL3 Defined	Project's process is tailored from organization's standard processes; understand process qualitatively; process contributes to the organizations assets
GP1.1 through GP2.10 All SPs	CL2 Managed	Adhere to policy; follow documented plans and processes, apply adequate resources; assign responsibility and authority; train people, apply configuration management, monitor, control, and evaluate process; identify and involve stakeholders; review with management
GP1.1 All SPs	CL1 Performed	Perform the work
A few GPs or SPs may be implemented	CL0	Not performed, incomplete

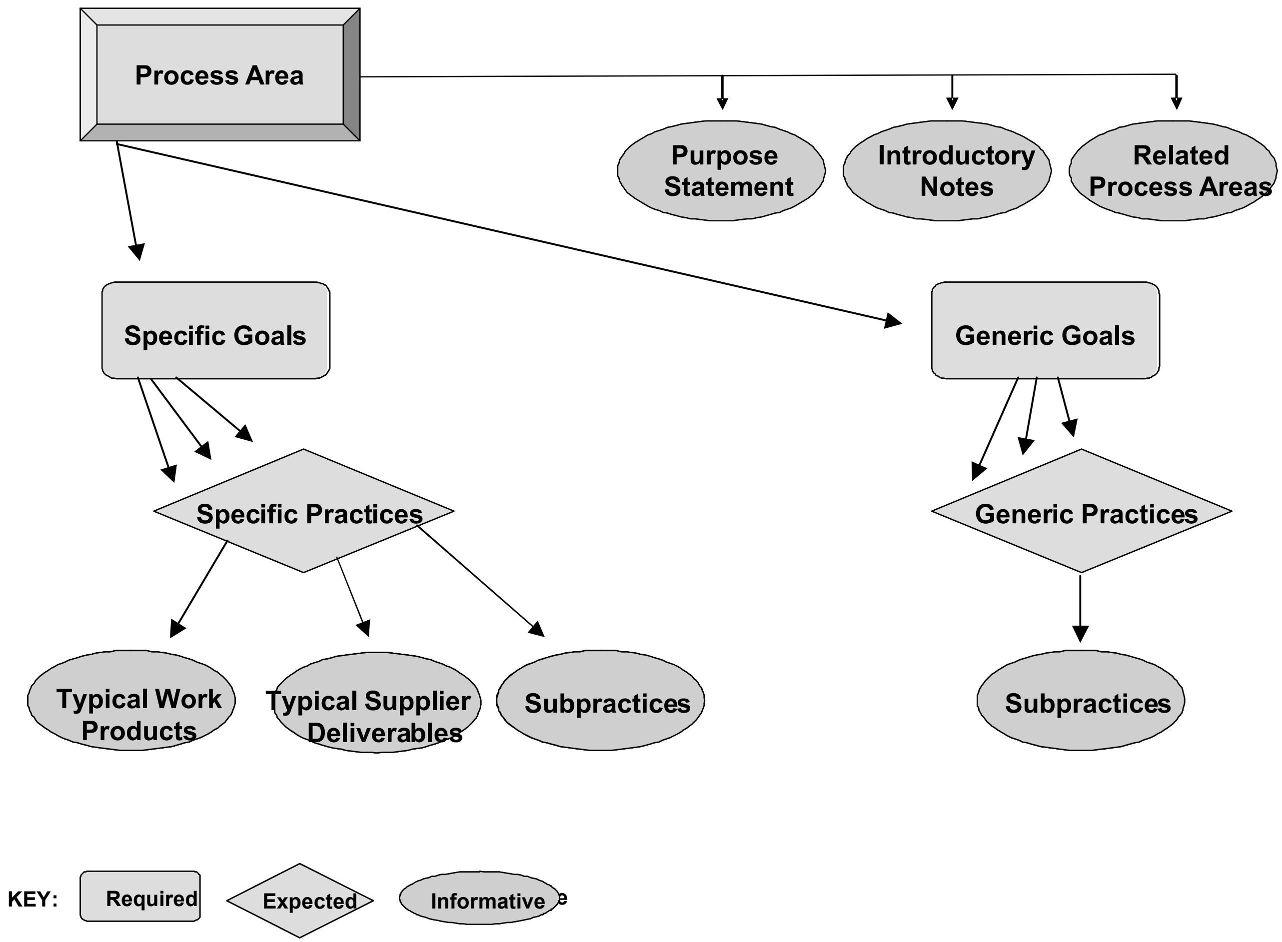
urity Levels

GP2.1 through GP3.2 All ML2, ML3, ML4, and ML5 PAs	ML5 Optimizing	Prevent defects; proactively improve; insert and deploy innovative technology
GP2.1 through GP3.2 All ML2, ML3, and ML4 PAs	ML4 Quantitatively Managed	Measure process performance; stabilize process and control charts; deal with causes of special variations
GP2.1 through GP3.2 All ML2 and ML3 PAs	ML3 Defined	Tailor the project's process from organization's standard processes; understand processes qualitatively; ensure that projects contribute to organization assets
GP2.1 through GP2.10 All ML2 PAs	ML2 Managed	Adhere to policy; follow documented plans and processes; apply adequate resources; assign responsibility and authority; train people; apply CM; monitor, control, and evaluate process; identify and involve stakeholders; review with management
	ML1 Initial	Processes are ad hoc and chaotic

Components


Process Area (PA)
Purpose Statement
Introductory Notes
Related Process Areas
Specific Goals (SG)
Generic Goals (GG)
Specific Practices (SP)
Generic Practices (GP)
Typical Work Products
Subpractices
Subpractices
Generic Practice Elaborations
Legend
Required
Expected
Informative

ture

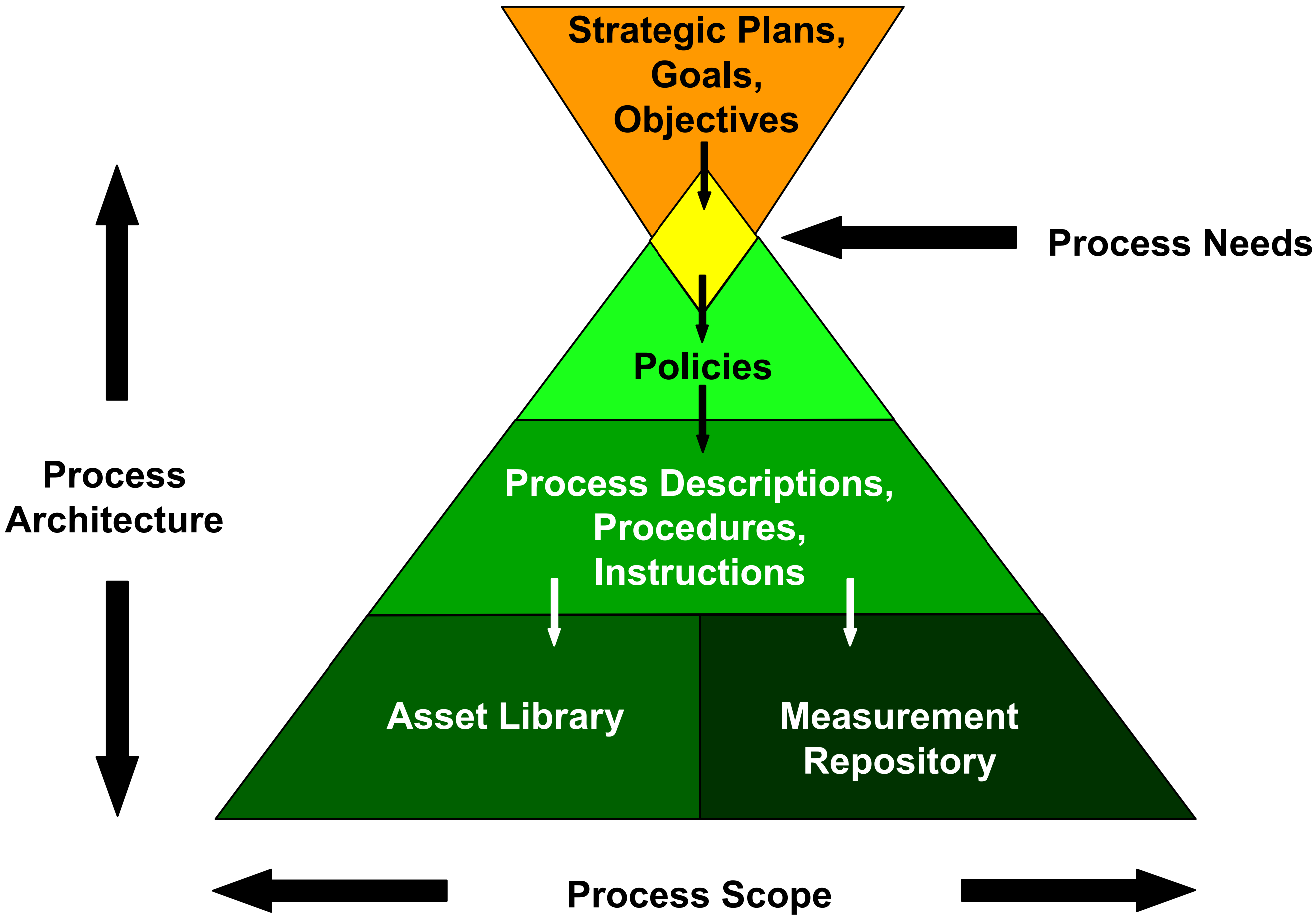

Process Area
Purpose Statement
Introductory Notes
Related Process Areas
Specific Goals
Generic Goals
Specific Practices
Generic Practices
Typical Work Products
Typical Supplier Deliverables
Subpractices
Subpractices
KEY:
Required
Expected
Informative

eneric Goals and Practices

Generic Goals		*Generic Practices*	
GG	Achieve Specific Goals	GP .	Perform Specific Practices
GG	Institutionali e a Managed Process	GP .	Esta lish an Organi ational Policy
		GP .	Plan the Process
		GP .	Provide Resources
		GP .	Assign Responsi ility
		GP .	Train People
		GP .	Manage Configurations
		GP .	Identify and Involve Relevant Stakeholders
		GP .	Monitor and Control the Process
		GP .	O ectively Evaluate Adherence
		GP .	Review Status with igher evel Management
GG	Institutionali e a Defined Process	GP .	Esta lish a Defined Process
		GP .	Collect Improvement Information
GG	Institutionali e a Quantitatively Managed Process	GP .	Esta lish Quantitative O ectives for the Process
		GP .	Sta ili e Su process Performance
GG	Institutionali e an Optimi ing Process	GP .	Ensure Continuous Process Improvement
		GP .	Correct Root Causes of Pro lems

Adapted from Cepeda Systems & Software Analysis, Inc.

tion Inputs


Strategic Plans, Goals, Objectives
Process Needs
Policies
Process Descriptions, Procedures, Instructions
Asset Library
Measurement Repository
Process Architecture
Process Scope

Area Category Topics

Process Management

Support

Project Management

Engineering

Acquisition

Process Definition +IPPD -1

Specific Goal	Specific Practice
Establish Organizational Process Assets	1.1 – Establish Standard Processes
	1.2 – Establish Lifecycle Model Descriptions
	1.3 – Establish Tailoring Criteria and Guidelines
	1.4 – Establish the Organization's Measurement Repository
	1.5 – Establish the Organization's Process Asset Library
	1.6 – Establish Work Environment Standards

ÅAdded ñand work environment standardsòto the purpose statement.

ÅAdded SP 1.6 ñEstablish Work Environment Standards.ò(This practice is new to CMMI.)

Process Definition +IPPD -2

Specific Goal	Specific Practice
Enable IPPD Management	**2.1 – Establish Empowerment Mechanisms**
	2.2 – Establish Rules and Guidelines for Integrated Teams
	2.3 – Balance Team and Home Organization Responsibilities

ÅAdded an IPPD Addition to OPD (SG2 ñEnable IPPD Managementò and its practices).

ÅTo emphasize the IPPD Addition, the name the process area is now ñOrganizational Process Definition +IPPDò or ñOPD +IPPD.ò

Process Focus -1

Specific Goal	Specific Practice
Determine Process Improvement Opportunities	1.1 – Establish Organizational Process Needs 1.2 – Appraise the Organization's Processes 1.3 – Identify the Organization's Process Improvements

ÅModified the purpose statement to emphasize deployment.

ÅSP 1.2 ñAppraise the organizationõs processes periodically and as needed to maintain an understanding of their strengths and weaknesses.ò uses ñorganizationõs processesò instead of ñprocesses of the organization.ò

Process Focus -2

Specific Goal	Specific Practice
Plan and Implement Process Improvements	2.1 – Establish Process Action Plans 2.2 – Implement Process Action Plans

ÅModified SG2 from ñPlan and Implement Process Improvement Activitiesòto ñPlan and Implement Process Improvements.ò

ÅMoved to a new SG3 and modified what were SP 2.3 and SP 2.4 in v1.1.

Process Focus -3

Specific Goal	Specific Practice
Deploy Organizational Process Assets and Incorporate Lessons Learned	3.1 – Deploy Organizational Process Assets 3.2 – Deploy Standard Processes 3.3 – Monitor Implementation 3.4 – Incorporate Process-Related Experiences into the Organizational Process Assets

- Added new SG3, "Deploy Organizational Process Assets and Incorporate Lessons Learned."
- Moved what were SP 2.3 and SP 2.4 in v1.1 to the new SG3 as SP 3.1 and SP 3.4.
- Added two new SPs: SP 3.2 "Deploy Standard Processes," and SP 3.3 "Monitor Implementation."

Training Goals

SG 1: Establish an Organizational Training Capability
A training capability that supports the organizationôs management and technical roles is established and maintained.

SG 2: Provide Necessary Training
Training necessary for individuals to perform their roles effectively is provided.

The process area also has generic goals to support institutionalization.

Note relationship with

- Organizational Training ⟺ GP 2.5

Organizational Innovation and Deployment Goals

SG 1: Select Improvements
Process and technology improvements that contribute to meeting quality and process-performance objectives are selected.

SG 2: Deploy Improvements
Measurable improvements to the organizationôs processes and technologies are continually and systematically deployed.

The process area also has generic goals to support institutionalization.

Note relationship with

- Organizational Innovation and Deployment ⟺ GP 5.1

Process Performance Goals

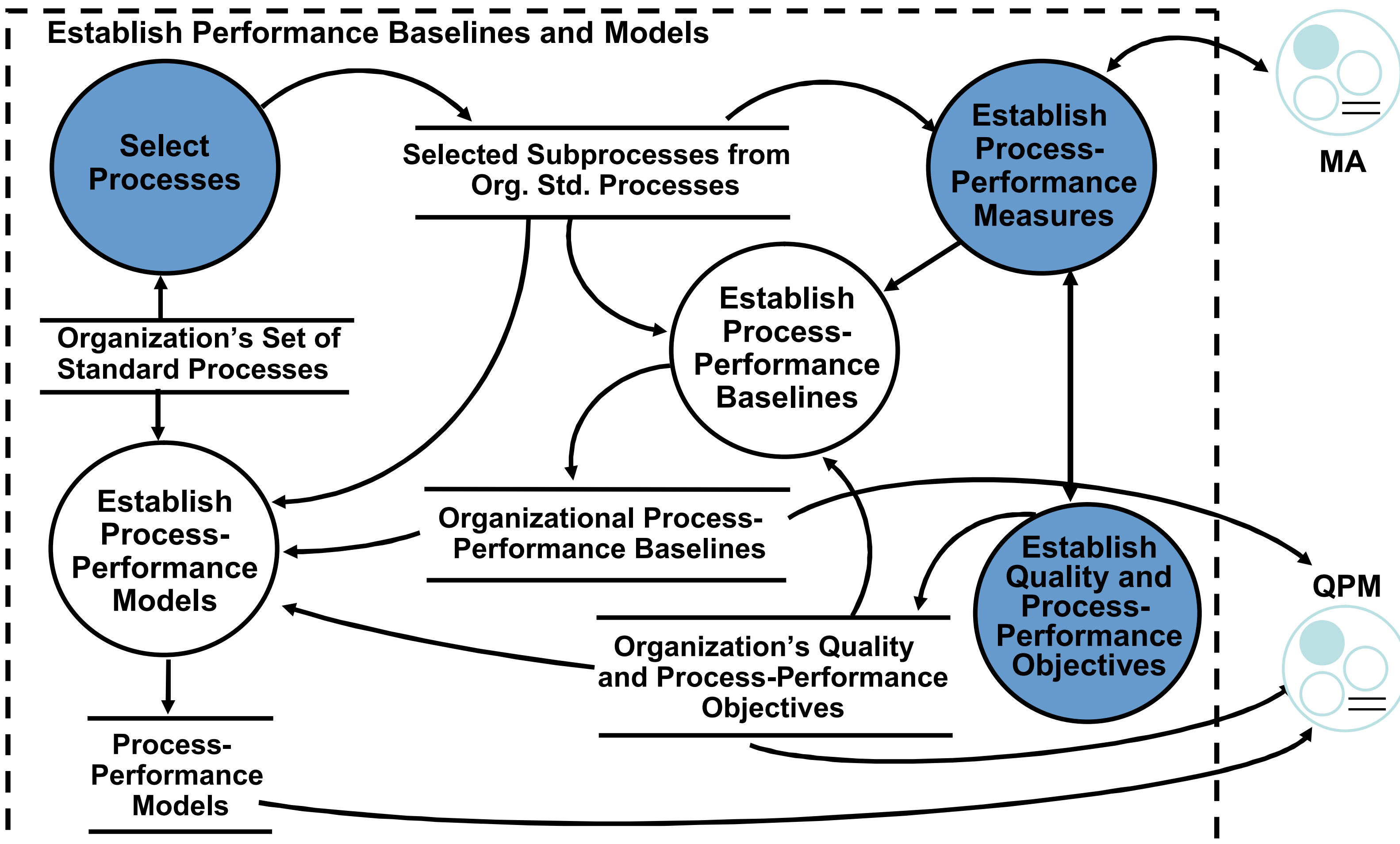
SG 1: Establish Performance Baselines and Models
Baselines and models that characterize the expected process performance of the organizationôs set of standard processes are established and maintained.

The process area also has generic goals to support institutionalization.

Note relationship with

- Organizational Process Performance ⟺ GP 4.1

The shaded SPs interrelate and may need to be performed iteratively.



Area Category Topics

Process Management

Support

Project Management

Engineering

Acquisition

Management Goals

SG 1: Establish Baselines
Baselines of identified work products are established.

SG 2: Track and Control Changes
Changes to the work products under configuration management are tracked and controlled.

SG 3: Establish Integrity
Integrity of baselines is established and maintained.

The process area also has generic goals to support institutionalization.

Note relationship with

Å Configuration Management ⟺ GP 2.6

nd Analysis Goals

SG 1: Align Measurement and Analysis Activities

Measurement objectives and activities are aligned with identified information needs and objectives.

SG 2: Provide Measurement Results

Measurement results that address identified information needs and objectives are provided.

The process area also has generic goals to support institutionalization.

roduct Quality Assurance Goals

SG 1: Objectively Evaluate Processes and Work Products
Adherence of the performed process and associated work products and services to applicable process descriptions, standards, and procedures is objectively evaluated.

SG 2: Provide Objective Insight
Noncompliance issues are objectively tracked and communicated, and resolution is ensured.

The process area also has generic goals to support institutionalization.

Note relationship with

- Process and Product Quality Assurance $\Longleftrightarrow$ GP 2.9

sis and Resolution Goals

SG 1: Evaluate Alternatives

Decisions are based on an evaluation of alternatives using established criteria.

The process area also has generic goals to support

institutionalization.

s and Resolution Goals

SG 1: Determine Causes of Defects
Root causes of defects and other problems are systematically determined.

SG 2: Address Causes of Defects
Root causes of defects and other problems are systematically addressed to prevent their future occurrence.

The process area also has generic goals to support institutionalization.

Note relationship with

- Causal Analysis and Resolution ⟺ GP 5.2

Area Category Topics

Process Management

Support

Project Management

Engineering

Acquisition

ng Goals

SG 1: Establish Estimates
Estimates of project planning parameters are established and maintained.

SG 2: Develop a Project Plan
A project plan is established and maintained as the basis for managing the project.

SG 3: Obtain Commitment to the Plan
Commitments to the project plan are established and maintained.

The process area also has generic goals to support institutionalization.

Note relationship with

- Project Planning ⟺ GP 2.2, GP 2.7

ring and Control Goals

SG 1: Monitor Project Against Plan

Actual performance and progress of the project are monitored against the project plan.

SG 2: Manage Corrective Action to Closure

Corrective actions are managed to closure when the projectÕs performance or results deviate significantly from the plan.

The process area also has generic goals to support institutionalization.

Note relationship with

- Project Monitoring and Control ⟺ GP 2.8

ment Management

Specific Goal	Specific Practice
Establish Supplier Agreements	1.1 – Determine Acquisition Type 1.2 – Select Suppliers 1.3 – Establish Supplier Agreements
Satisfy Supplier Agreements	2.1 – Execute the Supplier Agreement 2.2 – Monitor Selected Supplier Processes 2.3 – Evaluate Selected Supplier Work Products 2.4 – Accept the Acquired Product 2.5 – Transition Products

ÅV1.1 SAM SP2.1 ñReview COTS Products,òwas eliminated. ñIdentify candidate COTS products that satisfy requirementsòis a new subpractice under the Technical Solutions Process Area SP1.1, ñDevelop Alternative Solutions and Selection Criteria.ò

ÅSP2.2 and SP2.3 were added because ISM was eliminated.

ÅThe purpose of SAM was also updated.

ect Management +IPPD -1

Specific Goal	Specific Practice
Use the Project's Defined Process	1.1 – Establish the Project's Defined Process
	1.2 – Use Organizational Process Assets for Planning Project Activities
	1.3 – Establish the Project's Work Environment
	1.4 – Integrate Plans
	1.5 – Manage the Project Using the Integrated Plans
	1.6 – Contribute to the Organizational Process Assets

ÅModified SP 1.1 from ñEstablish and maintain the projectôs defined processò to ñEstablish and maintain the projectôs defined process from project startup through the life of the project.ò

ÅAdded SP 1.3 ñEstablish the Projectôs Work Environment.ò (This practice is new to CMMI.)

ect Management +IPPD -2

Specific Goal	Specific Practice
Coordinate and Collaborate with Relevant Stakeholders	2.1 – Manage Stakeholder Involvement 2.2 – Manage Dependencies 2.3 – Resolve Coordination Issues
Apply IPPD Principles	3.1 – Establish the Project’s Shared Vision 3.2 – Establish the Integrated Team Structure 3.3 – Allocate Requirements to Integrated Teams 3.4 – Establish Integrated Teams 3.5 – Ensure Collaboration among Interfacing Teams

ÅReduced the IPPD Addition to one goal (SG3 ñApply IPPD Principlesò) and its practices.

ÅTo emphasize the IPPD Addition, the name of this process area is now ñIntegrated Project Management +IPPDò or ñIPM +IPPD.ò

ms - IPM

- **IPM SP 1.6 Establish and maintain integrated teams.**
  - The project is managed using integrated teams that reflect the organizational rules and guidelines for team structuring and forming. The project's shared vision is established prior to establishing the team structure, which may be based on the WBS. For small acquirer organizations, the whole organization and the relevant external stakeholders can be treated as an integrated team.
  - Integrated team members must understand the standards for work and participate according to those standards.
  - Structuring the integrated teams involves defining the number of teams, the type of each team, and how each team relates with the others in the structure. Forming the integrated teams involves chartering each team, assigning team members and team leaders, and providing resources to each team to accomplish its work.

ent Goals

SG 1: Prepare for Risk Management
Preparation for risk management is conducted.

SG 2: Identify and Analyze Risks
Risks are identified and analyzed to determine their relative importance.

SG 3: Mitigate Risks
Risks are handled and mitigated, where appropriate, to reduce adverse impacts on achieving objectives.

The process area also has generic goals to support institutionalization.

oject Management Goals

SG 1: Quantitatively Manage the Project
The project is quantitatively managed using quality and process-performance objectives.

SG 2: Statistically Manage Subprocess Performance
The performance of selected subprocesses within the projectõs defined process is statistically managed.

The process area also has generic goals to support institutionalization.

Note relationship with

Å Quantitative Project Management $\Longleftrightarrow$ GP 4.1, GP 4.2

Area Category Topics

Process Management

Support

Project Management

Engineering

Acquisition

Management

Specific Goal	Specific Practice
Manage Requirements	1.1 – Obtain an Understanding of Requirements
	1.2 – Obtain Commitment to Requirements
	1.3 – Manage Requirements Changes
	1.4 – Maintain Bidirectional Traceability of Requirements
	1.5 – Identify Inconsistencies Between Project Work and Requirements

ÅV1.2 REQM SP 1.4 practice statement now reads, ìMaintain bidirectional traceability among the requirements and work products.ò

ÅProject plans are no longer mentioned in this SP statement.

ÅThe description of bidirectional traceability is improved as is its definition in the glossary.

Development -1

Specific Goal	Specific Practice
Develop Customer Requirements	1.1 – Elicit Needs 1.2 – Develop the Customer Requirements
Develop Product Requirements	2.1 – Establish Product and Product Component Requirements 2.2 – Allocate Product Component Requirements 2.3 – Identify Interface Requirements

ÅFormer base practice ñCollect Stakeholder Needsòis eliminated and former advanced practice, ñElicit Needsòis kept.

ÅInformative text is added to the introductory notes about applying RD to maintenance projects.

Development -2

Specific Goal	Specific Practice
Analyze and Validate Requirements	**3.1 – Establish Operational Concepts and Scenarios**
	3.2 – Establish a Definition of Required Functionality
	3.3 – Analyze Requirements
	3.4 – Analyze Requirements to Achieve Balance
	3.5 – Validate Requirements

ÅMaterial from V1.1 TS SP 1.2, ñEvolve Operational Concepts and Scenarios,òis incorporated into RD SP 3.1.

ÅMaterial from V1.1 RD SP 3.5-1, ñValidate Requirements,òand RD SP 3.5-2, ñValidate Requirements with Comprehensive Methodsò were consolidated into a single practice.

tion -1

Specific Goal	Specific Practice
Select Product-Component Solutions	**1.1 – Develop Alternative Solutions and Selection Criteria** 1.2 – Select Product-Component Solutions

ÅV1.1 TS SP 1.1-1, ñDevelop Alternative Solutions and Selection Criteria,òand TS SP 1.1-2, ñDevelop Detailed Alternative Solutions and Selection Criteriaòare consolidated into a single practice.

ÅñIdentify candidate COTS products that satisfy requirementsòis a new subpractice under SP1.1.

ÅV1.1 TS SP 1.2 ñEvolve Operational Concepts and Scenariosòis incorporated into RD SP 3.1, ñEstablish Operational Concepts and Scenarios.ò

tion -2

Specific Goal	Specific Practice
Develop the Design	2.1 – Design the Product or Product Component 2.2 – Establish a Technical Data Package 2.3 – Design Interfaces Using Criteria 2.4 – Perform Make, Buy, or Reuse Analyses
Implement the Product Design	3.1 – Implement the Design 3.2 – Develop Product Support Documentation

ÅV1.1 TS SP 2.3-1, ñEstablish Interface Descriptions,ò and TS SP 2.3-3, ñDesign Interfaces Using Criteriaò are consolidated into a single practice.

ation Goals

SG 1: Prepare for Product Integration
Preparation for product integration is conducted.

SG 2: Ensure Interface Compatibility
The product component interfaces, both internal and external, are compatible.

SG 3: Assemble Product Components and Deliver the Product
Verified product components are assembled and the integrated, verified, and validated product is delivered.

The process area also has generic goals to support institutionalization.

Specific Goal	Specific Practice
Prepare for Verification	1.1 – Select Work Products for Verification 1.2 – Establish the Verification Environment 1.3 – Establish Verification Procedures and Criteria
Perform Peer Reviews	2.1 – Prepare for Peer Reviews 2.2 – Conduct Peer Reviews 2.3 – Analyze Peer Review Data

- No changes to SG1, SG2, or their practices.

Specific Goal	Specific Practice
Verify Selected Work Products	**3.1 – Perform Verification** **3.2 – Analyze Verification Results**

ÅThe phrase ñand identify corrective actionòwas deleted from both the title and statement of SP 3.2 ñAnalyze Verification Results. (Corrective action is handled in PMC SG2, ñManage Corrective Action to Closure.)

Specific Goal	Specific Practice
Prepare for Validation	**1.1 – Select Products for Validation** **1.2 – Establish the Validation Environment** **1.3 – Establish Validation Procedures and Criteria**
Validate Product or Product Components	**2.1 – Perform Validation** **2.2 – Analyze Validation Results**

ÅNotes were added to VAL to stress that validation activities are performed incrementally and involve relevant stakeholders.

ÅThe phrase ñand identify issuesòwas deleted from the statement of SP 2.2 ñAnalyze Validation Resultsòto maintain parallelism with VER SP 3.2 ñAnalyze Verification Results.ò

Area Category Topics

Process Management

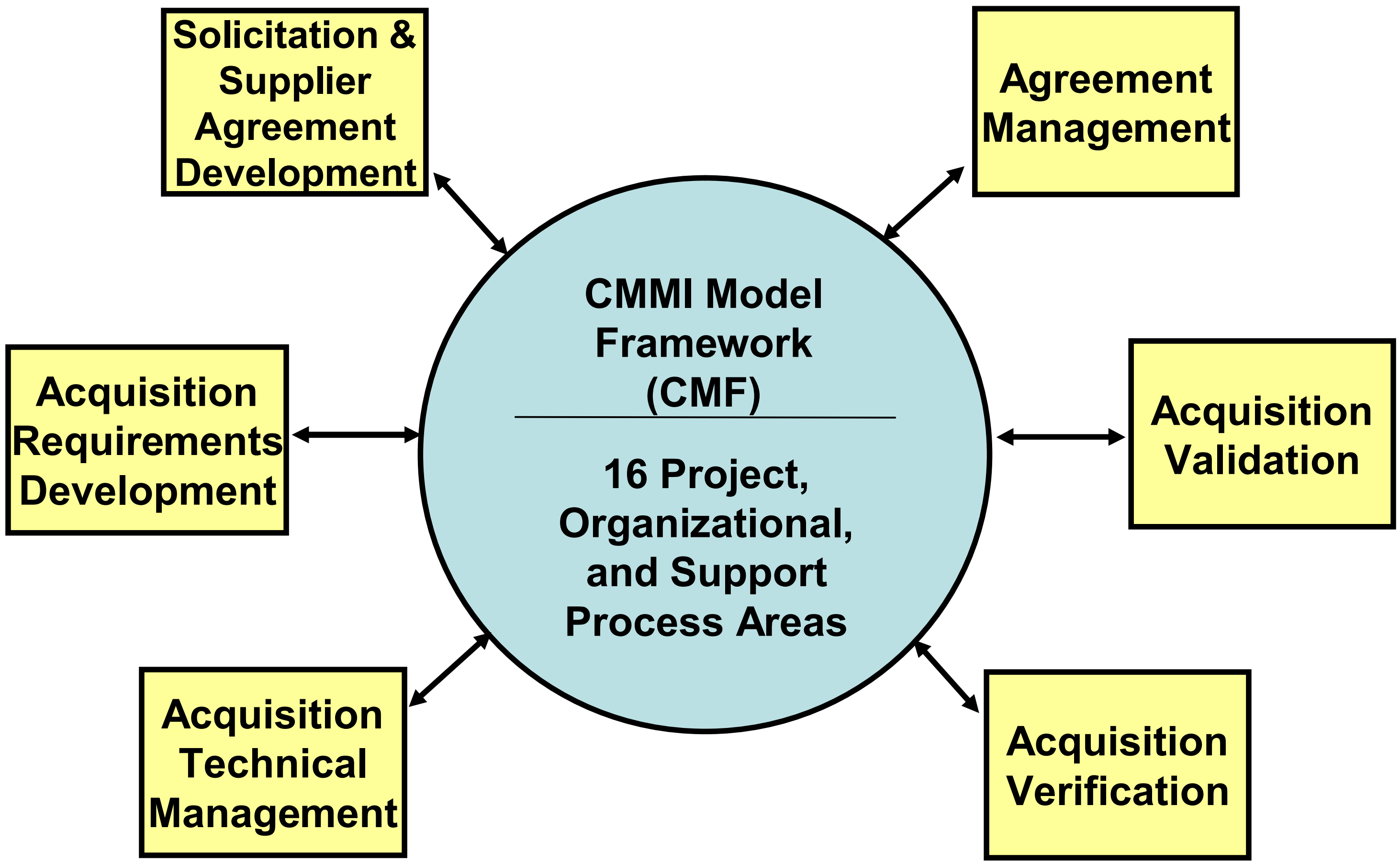
Support

Project Management

Engineering

Acquisition

...2 ...tegory Process Areas



rements Development - Goals

SG 1: Develop Customer Requirements

Stakeholder needs, expectations, constraints, and interfaces are collected and translated into customer requirements.

SG 2: Develop Contractual Requirements

Customer requirements are refined and elaborated to develop contractual requirements.

SG 3: Analyze and Validate Requirements

The requirements are analyzed and validated.

upplier Agreement Development - Goals

SG 1: Prepare for Solicitation and Supplier Agreement Development

Preparation for solicitation and supplier agreement is performed.

SG 2: Select Suppliers

Suppliers are selected based on an evaluation of their ability to meet the specified requirements and established criteria.

SG 3: Establish Supplier Agreements

Supplier agreements are established and maintained.

nical Management - Goals

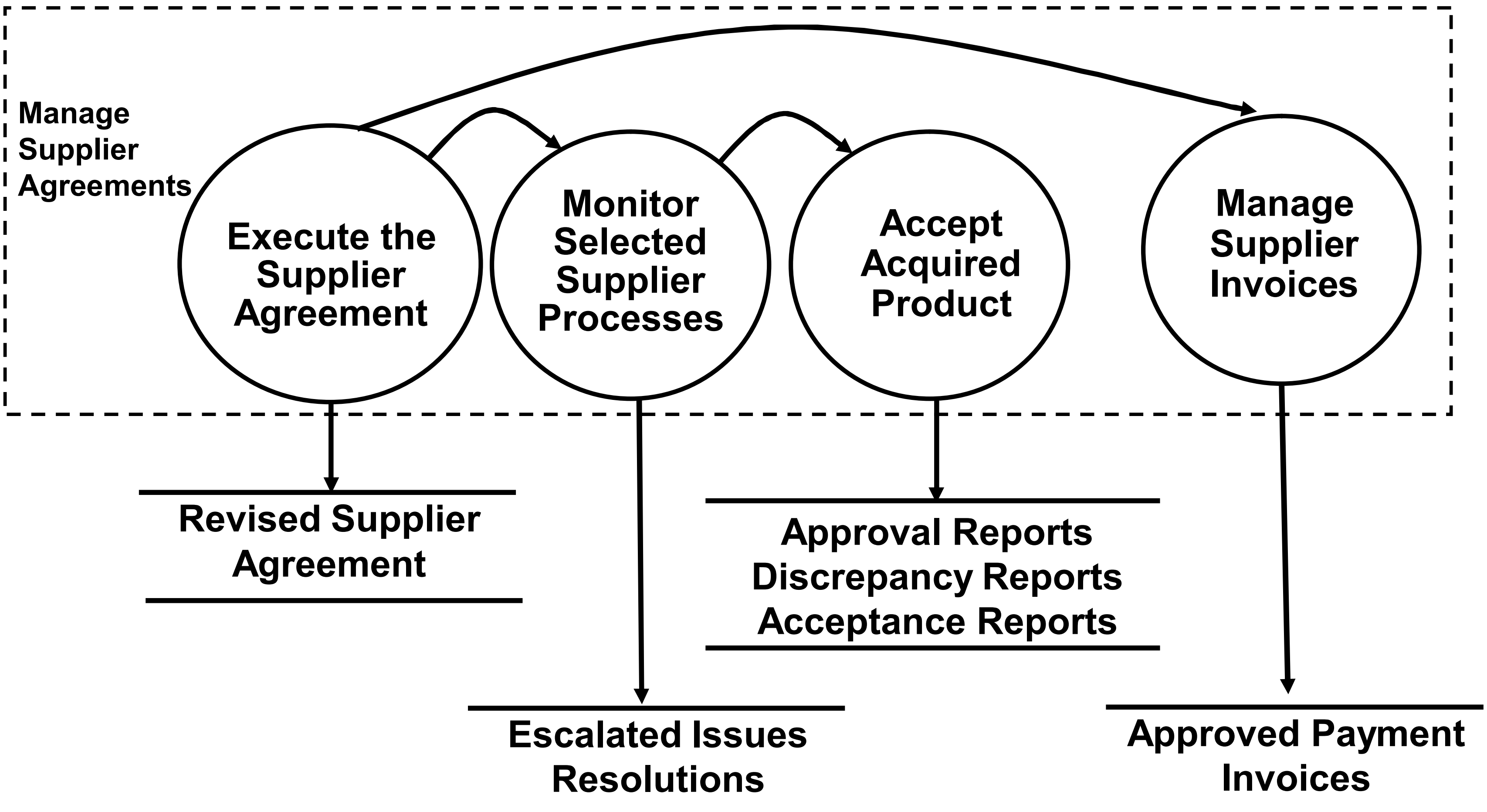
SG 1: Evaluate Technical Solutions

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

SG 2: Perform Interface Management

Selected interfaces are managed.

agement - Context



rification - 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 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.

the CMF

The key additions to the CMF include the following:

- Acquisition Strategy
- Transition to Operations and Support
- Integrated Product and Process Development (Teaming)

There are informative materials unique to the Acquisition Constellation in every process area.

ategy

- **Acquisition strategy** - Planning begins with the acquisition strategy that provides the framework for the acquisition project and its plans.
- **PP SP 1.1 Establish and maintain the acquisition strategy.**
- The strategy has the following attributes:
  - used to focus on specifying customer and contractual requirements that express customer value in the Acquisition Requirements Development process area practices.
  - is the business and technical management framework for planning, executing, and managing agreements for a project.
  - relates to the objectives for the acquisition, the constraints, availability of resources and technologies, consideration of acquisition methods, potential supplier agreement types, terms and conditions, accommodation of business considerations, considerations of risk, and support for the acquired product over its lifecycle.
  - reflects the entire scope of the project.
  - encompasses the work to be performed by the acquirer and the work to be performed by the supplier, or in some cases multiple suppliers, for the full lifecycle of the product

perations and Support

Transition to operations and support includes the approach for introducing and maintaining the readiness, sustainment, and operational capability of the product(s) delivered by the supplier.

- PP SP 2.7 - Plan for transition to lifecycle operations and support for the product.
- PMC SP 1.8 - Monitor the transition to operations and support.

Typically, the supplier has a role in integrating and packaging the products and prepares for the transition to operations and support, including support for business user acceptance. The acquirer monitors supplier activities.

Integrated Teams - OPD

Integrated Teams- The project is managed using integrated teams (IPM SP 1.6) that reflect the organizational rules and guidelines (OPD SP 1.7) for team structuring and forming.

Å**OPD SP 1.7 Establish and maintain organizational rules and guidelines for the structure and operation of integrated teams.**

- Å In an acquisition organization, integrated teams are useful not just in the acquirerôs organization, but between the acquirer and supplier, and among the acquirer, supplier and other relevant stakeholders as appropriate. Integrated teaming may be especially important in a system of systems environment.
- Å Operating rules and guidelines for integrated teams define and control how teams are created and how they interact to accomplish objectives.

mation…

For more information about CMMI

- http://www.sei.cmu.edu/cmmi/ (main CMMI site)

Other Web sites of interest include

- http://seir.sei.cmu.edu/seir/ (Software Engineering Information Repository)
- http://dtic.mil/ndia (annual CMMI Technology Conferences)
- http://seir.sei.cmu.edu/pars (publicly released SCAMPI appraisal summaries)
- https://bscw.sei.cmu.edu/pub/bscw.cgi/0/79783

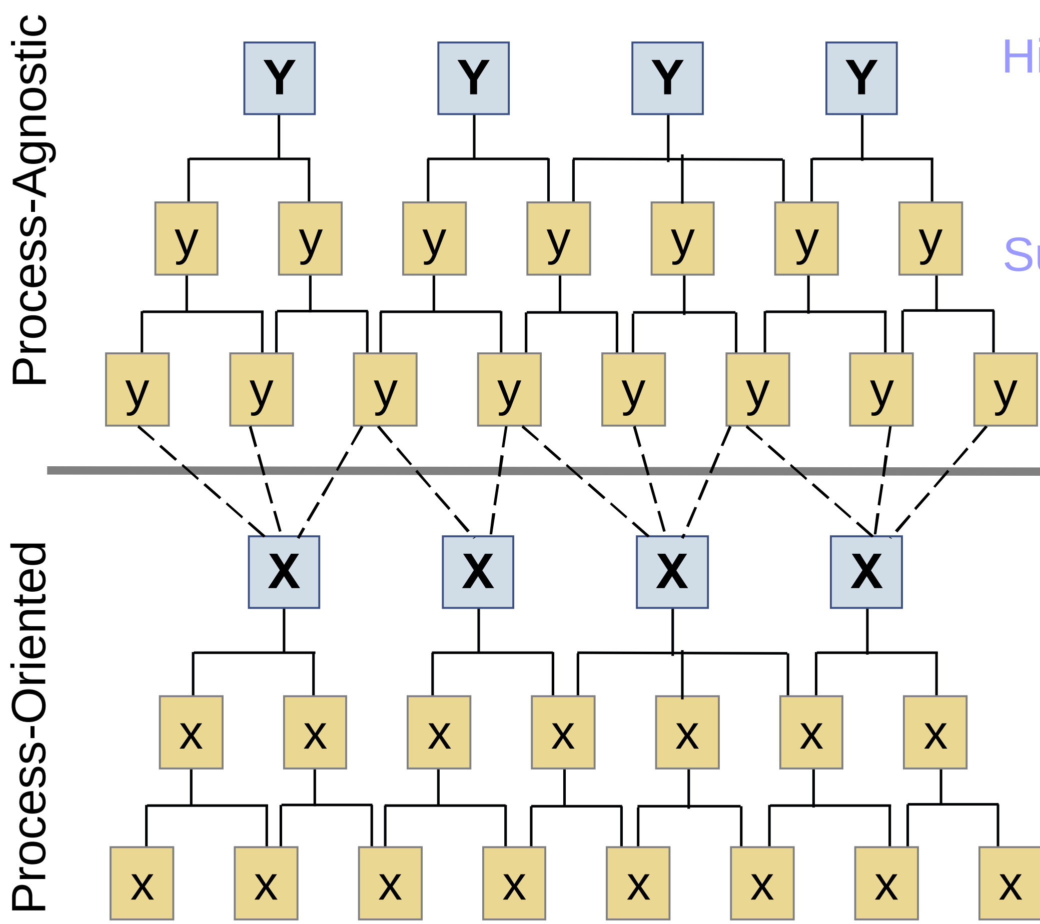
Or, contact

SEI Customer Relations

Phone: 412 / 268-5800

Email: customer-relations@sei.cmu.edu

…uld Flow-Down to …cesses



High-Level Business Objectives

(e.g., balanced scorecard)

Subordinate Business Objectives

(e.g., $ buckets, % performance)

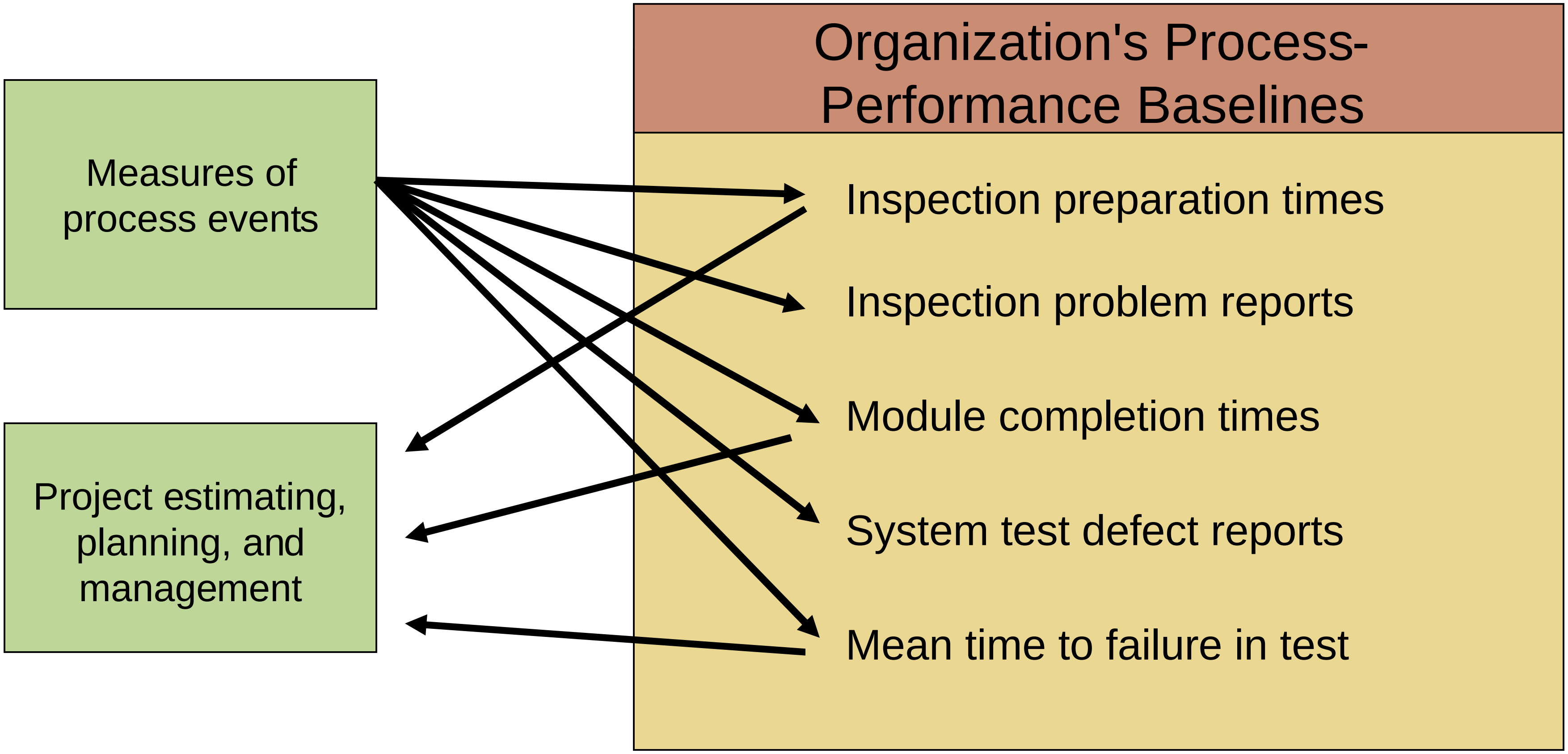
High-Level Processes

Subordinate Processes

(e.g., a vital subprocess to be statistically managed)

rmance Baselines

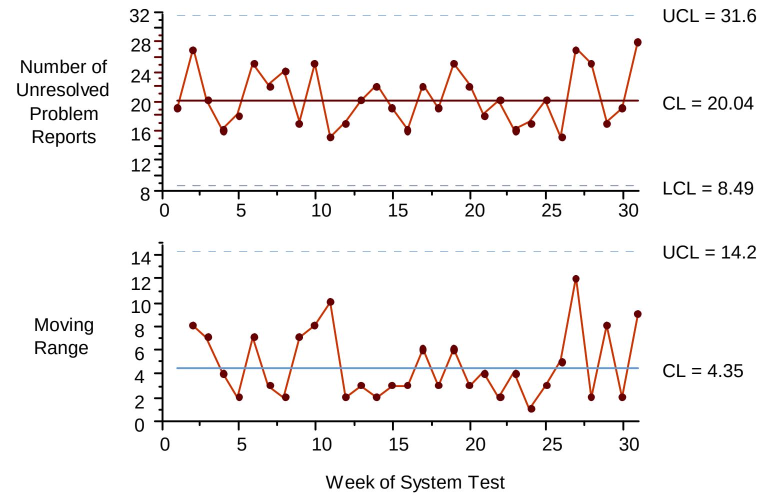
Process-performance baselines are built from project data.

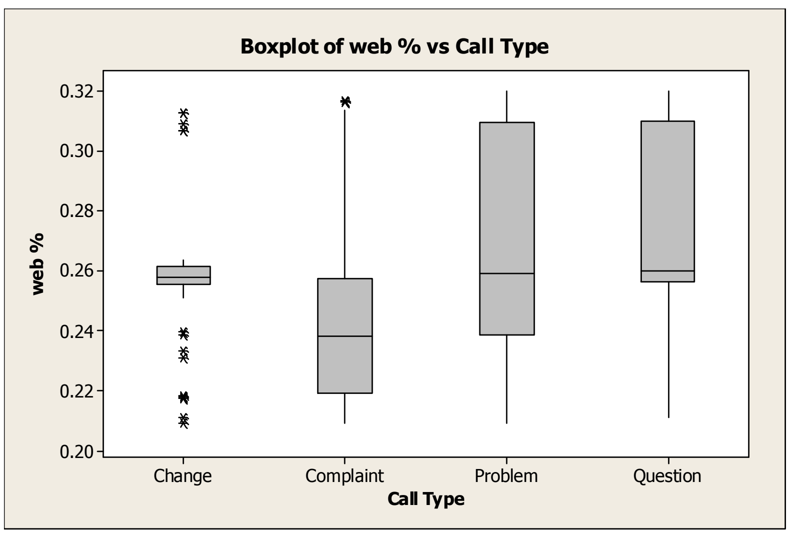


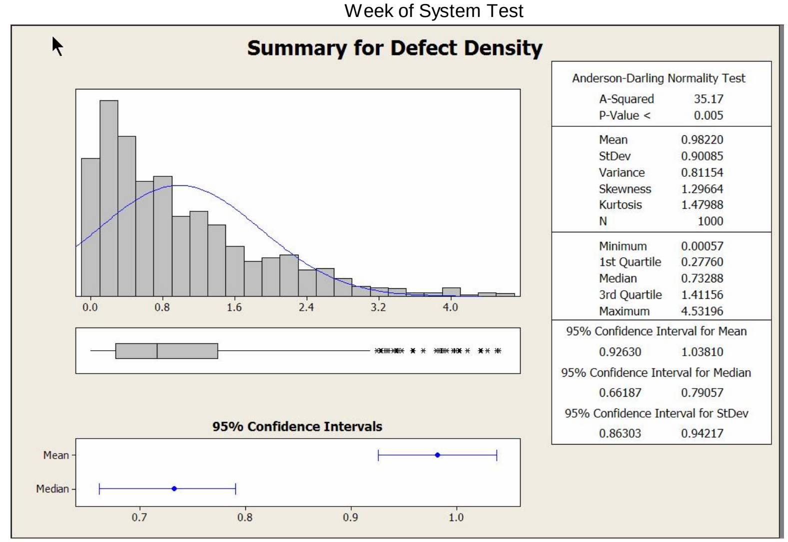
Projects use the organization's process-performance baselines in managing quality and performance results

ss-Performance Baselines

PPBs are derived by analyzing the collected measures to establish a distribution and range of results that characterize the expected performance for selected processes when used on any individual project in the organization.







…sting and PPBs

- To determine whether a process change (improvement or degradation) has occurred by comparing the before and after baselines.
- To determine whether or not a new sample of data representing the current process behavior is consistent with previous process behavior (e.g., a historical baseline).
- To determine whether or not stratification or segmentation of the data is appropriate by comparing a baseline from each segment or strata layer to other segments or strata layers.
- To enable benchmark comparisons between projects or organizations.

ss-Performance Models (PPMs)?

The organization uses PPMs

- for estimating, analyzing, and predicting the process performance of processes in the organization's set of standard processes.
- to assess the (potential) return on investment of process improvement activities.

Projects use PPMs

- for estimating, analyzing, and predicting the performance of their defined processes.
- for selecting which processes to include in the projectõs defined process.

dients of PPMs -1

- The essential ingredients of process-performance models include the following:
  - The models relate the behavior or circumstance of a process or subprocess to an outcome.
  - The models predict future outcomes based on possible or actual changes to factors (e.g., support ñwhat-ifò analysis).
  - The models use factors from one or more subprocesses to conduct the prediction. These factors are preferably controllable so that projects may take action to influence outcomes.
  - The models are statistical or probabilistic in nature rather than deterministic (e.g., the models account for statistical variation like QPM does; the models depict uncertainty in the factors and predict the uncertainty or range of values in the outcome).

dients of PPMs -2

- High maturity organizations generally possess a collection of process-performance models that go beyond earned value measures that predict cost and schedule variance.
- Specifically, the models predict quality and performance outcomes from factors related to one or more subprocesses involved in the development, maintenance, service, or acquisition processes performed by the projects. Example outcomes include the following:
  - schedule, effort, or cost variance
  - reliability of delivery to the customer
  - defect identification and removal rates
  - customer satisfaction
  - success indicators identified by the organization or project
  - a combination of these outcomes

to Be Modeled – Examples

- **Lifecycle phase subprocesses**
  Consider lifecycle phases such as the following: requirements, architecture, design, code, and test. Example subprocesses include requirements elicitation, requirements allocation, architecture selection, and design, code and test review. Example attributes of these subprocesses include cycle time, quality performance or defect density, productivity, staff attributes, and risk indices.

- Keep in mind attributes such as downtime of parts of the project environment (e.g., computing resources, test equipment, and specialized tools and compilers).

- **Inspection and peer review subprocesses**
  Consider subprocesses that are important to understand quality and therefore are important to your business such as preparation, meeting conduct and review. Example attributes of these subprocesses include preparation times, review rates, and defect densities.

- **Other subprocesses**
  Consider subprocesses (e.g, supplier agreement development, supplier monitoring, customer interaction, partner development) that involve responding to inquiries or actions related to key interfaces with suppliers, customers, and

mers – Example

- Olympic swimmers use process-performance models to evaluate their overall race time. With years of experience, they have identified several key subprocesses that dominate the overall race time:
  - the time off the blocks at the start of the race
  - the time it takes to complete a turn at the end of the pool
- By controlling and managing these times, Olympic swimmers have attained world class performance.

Many changes were made to the CMMI models to improve quality. The major changes include

Å name changed to ñCMMI for Developmentò

Å both representations in one document

Å amplifications improved; added hardware amplifications

Å common features and advanced practices eliminated

Å SS addition eliminated; ISM brought into SAM

Å guidelines for ñnot applicableòprocess areas clarified

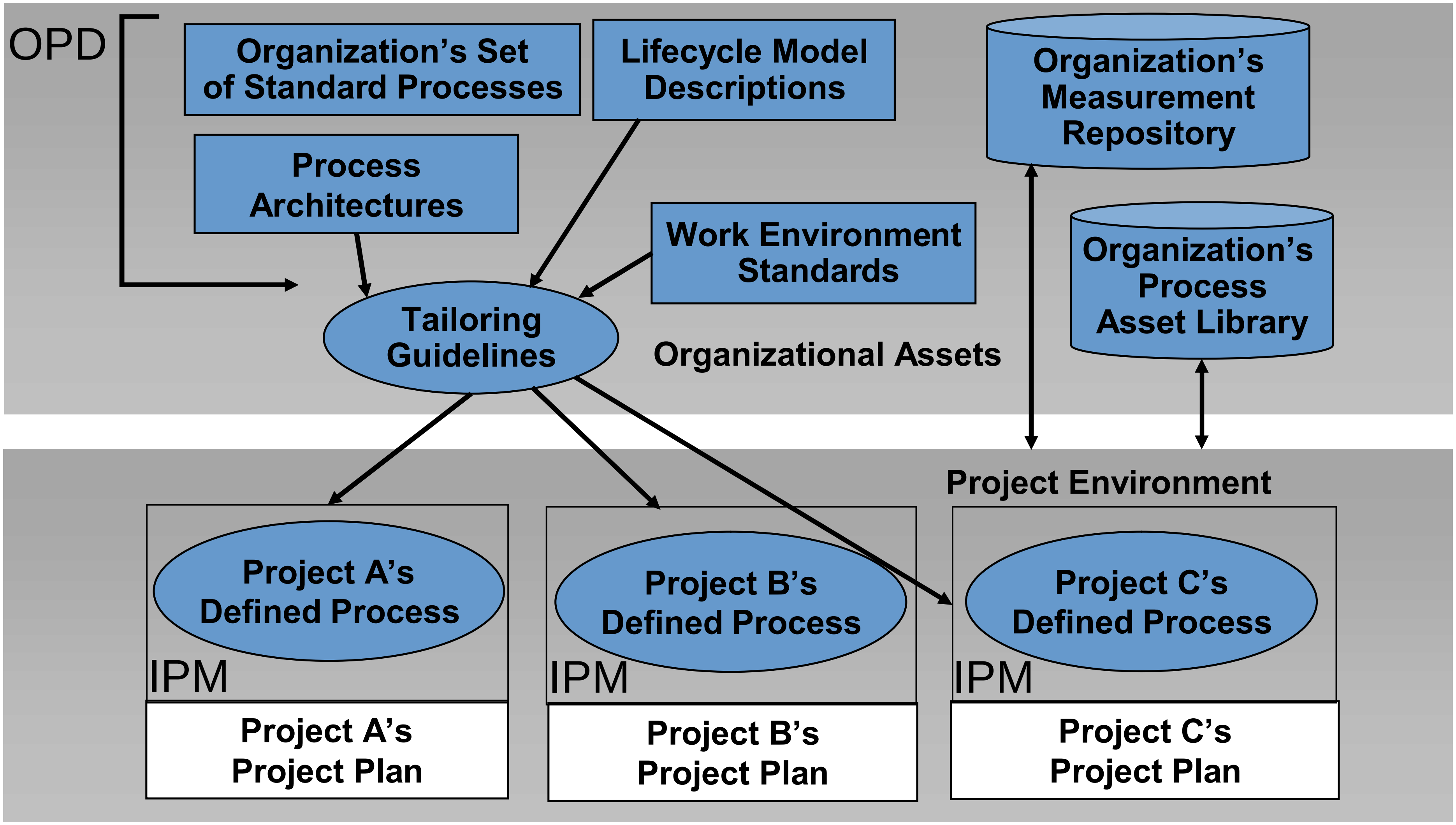
Å overview and glossary improved

Å work environment material added to OPD and IPM

Å IPPD material simplified and consolidated

Å process deployment strengthened in IPM and OPF

ween OPD and IPM



l e a n

software development

A History of Process

Detailed Command vs. Mission Command

mary@poppendieck.com

Mary Poppendieck

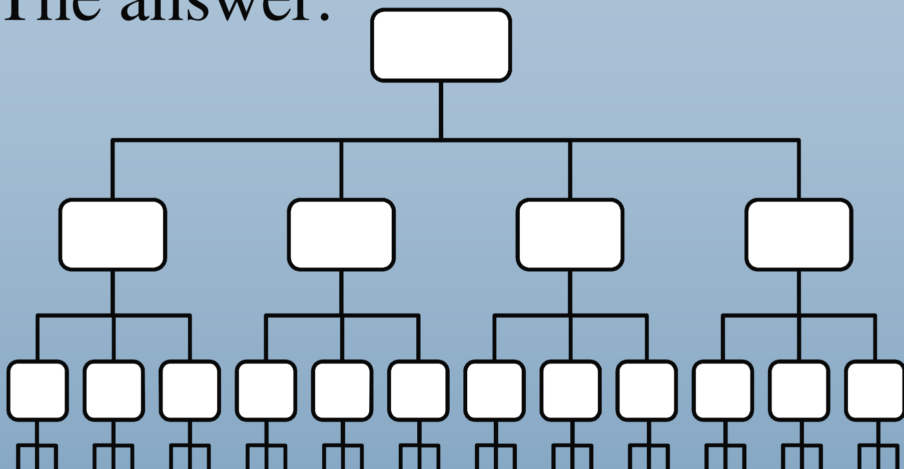
www.poppendieck.com

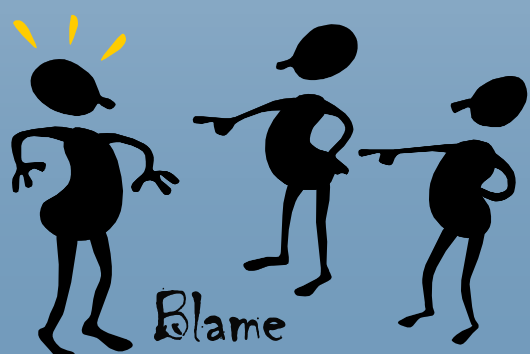
1850's Train Wreck Management

October 5, 1841 – First serious train wreck in the US.

Question: How to run a large, dispersed organization?

The answer:





*Six Principles of Administration:**

1. Proper division of responsibilities
2. Sufficient power conferred to enable same to be fully carried out
3. The means of knowing whether such responsibilities are faithfully executed
4. Great promptness in reporting all derelictions of duties
5. Information obtained through a system of daily reports and checks
6. Adoption of a system to enable the General Superintendent to detect errors immediately and point out the delinquent

* ***The Leader's Handbook*** by Peter Scholtes, quoting ***The Visible Hand: The Managerial Revolution in American Business*** by Alfred D. Chandler, (1977)

1880's Command Intent

Helmut von Moltke, Chief of the General Staff Prussian Army, 1857 – 1888 (30 years)

"No plan of operations extends with any degree of certainty beyond the first encounter with the main enemy force."

***Auftragstaktik* (literally, "mission tactics")**

Delegation of decision-making authority to subordinate commanders within the context of the higher commander's intent.

Helmut von Moltke
1800 - 1891

The heart of mission command:

"The advantage which a commander thinks he can attain through continued personal intervention is largely illusory. By engaging in it he assumes a task that really belongs to others, whose effectiveness he thus destroys. He also multiplies his own tasks to a point where he can no longer fulfill the whole of them."

Mission Command: Command and Control of Army Forces
Field Manual No. 6-0
Department of the Army
Washington, DC, 11August 2003

1910's
The One Best Way

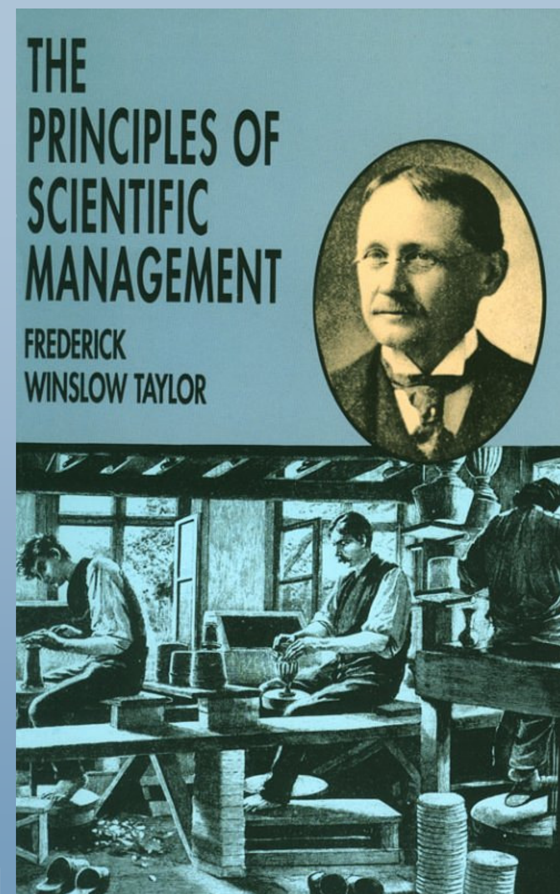
Frederick Winslow Taylor

Assumptions:

- ✓ Workers will do as little as possible
- ✓ Workers do not care about quality
- ✓ Workers are not smart enough to know the best way to do their job

Taylor's View of Efficiency:

- ✓ Efficiency comes from "knowing exactly what you want men to do and then seeing that they do it in the best and cheapest way."
- ✓ Expert defines the best way through breaking down the job into parts and finding the best way to do each part
- ✓ Pay workers extra for following the method determined by the experts



See: *The One Best Way: Frederick Winslow Taylor and the Enigma of Efficiency,* Robert Kanigel, 1999

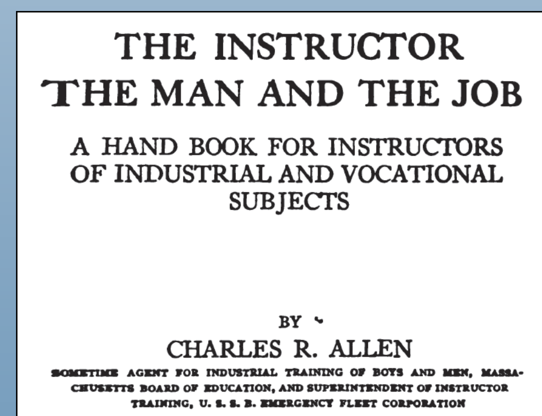
1920's Industrial Training

Charles R. Allen – New Bedford, Massachusetts

- ✓ On-the job training
- ✓ By a master at the job
  - Second class trainers produce second class learners
  - Experts know how to do the job
    - But they need training in how to train
- ✓ Four Step Method
  - Preparation, Presentation, Application, Testing

1917 – War Ships were needed

- ✓ Allen: Training for shipbuilders
  - 1,000 supervisors trained how to train
  - 88,000 shipbuilders trained
- ✓ Wrote ***"The Instructor, the Man and the Job"***



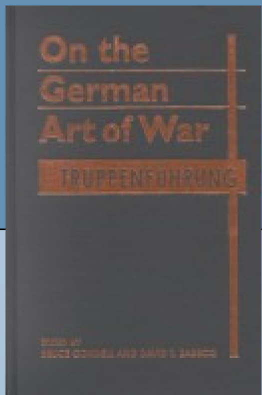
THE INSTRUCTOR
THE MAN AND THE JOB

A HAND BOOK FOR INSTRUCTORS OF INDUSTRIAL AND VOCATIONAL SUBJECTS

BY

CHARLES R. ALLEN

SOMETIME AGENT FOR INDUSTRIAL TRAINING OF BOYS AND MEN, MASSACHUSETTS BOARD OF EDUCATION, AND SUPERINTENDENT OF INSTRUCTOR TRAINING, U. S. S. B. EMERGENCY FLEET CORPORATION



1930's
Unit Command

Truppenfuhrung ("*Unit Command*")
German Army field manual, 1933/1934

Section 4: Lessons in the art of war cannot be exhaustively compiled in the form of regulations. The ***principles must be applied in accordance with the situation***. Simple actions, logically carried, out will lead most surely to the objective.

Section 6: The command of an army and its subordinate units requires ***leaders capable of judgment, with clear vision and foresight, and the ability to make independent and decisive decisions***.

Section 7: ***An officer is*** in every sense ***a teacher and a leader***.

Section 10: The decisive factor, despite technology and weaponry, is the value of the individual soldier. The battlefield requires ***soldiers who can think and act independently***, who can make calculated, decisive and daring use of every situation and who understand that victory depends on each individual.

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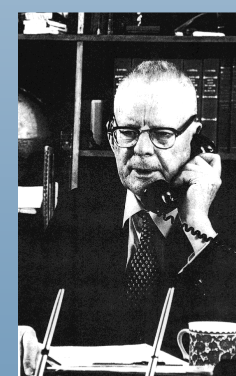
1940's
Wartime Production

Wartime Production

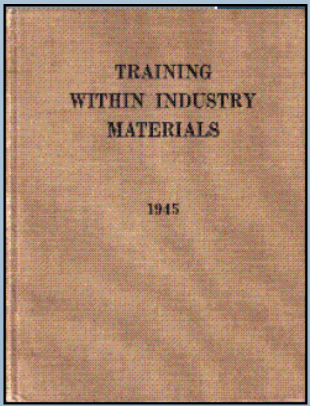
- ✓ Training within Industry (TWI)
  - Train first line supervisors
    - Job Instruction – how to train workers
    - Job Methods – how to improve the way work is done
    - Job Relations – how to treat workers with respect
- ✓ Statistical Process Control (SPC)
  - W. Edwards Deming
    - Taught defense contractor engineers & technicians
    - Over 30,000 trained
  - Widely used in defense production



TWI & SPC were ignored by manufacturers after 1945.

1950's
TWI & SPC move to Japan

TWI was introduced to Japan in1947-48. Toyota adopted Job Instruction (JI) in 1951, Methods (JM) 1952, Job Relations (JR) in 1953. JI widely used to this day.



JM did not drive deep enough into Kaizen and the elimination of waste strong enough to suit Taiichi Ohno, so he had Shigeo Shingo to replace it with a course on industrial engineering and productivity.

W. Edwards Deming
System of Profound Knowledge

- ✓***Appreciation for the system***
- ✓***Knowledge of Variation.***
- ✓***Theory of Knowledge***
- ✓***Psychology***

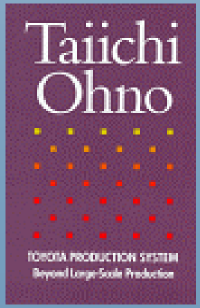
Prof. W. Edwards Deming

1960's
Toyota Production System

Taiichi Ohno

- ✓Just-in-Time Flow
  - Eliminate Waste
- ✓Stop-the-Line Culture
  - Mistake-Proof the System
- ✓Relentless Improvement
  - Learn Through Experimentation

Taiichi Ohno (1912-1990)



- ✓Books:

The Toyota Production System, 1978 (1988)

Workplace Management, 1982 (2007)

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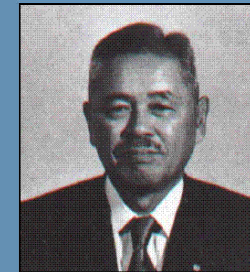
Taiichi Ohno Standard Work



There is something called standard work, but standards should be changed constantly. Instead, if you think of the standard as the best you can do, it's all over. The standard work is only a baseline for doing further kaizen. It is kai-aku [change for the worse] if things get worse than now, and it is kaizen [change for the better] if things get better than now. Standards are set arbitrarily by humans, so how can they not change?

You should not create these away from the job. See what is happening on the gemba and write it down.

From ***Workplace Management,*** by Taiichi Ohno, originally published in 1982, from translation by Jon Miller, Gemba Press, 2007.

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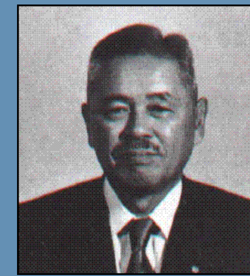
Taiichi Ohno Motivation

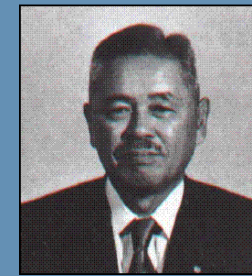


When creating Standard Work, it will be difficult to establish a standard if you are trying to achieve ‘the best way.’ This is a big mistake. Document exactly what you are doing now. If you make it better than it is now, it is kaizen. If not, and you establish the best possible way, the motivation for kaizen will be gone.

That is why one way of motivating people to do kaizen is to create a poor standard. But don’t make it too bad. Without some standard, you can’t say ‘We made it better’ because there is nothing to compare it to, so you must create a standard for comparison. Take that standard, and if the work is not easy to perform, give many suggestions and do kaizen.

From ***Workplace Management,*** by Taiichi Ohno, originally published in 1982, from translation by Jon Miller, Gemba Press, 2007.

Taiichi Ohno Ownership

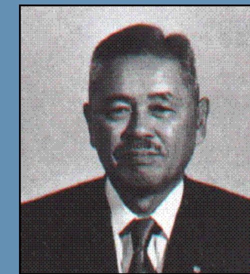


We need to use the words ‘you made’ as in ‘follow the decisions you made.’ When we say ‘they were made’ people feel like it was forced upon them. When a decision is made, we need to ask who made the decision. Since you also have the authority to decide, if you decide, you must at least follow your decision, and then this will not be forced upon you at all.

But in the beginning, you must perform the Standard Work, and as you do, you should find things you don't like, and you will think of one kaizen idea after another. Then you should implement these ideas right away, and make this the new standard.

From ***Workplace Management,*** by Taiichi Ohno, originally published in 1982, from translation by Jon Miller, Gemba Press, 2007.

Taiichi Ohno
Changing Standards



Years ago, I made them hang the standard work documents on the shop floor. After a year I said to a team leader, ‘The color of the paper has changed, which means you have been doing it the same way, so you have been a salary thief for the last year.’ I said ‘What do you come to work to do each day? If you are observing every day you ought to be finding things you don't like, and rewriting the standard immediately. Even if the document hanging there is from last month, this is wrong.’

At Toyota in the beginning we had the team leaders write down the dates on the standard work sheets when they hung them. This gave me a good reason to scold the team leaders, saying ‘Have you been goofing off all month?’ If it takes one or two months to create these documents, this is nonsense.

1970's
Theory X – Theory Z

Theory X

1. Most people dislike work and don't give their best efforts at their job.
2. Therefore people must be encouraged with financial incentives or threats to work towards organizational objectives.
3. Generally people would rather avoid responsibility and prefer to be directed.

Theory Z

People are motivated by:

1. The satisfaction of a job well done
2. The enjoyment of cooperating with others and being recognized by them
3. The satisfaction of using one's abilities to the fullest

Theory X : Douglas McGregor
Theory Z: Dr. William Ouchi

Kaoru Ishikawa

The fundamental principle of successful management is to allow subordinates to make full use of their ability.

Everyone who is connected with the company … must be able feel comfortable and happy with the company, and to make use of his capabilities and realize his potential.

Top managers and middle managers must be bold enough to delegate as much authority as possible. That is the way to establish respect for humanity as your management philosophy.

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Mission Command vs. Detailed Command

A Comparison

Mission Command: Command and Control of Army Forces
Field Manual No. 6-0
Department of the Army
Washington, DC, 11August 2003

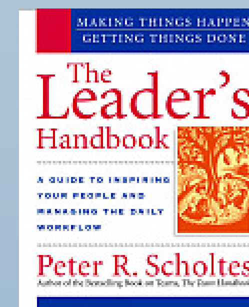
Mission Command		Detailed Command
• Probabilistic • Unpredictable	Assumes war is	• Deterministic • Predictable
• Disorder • Uncertainty	Accepts	• Order • Certainty
• Decentralization • Spontaneity • Informality • Loose rein • Self-discipline • Initiative • Cooperation • Acceptable decisions faster • Ability all echelons • Higher tempo	Tends to lead to	• Centralization • Coercion • Formality • Tight rein • Imposed discipline • Obedience • Compliance • Optimal decisions, but later • Ability focused at the top
• Implicit • Vertical and horizontal • Interactive	Communication types used	• Explicit • Vertical • Linear
• Organic • Ad hoc	Organization types fostered	• Hierarchic • Bureaucratic
• Delegating • Transformational	Leadership styles encouraged	• Directing • Transactional
• Art of war • Conduct of operations	Appropriate to	• Science of war • Technical/procedural tasks

1980's
Total Quality Management

1987: ISO 9000 – The Generic Quality Standard

What's Wrong with ISO 9000?

- ✓ ISO 9000 does not make sure you are doing the right thing, only that you are doing things consistently.
- ✓ Certification is expensive and bureaucratic.
- ✓ Constant improvement of processes may be discouraged because it might require recertification.
- ✓ ISO displaces internal motivation to do good work with external motivation to pass the inspection.



From The Leader's Handbook by Peter R. Scholtes, 1998

ISO 9000 certification fits the mental model of Direct Command:

Deterministic	Imposed discipline
Predictable	Obedience
Order	Compliance
Certainty	Optimal decisions, but later
Centralization	Ability focused at the top
Coercion	Explicit Communication
Formality	Hierarchic
Tight rein	Bureaucratic

Discipline is essential.
Learning is fundamental.
Documentation is incidental.

1990's
CMM & CMMI

Point:

- ✓ Disciplined organizations do a better job.
- ✓ CMM and CMMI present a good set of process areas to consider.

Counter Point:

- ✓ Kaizen (Relentless Improvement) is the 1st – not the 4th – step.
  - The purpose of standards is to provide a baseline for change.
- ✓ Building-Quality-In is not optional.
  - Finding defects during final verification indicates a defective process.
- ✓ You *can* have it all: high speed, high quality, and low cost.
  - The maturity of an organization is measured by the speed at which it reliably and repeatedly executes its core processes.
- ✓ Using feedback to discover value is better than following a plan.
  - Plans are made when we are the most ignorant.
- ✓ KLOC's and Function Points are a measure of complexity.
  - The fewer lines of code and function points, the better.

L E A N

- ✓ Assessment has the same problems as ISO 9000.

High Reliability Organizations

High Reliability Organizations

- ✓ Where a mistake is a matter of life and death
  - Firefighters
  - Nuclear Power Plants
  - Power Grid Dispatching Centers
  - Hospital Emergency Rooms
  - Air Traffic Control
  - Aircraft Carriers

High Reliability Organizations…

- ✓ Have more than their fair share of unexpected events
- ✓ Persistently have less than their fair share of accidents

Common Characteristic

Mindfulness*

* See *Managing the Unexpected: Assuring High Performance in an Age of Complexity* by Karl E. Weick and Kathleen M. Sutcliffe, 2001

Mindfulness

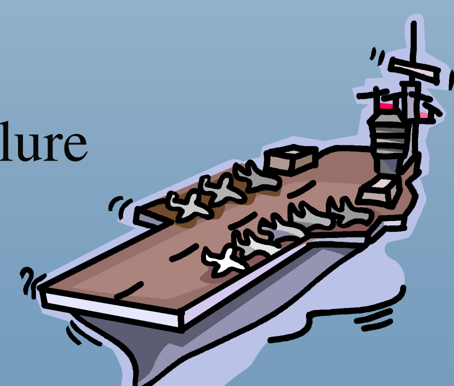
Preoccupation with Failure
- ✓ Anticipate and become aware of the unexpected
  - Anything that can go wrong will eventually go wrong

Reluctance to Simplify
- ✓ Learn to live in a complex, unpredictable world
  - "Standard Procedures" cannot replace thinking people

Sensitivity to Operations
- ✓ Be attentive to the front line where the work gets done
  - Go "to the Gemba" and see for yourself

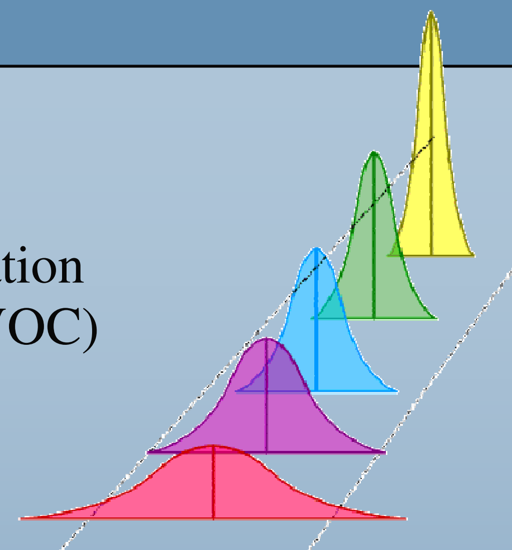
Commitment to Resilience
- ✓ Learn to detect, contain and bounce back from failure
  - *STOP* – Investigate – Find Root Cause – Rectify

Deference to Expertise
- ✓ Move decisions to the front line
  - Use Mission Command, not Detailed Command



From *Managing the Unexpected: Assuring High Performance in an Age of Complexity* by Karl E. Weick and Kathleen M. Sutcliffe

2000's Six Sigma



Point:

- ✓ Excellent tool set for using the Scientific Method
- ✓ Broad education in toolset throughout the organization
- ✓ Defines Quality as the "Voice of the Customer" (VOC)
- ✓ Closer to mission control than detailed control

Counter Point:

- ✓ Focus on Variation
  - Variation comes in two forms: Assignable Cause & Chance Cause
    - Trying to eliminate "chance cause" usually makes the situation worse
  - In a development process, variation is desirable – it creates knowledge.
- ✓ Focus on VOC
  - VOC drives sustaining technologies, but not disruptive technologies

    "The truth is that no system seems all that good at picking winners in advance. What makes a system successful is its ability to generate lots of losers and then to recognize them as such and kill them off." – James Surowiecki, *The Wisdom of Crowds*

    "Nothing will kill innovation faster than trying to manage it, predict it, and put it on a timeline." – Vishva Dixit, vice president for research of Genentech

Plank Road Fever

USA: Late 1840's – mid 1850's

Massive boom in plank road construction

- ✓High capital investment
  - ×Numerous large and small investors
- ✓To be paid for with tolls

Immediate, positive results

- ✓Far superior to muddy, rutted roads
- ✓Dramatic decrease in travel time
- ✓Expanded rural markets

BUT

- ✓Roads deteriorated in 4 years
  - ×Half the projected lifespan
- ✓Maintenance costs were very high
  - ×Annual costs were 20-30% of initial cost
- ✓Most plank roads were soon abandoned

Information Cascade

"The first plank roads were a huge success. People looking for a solution to the road problem found one ready-made at hand. As more people built plank roads, their legitimacy became more entrenched and the desire to consider alternate solutions shrank. It was years before the fundamental weakness of plank roads – they didn't last long enough – became obvious."

James Surowiecki, *The Wisdom of Crowds*

Of 58 large companies that have announced Six Sigma programs, 91 percent have trailed the S&P 500 since.

Fortune, July 2006

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software development

Thank You!

More Information: www.poppendieck.com

CMMI: Fitting a Vision to Program Execution Needs

November 13, 2007

Mark D. Schaeffer
Director, Systems and Software Engineering
Office of the Under Secretary of Defense (AT&L)

CMMI Vision*

The initial vision for CMMI was to integrate the competing maturity models and provide a framework for more consistent process improvement

ÅCause integration of the functional disciplines within organizations and across programs

ÅIncrease systems engineering and software process maturity as organizations migrate from the sun-setting CMMs to CMMI

Build on and improve the significant work done by many to establish best practices

* Extract: 2004, 2005, 2006 CMMI Conference Keynotes

gress Toward Executing the Vision

- We have attained the original vision
- We have taken steps to address CMMI issues:
  - Integrity issues with appraisals
  - Guidance for acquiring organizations
- Current Issues:
  - Staged vs. Continuous
    - Cost of levels versus Return on Investment
  - High Maturity
    - Level 4 and 5 inconsistency
    - High maturity appraisals and training
    - Relationship to other continuous process improvement initiatives
  - Next Gen Process Improvement
    - How do we revise the CMMI vision to meet program execution needs?

Necessary but not sufficient.

ÅWe have revitalized Systems Engineering Policy, Guidance, Education and Trainingé

ÅWe have driven good systems engineering practices back into the way the acquisition community does business, and have had a positive impact on programsé

ÅWe have expanded the boundaries to include increasingly important enablers for sound SE applicationé

ÅWe have a rigorous process to capture what went wrong...

Åé but failed to change, root cause behavior that leads to programs that do not meet cost, schedule, and performance expectationsé adequate maturity at program initiation

What are the systemic issues that need to be addressed?

The Real World and CMMI: …nship between CMMI and Program Execution*

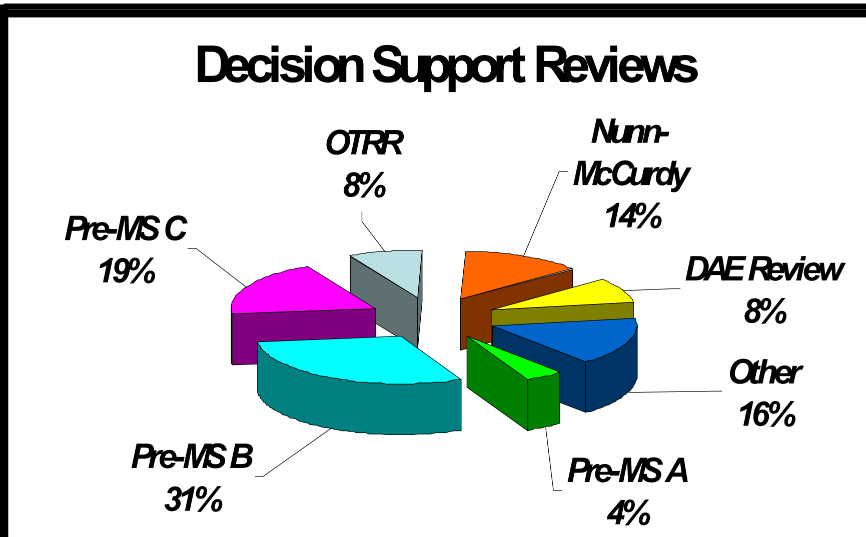
- Programs adhering to organizational processes:
  - 85% of programs find the supplier performs their defined processes with minor non-compliance
- For programs that don't adhere to processes:
  - Primary reasons are schedule, cost, and customer impact
- There does <u>not</u> appear to be a link between maturity levels and program performance
  - No correlation between maturity levels and cost variance or CPI
  - Indication of negative correlation between ML and schedule variance or SPI
- There does <u>not</u> appear to be cost and schedule improvement from ML3 -> ML5

***DCMA Data Findings (2007)**

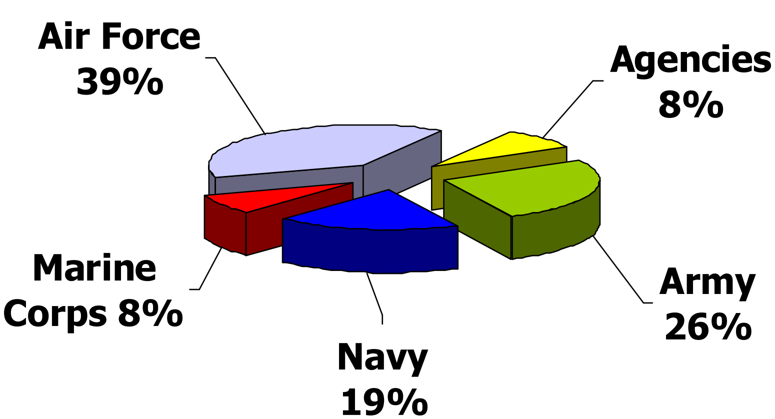
m Support Review Activity

(since March 2004)

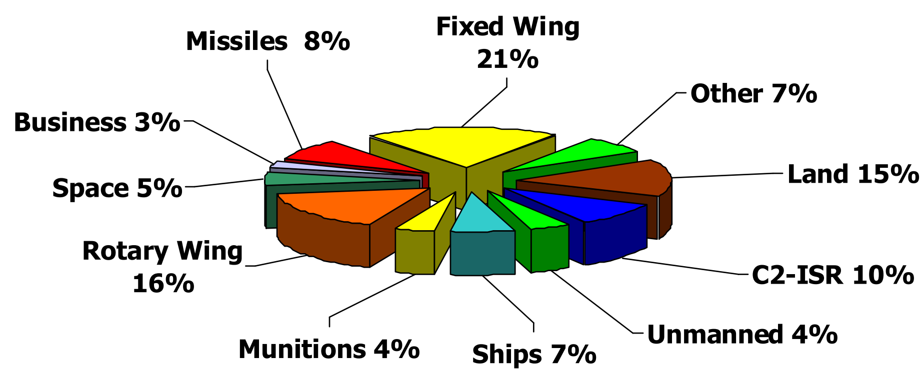
- PSRs/NARs completed: 42
- AOTRs completed: 10
- Nunn-McCurdy Certifications: 10
- Participation on Service-led IRTs: 2
- Technical Reviews: 9
- Reviews planned for remainder FY07
  - PSRs/NARs: 12
  - AOTRs: 2
  - Nunn-McCurdy: 6
  - Technical Reviews: 3



Service-Managed Acquisitions



Programs by Domain Area



0 Emerging Systemic Issues

“Deep Dive” Program Reviews since Mar 04)

1. Management	Å IPT roles, responsibilities, authority, poor communication Å Inexperienced staff, lack of technical expertise
2. Requirements	Å Creep/stability Å Tangible, measurable, testable
3. Systems Engineering	Å Lack of a rigorous approach, technical expertise Å **Process compliance ≠ Program execution**
4. Staffing	Å Inadequate Government program office staff
5. Reliability	Å Ambitious growth curves, unrealistic requirements Å Inadequate ñtest timeò for statistical calculations
6. Acquisition Strategy	Å Competing budget priorities, schedule-driven Å Contracting issues, poor technical assumptions
7. Schedule	Å Realism, compression
8. Test Planning	Å Breadth, depth, resources
9. Software	Å Architecture, design/development discipline Å Staffing/skill levels, organizational competency (process)
10. Maintainability/Logistics	Å Sustainment costs not fully considered (short-sighted) Å Supportability considerations traded

Nunn-McCurdy Breaches

- Nine key visible failures:
  - Change in doctrine, driving quantity or mission changes
  - Requirements problems (immature, unrealistic, not stable, creep, etc)
  - Lack of a robust baseline
  - Inadequate SE/T&E, risk management, and/or FMECA
  - Inadequate staffing/experience/oversight levels
  - Poor reliability
  - Acquisition reform
  - Schedule/cost realism (concurrency, estimation, etc)
  - Contract (warranty, price curves, TSPR, etc)

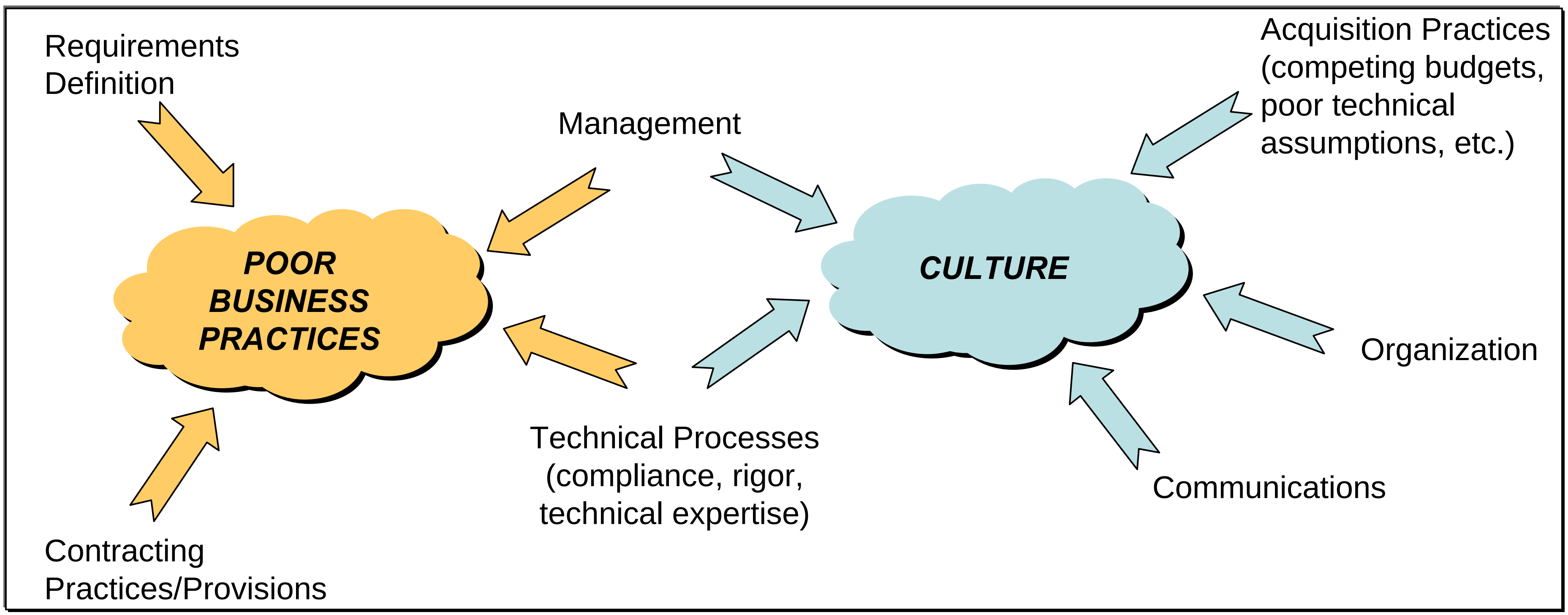
Processes in place ≠ Program Execution

10 Emerging Systemic Issues from Triage Assessment

1. Insufficient trade space (resources)	24 programs (37%)
2. Insufficient schedule trade space	22 programs (34%)
3. Budget not properly phased/ magnitude to support planned developmental (SE, T&E, production, etc.) efforts	17 programs (26%)
4. Concurrent test program	16 programs (25%)
5. Insufficient performance/ requirements trade space	16 programs (25%)
6. Operational or Developmental performance results indicate not effective/ suitable or KPPs not meeting threshold	15 programs (23%)
7. Lack of JROC-validated requirements document for basic program (ORD, CDD, CPD)	14 programs (22%)
8. Funding instability	14 programs (22%)
9. Inadequate implementation of EVMS and use of EVM as a vehicle for planning, executing, and controlling the program	14 programs (22%)
10. Current unit cost factors indicate significant/ critical APB breach	12 programs (19%)

Root Cause Analysis Emerging Results

Å Emerging systemic analyses point to the following 2 core root cause areas and their top 4-5 drivers:



An "Execution Discipline" problem… Solutions need to address "state-of-the-practice" vice "state-of-the-art"

Let’s Review…

- Staged vs. Continuous
  - DoD does not encourage use of levels
  - Current practice of attaining levels
    - Continues to drive program/enterprise cost
    - Does not correlate to program success
    - Contributes to acquirers and developers not having to ñthinkò about program execution
- High Maturity
  - High maturity is ill defined/narrowly applied -- vice adopting CPI in all required areas
- Next Gen Process Improvement
  - Starting programs right ï disciplined execution ï highest probability for program success
  - We must address state of the practice, vice state of the art

Fit CMMI Vision to Program Execution Needs

CMMI Vision for the Future

ÅCurrent

ï 5 Levels

ï Three SCAMPIs

ï Constellations for major stakeholders

ï High Maturity improvement plans

ï Cost of integrity

ÅFuture

ï Foundational best practices

ï Tailored to organizational, domain, and program needs

ï Focus areas to extend the foundation to specific interest areas (e.g. safety, COTS)

ï Structured measurement process ï aligned with tools for high maturity

CMMI should continue to ensure foundational best practices; tailored to Org/Domain/Program needs

Backup

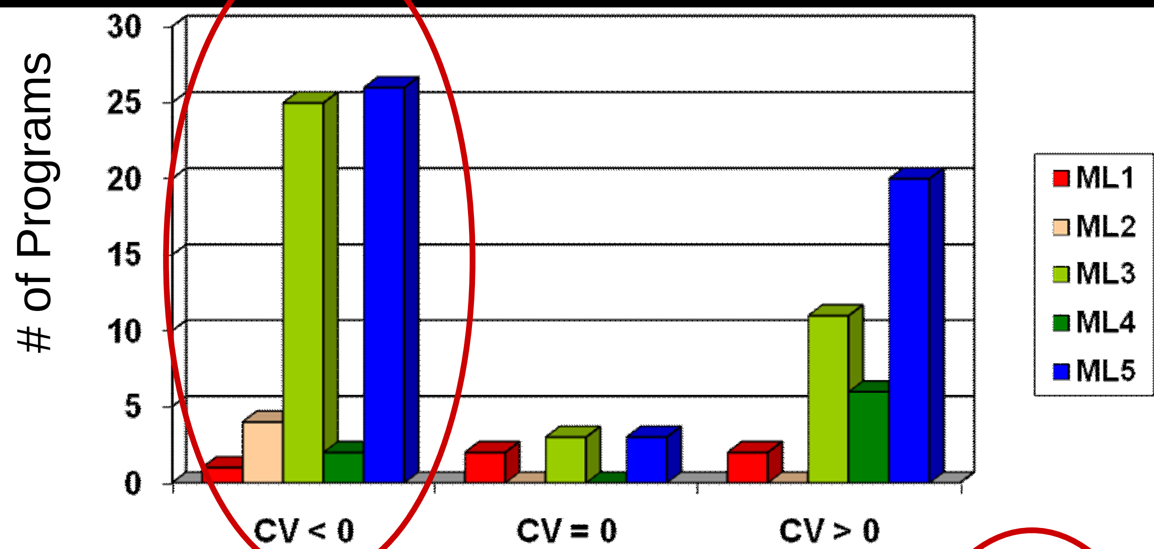
DCMA Survey and Data Collection*

- Survey conducted in response to OUSD (AT&L) request:
  - ñIs there a relationship between CMMI levels and program performance?ò
- 85-142 programs reported each quarter
- ACAT Levels reported
  - ACAT IAC ï 9 programs
  - ACAT IAM ï 5 programs
  - ACAT IC ï 33 programs
  - ACAT ID ï 79 programs
  - ACAT II ï 16 programs
- Claimed maturity levels (MLs)
  - ML 1 ï 3 programs
  - ML 2 ï 1 program
  - ML 3 ï 47 programs
  - ML 4 ï 17 programs
  - ML 5 ï 74 programs

* Excerpt from DCMA Data Call Results briefing - Nov 07

CV/SV and Maturity Levels

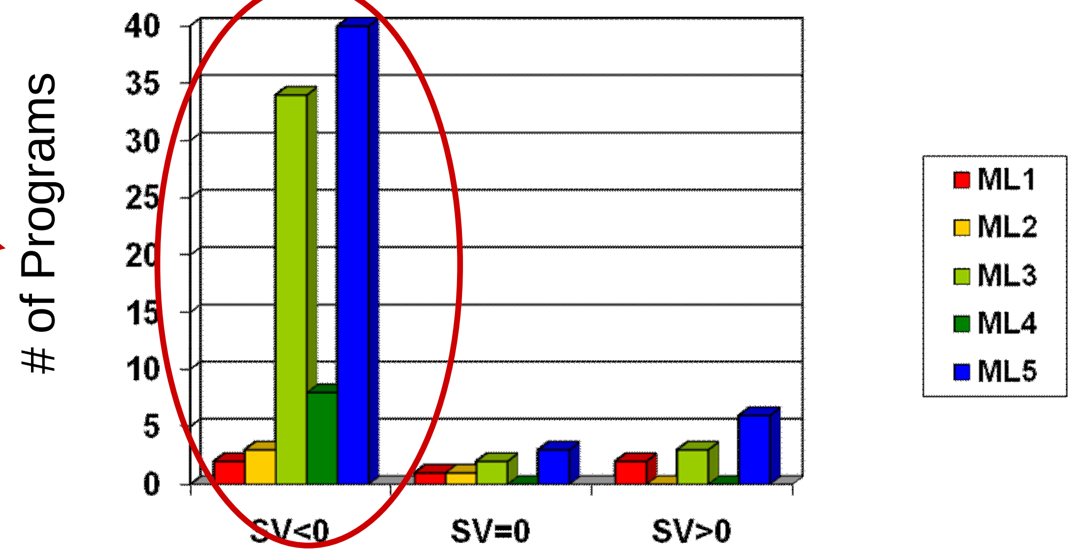
MAY



CV

Unfavorable

SV



DCMA Study - Data Assumptions

Å Many survey questions are subjective (Local DCMA viewpoints)

Å If both Maturity Level (ML) and Capability Level (CL) reported, only captured ML

Å Only captured highest Maturity Level achieved

  Å Example: ML 5 SW only with ML 3 for SE; ML 5 data was used

Å If a range (eg. 5-10%) was given for any EV data, highest value (10%) was recorded

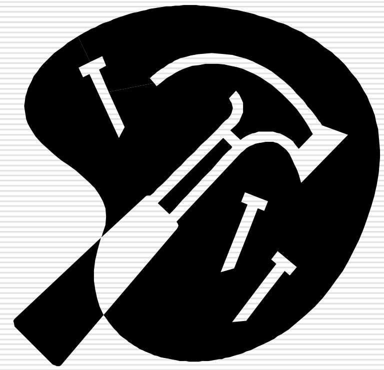
Å Only used latest PO/contract for a program

Å Not all the totals will add up to the sample size due to unanswered questions

Å Have deleted some EV data points due to suspect data (Suspect decimal point issues)

16

"When the Only Tool You Have is a Hammer, Every Problem Begins to Look Like a Nail"

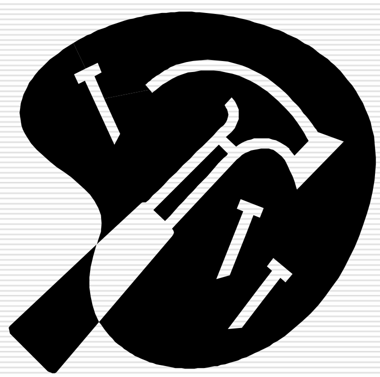


Sam Fogle
ACE Guides, LLC

Agenda

- Tools? You mean like a hammer?
- If it ain’t broke, don’t fix it. But if it IS, you’ll probably need a tool.
- I watched that danged exercise video 15 times and I ain’t lost a pound.

Tools?
You mean like a hammer?



Definitions*

- **Work**: something on which exertion or labor is expended; a task or undertaking

- **Tool**: anything used as a means of accomplishing a task or purpose

Tools help us accomplish our work

What tools does your organization use?

*Definitions from Dictionary.com

What tools do you need?

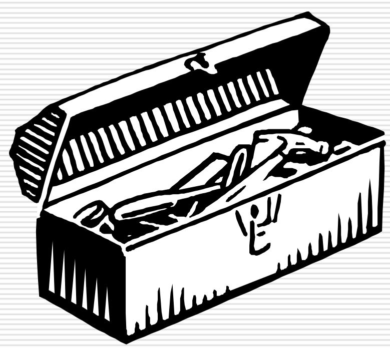
Does your organization have a good set of tools to do its work?

- Well, we get the work done so I guess so
- We don’t know of any other tools that would help, so I guess so
- We do a reasonable job of keeping up with what is available, and investigating new tools, so I guess so

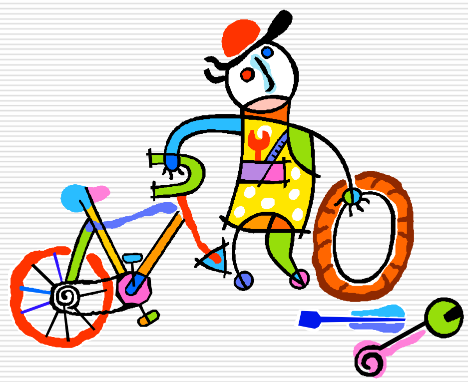
What's in it for us?

What does moving up a CMMI level get you?

- A nice certificate to hang on the wall
- Bragging rights
- Ability to bid on some new work
- NEW TOOLS



If it ain't broke, don't fix it.
But if it IS,
you'll probably need a tool.



We are in a Level 1 organization and we hear these type of complaints:

- "Our project managers never seem to be able to live within the budgets we give them."

We are in a Level 1 organization and we hear these type of complaints:

- "Projects seems to be on track until the last minute (90% complete!) and then there is a train wreck."

Project Planning – documenting plans
Measurement and Analysis – analyzing measures
Project Monitoring and Control – monitoring progress

Our organization has moved up to Level 2, but now we hear these type of complaints:

- "Every project has its own custom processes, but new projects don't know which ones to adopt, or whether to create their own."

Organizational Process Definition – developing standard processes, tailoring guidelines
Integrated Project Management – defining project's process

Our organization has moved up to Level 2, but now we hear these type of complaints:

- "It seems that for every project that gets into trouble, we can look back to one or two critical choices that were made too hastily."

Our organization has moved up to Level 2, but now we hear these type of complaints:

- "It seems that a lot of the issues we discover in testing are simple mistakes that the author couldn't see because they were too close to the work."

Verification – Peer Reviews

We are now proudly Level 3, but people are still complaining:

- "We keep 'improving' our processes, but how do we know if they are good enough."

Organizational Process Performance – establishing a quantitative understanding of process performance

We are now proudly Level 3, but people are still complaining:

- "Our PMs do a great job of planning and tracking their projects and integrating their plans, but even if things are on plan today, they still worry whether they will be able to meet their project's end goals."

Level 4 is great, but do you think that shut them up?:

- “We understand our processes and what we can expect from them, but it seems that we keep having to fix the same type of problem time-after-time.”

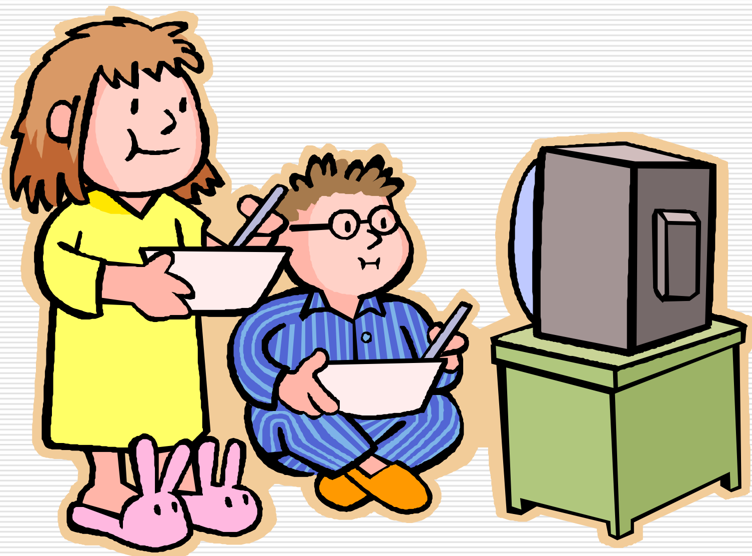
Causal Analysis and Resolution – stopping defects before they occur

Level 4 is great, but do you think that shut them up?:

- “Our processes are very stable. In fact they are so stable they haven’t changed in years. I can’t believe that there aren’t ways out there to do some of the things we do.”

Organizational Innovation and Deployment – incremental and innovative improvements

I watched that danged exercise video 15 times and I ain't lost a pound.



[illegible]vels – Cost & Benefits

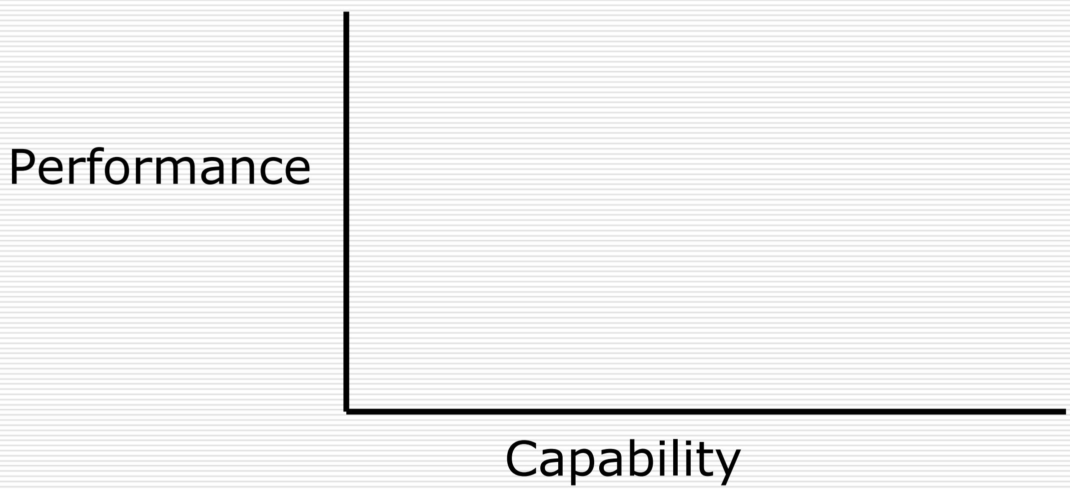
	Cost	Benefits
Get the Rating	X	• Certificate • Bragging • Able to bid • Capability (tools)
Improve the Organization	$X+\Delta$	• Above plus • Improved performance

Conference Theme

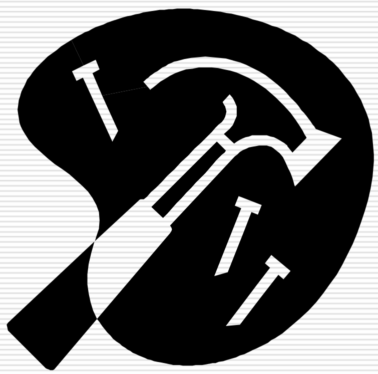
"Investigation, Measures and Lessons Learned about the Relationship between CMMI Process Capability and Project and Program Performance."

Process Capability = you have demonstrated that you have and can use the tools that characterize a level

Project and Program Performance = You have adopted and effectively use those tools



Adoption



Questions

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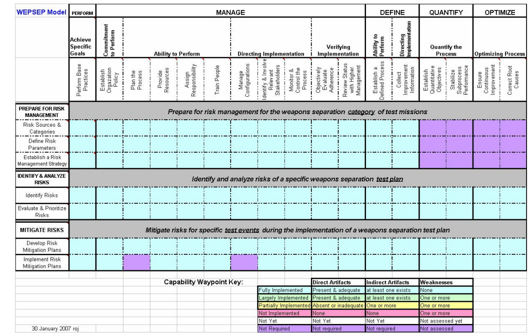
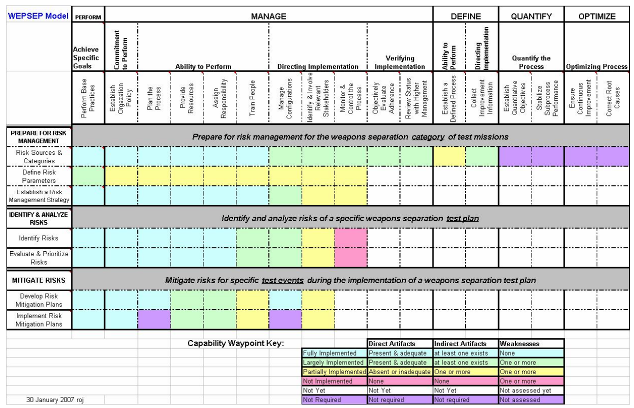
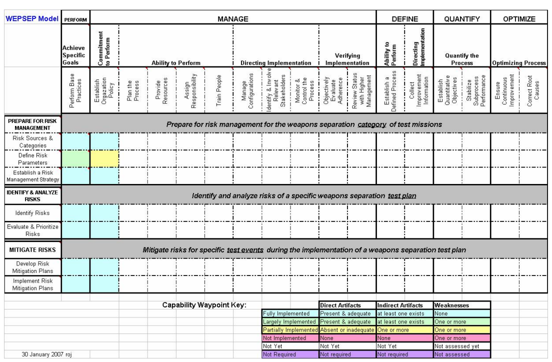
Visualizing Improvement with Capability Waypoints







Robert O. Jacob,
Naval Air Systems Command,
Patuxent River MD

Ron Abler,
Sabre Systems,
Lexington Park, Maryland

RANGE SAFETY

Our specific goals are similar to CMMI-DEV RSKM process area

Range Safety manages risk in support of different product lines. Each product line presents different range hazards and requires facilities, equipment, and skills to ensure safe operation.

SPECIFIC GOAL 1: Prepare for risk management. Establish policies and procedures at this level...

Mission Areas

Weapons Separation

Supersonic Operations

Targeting Lasers

Airborne and Surface Gunfire

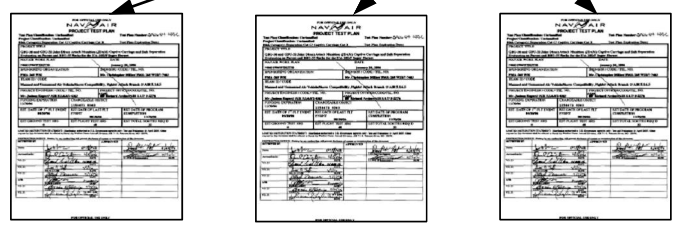
Tactical Missiles

UAVs

Test Plans

Each mission area has multiple test plans associated with it.

SPECIFIC GOAL 2: Identify and analyze risks at this level



Test Events

Each test plan has multiple test events.

SPECIFIC GOAL 3: Mitigate risks. Develop and implementing risk mitigation plans at this level.

Straight & Level

Shallow dive

High-G turn

etc

How can Range Safety be improved?

- **What is our current performance?**
  - Can we provide management with a “metric”?
  - What is our desired performance?
  - How can we excel?

- **What is “improvement”?**
  - Improving effectiveness?
  - Improving efficiency?
  - Can we do both?

- **What should our strategy for improvement be?**
  - Lean / Six Sigma ?
  - CMMI ?

…MMI to visualize improvement?

Our Questions: Will a CMMI improvement effort be useful?

ÅWill the benefits be clear?

ÅWill the benefit in effectiveness or efficiency justify the depth, breadth, time, and cost of the CMMI improvement effort?

Problem: To the novice, the benefit of implementing CMMI is offset by its intimidating complexity.

ÅThe Intro to CMMI course is a sip out of a very large fire hydrant.

ÅThe sheer volume of information delivered in three days is overwhelming, intimidating, and discouraging to students.

ÅHow does CMMI help?

ÅHow can we use the CMMI tool to measure and improve our current performance?

Solution: The **Capability Waypoint Matrix** tool can show at a glance:

ÅCapability levels of specific practices

ÅEffectiveness of individual process areas.

ÅEfficiency of individual process areas

ÅSimple but detailed insight into the improvement status of the entire organization.

ypoint Concept of Improvement

ñIncrease effectiveness, efficiency, or bothò

Å **Effectiveness**

- ï *Meet process area specific goals, if…*
- ï *Specific goals are traceable to organization's mission objectives*

Å **Efficiency:**

- ï Meet goals faster, cheaper, better
- ï Increasing CMMI capability levels implies improvement in schedule, cost, and quality

veness and Efficiency

Range Safety example

- **Range Safety Effectiveness:**
  Meet organization’s goals
  - Technical competency & proficiency in safety support of weapons tests
    - *“Prepare for risk management”*
  - Conduct weapons tests without unacceptable risk to personnel or property
    - *“Identify and analyze risks”*
    - *“Develop & implement risk mitigation plans”*

- **Range Safety Efficiency:**
  Meet goals faster, cheaper, better, smarter
  - Minimize costs of risk management without compromising safety
  - CMMI model capability levels address improvement in cost, schedule and performance

- **Improvement:** Increase effectiveness, efficiency, or both

Range Safety Specific Goals & Practices

***Effectiveness** means "meeting specific goals"*

1. Prepare for Risk Management

Different for various categories of test events (Bombs, guns, lasers, UAVs, etc)

Å Determine risk sources and categories
Å Define risk parameters
Å Establish a risk management strategy

2. Identify and Analyze Risks

For each test plan

Å Identify risks
Å Evaluate, categorize, and prioritize risks

3. Mitigate Risks

For each test event

Å Develop risk mitigation plans
Å Implement risk mitigation plans

We are <u>effective</u> if we are proficient in all range safety practices and achieve the range safety specific goals.

We are <u>ineffective</u> if range safety specific goals are not met.

…ity Levels as a Measure of Efficiency

*…ability levels results in improved **quality** and **efficiency***

- **Capability Level 1 "PERFORM"**
  (i.e., "Be Effective")
  - Achieve specific goals *
    - Perform base practices
- **Capability Level 2 "MANAGE"**
  (i.e., better, smarter, etc.)
  - Commitment to perform *
    - Establish organization policy
  - Ability to perform
    - Plan the process
    - Provide resources
    - Assign responsibility
    - Train people
  - Direct implementation
    - Manage configurations
    - Involve stakeholders
    - Monitor & control process
  - Verify implementation
    - Objectively evaluate adherence
    - Review status with higher management
- **Capability Level 3 "DEFINE"**
  - Ability to perform
    - Establish a defined process
  - Directing implementation
    - Collect improvement information
- **Capability Level 4 "QUANTIFY"**
  - Quantify the Process
    - Establish quantitative objectives
    - Stabilize sub process performance
- **Capability Level 5 "OPTIMIZE**
  - Optimizing Process
    - Ensure continuous improvement
    - Control root causes

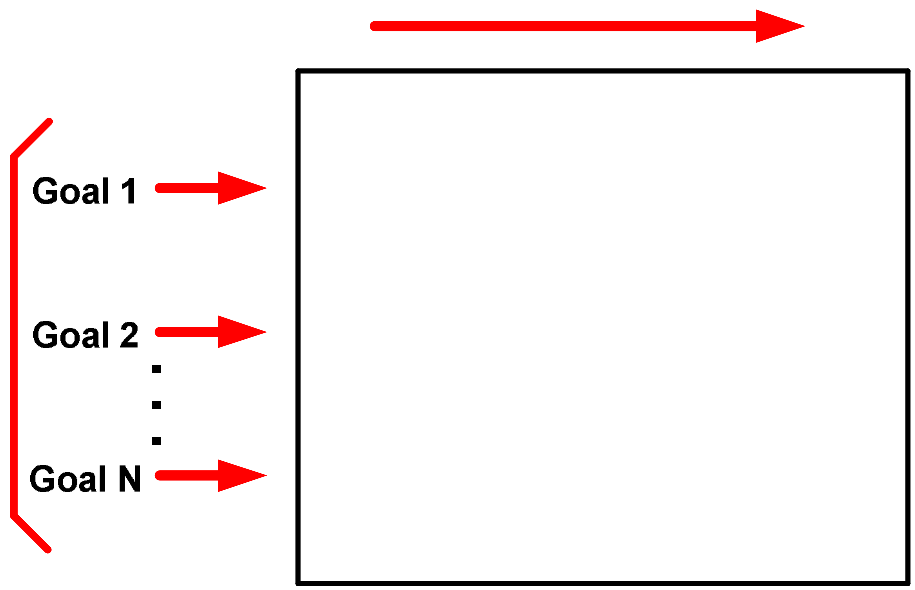
** "Common Features" terminology (commitment to perform, ability to perform, direct implementation, etc.) , used in CMMI-DEV version 1.1 but not in version 1.2, are retained because they help us explain the value and importance of generic practices.*

ualizing Improvement

<u>EFFICIENCY</u>
Meet organization goals
faster, better, cheaper

<u>EFFECTIVENESS</u>

'***Completeness***' of meeting
organization's goals

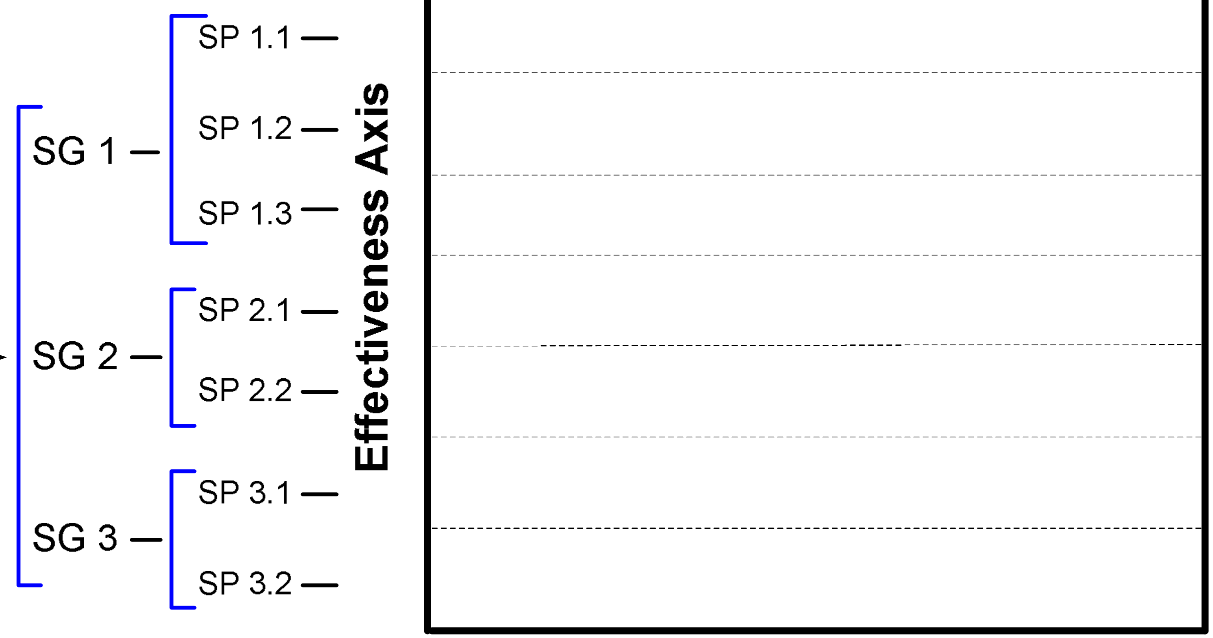


The Effectiveness Axis

Effectiveness Axis

- Completeness in process area specific goals
- Proficiency in specific practices required to meet those goals
- Number of specific goals and specific practices varies by process area

3 Specific Goals
Risk Management process area example



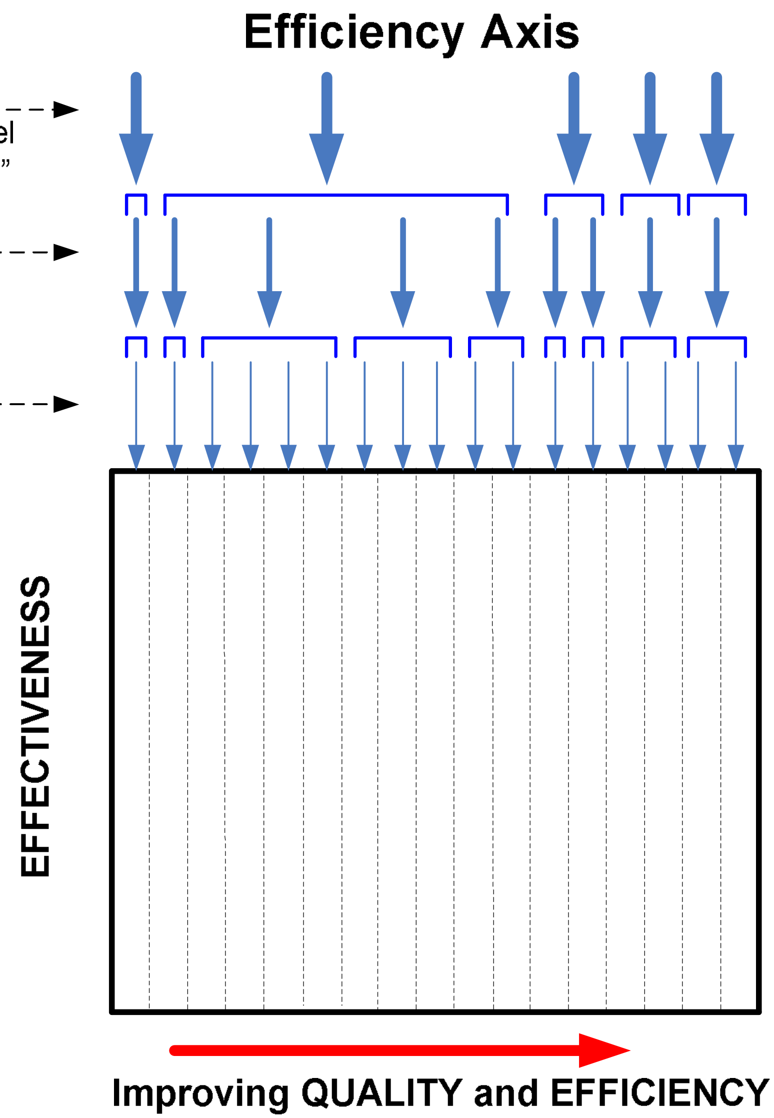
7 Specific Practices
(Risk Management process area example)

fficiency Axis

5 CMMI Capability Levels
Represent continuous improvement from Capability Level 1: "PERFORM" through Capability Level 5: "OPTIMIZE"

9 Generic Goals
Derived from the 5 CMMI Capability Levels

17 Generic Practices
Derived from the 9 Generic Goals



Visualizing Improvement

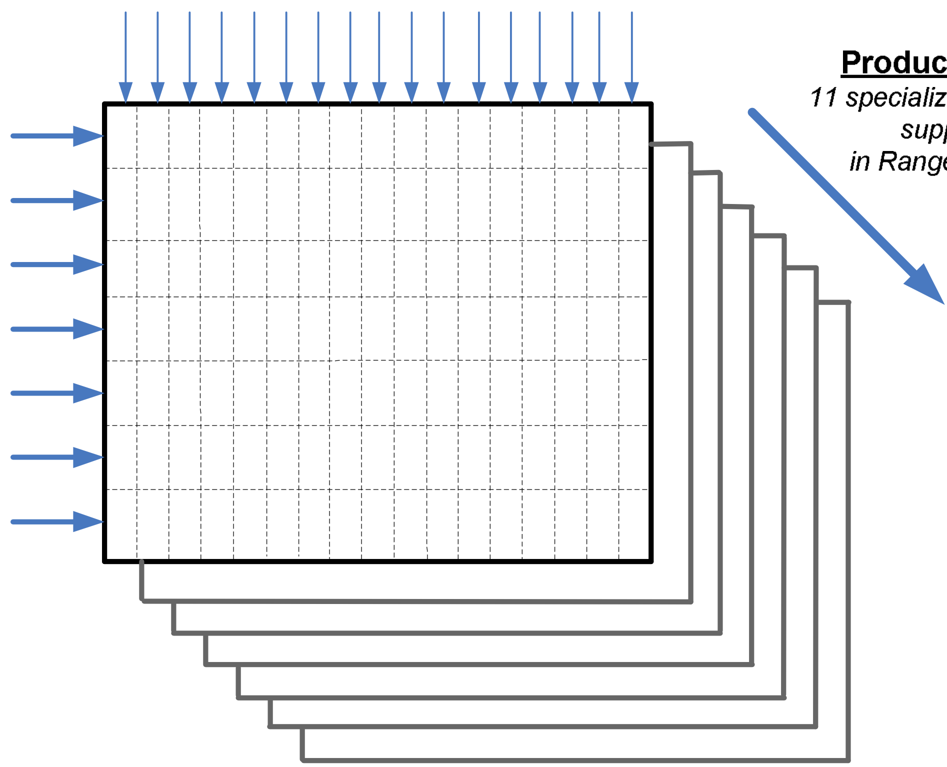
EFFICIENCY
CMMI Capability Levels
Improving Capability

*17 **Generic Practices** define*
5 capability levels

EFFECTIVENESS

- Completeness in Risk Management Goals
- Proficiency in specific practices required to meet those goals

Specific Practices
*7 **Specific Practices** required*
*to accomplish 3 **Specific Goals***
*for **Risk Management** process area*



Product Lines
11 specialized areas of support in Range Safety

isualizing Improvement

EFFICIENCY
CMMI Capability Levels
Improving Capability

17 ***Generic Practices*** *define*
5 ***capability levels***

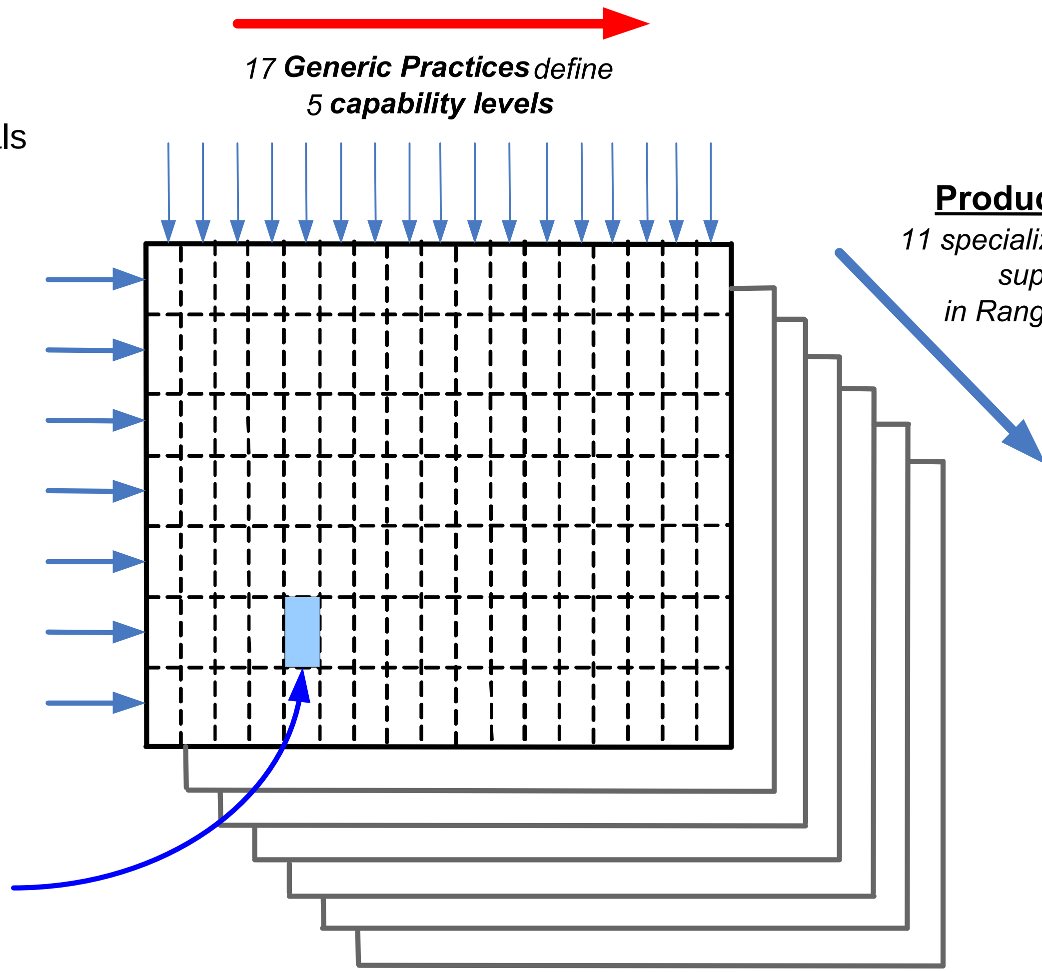
EFFECTIVENESS
- Completeness in Risk Management Goals
- Proficiency in specific practices required to meet those goals

Specific Practices
7 ***Specific Practices*** *required*
to accomplish 3 ***Specific Goals***
for ***Risk Management*** *process area*

Capability Waypoints
Detailed improvement milestones

Color codes
- Fully implemented
- Largely implemented
- Partially implemented
- Not implemented
- Not assessed yet
- Not required

Range Safety model
- 119 waypoints per product line
- 11 Product lines



Product Lines
11 specialized areas of support
in Range Safety

sures of Implementation

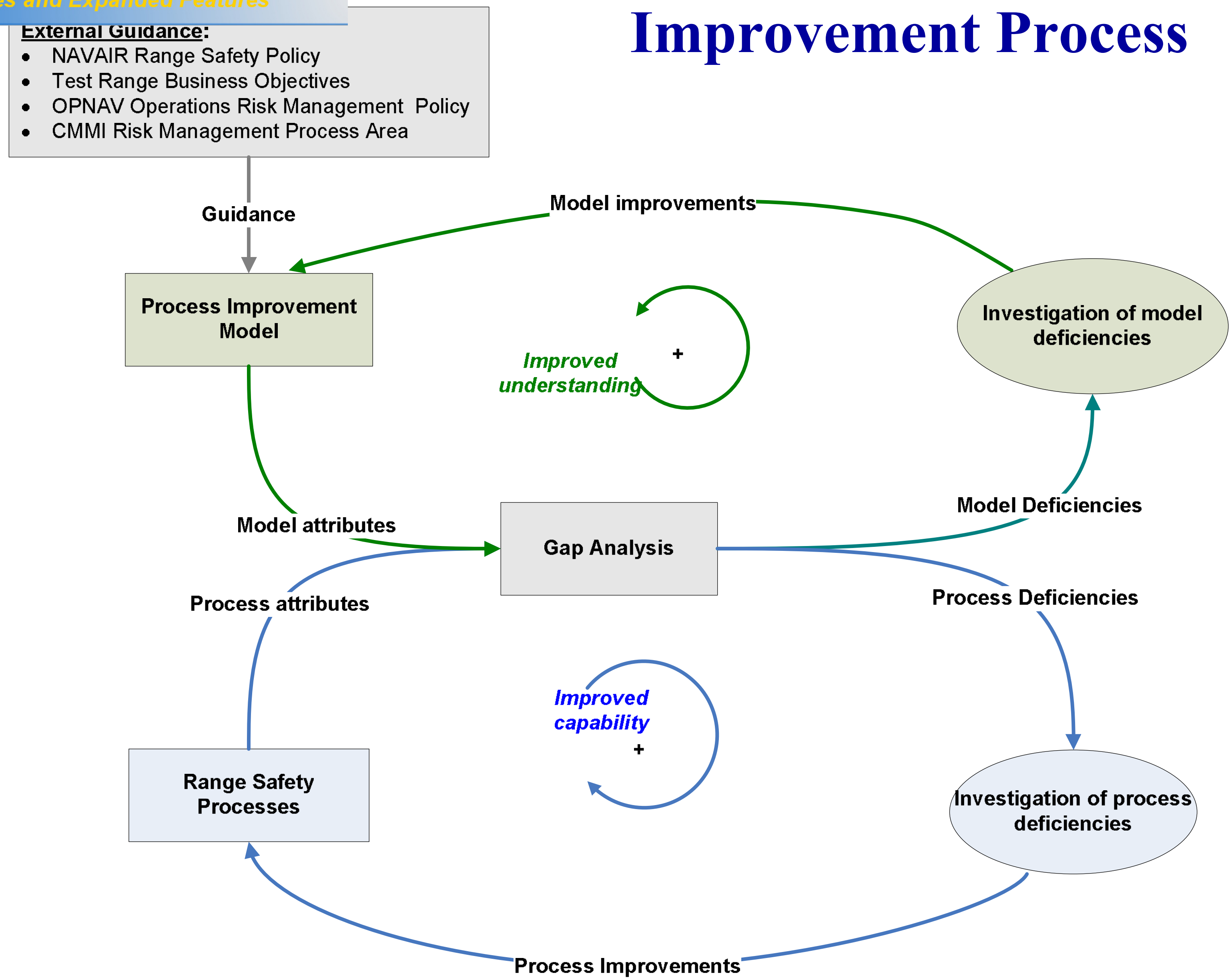
Using color to indicate waypoint status

	Direct Artifacts	Indirect Artifacts	Weaknesses
Fully Implemented	Present & Adequate	One or more	None
Largely Implemented	Present & Adequate	At least one exists	One or more
Partially Implemented	Absent or inadequate	At least one exists	One or more
Not Implemented	None	None	One or more
Not Assessed Yet	Not yet	Not yet	Not assessed yet
Not Required	Not required	Not required	Not required

Adapted from SCAMPI Method Definition Document

Standard CMMI Appraisal Method for Process Improvement (SCAMPI) A, Version 1.2: Method Definition Document, August 2006

Notional Test Range Safety Improvement Process



Capability Waypoint Checklist

Checklist is used to capture details of each capability waypoint

- Details recorded in a document or database
- Document is continuously referred to and updated during the improvement process

Checklist addresses:

- **Waypoint identity** – which waypoint is it?
  - In terms of specific practice, generic practice, and product line (or mission area)
- **Waypoint Amplification** – Why is it important?
  - Relevance in terms of supporting specific goal
- **Waypoint Evidence** – How do we know its current status?
  - Direct artifacts – direct tangible output from the process
  - Indirect artifacts – side effects which indicate process is performed
- **Waypoint Improvement Opportunities** – What will make it better?
  - Significant weaknesses – what is the impact on specific goal?
  - Desired improvements & Priority
    - What will the improvement accomplish in terms of supporting specific goal?
- **Date reviewed** – When did someone last review it?

l start of model review é

Product Line A	PERFORM	MANAGE										DEFINE		QUANTIFY		OPTIMIZE	
	Achieve Specific Goals	Commitment to Perform	Ability to Perform				Directing Implementation			Verifying Implementation		Ability to Perform	Directing Implementation	Quantify the Process		Optimizing Process	
	Perform Base Practices	Establish Orgazation Policy	Plan the Process	Provide Resources	Assign Responsibility	Train People	Manage Configurations	Identify & Involve Relevant Stakeholders	Monitor & Control the Process	Objectively Evaluate Adherence	Review Status with Higher Management	Establish a Defined Process	Collect Improvement Information	Establish Quantitative Objectives	Stabilize Subprocess Performance	Ensure Continuous Improvement	Correct Root Causes
PREPARE FOR RISK MANAGEMENT																	
Risk Sources & Categories																	
Define Risk Parameters																	
Establish a Risk Management Strategy																	
IDENTIFY & ANALYZE RISKS																	
Identify Risks																	
Evaluate & Prioritize Risks																	
MITIGATE RISKS																	
Develop Risk Mitigation Plans																	
Implement Risk Mitigation Plans																	

Capability Waypoint Key:

	Direct Artifacts	Indirect Artifacts	Weaknesses
Fully Implemented	Present & adequate	at least one exists	None
Largely Implemented	Present & adequate	at least one exists	One or more
Partially Implemented	Absent or inadequate	One or more	One or more
Not Implemented	None	None	One or more
Not Yet	Not Yet	Not Yet	Not assessed yet
Not Required	Not required	Not required	Not assessed

23 April 2007 roj

…nt in need of Improvement …

…t of a document linked to the waypoint matrix

Å **Waypoint identity** ï which waypoint is it?

ï SP 1.2 Define Risk Parameters, & GP2.1 Establish Organization Policy

ï Product line ñAò

Å **Waypoint Amplification** ï Why is it important?

ï Risk parameters must be included in approved policy and procedure documentation so safety personnel and decision authorities understand the basis of the risk decisions.

Å **Waypoint Evidence** ï How do we know its current status?

ï Direct artifacts ï Inadequate explanation in procedures manual section 8.1.

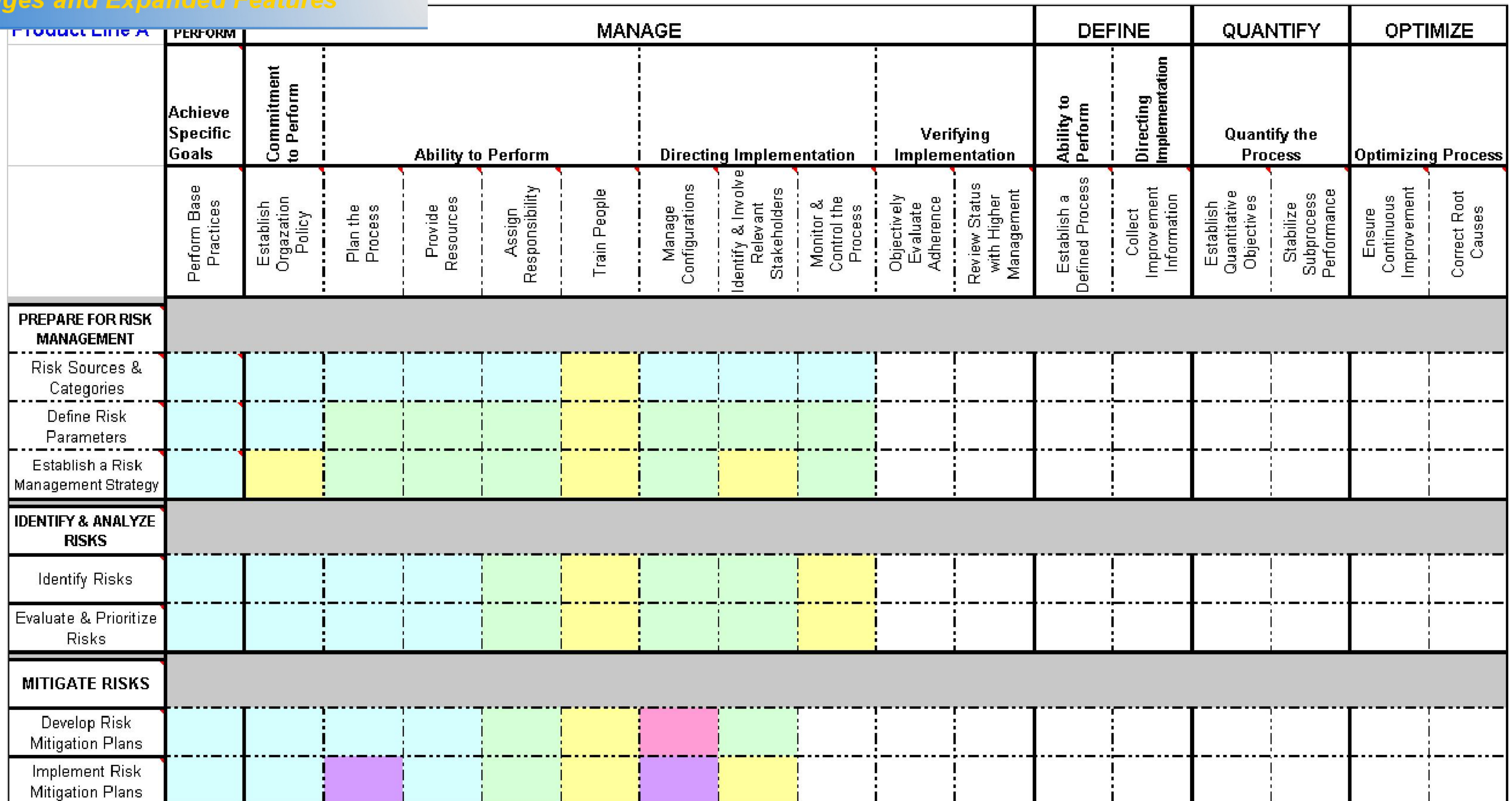
ï Indirect artifacts ï Several key folks were asked and did not understand parameters linked to product line A risks

Å **Waypoint Improvement Opportunities** ï What will make it better?

ï Need more depth and clarity of these risk parameters in procedures manual.

Å **Date reviewed** ï 11 Nov 2007 RJ

isualization after significant review é



Capability Waypoint Key:

	Direct Artifacts	Indirect Artifacts	Weaknesses
Fully Implemented	Present & adequate	at least one exists	None
Largely Implemented	Present & adequate	at least one exists	One or more
Partially Implemented	Absent or inadequate	One or more	One or more
Not Implemented	None	None	One or more
Not Yet	Not Yet	Not Yet	Not assessed yet
Not Required	Not required	Not required	Not assessed

23 April 2007 roj

Now, can use Lean, Six Sigma, Theory of Constraints for further improvement …

	Tools			Outcomes	
	Lean	**TOC**	**Six Sigma**	**Quality & Productivity**	**Risk & Waste**
Capability Level 0 – INCOMPLETE: Specific goals <u>not met</u>.	**N/A**	**N/A**	**N/A**		**XXXXX**
Capability Level 1 – PERFORMED: Specific goals <u>are met</u>. Supports work needed to produce work products.	**N/A**	**N/A**	**N/A**	**X**	**XXXX**
Capability Level 2- MANAGED. <u>Performed</u> processes with infrastructure to establish commitment to perform, ability to perform, direct implementation, and verify implementation.	**Use Lean to define processes**	**Begin collecting data.**	**Begin collecting data.**	**XX**	**XXX**
Capability Level 3- DEFINED: <u>Managed</u> processes use organization-wide standardized processes.		**Apply TOC to defined processes.**	**Refine data.**	**XXX**	**XX**
Capability Level 4 – QUANTITATIVELY MANAGED: <u>Defined</u> processes are controlled using statistical and other quantitative techniques.			**Apply 6σ to quanti-tatively managed processes**	**XXXX**	**X**
Capability Level 5 – OPTIMIZING: <u>Quantitatively managed</u> processes are improved based on understanding of variation in the processes.				**XXXXX**	

…f desired improvement goal state é

Product Line A	PERFORM	MANAGE										DEFINE		QUANTIFY		OPTIMIZE	
	Achieve Specific Goals	Commitment to Perform	Ability to Perform				Directing Implementation			Verifying Implementation		Ability to Perform	Directing Implementation	Quantify the Process		Optimizing Process	
	Perform Base Practices	Establish Orgazation Policy	Plan the Process	Provide Resources	Assign Responsibility	Train People	Manage Configurations	Identify & Involve Relevant Stakeholders	Monitor & Control the Process	Objectively Evaluate Adherence	Review Status with Higher Management	Establish a Defined Process	Collect Improvement Information	Establish Quantitative Objectives	Stabilize Subprocess Performance	Ensure Continuous Improvement	Correct Root Causes
PREPARE FOR RISK MANAGEMENT																	
Risk Sources & Categories																	
Define Risk Parameters																	
Establish a Risk Management Strategy																	
IDENTIFY & ANALYZE RISKS																	
Identify Risks																	
Evaluate & Prioritize Risks																	
MITIGATE RISKS																	
Develop Risk Mitigation Plans																	
Implement Risk Mitigation Plans																	

Capability Waypoint Key:

	Direct Artifacts	Indirect Artifacts	Weaknesses
Fully Implemented	Present & adequate	at least one exists	None
Largely Implemented	Present & adequate	at least one exists	One or more
Partially Implemented	Absent or inadequate	One or more	One or more
Not Implemented	None	None	One or more
Not Yet	Not Yet	Not Yet	Not assessed yet
Not Required	Not required	Not required	Not assessed

23 April 2007 roj

…ability Waypoint Model:

…s

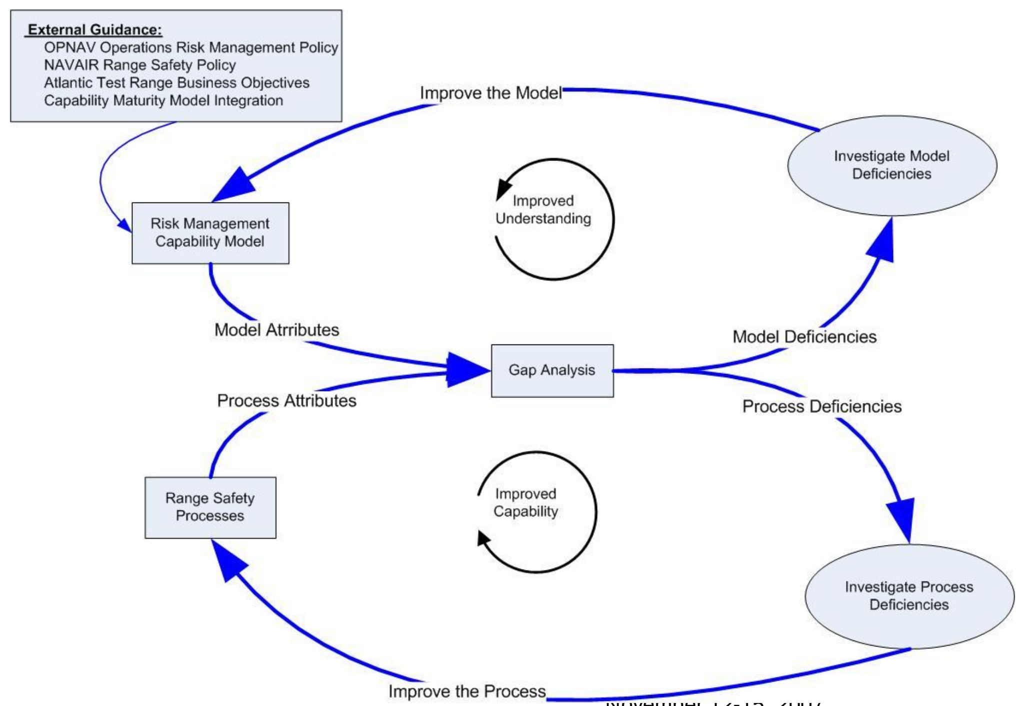
ÅExplicit definitions of improvement, effectiveness, efficiency
ÅImprovement is traceable from waypoint to process area to organizationȇs mission objectives

ÅPath to improvement is obvious

ÅStrong and weak areas easy to visualize from a high level
ÅSimple path to dig into the details to address problem areas

ÅCan be applied to any process area

ÅCMMI- and SCAMPI-compliant



Visualizing Improvement

Simple!

Clear!

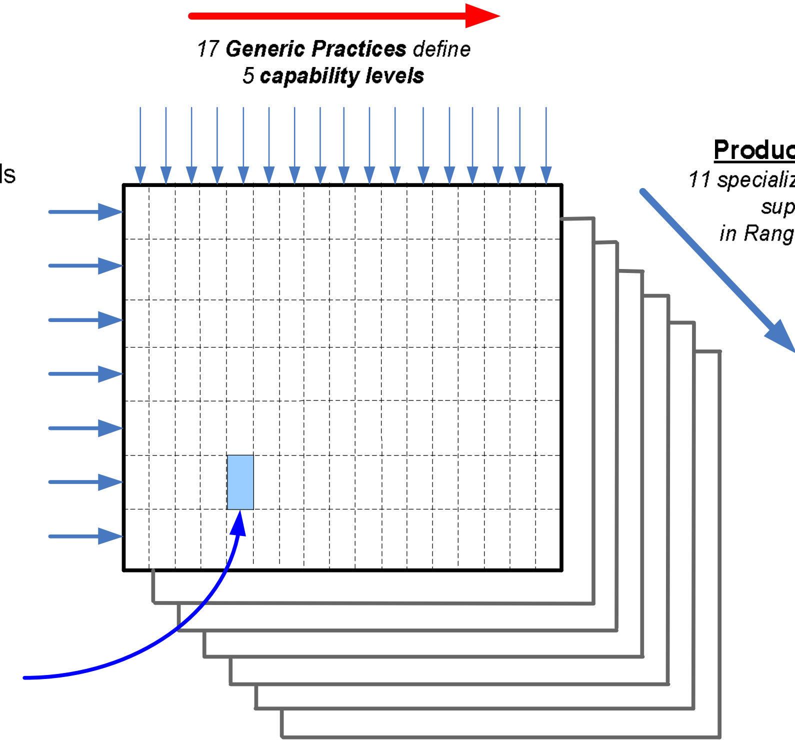
Inexpensive!

EFFICIENCY
CMMI Capability Levels
Improving Capability

*17 **Generic Practices** define*
*5 **capability levels***

EFFECTIVENESS
- Completeness in Risk Management Goals
- Proficiency in specific practices required to meet those goals

Specific Practices
*7 **Specific Practices** required*
*to accomplish 3 **Specific Goals***
*for **Risk Management** process area*



Product Lines
11 specialized areas of support
in Range Safety

Capability Waypoints
Detailed improvement milestones

Color codes:
- Fully implemented
- Largely implemented
- Partially implemented
- Not implemented
- Not assessed yet
- Not required

Range Safety model:
- 119 waypoints per product line
- 11 Product lines

Questions?

in Aeronautics –
The Journey to CMMI® Level 3

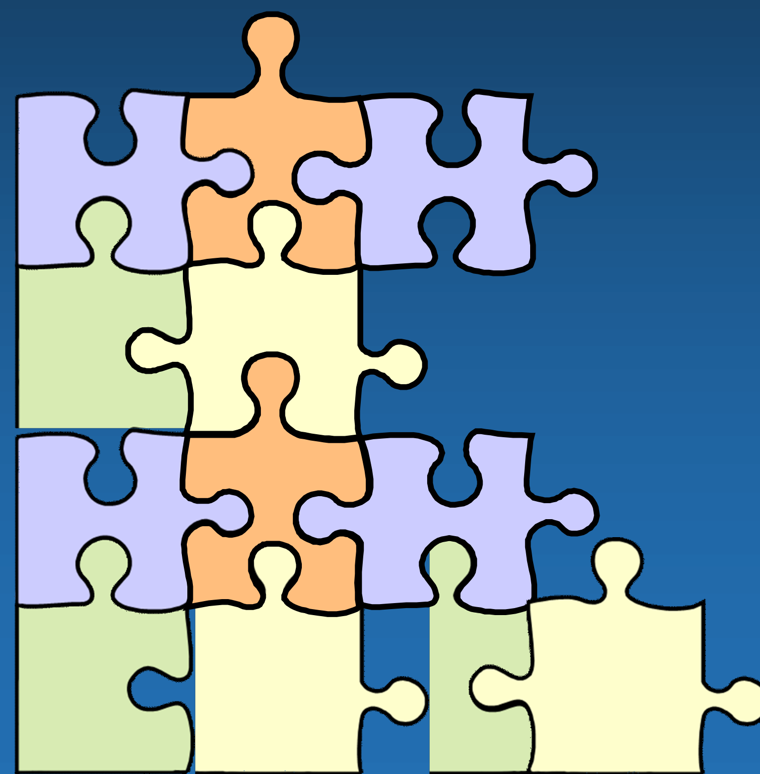
7th Annual CMMI Technology Conference and User Group

November 13-15, 2007

Andy C. Lay
Lockheed Martin Aeronautics
CMMI Project Team Lead
817-935-5379, andy.c.lay@lmco.com

ics

- Lockheed Martin Aeronautics Improvement Legacy
- Achieving Maturity Level 3
- Lessons Learned And Insights
- Vision For The Future



Aeronautics Overview

29,000 employees across the company and around the world

Aeronautics:
ovement And Recognition

1958 Robert J. Collier Trophy – F-104 Starfighter
1963 Robert J. Collier Trophy – SR-71 Blackbird
1975 Robert J. Collier Trophy – F-16 Fighting Falcon
1996 SW-CMM® Maturity Level 3
1999 SW-CMM® Maturity Level 4
2000 Shingo Prize – Fort Worth, TX
2001 Robert J. Collier Trophy – F-35 STOVL lift fan
2003 ISO 9001/AS 9100
2003 Shingo Prize – Palmdale, CA
2006 Robert J. Collier Trophy – F-22 Raptor
2007 CMMI Maturity Level 3

Robert J. Collier Trophy is a national award honoring those who had made significant achievements in the advancement of aviation.

The Shingo Prize was established in 1988 to recognize companies that achieve world-class manufacturing status.

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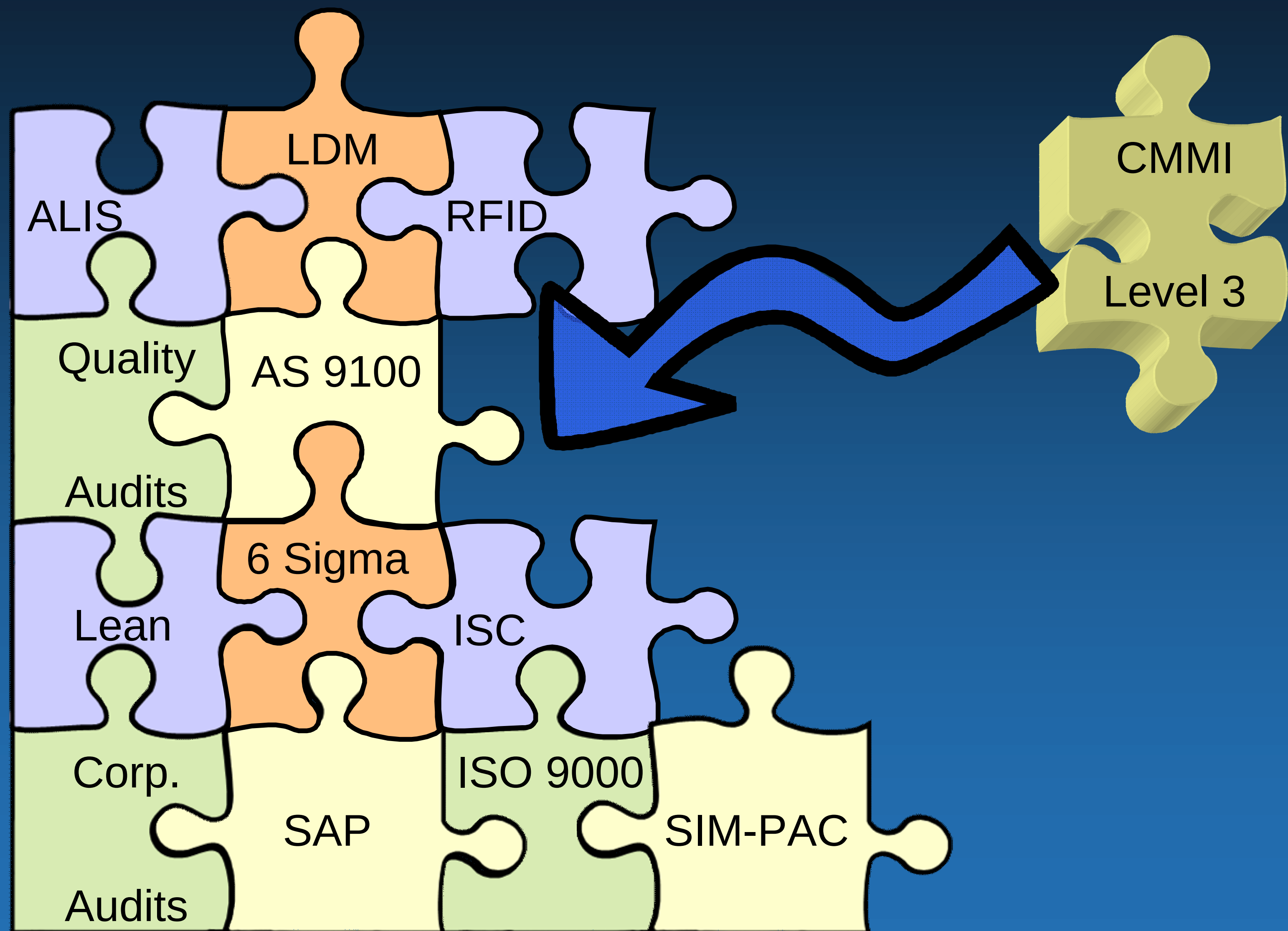
e Element of Our
vement Landscape



l Projects Strategically Selected

- **Organizational strategy**
  - ***Reflect anticipated business base***
  - ***Include all major development sites***
  - ***Touch full span of our products***
    - From JSF, largest aircraft program in history
    - To smaller projects of 30-35 heads
  - ***Reflect range of program types***
    - Major A/C development
    - R&D projects

- **Result: Chose 3 appraisal projects**
  - ***F-35 – Fort Worth, Texas***
  - ***F-22 – Marietta, Georgia***
  - ***Advance Development Programs (ADP) RATTLRS – Palmdale, California***

F-35

F-22

RATTLRS-Revolutionary Approach To Time-critical Long Range Strike

rces From Our Corporate Family

- **Used our corporate expertise**
  - ***Understood model and addressed challenges***
  - ***On-site participation for SCAMPI***

- **Adopted best practices**
  - ***LM Continuous Appraisal Methodology (CAM)***
  - ***Lockheed Martin Integrated Enterprise Process (LM-IEP) Architecture***
  - ***Best practices from sister companies***

Built our approach using the best!

rise Process (LM-IEP) Architecture

A comprehensive enterprise architecture serves as the foundation for continuous process improvement

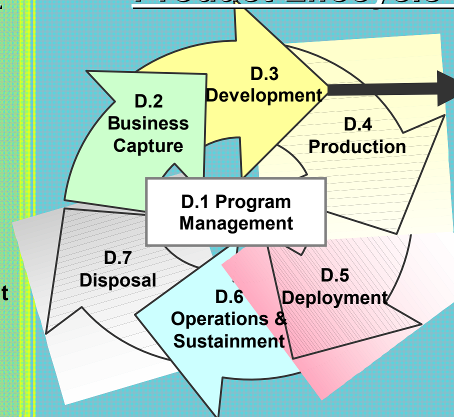
Enterprise Processes

- A.1 Organizational Management
- A.2 Strategic Planning
- A.3 Quality Management
- A.4 Ethics & Business Conduct
- A.5 Legal
- A.6 Communications

Infrastructure Processes

- B.1 Process Management
- B.2 Work Environment Management
- B.3 Technology Management
- B.4 Contracts
- B.5 Workforce Management
- B.6 Finance
- B.7 Supplier Agreements & Procurement
- B.8 Security
- B.9 Property Management

Product Lifecycle Processes



- D.3.1 Stakeholders Needs Analysis
- D.3.2 Requirements Development
- D.3.3 Architectural Design
- D.3.4 Detailed Design
- D.3.5 Implementation
- D.3.6 Integration
- D.3.7 Verification
- D.3.8 System Validation

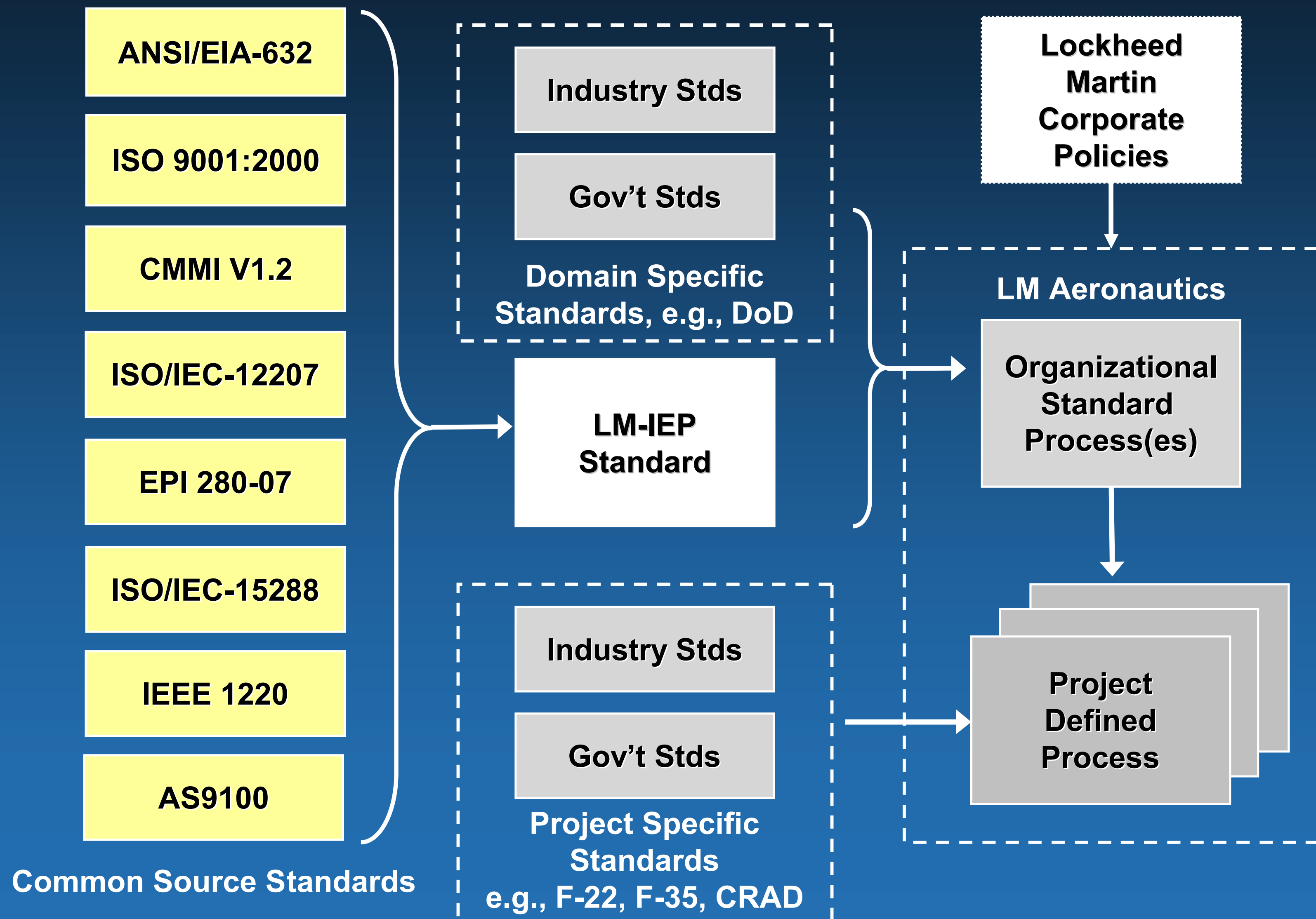
Business Execution Processes

Program Execution Processes

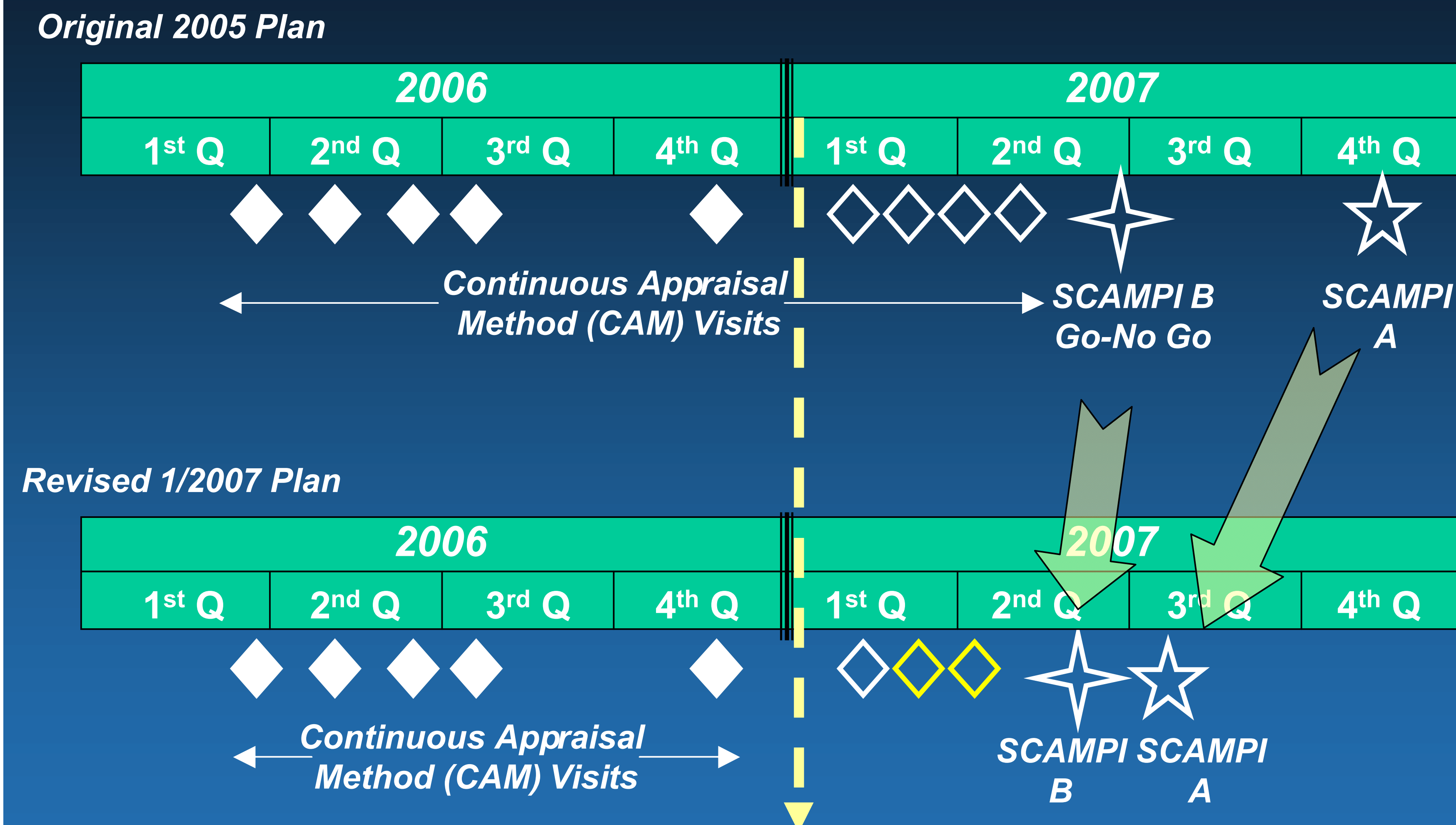
Common Management Processes

- C.1 Planning
- C.2 Decision Analysis
- C.3 Configuration and Data Management
- C.4 Performance Assessment and Control
- C.5 Risk and Opportunity Management

d From Numerous Sources



… of V1.1 Forced … dule



Earlier v1.1 sunset schedule required accelerated SCAMPI℠ preparation to protect our v1.1 OSP investment

ised Project Plan
Milestones

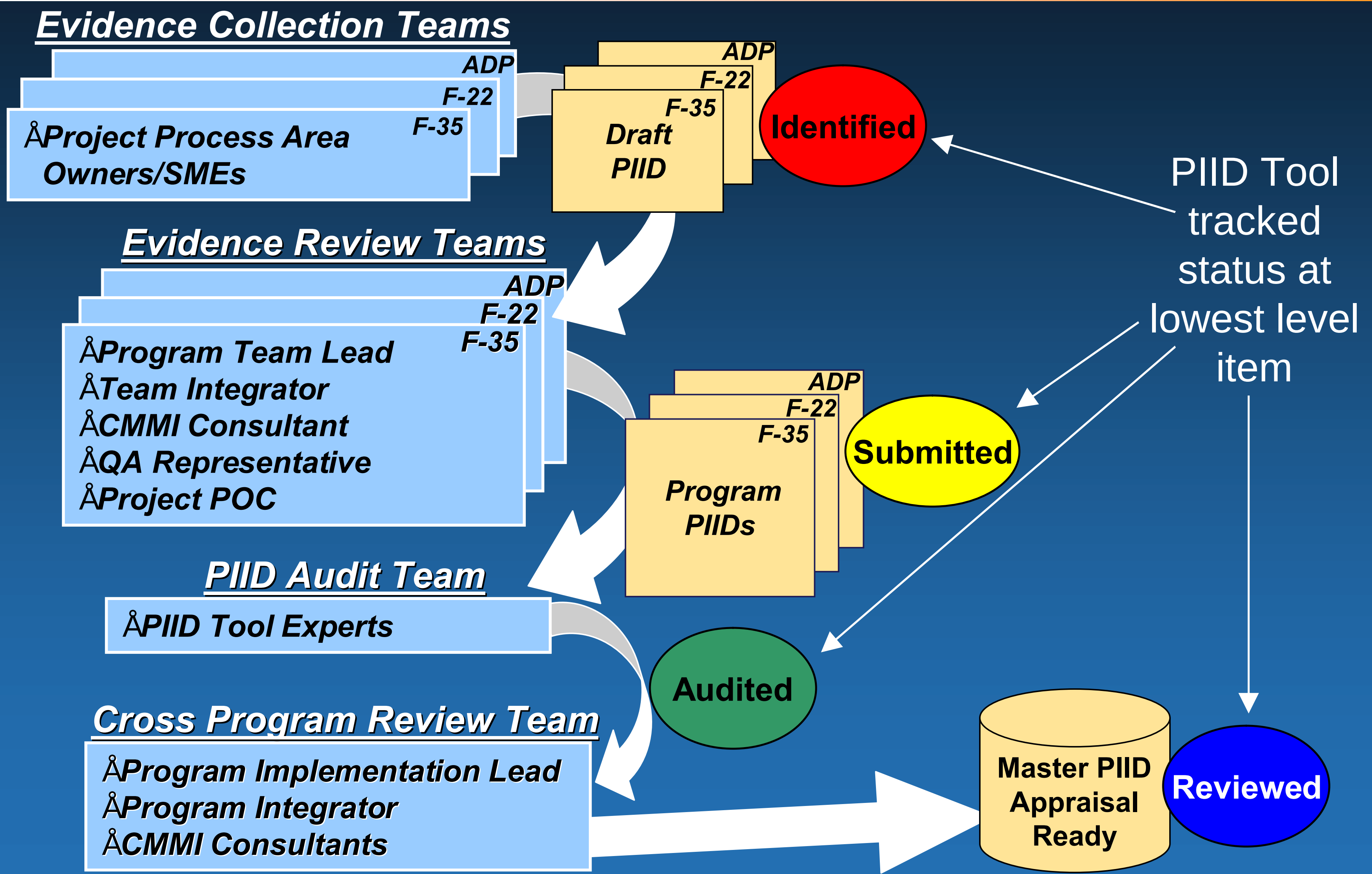
2007							
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
	PA Coverage Review 2/16	Org PIID Review 3/16	Program PIID Review 4/13	Readiness Review 5/2-3	SCAMPI B 5/29 – 6/8	Readiness Review 7/9 – 7/13	SCAMPI A 8/20 – 8/31

- Finalize and Release Processes
- Finalize and Release Program Plans & Procedure
- Conduct & Attend Process Training
- Implement Plans/Procedures & Collect Evidence
- Conduct and Support Internal Evidence Evaluations
- Improve Processes / Update OSP, PDPs, and Other Products
- Address Findings
- Address Information Needs

Used our project management strengths
- Clear lines of authority
- Risk/schedule management
- Accountability reviews

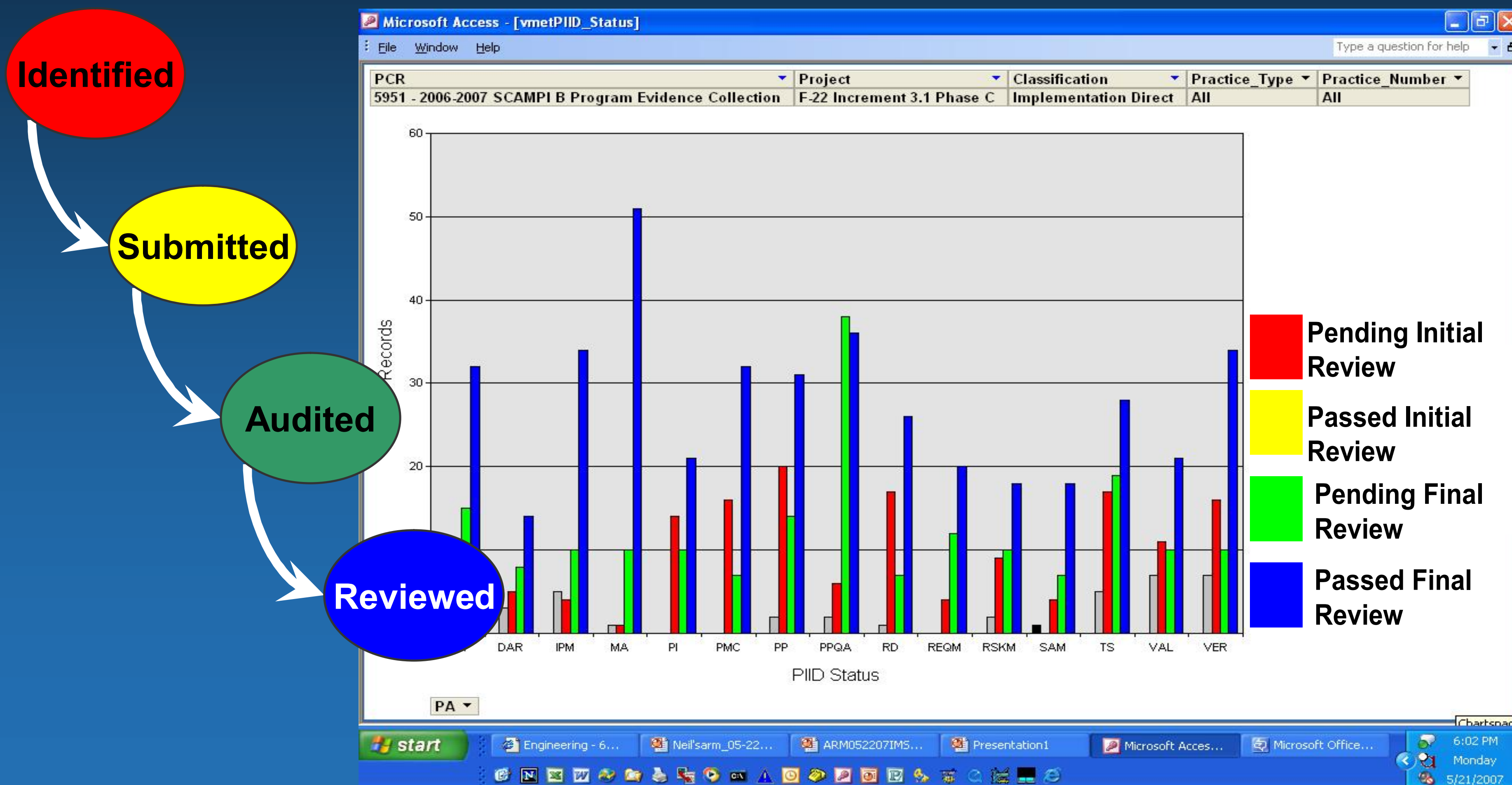
Features of the LM Continuous Appraisal Method (CAM) incorporated into CMMI review teams and independent PIID reviews

eview Teams Established to lve Issues Real-Time



nt Adjustments
D Tool

Custom MS Access-based tool provided real-time status across entire CMMI project

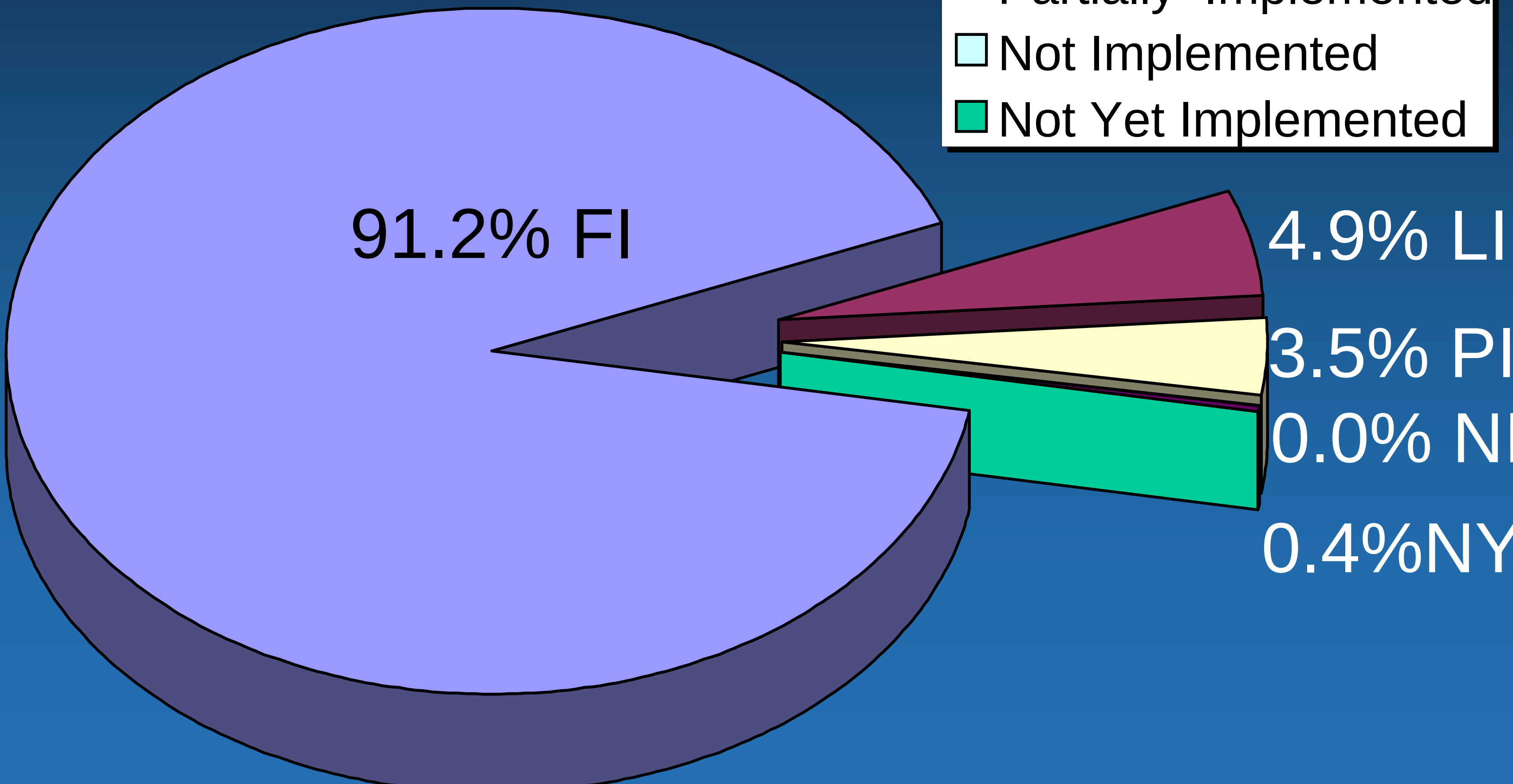


...ss Validated ...egy

3760 Documents reviewed

270 Information Needs closed

1 Global finding identified



...ignificant Effort

- **Document review**
  - ***Over 3900 items examined***
  - ***Included classified data***
  - ***Only 9 Information Needs***
  - ***No major findings***
- **Interviews**
  - ***Over 100 participants at 3 sites***
  - ***Conducted 9 group interviews***
  - ***Included major engineering disciplines***
    - Hardware
    - Software
    - System
- **Appraisal Team**
  - ***Team consisted of 11 members***
    - 5 internal, 6 external
    - 4 SCAMPI Lead Appraisers℠
  - ***Consistent mini-team assignments***

SYSTEMS AND SOFTWARE CONSORTIUM
BUILDING BETTER SOLUTIONS TOGETHER

The Systems and Software Consortium completed a CMMI® -Based Appraisal on August 30, 2007 in accordance with the Standard CMMI® Appraisal Method for Process Improvement (SCAMPI℠), V1.1 and determined that

Lockheed Martin Aeronautics

achieved

Process Maturity Level 3

as defined by the SEI CMMI® Version 1.1 SE/SW Continuous Representation.

Gene Jorgensen, SSCI
SEI Authorized Lead Appraiser

Drew Allison, SSCI
Appraisal Team Member

Mission Accomplished!

CMMI

Maturity Level 3

Improved Company Behaviors

- **Vice President assigned full time to sponsor the effort**
  - ***Management commitment from the company president down***
  - ***"Direct leadership from the sponsor provided solid foundation for process improvement"***
- **Feedback from programs and functions**
  - ***Programs are more involved in process changes and deployment of processes***
    - Changes are pre-coordinated with programs
    - Programs incorporate changes prior to formal deployment
  - ***Increased use of disciplined processes***
  - ***Improvements identified on one program are shared across programs in a more timely manner***
  - ***Improved communications across programs, sites and functions***
  - ***Program integration – good communication and consistent expectations***

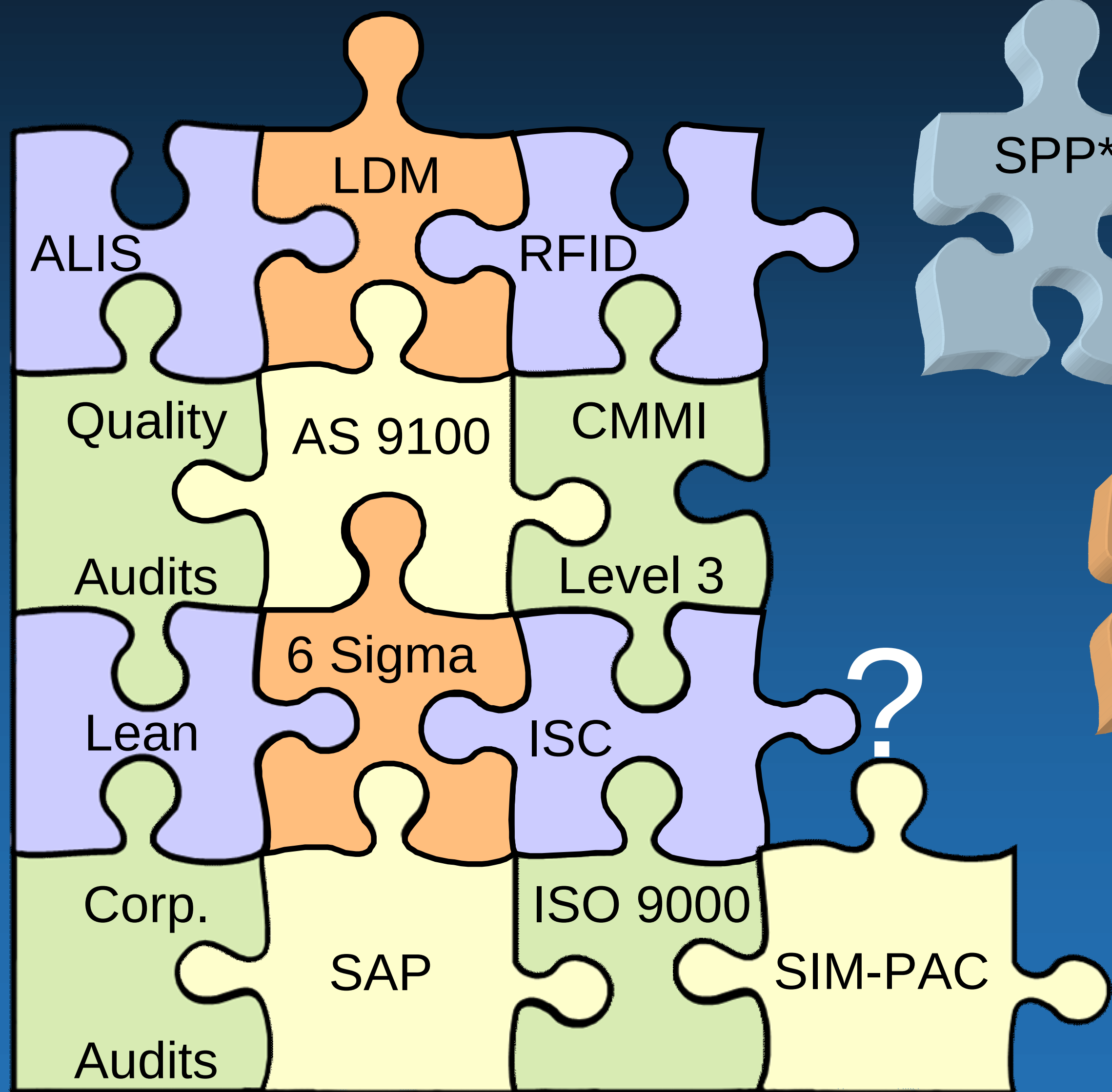
earned

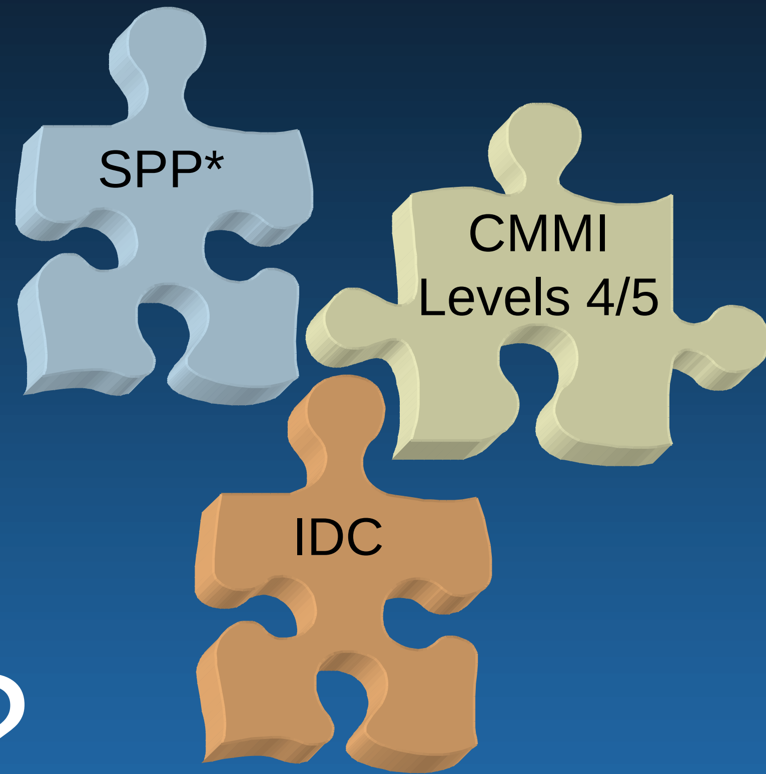
- Longest effort: Development & release of the CMMI compliant OSP
  - *OSP "what's in vs. what's out" was a big issue*
  - *Processes were written within each functional area*
  - *Process owners previously had no common vision / framework*
  - *Was difficult to obtain program engagement – too busy*
  - *Few subject matter experts were available*
- It pays to keep it simple
  - *Took advantage of common metrics already in use*
  - *Combined peer review methods into one common process*
  - *Aligned auditing groups under one process*
  - *Standardized training across multiple functions*

r Journey

- Major obstacles to overcome…
  - *Long development life cycles (7-10 years)*
  - *Large functional organizations*
  - *Multiple work cultures within large company*
  - *Program size varies from extremely large to very small*
- Key factors that helped us to be successful
  - *Vice president leadership and executive sponsorship*
  - *Engagement of strong corporate expertise*
  - *Experienced appraisal team*
  - *Disciplined programs*
  - *Recognition of model flexibility*
  - *PIID reviews to accelerate evidence collection*
  - *Documented our standard approach for generic practices*
  - *Structured SCAMPI opening briefings to maximize GP coverage*

Aeronautics Is ntinuous Improvement





What's next?
Must determine best strategy to maximize payoff


LOCKHEED MARTIN

Institutionalization Measures: Key to Improved Process Monitoring

Jeff Smith and John Rusnak, Lockheed Martin Space Systems Company
John Gaffney, Perla Unpingco and Joan Weszka, Lockheed Martin Corporate Engineering & Technology, Systems & Software Resource Center

NDIA CMMI® Technology Conference
November 13, 2007

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Agenda

- Lockheed Martin Space Systems Company (SSC) Overview and Background
- The Institutionalization Challenge
- Institutionalization in CMMI
- Institutionalization Scorecard Development Approach and Overview
- Sample Institutionalization Scorecards
- Scorecard Initial Version Development and Use
- Next Steps

…rtin Space Systems Company Overview

- Space Systems is engaged in the design, research, development, engineering and production of
  - Satellites
  - Strategic and Defensive Missile Systems
  - Space Transportation Systems
- 2006 net sales of $7.9 billion
- Integrated Engineering across all Space Systems sites
- Achieved CMMI ® Maturity Level 3 December 2005
  - SCAMPI SM V1.1 and CMMI-SE/SW/IPPD/SS V1.
  - Systems, Software, and Hardware Engineering
  - Validated LM-IEP to achieve CMMI compliance
- Journey of continual improvement aligned with Space Systems business objectives

SCAMPI SM – Standard CMMI Appraisal Method for Process Improvement. SCAMPI is a service mark of Carnegie Mellon University.

CMMI ® – Capability Maturity Model Integration. CMMI is registered in the U. S. Patent and Trademark Office by Carnegie Mellon University.

LM-IEP – Lockheed Martin Integrated Enterprise Process

stitutionalization Challenge

- The Lockheed Martin Space Systems Company (SSC) process improvement objectives are aligned with two major business objectives:
  - Operational Excellence - quality products/service throughout the process
  - 100% Mission Success - quality of product delivered
- Several major process improvement initiatives are underway
  - Integration of Command Media across several major business sites
  - Improving processes for usability and scalability
  - Integrating tools and processes and enterprise measurement repositories
- Process institutionalization needs to be maintained during deployment of these initiatives
  - The needs for measures to monitor institutionalization and measures of progress toward achieving initiative goals were identified
  - Monitoring institutionalization measures reduces the probability of ñprocess lapsesò while major improvements are deployed
- A set of ñscorecardsò to track process institutionalization has been developed
  - Deployment is underway

tutionalization In CMMI®

CMMI for Development, Version 1.2

Institutionalization ï the ingrained way of doing business that an organization follows routinely as part of its corporate culture

Institutionalization means "the level of adoption of a particular set of practices … is deep enough, and broad enough, that their use would continue even through organizational and leadership changes." Reference: Suzanne Garcia and Richard Turner, CMMI Survival Guide, Addison Wesley 2006.

Institutionalization ï SSC processes are used and are part of the culture.

1. Plan, deploy and monitor the processes across the Enterprise
2. Ensure the proper infrastructure is in place to support these processes

Selecting Scorecard Measures

- Identified candidate measures
  - Noted measures already required by Common Integrated Process System (CIPS) and used to gauge institutionalization
  - Noted measures related to CMMI Generic Practices
- Selected measures of highest importance to SSC
- Developed a scorecard that provides an overall measure of institutionalization that is a weighted sum of values computed for each measure

…g of Scorecard Measures to …MMI Generic Practices

Name	Generic Practice
Process Trained Personnel	GP 2.5 Train People
Establishing & Maintaining PDP	GP 3.1 Establish a Defined Process
Approved PDP & Program Deployment Summary	GP 2.3 Provide Resources GP 2.4 Assign Responsibility GP 2.5 Train People
Approved Measurement Plan	GP 2.2 Plan the Process

Name	Generic Practice
Total Measurement Collection Compliance	
Measurement Usage	GP 2.8 Monitor and Control the Process
Enterprise Standard Measurement (ESM) Collection Compliance	
CIPS Process Compliance	GP 2.9 Objectively Evaluate Adherence
Objective Evidence: Available vs. Required	GP 2.8 Monitor and Control the Process
CMMI-Based Appraisal Readiness Index	

Selected generic practices focus on institutionalization of highest importance to SSC

1. Training
2. Measurement
3. Compliance

stitutionalization Scorecards Overview

Major Functional Organizations (MFOs)	Program/Line of Business (LOB)
Measures for MFOs	Measures for Programs and LOB
Covers MFOs with responsibility for enterprise processes (e.g., systems engineering)	Covers Individual Program Measures
MFO measures include level of MFO proactive engagement in process performance assessment	Institutionalization measures for different programs in an LOB tier up to that LOBôs measures

Scorecard Structure-1

Level	Current (in Month) View	Progress (Trend) View
Program	The component and overall score for a program in a particular month.	The actual and planned overall scores for a program versus month.
LOB (Set of Programs)	The overall scores for the programs in a LOB in a particular month and the averages of those scores.	The actual and planned average scores for a LOB versus month.
Enterprise (All of the LOBs in SSC)	The average of all of the LOB average scores, across all of the LOBs in the Enterprise (SSC).	The actual and planned average of all of the LOB average scores versus month.

Note: Enterprise (All of the LOBs in SSC) Level is not shown.

Scorecard Structure-2

Name	Description	Component Data Entry	
Process Trained Personnel	Compare Number of Program Target Audience to Target Audience Baseline	Number of People Trained	Number of People in Target Audience Baseline
Establishing & Maintaining PDP	Timely Disposition of the OSP Documents in the PDP	Number of Documents Dispositioned as of Latest Command Media Release	Number of Undispositioned Documents Spanning 2 Command Media Releases
Approved PDP & Program Deployment Summary	Approved PDP & Program Deployment Summary	User enters "Yes" or "No"	
Approved Measurement Plan	Approved Measurement Plan	User enters "Yes" or "No" / In Progress	
Total Measurement Collection Compliance	Compare Measures Planned to be Collected to Measures Collected	Number of Measures Collected	Planned Number of Measures Collected

3 Scorecard Structure-3

Name	Description	Component Data Entry	
Measurement Usage	Compare Measurement Planned to be Used to Measures Analyzed and Reported "Usage"	Number of Measures Analyzed and Reported "Usage"	Planned Number of Measures Analyzed and Reported "Usage"
Enterprise Standard Measurement (ESM) Collection Compliance	Compare Enterprise Standard Measurement Committed to Collect to the ESM Collected	Number of ESM Collected	Committed Number of ESM to Collect
CIPS Process Compliance	Running Average of Audit Findings/Processes Audited	Number of CIPS Processes Compliant (monthly)	Number of Processes Audited (monthly)
Objective Evidence: Available vs. Required	Compare Objective Evidence Available to Objective Evidence Required	Objective Evidence Available	Objective Evidence Required (Number of Processes Performing that Require Objective Evidence)
CMMI-Based Appraisal Readiness Index	Program Readiness by Completion of Key Appraisal Milestones	Cumulative Number of Milestones Achieved to Date	Total Number of Milestones in Process

stitutionalization Score

Å Map each component score, e.g., ñPercent of Process Trained Personnel, Approved Measurement Plan,òto its corresponding utility.

ï A ñutilityòis the value accorded to some data item; the ñvalueòcan be numeric (e.g., 10) or linguistic (e.g., yes).

Å The institutionalization score for a given program for a particular month is the weighted sum of the utilities for the 10 component measures.

ï Each ñweightòrepresents the importance or value of that attribute relative to those for the other 9 attributes.

Å Management selects the attribute weights according to their view of the importance or value of each attribute.

ï In the example, the utilities for each of the attributes are accorded equal weight.

alization Score For Program A

Institutionalization Score for Program A			Date (Month)
PROGRAM SCORE (Utility)	82	Score range (0-100); weighted sum of available individual component measures	
COMPONENT MEASURES	COMPONENT SCORE	THRESHOLDS	UTILITY
1. Process Trained Personnel	45%	Red - < 30%; Yellow - = >30% to = < 50%; Green - >50%	45
2. Establishing & Maintaining PDP	92%	Red < 90% or undispositioned for more than 2 Releases; Yellow - 90% to < 100%; Green - =100%	92
3. Approved PDP & Program Deployment Summary	Yes	Red = PDP & Program Deployment Summary Not Approved; Green = PDP & Program Deployment Summary Approved	100
4. Approved Measurement Plan	Yes	Red = Plan Not Approved, Yellow = Plan in Progress, Green = Plan Approved	100
5. Total Measurement Collection Compliance	90%	Red < 90%, Yellow =>90% to < 95%, Green = >95%	90

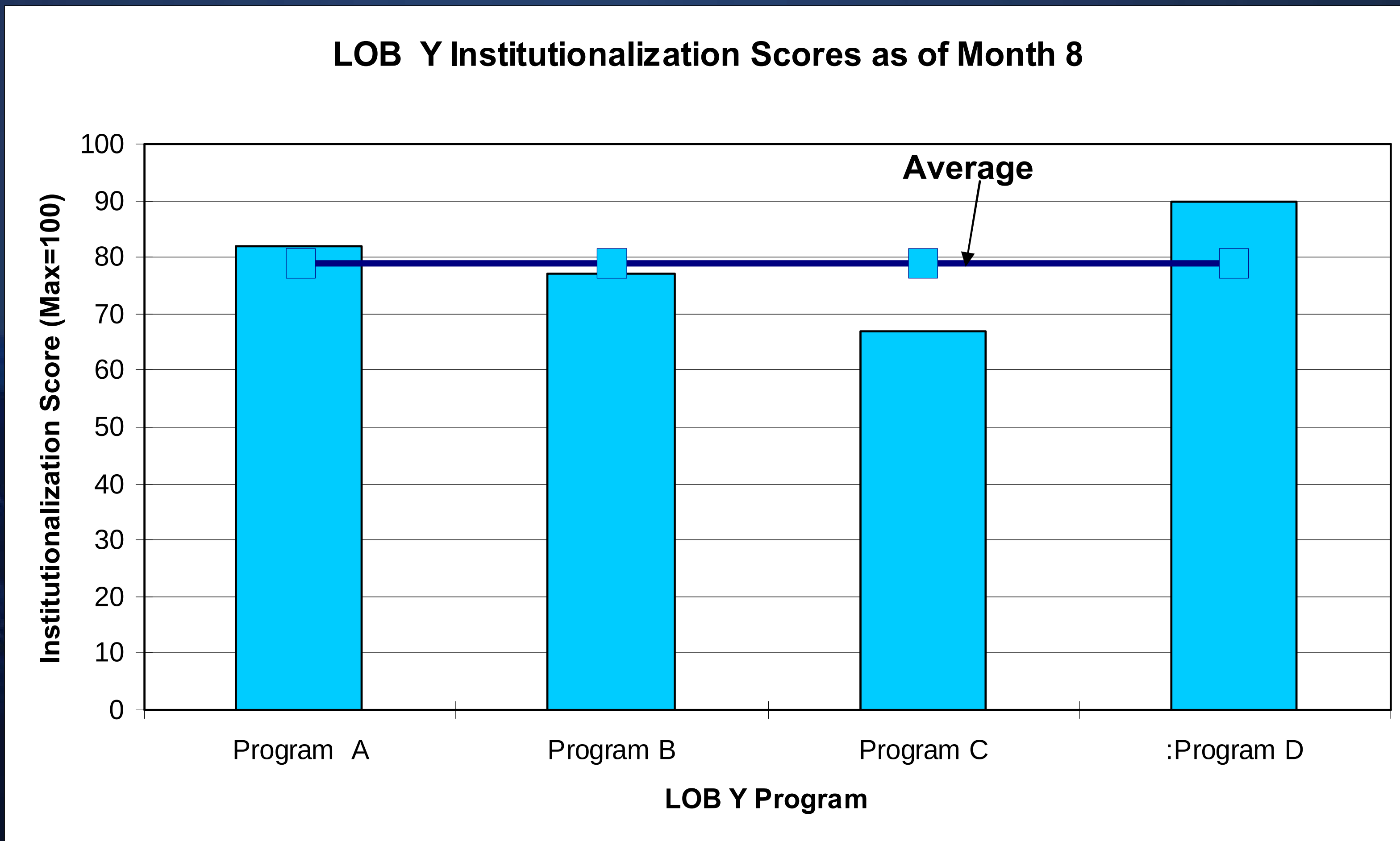
The component measure weights are selected by management. Each weight is 10% in this example. This data is notional.

alization Score For Program A

Institutionalization Score for Program A			Date (Month)
PROGRAM SCORE (Utility)	82	Score range (0-100); weighted sum of available individual component measures	
COMPONENT MEASURES	COMPONENT SCORE	THRESHOLDS	UTILITY
6. Measurement Usage	90%	Red < 90%, Yellow = > 90% to < 95%, Green = >95%	90
7. Enterprise Standard Measurement (ESM) Collection Compliance	92%	Red < 90%, Yellow = >90% to < 95%, Green = >95%	92
8. CIPS Process Compliance	90%	Red - < 80%;Yellow - = > 80% to = < 90%; Green - >90%	90
9. % Objective Evidence Available vs Objective Evidence Required	80%	Red - < 80%; Yellow - = > 80% to =< 90%; Green - >90%	80
10. CMMI-Based Appraisal Readiness Index	2	User enters a digit 0,1,2,3,4, or 5 corresponding to the number of milestones that have been achieved.	40

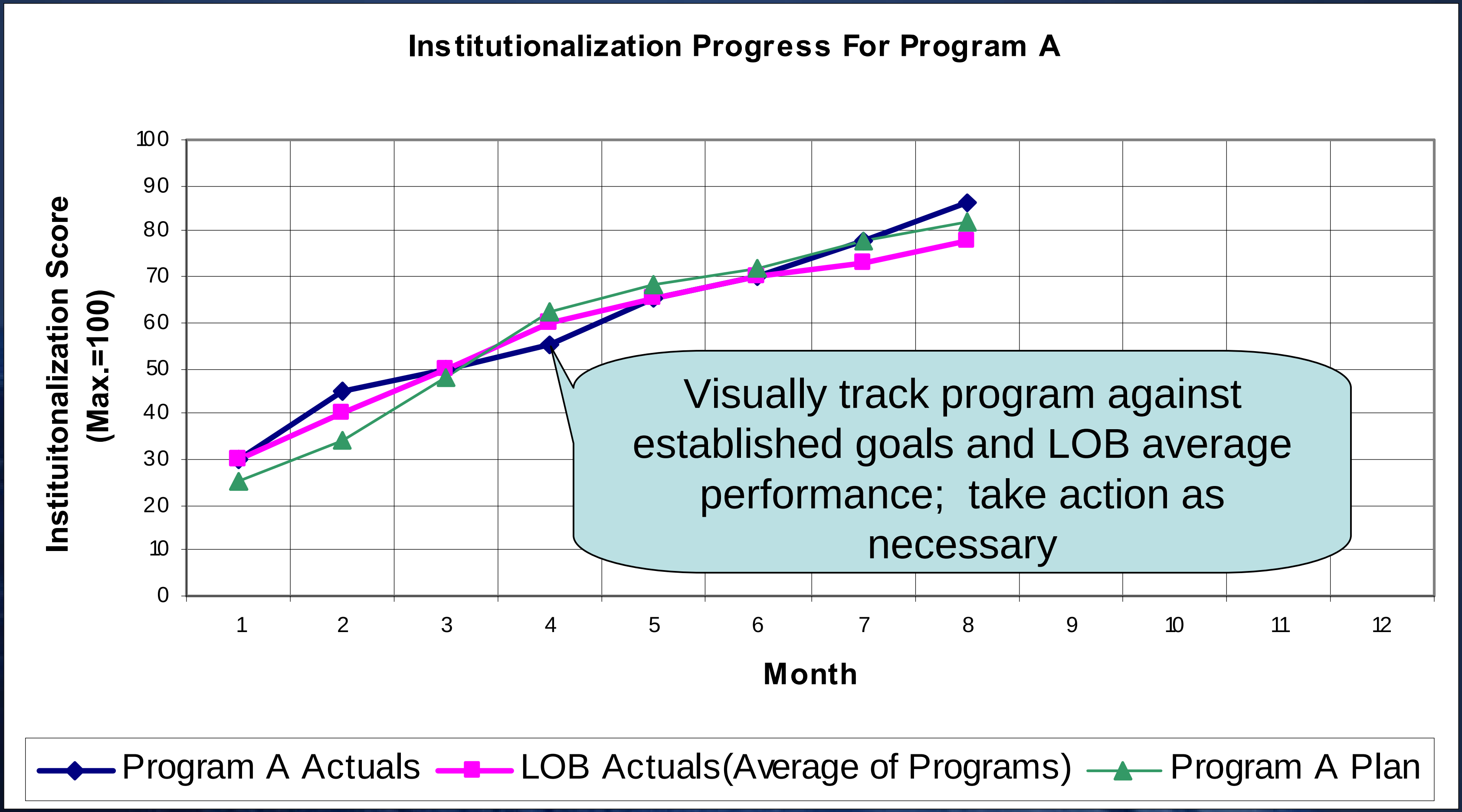
The component measure weights are selected by management. Each weight is 10% in this example. This data is notional.

nalization Score - LOB Level



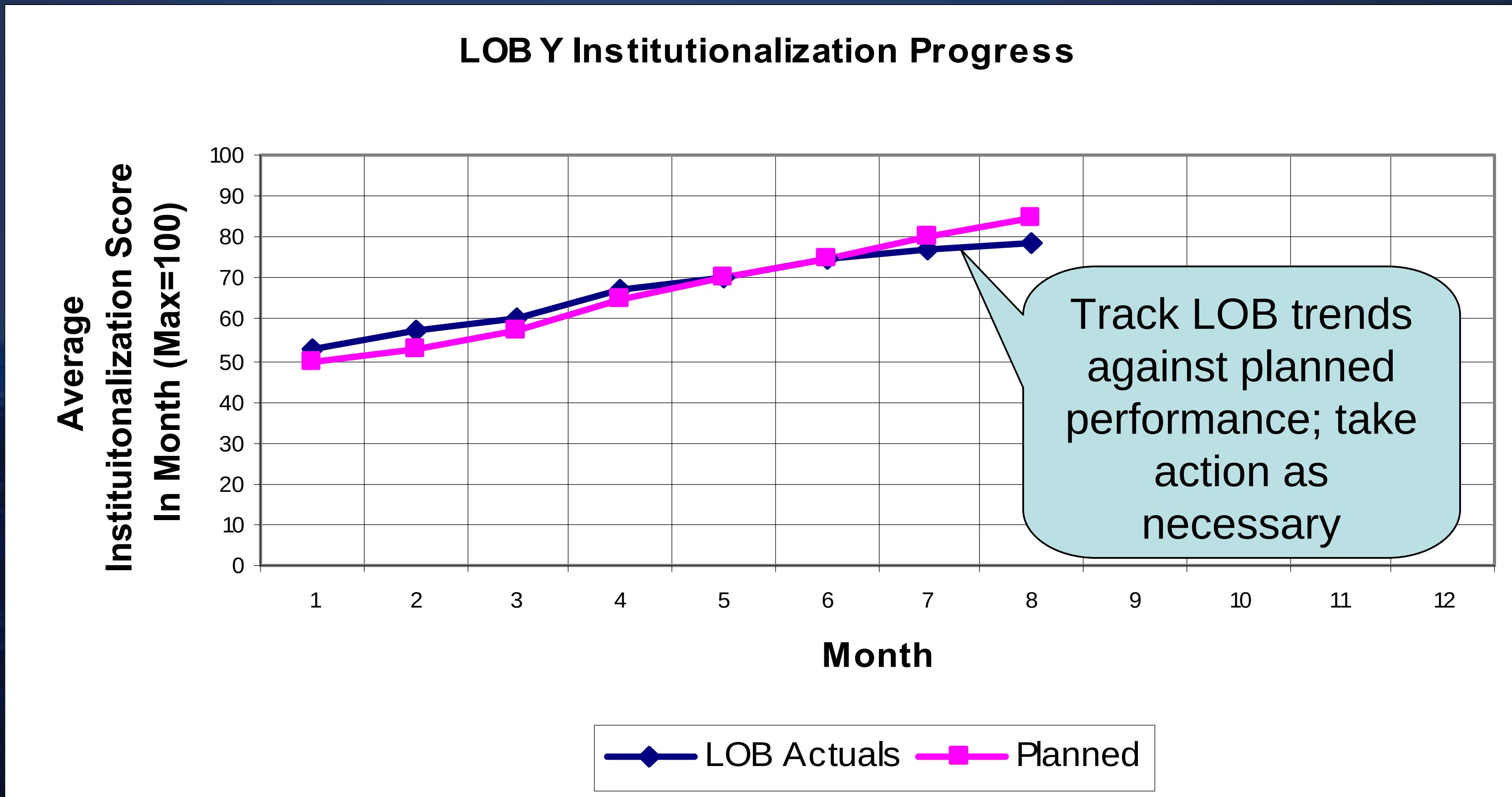
This profile or snapshot shows the institutionalization scores across a set of programs at one point in time as well as their average. This data is notional.

itutionalization Score ï Program A by Month



This graph shows the institutionalization progress trend for a program over a period of time, compared to LOB average results. This data is notional.

ization Score ï LOB by Month



This graph shows the institutionalization progress trend for the programs in LOB Y over a period of time compared to planned progress. The progress measure is the average of the scores for the programs LOB-wide. This data is notional.

ummary & Next Steps

- Summary
  - Systematic use of key institutionalization measures support SSC business goals and objectives
- Next Steps
  - The initial versions of the scorecards have been developed.
  - Some data has been collected for several measures.
  - We are moving toward deployment across major functional areas and lines of business/programs.

Additional Information

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Robust Solutions

for

Efficient & Sufficient

Testing

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- Testing Challenges
- Wipro's Solution – Robust Test Methodology
  - DSM/SCE/SCIM for Test Strategy & Planning
    - Essence of these techniques
    - Examples
  - Orthogonal Array for Test Case Design
    - What is OA Based Testing
    - Walkthrough of the Wipro OA tool
    - Sample Case studies with Benefits
  - Reliability Modeling for Residual Defect Estimation
    - About Reliability Modeling
    - Assumptions behind the Wipro Reliability Tool
    - Demo of Wipro Reliability Tool
  - Summary of Solutions to Address Testing Challenges
  - Q & A

...ges

Business Challenges

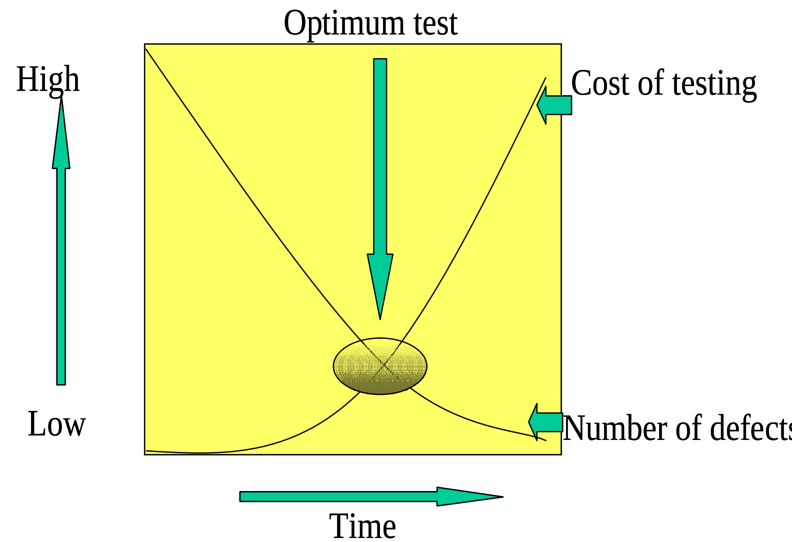
Tight Budget

Demanding Customer

Schedule Pressure

Testing Cost Curve

Testing cost curve: by William Perry



The Key to success is to address these Challenges as well as to ensure quality!!

lenges

- **How to detect most of defects early in the testing lifecycle?**
- **How to prioritize on Test Areas?**
- **How to Map resources to Test Areas?**
- **How to Allocate proportionate time to test different test Areas?**

Test Strategy & Planning

- **Are all the paths covered? (Unit Testing or white box testing)**
- **Are all interfaces tested? (Integration Testing)**
- **Is the system functionality validated? (System Testing)**
- **Are all single mode and double mode faults detected?**
- **It is next to impossible to do exhaustive testing (100% possible test cases)**
- **How to ensure that there is no redundancy in test cases?**

Test Design & Execution

- **When to Stop Testing?**

Test Results Analysis

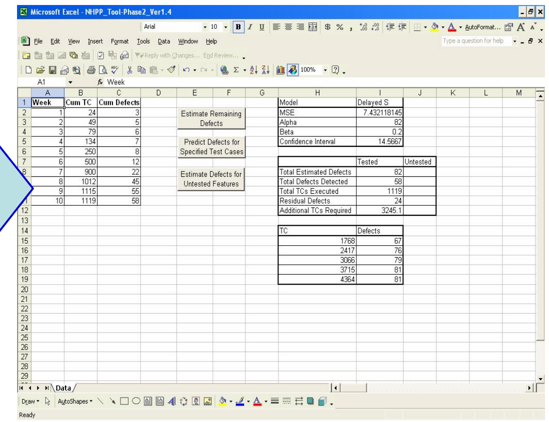
Robust Test Methodology

DSM/SCE

App Dependency Matrix	AIS	LVS	TDES (Kernel)	SMCE (Kernel)	OSM	OSIO (Kernel)	Scheduler	Infrastructure	Database	GUI	Install upgrade	Borolo
AIS	Row ED Col	Row LD Col	Row LD Col	ND	Row LD Col	ND	Row LD Col	Row MD Col	Row MD Col	ND	ND	Row HD Col
LVS	Row LD Col	Row ED Col	Row HD Col	Row MD Col	Row MD Col	ND	ND	Row MD Col	Row MD Col	ND	ND	Row HD Col
TDES (Kernel)	Row LD Col	Row HD Col	Row ED Col	ND	Row LD Col	Row HD Col	ND	Row MD Col	Row MD Col	ND	ND	Row HD [illegible]
SMCE (Kernel)	ND	Row MD Col	Row MD Col	Row ED Col	ND	ND	ND	Row MD Col	ND	ND	ND	[illegible]
OSM	Row LD Col	Row LD Col	ND	ND	Row ED Col	Row HD Col	Row HD Col	Row MD Col	Row MD Col	ND	ND	[illegible]
OSIO (Kernel)	ND	ND	Row MD Col	ND	Row HD Col	Row ED Col	ND	Row MD Col	Row MD Col	ND	ND	[illegible]
Scheduler	Row LD Col	ND	ND	ND	Row MD Col	ND	Row ED Col	Row MD Col	Row MD Col	ND	ND	Row HD Col
Infrastructure	ND	ND	ND	ND	ND	ND	ND	Row ED Col	Row MD Col	ND	ND	Row HD Col
Database	ND	ND	ND	ND	ND	ND	ND	Row LD Col	Row ED Col	ND	Row LD Col	Row MD Col
GUI	Row HD Col	ND	ND	ND	ND	ND	ND	ND	ND	Row ED Col	ND	ND
Install upgrade	ND	ND	ND	ND	ND	ND	ND	ND	Row LD Col	ND	Row ED Col	Row HD Col
Borolo	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Row ED Col

OA Technique

Reliability



Lean Management & Six sigma Techniques

Test Strategy & Planning

- Systematic Test Strategy
- Prioritizing Test Areas
- Early Defect Detection
- Effective Time & Resource Allocation

Test Design & Execution

- Maximize Test Coverage
- Minimize Test Cases
- Foundation for Defect Correlation

Test Results Analysis

- When to stop testing
- Certify S/w Quality Levels
- Facilitate to Plan Maintenance Resources

DSM – Dependency Structure Matrix SCE – Software Complexity Estimate OA – Orthogonal Array

SCE

ing to

- ✓ Prioritize the Test Areas by identifying the most complex Test Area to facilitate early defect detection.
- ✓ Sequence the Order of Testing of Different Test Areas so that there is minimal delay or waiting time between activities which will facilitate in Schedule adherence.
- ✓ Prioritize the Test Area & Test Cases in case of Regression Testing for optimal use of Testing effort.

Input/Output Summary for DSM tool

Objective/Tool	Inputs	Output
Sequencing/DSM	1. No of Components/Activities 2. Dependencies Between Components (Dependency on a binary scale)	1. New Sequence for activities 2. Cyclic Dependency blocks 3. Components/activities that can be done in parallel
Test Area Prioritization/SCE	1. No of Components/Activities & Names 2. Dependencies Between Components (Dependency on a 5 point scale)	1. Total Relative Complexity of the System 2. Individual Relative Complexity of Modules/Components 3. Components/activities that can be done in parallel
Test Area Prioritization/SCIM **(Software Change Impact Matrix for** Regression Testing)	1. No of Components/Modules & Names 2. No of Change Requests/Requirements 3. Impact of each Change on each of the component/Module (On a 5 point scale)	1. Relative Impact of each Change on the whole system 2. Relative Impact on each component 3. Total Software Change Impact Metric

WIPRO
Applying Thought

Inputs to DSM for Sequencing

Component Name		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Client Maintenance	1	1								1			1							1
Consortium	2		2										1							1
CP Maintenance	3			3		1							1							1
Escalation Matrix	4				4								1							1
HP Customization	5					5		1					1							1
Keyword Maintenance	6						6	1		1			1							1
Nugget Maintenance	7						1	7		1			1							1
Password Reset	8								8				1							1
Search	9						1	1		9			1							1
User Collections	10									1	10		1							1
TAF	11											11	1							0
Employee NT/XP Login	12												12							1
Alias	13												1	13						1
POINT SSO	14		1										1		14					0
Announcement	15							1					1			15				1
EmployeeNet	16												1				16			0
LL Tasks	17												1					17		1
LL Admin	18												1						18	1
ClearTrust	19		1							1			1							19

Output of DSM – New Sequence

Component Name		Consortium	Keyword Mainter	Nugget Maintena	Search	Employee NT/XF	ClearTrust	Client Maintenar	Escalation Matrix	HP Customizatio	Password Reset	User Collections	TAF	Alias	POINT SSO	Announcement	EmployeeNet	LL Tasks	LL Admin	CP Maintenance
		2	6	7	9	12	19	1	4	5	8	10	11	13	14	15	16	17	18	3
Consortium	2	2				1	1													
Keyword Maintenance	6		6	1	1	1	1													
Nugget Maintenance	7		1	7	1	1	1													
Search	9		1	1	9	1	1													
Employee NT/XP Login	12					12	1													
ClearTrust	19	1			1	1	19													
Client Maintenance	1				1	1	1	1												
Escalation Matrix	4					1	1		4											
HP Customization	5			1		1	1			5										
Password Reset	8					1	1				8									
User Collections	10				1	1	1					10								
TAF	11					1	0						11							
Alias	13					1	1							13						
POINT SSO	14	1				1	0								14					
Announcement	15			1		1	1									15				
EmployeeNet	16					1	0										16			
LL Tasks	17					1	1											17		
LL Admin	18					1	1												18	
CP Maintenance	3					1	1			1										3

Output of DSM – New Sequence Table

Sequence	2	6	7	9	12	19	1	4	5	8	10	11	13	14	15	16	17	18	3
levels																			
1	2	6	7	9	12	19													
2	1	4	5	8	10	11	13	14	15	16	17	18							
3	3																		

Helps in identifying components for concurrent engineering resulting in optimizing schedule

	System Complexity Estimator
Name of Project	XYZ
Contact person	
Email	

System Complexity Estimator	
Number of Modules	12

SYSTEM COMPLEXITY 37.5

SCE Outputs

# of functions	Module Dependency Matrix	Component1	Component2	Component3	Component4	Component5	Component6	Component7	Component8	Component9	Component10	Component11	Component12	Module contribution to Complexity
1	Component1	Row ED Col	Row LD Col	ND	ND	ND	ND	Row LD Col	ND	ND	Row MD Col	ND	ND	3.16
4	Component2	ND	Row ED Col	ND	ND	ND	ND	Row LD Col	ND	ND	ND	ND	ND	3.65
1	Component3	ND	ND	Row ED Col	ND	ND	ND	ND	Row HD Col	ND	ND	ND	ND	2.51
4	Component4	ND	ND	ND	Row ED Col	ND	ND	ND	Row HD Col	ND	ND	ND	ND	3.22
3	Component5	ND	ND	ND	ND	Row ED Col	ND	ND	Row HD Col	ND	ND	ND	ND	3.06
2	Component6	ND	ND	ND	ND	ND	Row ED Col	Row HD Col	ND	ND	ND	ND	ND	3.00
2	Component7	Row LD Col	Row MD Col	ND	ND	ND	ND	Row ED Col	ND	ND	ND	ND	Row LD Col	3.35
1	Component8	ND	ND	Row LD Col	Row LD Col	Row LD Col	ND	ND	Row ED Col	Row LD Col	ND	Row LD Col	ND	4.25
2	Component9	ND	ND	ND	ND	ND	ND	ND	Row HD Col	Row ED Col	ND	ND	ND	2.85
1	Component10	Row HD Col	ND	ND	ND	ND	ND	ND	ND	ND	Row ED Col	ND	ND	2.77
2	Component11	ND	ND	ND	ND	ND	ND	ND	Row HD Col	ND	ND	Row ED Col	ND	2.85
1	Component12	Row LD Col	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Row ED Col	2.82

SCE Inputs

Relative System Complexity & Component level Complexity is calculated for prioritization.

WIPRO
Applying Thought

Real Life example from Telecom Domain

Change Requests/ Requirements/Enhancements

Modules/ Components

Software Change Impact Matrix

Name of Project	ABC
Contact person	
Email	

act Matrix Analysis

Number of Modules	13	Number of Test	
Impact of the CRs on the system	813.3		

	est Impact Matrix	tserver	rserver	Agent UI	Admin UI	CIR	Primary DB	Installation	inbasket	SMPT/POP3	I18N/localisation	patch	webview	lambda	CR Impact on the system	% Coverage
11	Installation / Configuration	No	No	No	No	No	No	Extreme	Extreme	Med	Extreme	Extreme	Extreme	Extreme	175.09	21.53%
12	Admin UI	Extreme	Extreme	No	Extreme	Hi	No	No	Low	Med	Hi	No	Extreme	No	127.55	15.68%
13	Agent UI	Extreme	No	Extreme	No	Hi	Med	No	Low	No	Hi	No	Extreme	No	76.91	9.46%
14	Cem Services	No	No	No	No	No	No	No	Extreme	Med	Extreme	No	Extreme	Extreme	49.97	6.14%
15	TIM feature	Extreme	Extreme	No	No	Hi	No	No	Low	Med	Hi	No	Extreme	No	64.99	7.99%
16	Load	Extreme	No	Extreme	No	Hi	Med	No	Low	No	Hi	No	Extreme	No	76.91	9.46%
17	Faultfail	No	No	No	No	No	No	No	Extreme	Med	Extreme	No	Extreme	Extreme	49.97	6.14%
18	Multi instance	Extreme	Extreme	No	No	Hi	No	No	Low	Med	Hi	No	Extreme	No	64.99	7.99%
19	Real Time display	Extreme	No	Extreme	No	Hi	Med	No	Low	No	Hi	No	Extreme	No	76.91	9.46%
20	webview	No	No	No	No	No	No	No	Extreme	Med	Extreme	No	Extreme	Extreme	49.97	6.14%
21	Module covered by Test Areas	291.55	21.91	72.53	4.74	26.86	3.82	8.37	24.28	10.81	54.58	19.84	206.42	67.56	813.28	

Outputs of SCIM

Inputs To SCIM

A Quantitative Framework for Test Area Prioritization & Effort Allocation.

…d Testing?

OA Based Testing is a methodology which facilitates in ensuring a higher coverage of Testing the Possible causes of failure with a lower number of Test Cases

The first Step in OA based Test design is to parameterize the Test Area into Factors & levels

Once factors & levels identified are fed into Wipro's OA tool, Test Runs are automatically generated which reduces the test case writing time.

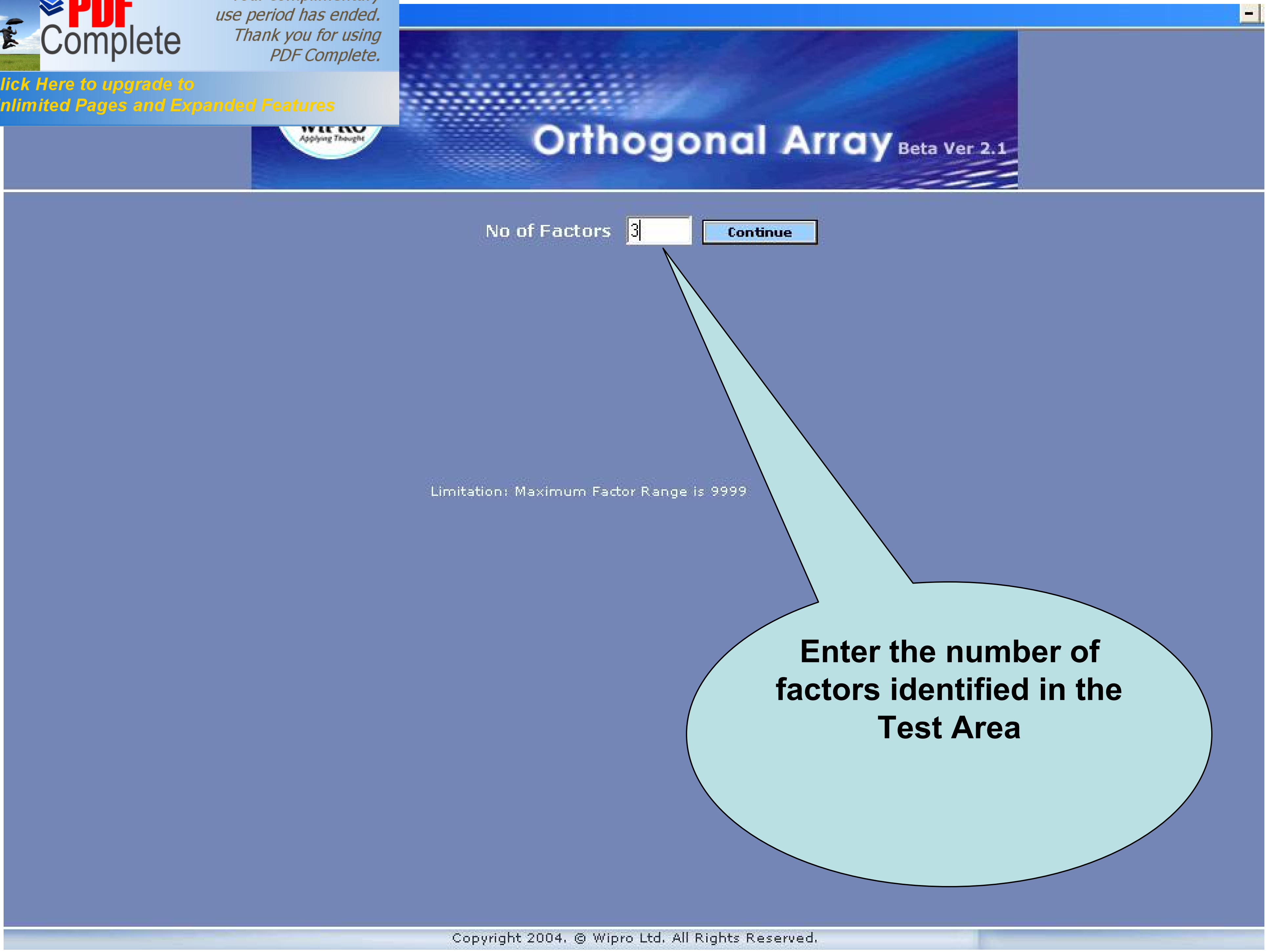
OA ensures that all levels of each factors are tested at least once & all possible pair wise combinations of factors are tested at least once.

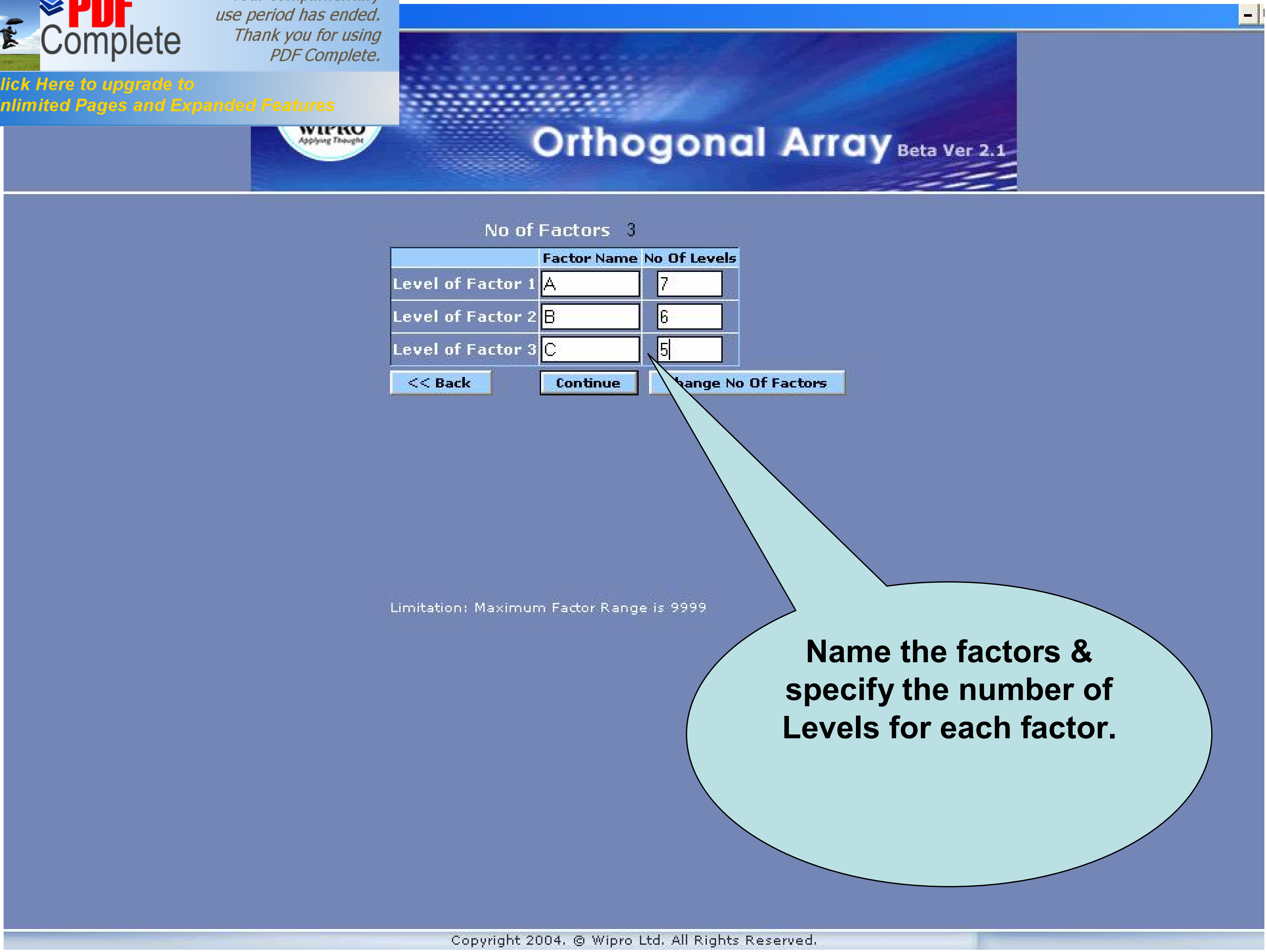
Wipro's OA application experience indicate benefits of significant reduction in total testing effort or significant improvement in test coverage of possible failure modes.

Walk Through

Of

Wipro OA Tool


Orthogonal Array Beta Ver 2.1
Applying Thought
No of Factors
3
Continue
Limitation: Maximum Factor Range is 9999
Enter the number of factors identified in the Test Area
Copyright 2004. © Wipro Ltd. All Rights Reserved.


Orthogonal Array Beta Ver 2.1
No of Factors 3
Factor Name
No Of Levels
Level of Factor 1
A
7
Level of Factor 2
B
6
Level of Factor 3
C
5
<< Back
Continue
hange No Of Factors
Limitation: Maximum Factor Range is 9999
Copyright 2004, © Wipro Ltd. All Rights Reserved.
Name the factors & specify the number of Levels for each factor.

Orthogonal Array Beta Ver 2.1

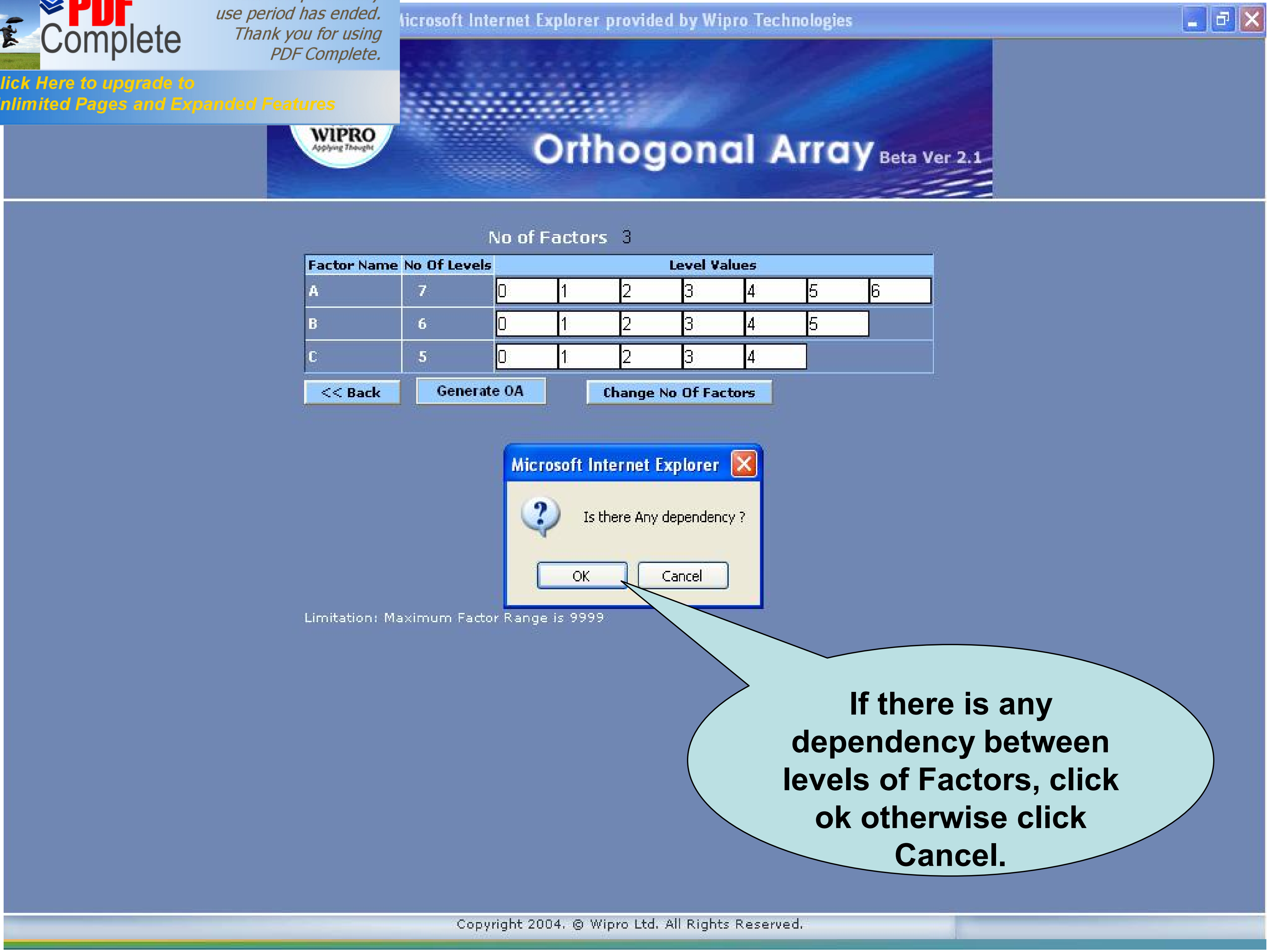
No of Factors 3

Factor Name	No Of Levels	Level Values						
A	7	0	1	2	3	4	5	6
B	6	0	1	2	3	4	5	
C	5	0	1	2	3	4		

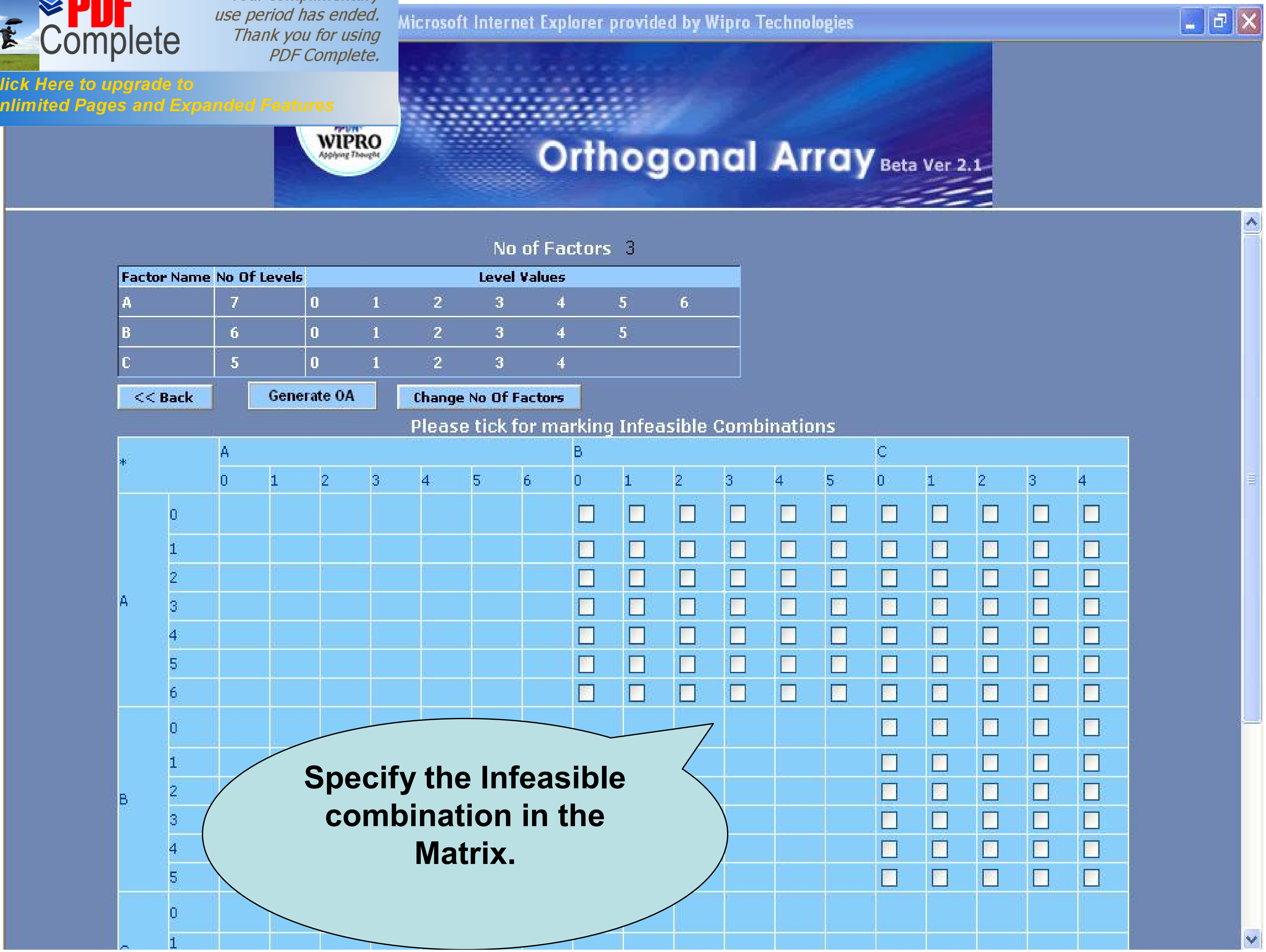
<< Back | Generate OA | Change No Of Factors

Limitation: Maximum Factor Range is 9999

Name the level for each of the factors & generate OA



If there is any dependency between levels of Factors, click ok otherwise click Cancel.



Specify the Infeasible combination in the Matrix.

Orthogonal Array Beta Ver 2.1

No of Factors 3

Factor Name	No Of Levels	Level Values						
A	7	0	1	2	3	4	5	6
B	6	0	1	2	3	4	5	
C	5	0	1	2	3	4		

<< Back | Change No Of Factors | Excel

OA

Runs	A	B	C
1	0	0	0
2	0	1	1
3	0	2	2
4	0	3	3
5	0	4	4
6	0	5	0
7	0	0	1
8	1	0	1
9	1	1	2
10	1	2	3
11	1	3	4
12	1	4	0
13	1	5	1
14	1	0	0
15	2	0	2
16	2	1	3
17	2	2	4
18	2	3	0
19	2	4	1
20	2	5	0
21	2	0	1

OA : % Coverage

Combinations	Possible Combinations	% Coverage
AB	42	100
AC	35	100
BC	30	100
ABC	210	23.3

Test Sets are generated & the proportion of coverage of all the possible combinations are given as output. Expected output for the tests have to be manually specified

tput

Runs	A	B	C
1	0	0	0
2	0	1	1
3	0	2	2
4	0	3	3
5	0	4	4
6	0	5	0
7	0	0	1
8	1	0	1
9	1	1	2
10	1	2	3
11	1	3	4
12	1	4	0
13	1	5	1
14	1	0	0
15	2	0	2
16	2	1	3
17	2	2	4
18	2	3	0
19	2	4	1
20	2	5	0
21	2	0	1
22	3	0	3
23	3	1	4
24	3	2	0
25	3	3	1
26	3	4	0
27	3	5	1
28	3	0	2
29	4	0	4
30	4	1	0
31	4	2	1
32	4	3	0
33	4	4	1
34	4	5	2
35	4	0	3
36	5	0	0
37	5	1	1
38	5	2	0
39	5	3	1
40	5	4	2
41	5	5	3
42	5	0	4
43	6	0	1
44	6	1	0
45	6	2	1
46	6	3	2
47	6	4	3
48	6	5	4
49	6	0	0

ÅOnce Factors & Levels are identified, test sets are generated by the tool

ÅAll levels of each factor are tested at least once. (All single mode failures re covered)

ÅAll possible pair wise combinations are tested at least once (All Double mode failures are covered at least once)

…dies – OA

…oject 1

- **Project Objective:**
  - To optimize test cases
- **Project Goal :**
  - To Improve test coverage, defect detection
- **Methodology Used** : DSSS+
  - Orthogonal Array
- **Results:**
  - Full factorial test cases : 58632
  - OA based test cases :535
  - After adding a few more test cases : 563
- Business Benefits
  - Test case reduction by 35%
  - New bugs found using OA ï 6
  - All Defects found in previous releases detected

OA Applied in Telecom - Project 2

- Project Objective:
  - To optimize test cases
- Project Goal :
  - To Improve test coverage, defect detection
- Methodology Used : DSSS+
  - Orthogonal Array
- **Business Benefits**
  - Earlier release had 17 test cases and did not detect any bugs
  - For the same release with OA generated 24 test cases, the test coverage and defect detection improved drastically
  - Test Coverage improved from
    - 25 to 51 % in service option.
    - 50 to 70% in protocol revision
    - .40 to 100 % in service negotiation. 2
    - 5 to 40 % in service handoff

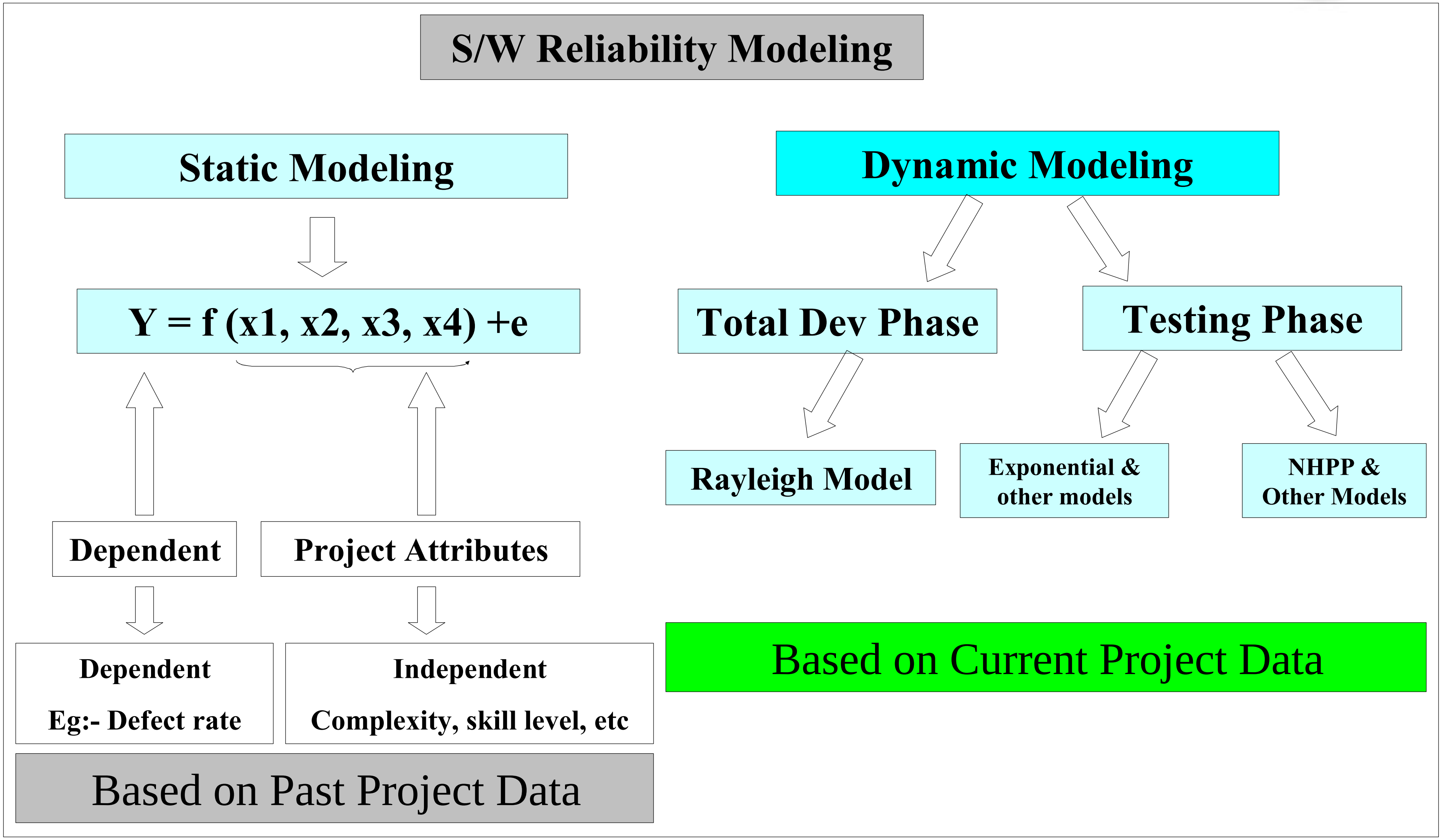
OA Applied in retail domain

- **Project Objective:**
  - Optimize the number of test cases
- **Project Goal :**
  - Reduce testing effort
  - 100% functionality coverage
- **Methodology Used :** DSSS+
  - Orthogonal Array
- **Results**
  - 848 test cases reduced to 167
- Business Benefits
  - Able to complete 2 complete cycles of testing in planned time
  - Test case reduction by 80%
  - 100% functionality covered
  - Validated with requirements trace ability matrix

OA Applied in Finance domain

- **Project Objective:**
  - Optimize the number of test cases
- **Project Goal :**
  - Reduce testing effort
- **Methodology Used :** DSSS+
  - Orthogonal Array
- **Results**
  - Full factorial : 548 test cases
  - rdExpert (industry product) : 290tc
  - Wipro OA tool : 236tc
- **Business Benefits**
  - Reduced testing effort by 56%
- **Concluding remarks of the practioner**
  - Wipro's OA tool generated lower test cases when the factors and levels are high
  - Despite the lower number of test cases the coverage is more when compared with rdExpert (industry standard tool)

Estimation – Reliability Modeling



...ind The Wipro Reliability Tool

- Effort in Testing is homogeneous throughout the testing phase.
- Since this assumption is not always applicable, normalization of defect data wrt test cases is required.
- An acceptable amount of coverage is achieved by the test cases under use (Use of OA based test case design or other robust methods is assumed)
- The time sequence of the defect data should be maintained
- At least 75% of the testing(test case execution) should be complete for predictive validity AND
- A plot of the defect rate should indicate a declining defect trend

Tool is not to be used for defect estimation without Test Execution.

Wipro Reliability

Tool Walkthrough/Demo

gh the tool

Day	TC	Cum Failures
1	24	3
2	49	5
3	79	6
4	134	7
5	250	8
6	500	12
7	900	22
8	1012	45
9	1115	[illegible]
10	1119	[illegible]

Estimate Remaining Defects

Predict Defects for Specified Test Cases

Estimate Defects for Untested Features

Model	Delayed S
MSE	
Alpha	
Beta	
Confidence Interval	
Accuracy	

	Tested	Untested
Total Estimated Defects		
Total Defects Detected		
Total TCs Executed		
Residual Defects		
Additional TCs Required		

TC	Defects	%

Reliability Plot | Data

Input Columns: Cum TC – Cumulative test cases
Cum Defects – Cumulative no of defects detected
Day/Week – WK no which indicates the times series order in which the testing is carried out

gh the tool

Input Data Here

Options available

Output Display

Day	TC	Cum Failures
1	24	3
2	49	5
3	79	6
4	134	7
5	250	8
6	500	12
7	900	22
8	1012	45
9	1115	55
10	1119	58

1 Estimate Remaining Defects

2 Predict Defec… r Specified Test … s

3 Estimate Defe… Untested Fea…

Model	Delayed S
MSE	
Alpha	
Beta	
Confidence Interval	
Accuracy	

	Tested	Untested
Total Estimated Defects		
Total Defects Detected		
Total TCs Executed		
Residual Defects		
Additional TCs Required		

TC	Defects	%

Reliability Plot | Data

Option 1 – Estimate Remaining defects
On click of this button, a dialog box pos up which asks for the required confidence level. Once that is specified, the tool gives the output as shown in next slide

gh the tool

Day	TC	Cum Failures
1	24	3
2	49	5
3	79	6
4	134	7
5	250	8
6	500	12
7	900	22
8	1012	45
9	1115	55
10	1119	58

Estimate Remaining Defects

Predict Defects for Specified Test Cases

Estimate Defects for

Data

Required Confidence Level 95

Continue

Cancel

Reliability Plot | Data

When you click on Estimate Remaining Defects, The tools asks for a confidence level for the estimate. Specify a confidence level of 95% in most of the cases & click on the continue tab

...gh the tool

Day	TC	Cum Failures
1	24	3
2	49	5
3	79	6
4	134	7
5	250	8
6	500	12
7	900	22
8	1012	45
9	1115	55
10	1119	58

Estimate Remaining Defects

Predict Defects for Specified Test Cases

Estimate Defects for Untested Features

Model	Delayed S
MSE	7.432118145
Alpha	82
Beta	0.2
Confidence Interval	14.5667
Accuracy	0.8503

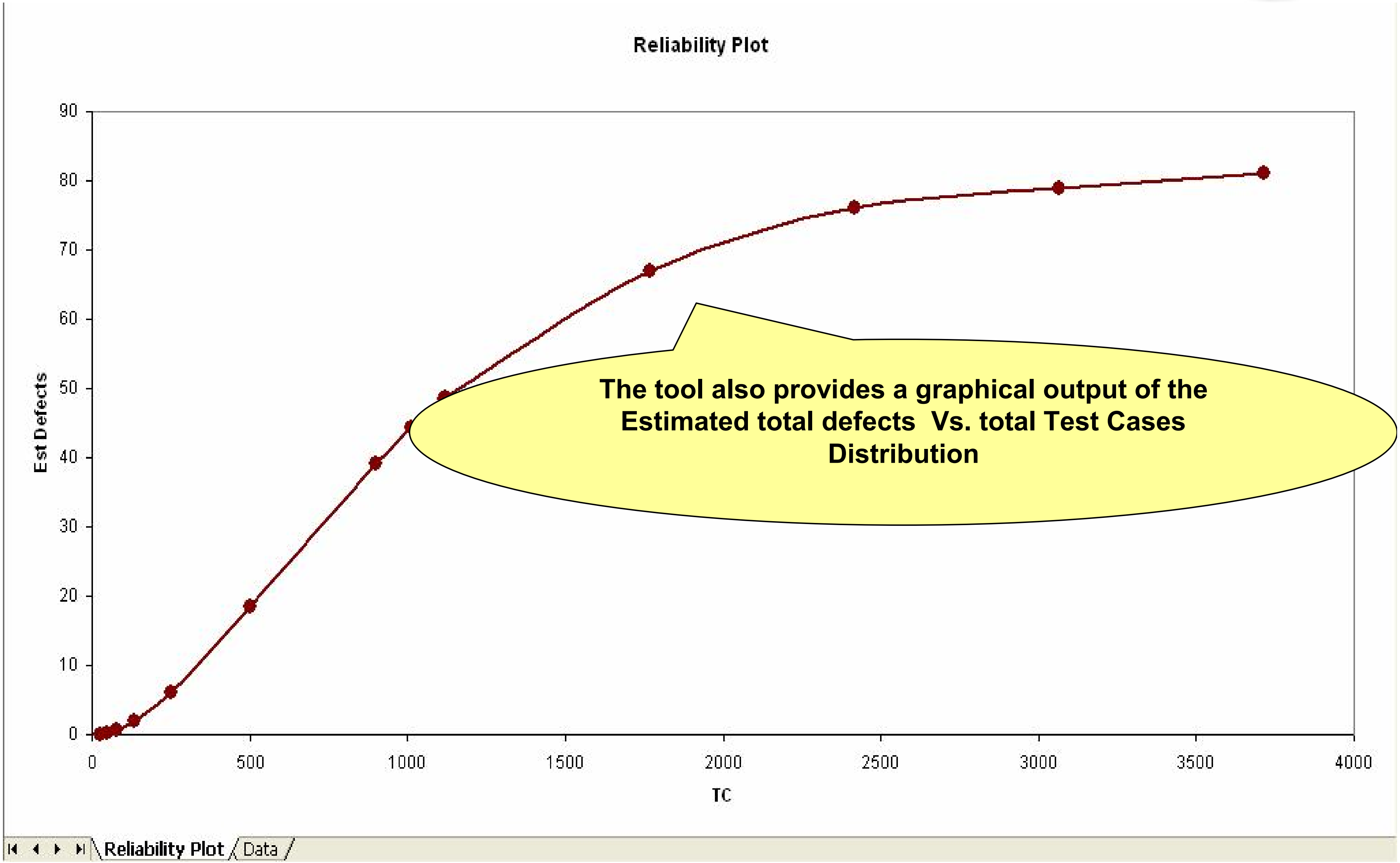
	Tested	Untested
Total Estimated Defects	82	
Total Defects Detected	58	
Total TCs Executed	1119	
Residual Defects	24	
Additional TCs Required	3245.1	

TC	Defects	%
1768	67	81.71
2417	76	92.68
3066	79	96.34
3715	81	98.78
4364	82	100.00

Reliability Plot | Data

Outputs of the tool are in the form of Three tables.
1st table gives the details of the Statistical model which has been chosen for estimation.
2nd table gives the details of the remaining defects &no of test cases to be executed to find out the remaining defects.
3rd table gives the estimated breakup of testcases to be executed & remaining defects that will be found out

gh the tool


Reliability Plot
Est Defects
TC
0
10
20
30
40
50
60
70
80
90
0
500
1000
1500
2000
2500
3000
3500
4000
The tool also provides a graphical output of the Estimated total defects Vs. total Test Cases Distribution
Reliability Plot
Data

Summary

of

Solutions to Address

Testing Challenges

OA Tool

Orthogonal Array

Test Phase : Test Optimization

Features

Å Systematic and statistical method of pair-wise combinations of selected factors or variables across their levels.

Å Creates an optimized test suite with lesser test cases.

Å Detects all single mode and double mode defects.

Å Increases confidence level in the system by executing a concise set of tests and uncovering most of the bugs.

Benefits

Å Helps in productivity improvement with cycle time reduction.

Å Helps in improving the test coverage.

Å Helps in minimizing the size of test suite by eliminating the redundant test cases from the test suite.

Å Test effort reduction in terms of test case writing and execution.

Case Study

Client Name : A large North American telecom equipment manufacturer

Project Scope:

Å Testing of a large IP-PBX system.

Å Live Communication Version features to be incorporated.

Å Initial test suite contains more than 800 test cases.

Challenges :

Optimizing the test suite without compromising on the test coverage.

Benefits :

Considerable amount of saving in terms of test effort and time.

- The number of test cases was reduced from 800 to 170 .
- There was a reduction in approx. 75% of the testing effort.
- No compromise on test coverage

CoDeC Tool

Complexity Dependency Change impact

CoDeC is an integrated tool consists of DSM, SCE and SCIM features

DSM Tool (Dependency Structure Matrix)

Test Sequencing

Dependency Structure Matrix analyses the dependencies among the modules and Helps project managers in

- Determining the sequence of test execution of the modules.
- Deciding which modules should be kept under a single team.
- Deciding which modules can be executed in parallel without any dependency clash.

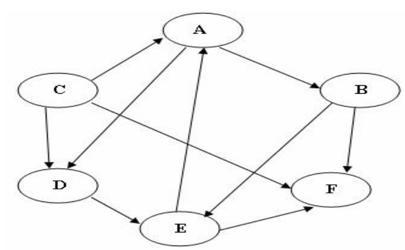
Which modules should be tested first?

SCE Tool (System Complexity Estimator)

Effort Estimation

System Complexity Estimator analyses the complexity and the dependency of modules in a system and helps project managers in estimating testing effort distribution across the modules.

Which module requires maximum testing effort?



SCIM Tool (System Change Impact Matrix)

Maintenance Phase

System Change Impact Matrix analyses the system complexity, and the impact of each Change Request (CR) on all the modules in a system and helps project managers in

- Estimating the relative test effort distribution across modules during maintenance phase.
- Estimating the relative test effort distribution across different CRs.

Which module requires maximum attention from a change perspective?

CASE STUDY

Client: A large North American server and storage manufacturer.

Project: Asset Management Systems (Maintenance Project)

Project Scope

- to reduce the test execution cycle time of the release.
- to avoid unnecessary repetition of test cases.
- to ensure that there is no defect slippage because of the reduced set of regression test cases.

Challenges

- to find the correct sequence of execution of modules.

Benefits

- Helped in determining the sequence of execution without any dependency clash
- Before using DSM around 871 regression test cases were executed. However during the beta testing conducted in Feb 2007, only 208 optimized (DSM) regression test cases were executed by avoiding duplication.
- The test cycle time got reduced from 20 person days to 12 person days.

DFA Tool

Defect Flow Analysis

DFA Tool has 2 features: Metric Analysis and Reliability Analysis

Metric Analysis

Reliability Estimation

Test Reporting

This tool helps project managers in

- systematically analyzing various metrics applicable in a testing project faster and thus with less effort.

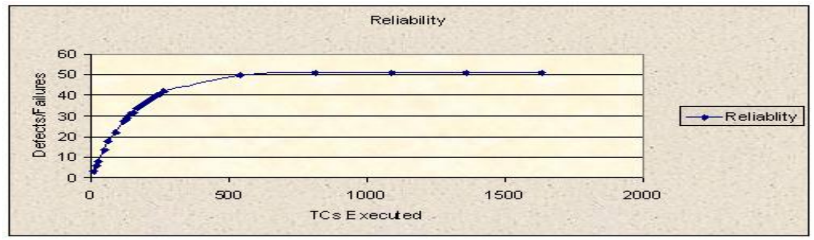
- standardizing reports generated across projects by providing graphical and tabular representation of

  - Defect Trend
  - Test case productivity, Pass rate, test efficiency
  - Defect priority analysis etc.

Reliability Analysis

This tool analyses the trends of Defect Detection in a test cycle and helps the test manager in

- Estimating residual defects in the system.
- Deciding when to stop Testing of a system.



Case Study

Client: A large North American Telecom Equipment manufacturer.

Project Scope

- verification of leading north American equipment vendor's element management system for his broad band access products.

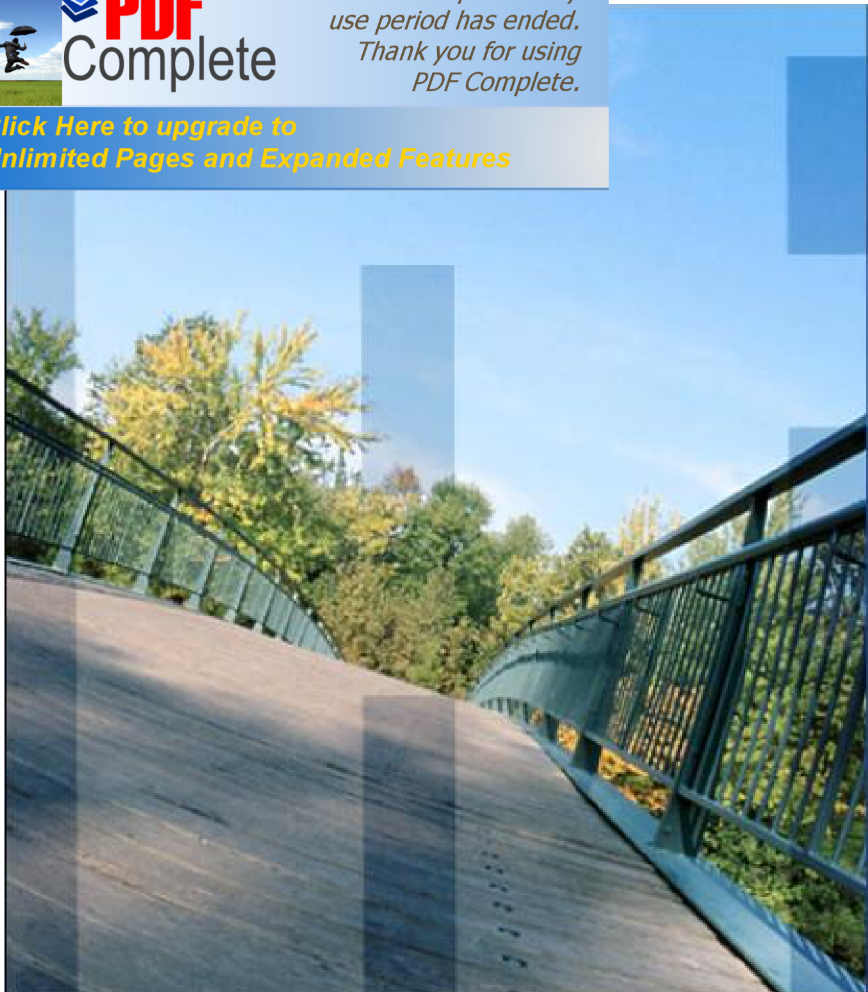
Challenges

- whether to release product or continue testing.
- to release products in the field with a level of confidence.

Benefits

- Predicted number of defects in the past were validated by the response from the field.
- Helped in taking a decision on whether to continue testing or release the feature.
- Based on the reliability output, recommendation was given to stop the general availability of one of the release.


Thank You



vision

Bridging Process Improvement During Program Management Evolution: An Experience Report

Frank Sisti/Capt. DeWitt Latimer

October 25, 2007

THE AEROSPACE CORPORATION

Overview

- Environment of an Acquisition Office SCAMPI
  - The Program
  - Programmatics
  - The Organization
  - The Timeline
- SCAMPI-C Outcomes
- Utilization of SCAMPI-C Outbrief
- Observations

The Program

- Space-Based Radar (SBR) is a DoD program for a constellation of radar satellites organized as an Air Force program under the Space and Missile Systems Center (SMC) as the lead execution agency (PEO) and USECAF(Space) as the milestone decision authority
  - Critical partner agencies were on management boards, but lacked direct ties into PMO staff at SMC
- SBR was projected to be a US$20B program with 10+ years until first launch

SBR Programmatics

- SBR was in Phase A (NSS-0301 life cycle) Concept Development with two competing prime contractors
  - USAF management by Colonel SPD and 3-Star PEO
- SBR Engineering Challenges: applying systems engineering principals across JPO and independent partner agencies, high risk technologies in baseline
- SBR had created a family of plans, two of which called for acquisition process improvement: the Software Acquisition Management Plan (SAMP) and the System Engineering Management Plan (SEMP – in draft)
- SCAMPI-C's based on the CMMI-AM were to be used as a measurement tool to guide process improvement efforts

Executive Organization

Undersecretary of the Air Force for Space (USECAF(Space))
Milestone Decision Authority (MDA)

Commander, Space and Missile Systems Center
Program Executive Officer for Space (PEO Space)

System Program Director (SPD)
Space-Based Radar Joint Program Office

Partner Agency Representation

Joint Program Office Staff

SCAMPI Timeline

- August 2004 SAMP directed SCAMPI
- October 2004 SPD charter to SCAMPI team
- December 2004 SCAMPI team formed and document inventory begun
- 21 Feb 2005 initial SCAMPI brief/start SCAMPI
- 1 March 2005 New Management Structure Announced
- 4 March 2005 Complete SCAMPI interviews
- 10 March 2005 SCAMPI outbrief

New Program

- In March 2005, SBR was formally changed to become Space Radar (SR) under (then) BGen Sheridan as his own PEO and SPD under USECAF(Space) as MDA
- Program office was to be slimmed down and moved from SMC to the Washington DC area to be closer to partner agency representatives
  - Agencies would provide staff members into the new “Integrated Program Office”

SR Programmatics

- SR goals
  - Consolidate management and budget execution
    - Program was made the responsibility of a new PEO
    - PEO/SPD combined under single USAF general officer
  - New, leaner technical baseline
  - Geographically move program office to be closer to stakeholders
- SR challenges
  - "Consolidate", "Geographically Move", "new ... baseline" - Continue operations without interruption during these transitions
- SR engineering challenges
  - Rescope contracts, re-validate technical baselines, maintain and improve engineering capabilities

SCAMPI-C Outcomes

- The SCAMPI-C of the SBR program identified goals for process improvement as well as process assets that should be nurtured
- General findings were that most process areas were operating at level 2
  - Contracting was found to be executing at or above level 3
- Broadly, several process assets were identified in the process creation
  - Several staff members were noted for their ability to create consensus processes of high capability and maturity
- Subject Matter Experts were less communicative about their jobs after the announced management change, due to uncertainty if they would be involved in the new program or be reassigned

zation of SCAMPI Results

- Moving the PMO resulted in a need to decide who would move
  - SCAMPI identified which processes were effective, so the staff who developed those processes were identified as key program personnel
  - Personnel who wouldn't be able to be moved triggered a program risk to be created and then mitigated via a staffing plan
  - When personnel slated to move were subject to a staffing reclama by SMC, SR was able to demonstrate the direct impact of those staff members being unavailable

zation of SCAMPI Results

- Several open issues were identified
  - Several specific practices needed their processes to be defined (in the CMMI sense) via the creation of management plans and operating instructions to achieve level 3; prioritization could be given to which instructions based on the observations of the SCAMPI team
- The maturity of the various process areas gave a set of metrics to management's transition team to base decisions on staff composition, size, and location

Observations

- SCAMPI-C based on the CMMI-AM was useful
  - Despite a significant management change
- Results of the SCAMPI-C were usable by the new management
  - Despite some changes to the technical baseline of the program
- Mechanism remains a very useful tool for maintaining insight into the acquisition organization during changes in its lifecycle
- Overall observation: anticipated or actual changes in a program are no reason to avoid a SCAMPI; indeed a SCAMPI may even inform decision makers during such periods of uncertainty

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Backup Slides

Acronyms

- CMMI-AM – CMMI – Acquisition Module
- PEO – Program Executive Officer
- PMO – Program Management Office
- MDA – Milestone Decision Authority
- SBR – Space-Based Radar (Program)
- SMC – Space and Missile Systems Center
- SPD – System Program Director
- SR – Space Radar (Program)
- USECAF(Space) – Undersecretary of the Air Force for Space

…erences (Versions at Time of Assessment)

- CMMI-Acquisition Module (CMMI-AM), Version 1.0, dated: February 2004
- NSS 0301, National Security Space Policy Directive 03-01, dated: 27 December 2005
- Standard CMMI(SM) Appraisal Method for Process Improvement (SCAMPI(SM)), Version 1.1: Method Definition Document, Dated: December 2001

An "Embedded" SCAMPI-C Appraisal at the National Security Agency

NDIA CMMI Technology Conference and User's Group
November 15, 2007

Joe Wickless
Software Engineering Institute
Acquisition Support Program

The “Situation” - 1

PM seeks to ascertain fidelity to CMMI among bidders; would like to encourage most capable to bid as ŕprimesòand encourage others to partner.

PM has had good experience using CMMI and SCAMPI-B for previous source selection

PM needs to minimize time and effort to gather the data

SEI called in by SETA supporting PMO to develop a strategy that will work under these contraints

The “Situation” - 2

RFP to be released by NSA Program for software-centric infrastructure management system.

16 vendors express interest in competition through participation in pre-RFP workshops

Program is looking for ñLevel 3ò for potential winner

All potential bidders have ñraised their handò

The Plan: Simple Version

Publish a Request For Information seeking, among other things, objective evidence oriented to CMMI process areas

Use the FAR Multi-step Process (15.202) to conduct an evaluation and advise certain offerors that they are highly competitive. Note: all others may still bid with no prejudice.

Initial Steps

Help the program narrow the scope of CMMI process areas to those most critical for success

Quickly assemble an evaluation team and train them in CMMI (refresher) and SCAMPI

Produce an evaluation plan and communicate to offerors

What We Requested

Firsté

A ñPIID Matrixò listing appropriate artifacts for each CMMI practice within scope

Thené

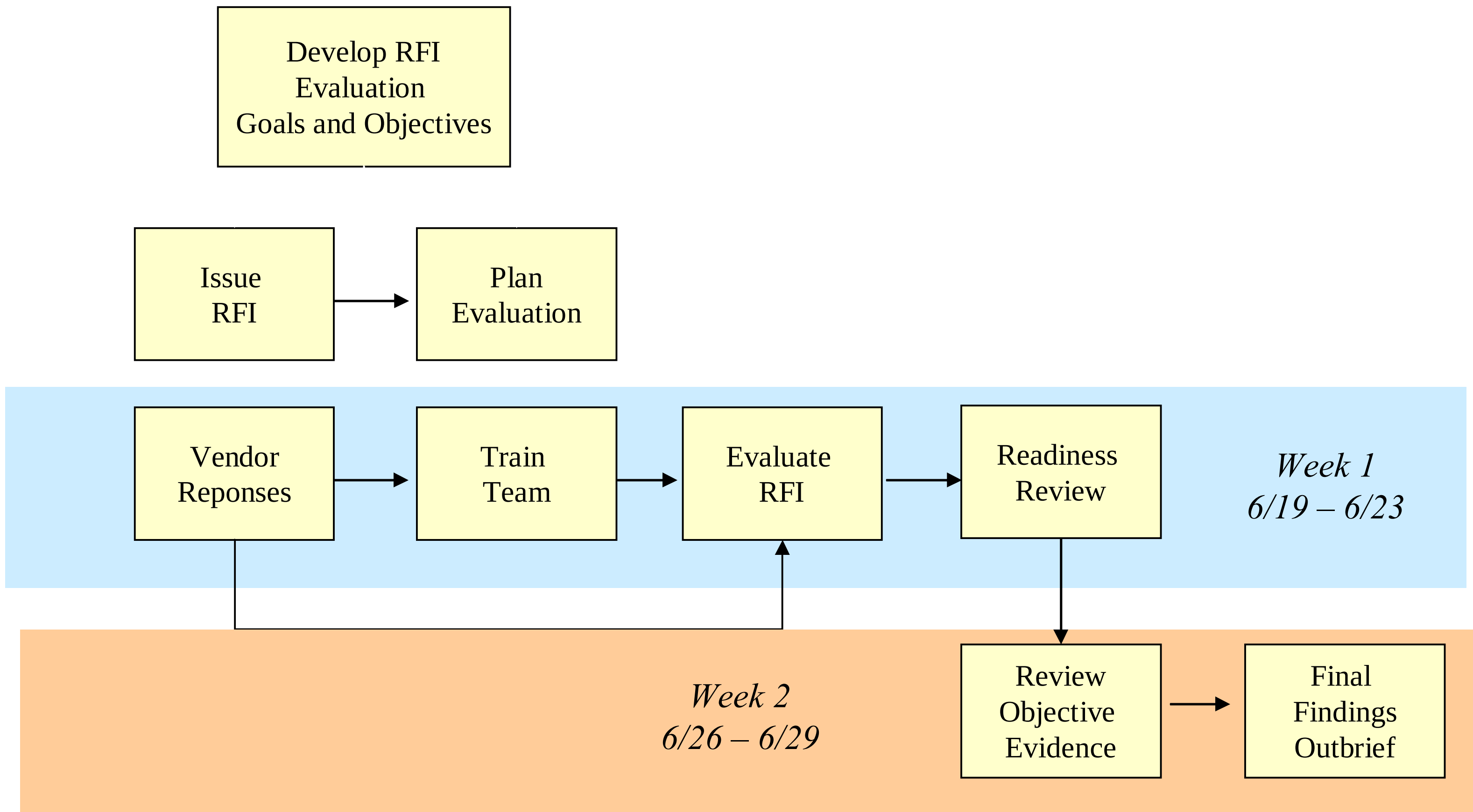
The actual artifacts for review by the SCAMPI Team

Summary of the CMMI-DEV®

Category	Process Areas
Process Management	Organizational Process Focus Organizational Process Definition Organizational Training Organizational Process Performance Organizational Innovation and Deployment
Project Management	Project Planning Project Monitoring and Control Supplier Agreement Management Integrated Project Management for IPPD Risk Management Integrated Teaming Integrated Supplier Management Quantitative Project Management
Engineering	Requirements Management **Requirements Development** **Technical Solution** **Product Integration** Verification Validation
Support	Configuration Management Process and Product Quality Assurance Measurement and Analysis Decision Analysis and Resolution Organizational Environment for Integration Causal Analysis and Resolution

Most Critical for Program

RFI Evaluation Process



Scope of the Evaluation

Eight of the original sixteen organizations chose to participate in the evaluation

This was not known until the first day of the evaluation

Three projects from each organizations were to be evaluated

Needed to scope the activities to match the available resources

Used variation of Nominal Group Technique to assist team in selection of critical Specific and Generic Practices from CMMI V1.1

The Challenge

Requirements Development: 10 Specific Practices

Technical Solution: 9 Specific Practices

Product Integration: 9 Specific Practices

Generic Practices (CL3): 36 Practices

Multiply by 8 Business Units and 3 projects per BU

1536 practices to be characterized in approximately 20 hours!

Three Dimensions

CMMI V1.1 Process Areas

- Most critical to program success
- Specific (performance) and generic (institutionalization) practices

Target Capability Level

- Indicated by fidelity to Generic Practices in each PA
- Target is Capability Level 3
  - Organizational processes
  - Tailored for program use
  - Stakeholder involvement
  - Monitoring and control
  - Driven by policy

Past Appraisal Data

- Appraisal Disclosure Statement

CMMI Scope – Specific Practices

Requirements Development

- Goal 1, Develop Customer Requirements, is excluded
- Establish Product Requirements
- Allocate Requirements to Components
- Identify Interface Requirements
- Establish CONOPS and Scenarios
- Validate Requirements

Technical Solution

- Evolve CONOPS and Scenarios
- Select Product Solutions
- Design the Product
- Establish Tech Data Package
- Design Interfaces
- Implement the Product Design

Product Integration

- Establish Integration Environment
- Manage Interfaces
- Confirm Product Readiness for Integration
- Assemble the Product
- Evaluate the Assembled Product
- Package and Deliver the Product

Generic Practices for Each PA

- CL3: Establish and Maintain Organizational Processes
- CL2: Plan the Process
- CL2: Involve Relevant Stakeholders

Typical Work Products

Requirements Development	*Requirements Specifications* *Allocation Tables* *Requirements Traceability Matrices* *Interface Control Documents* *SRR Presentations*
Technical Solution	*CONOPS* *Use Cases and Scenarios* *Unit Development Folders* *Source Code* *Rack Elevations*
Product Integration	*Integration and Test Plans* *Integration Test Results* *Pre-Ship Checklists* *System Inventory* *Shipping Documentation*

Review of Objective Evidence

Each offeror supplies the actual artifacts for the CMMI® practice listed in the PII matrix submitted earlier.

Appraisal team makes a judgment based on the artifact and ñcharacterizesòthe practice for each project by CMMI® process area.

Appraisal team aggregates the characterization to the BU level .

This is the same process used during a SCAMPI-A℠ with much less evidence, coverage and rigor.

Characterizing Practices

Low	*The intent of the model practice is judged to be absent or poorly addressed in the approach or deployment. Goal achievement is judged unlikely because of this absence or inadequacy.*
Medium	*The intent of the model practice is judged to be partially addressed in the approach or deployment. Only limited support for goal achievement is evident.*
High	*The intent of the model practice is judged to be adequately addressed in the set of planned or deployed practices, in a manner that clearly supports achievement of the goal in the given process context.*

Rating of CMMI Practice Characterization for the Business Unit (BU)

The BU Characterization is Red

Åwhen at least one of the instances is characterized Red

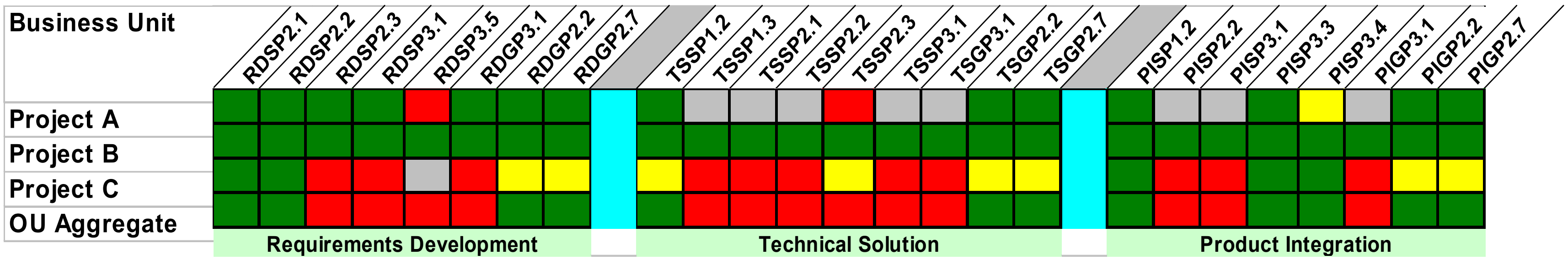
The BU Characterization is Yellow

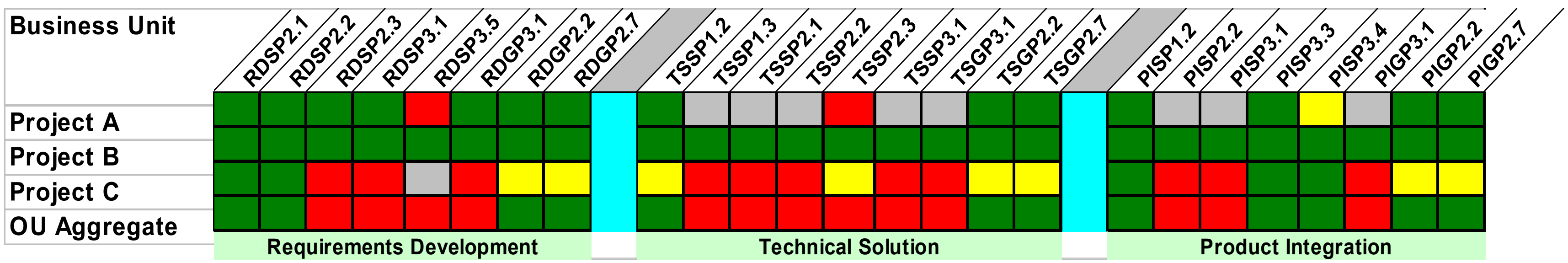
- when none of the instances are characterized Red, and fewer than two of the instances are characterized Green

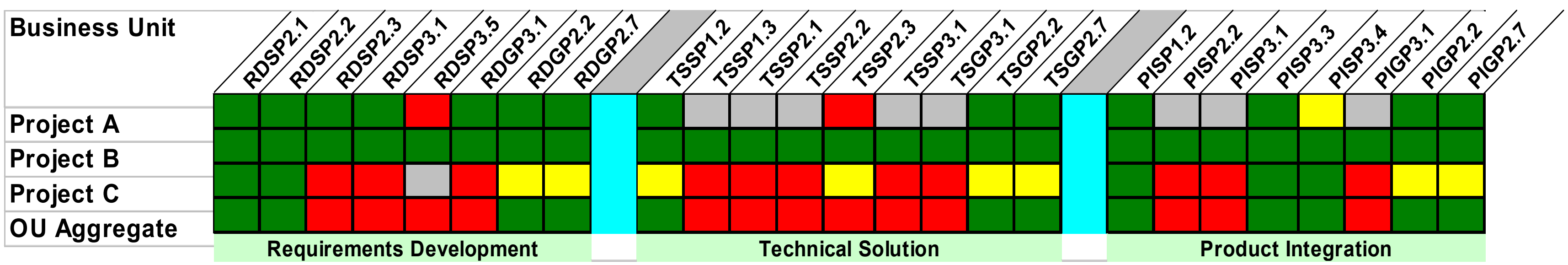
The BU Characterization is Green

- when at least two of the instances are characterized Green and none of the instances are characterized as Red.

Final CMMI Scope: 25 Practices, 200 Instances







Past Appraisal Data

Offerors were asked to submit relevant Appraisal Disclosure Statements (ADS) dated within the last 3 years

An ADS is generated each time that a SCAMPI^{SM}-A appraisal is conducted. The only way for a business unit to obtain a CMMI® Capability or Maturity Level is to conduct a SCAMPI^{SM}-A .

Every SCAMPI^{SM}-A consists of a model scope (CMMI® process areas) and an organizational scope (sample projects and support groups)

The current ADS in use leaves much room for variability in the amount of insight provided, thus the need for some expert analysis

Past Appraisal Data: Example

Submitted ADS (11/04) for the business unit ABC Systems.

Achieved ML3 which represents equivalence of CL3 in PA scope.

No projects listed on ADS. Cover letter indicates that one submitted project ŗparticipatedò

Lead by consultant lead appraiser with additional lead appraiser on the team.

Very little contextual information in ADS.

YELLOW

Combined Aggregated Results

Requirements Development

	Establish Product Requirements	Allocate Product Requirements	Identify Interface Requirements	Establish CONOPS and Scenarios	Validate Requirements	Establish a Defined Process for RD	Plan RD Process	Involve Stakeholders in RD Process
Offeror #1	H	H	H	H	H	H	H	H
Offeror #2	H	H	H	H	H	H	H	H
Offeror #3	H	H	H	H	H	H	H	H
Offeror #4	H	H	H	H	H	M	H	H
Offeror #5	H	H	L	L	L	L	H	H
Offeror #6	H	L	H	L	L	H	L	L
Offeror #7	L	L	L	L	L	L	L	L
Offeror #8	L	L	L	L	L	L	L	L

Technical Solution

	Evolve CONOPS and Scenarios	Select Product Solutions	Design the Product	Establish Tech Data Package	Design Interfaces Using Criteria	Implement the Design	Establish a Defined Process for TS	Plan TS Process	Involve Stakeholders in TS Process
Offeror #1	H	H	H	H	H	H	H	H	H
Offeror #2	H	H	H	H	H	H	H	H	H
Offeror #3	H	M	H	H	H	H	H	H	H
Offeror #4	H	H	H	H	H	H	M	H	H
Offeror #5	H	L	L	L	L	L	L	H	H
Offeror #6	L	L	L	L	L	L	H	L	L
Offeror #7	L	L	L	L	L	L	L	L	L
Offeror #8	L	L	L	L	L	L	L	L	L

Product Integration

	Establish Integration Environment	Manage Interfaces	Confirm Readiness for Integration	Evaluate Assempled Product	Package and deliver Product	Establish a Defined Process for PI	Plan PI Process	Involve Stakeholders in PI Process
Offeror #1	H	H	H	H	H	H	H	H
Offeror #2	H	H	H	H	M	H	H	H
Offeror #3	H	H	H	H	H	H	H	H
Offeror #4	H	H	H	H	H	M	M	H
Offeror #5	H	L	L	H	H	L	H	H
Offeror #6	M	L	L	L	H	H	L	L
Offeror #7	L	L	L	L	L	L	L	L
Offeror #8	L	L	L	L	L	L	L	L

ddressed Yellow Questionable Red Not Addressed

Qualities of Relevant Past Performance
Aggregate

Screening Gate

Criteria	One	Two	Three	Four	Five	Six	Seven	Eight
1. Rapid Prototyping	Y	G	G	R	R	G	Y	Y
2. Transitioning software prototypes to operations	G	R	G	Y	R	R	Y	Y
3. Service Oriented Architecture	Y	R	Y	R	G	G	G	G
4. Modular design that accommodates new interfacing systems and growth to enhanced protection levels	Y	Y	G	R	Y	G	G	Y
5. Systems engineering, integration and software development processes	Not Pass	Not Pass	Pass	Pass	Pass	Pass	Pass	Not Pass
6. EITC and NSA Enterprise Architecture compliance	R	R	R	R	R	Y	Y	G
Aggregate								

Qualities of Relevant Past Performance

Aggregate
(Using Process as a gate)

Weight	Evaluation Criteria	Three		Four		Five		Six		Seven	
0.2	1. Recent performance record in developing, producing, and delivering rapid prototypes or capabilities in Spins or Spirals.	10	2	1	0.2	1	0.2	10	2	5	1
0.2	2. Recent performance record in transitioning software prototypes to operational status.	10	2	5	1	1	0.2	1	0.2	5	1
0.2	3. Recent performance record in developing a service oriented architecture with a foundation of logical core services that enables the system to be extended over time.	5	1	1	0.2	10	2	10	2	10	2
0.2	4. Recent performance record in the development of a scalable, extensible, and modular design that accommodates new interfacing systems, changes to interfaces, and growth opportunities to enhanced protection levels.	10	2	1	0.2	5	1	5	1	10	2
0.2	6. Recent performance record in integrating new COTS capabilities into customer legacy systems with EITC and NSA Enterprise Architecture compliance.	1	0.2	1	0.2	1	0.2	1	0.2	5	1
1	Total Scores		7.2		1.8		3.6		5.4		7
	Rating	Highly Competitive		Competitive		Highly Competitive		Highly Competitive		Highly Competitive	

GREEN = 10
YELLOW=5
RED=1

Lessons Learned

The Advisory Multi-step Request For Information (RFI) is an excellent mechanism for identifying contractor viability.

Using the CMMI© and SCAMPI℠ to verify process maturity of future offerors during the RFI evaluation was valuable and proved to be a useful ŗgatingò mechanism

If Appraisal Disclosure Statements rate very high in relation to timeliness, correlation of sample projects, CMMI scope, etc, use that project data versus inspecting CMMI artifacts

Offerors should be advised that they have the option to also submit final findings or other contextual information to accompany any relevant ADS

Offerors should be given a firm requirement for data format (e.g. CD, DVD, etc) and not allowed to deviate

Questions

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Linking Project Performance to CMMI Process Capability through Lean Measurements

CMMI® Technology Conference and User Group
November 14, 2007

Jeffrey L. Dutton
ITSS Chief Engineer
Jacobs Technology, Inc.

JACOBS

Lessons Learned fromé

Å 5 organizations: Jacobs and Government

Å About 75 projects

Å Over three years

What we will discussé

Å Perspectives of project performance

Å Relationships of performance to process capability

ï Project level

ï Organizational level

Å How Lean can help

Å Conclusions and summary

yada yadaé .

Å Chief Engineer, Jacobs Technology/ITSS

Å SCAMPI Lead Appraiser

Å (lean) Six Sigma Black Belt

Å Member of the Steering Committee and Co-Chair of the Software Committee, NDIA Systems Engineering Division

Å Visiting Scientist, Software Engineering Institute

Å Experience:

ï Project Manager, Software Development

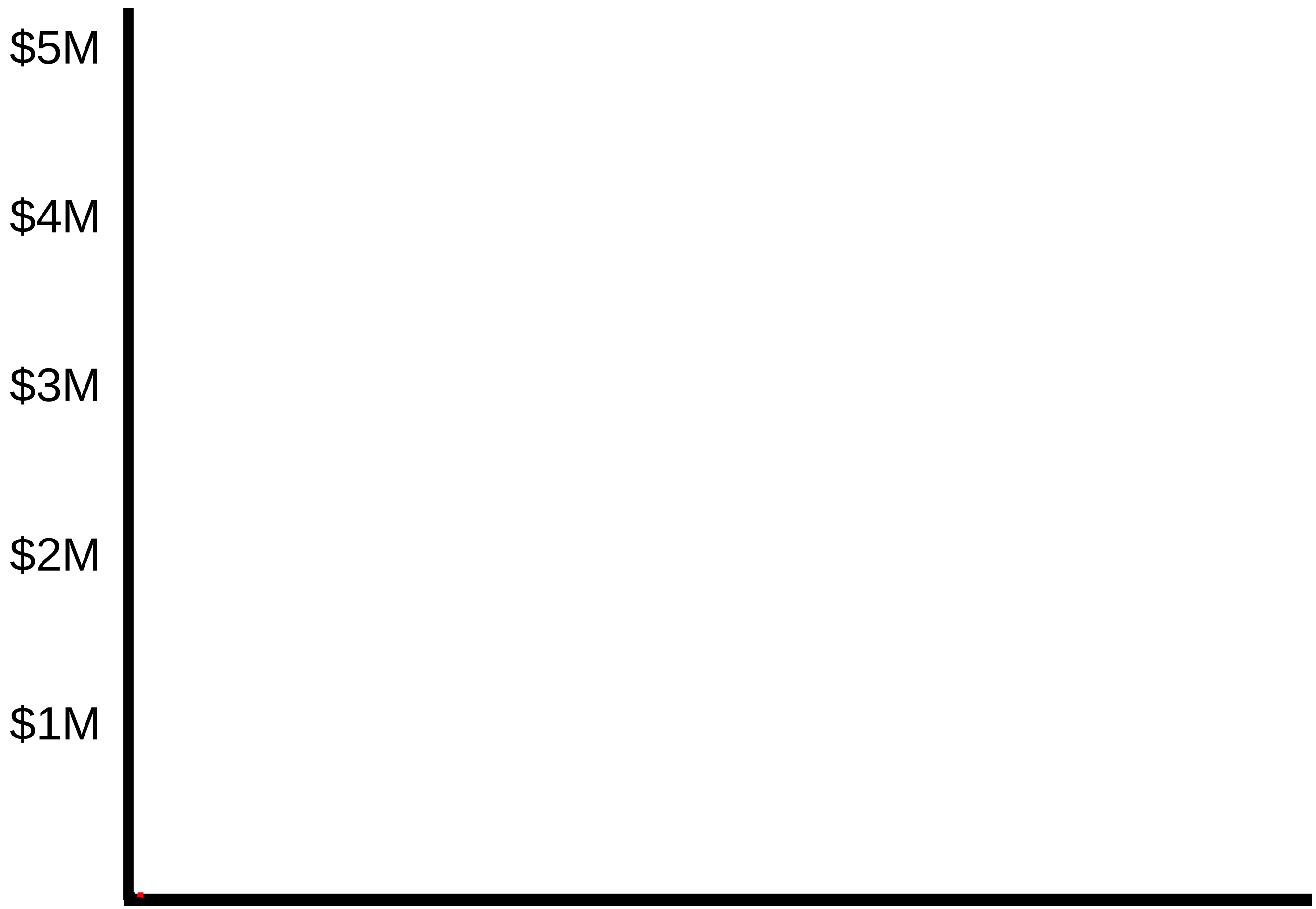
ï Systems Engineer, Advanced Research Center

ï Program Manager ï Air Force Systems Acquisition and Development

ï B.S. Aerospace Engineering

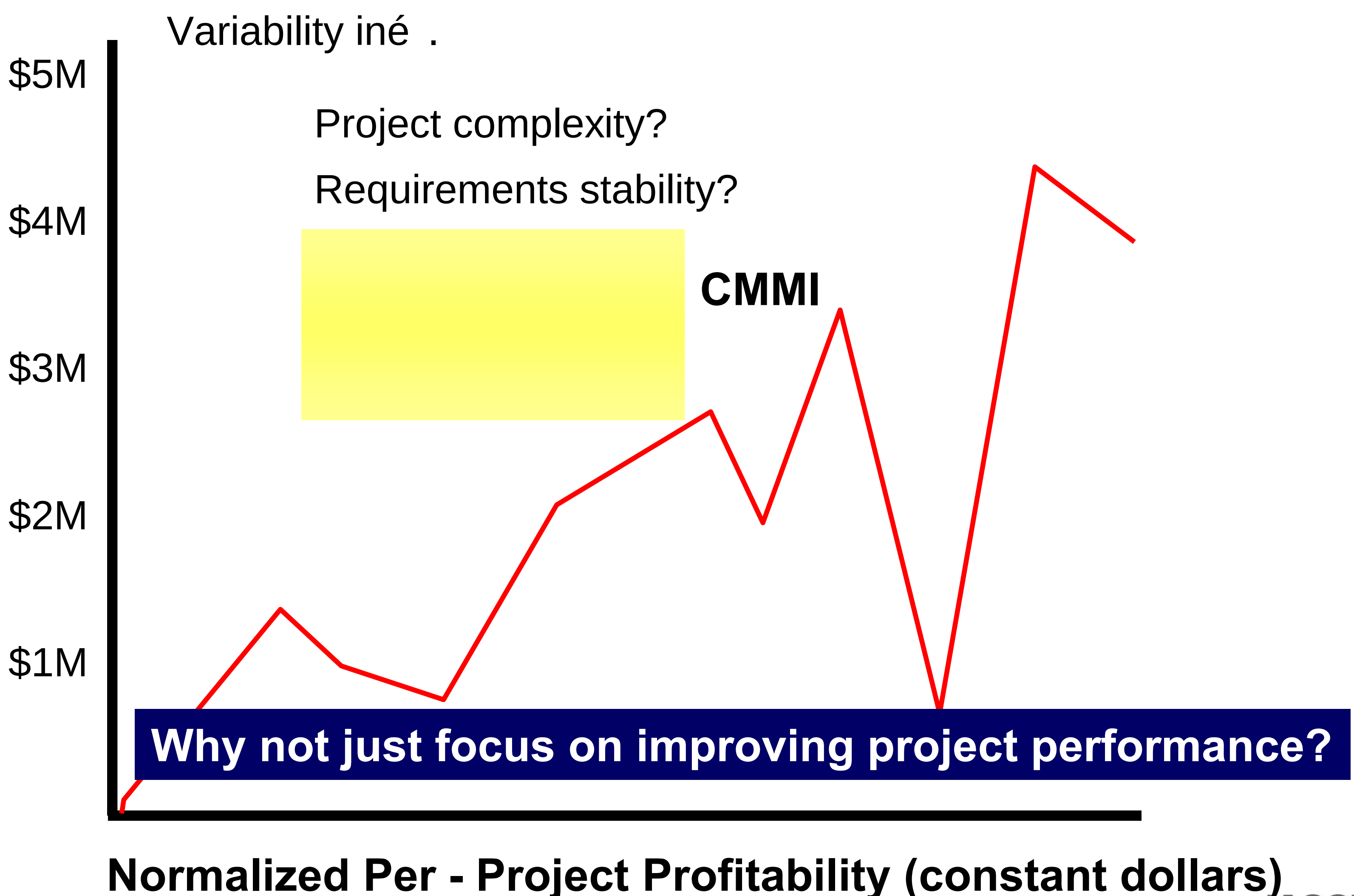
ï M.S. Operations Research

A Sample Project Performance Measure…



Normalized Per - Project Profitability (constant dollars)

What may be causing the variability?



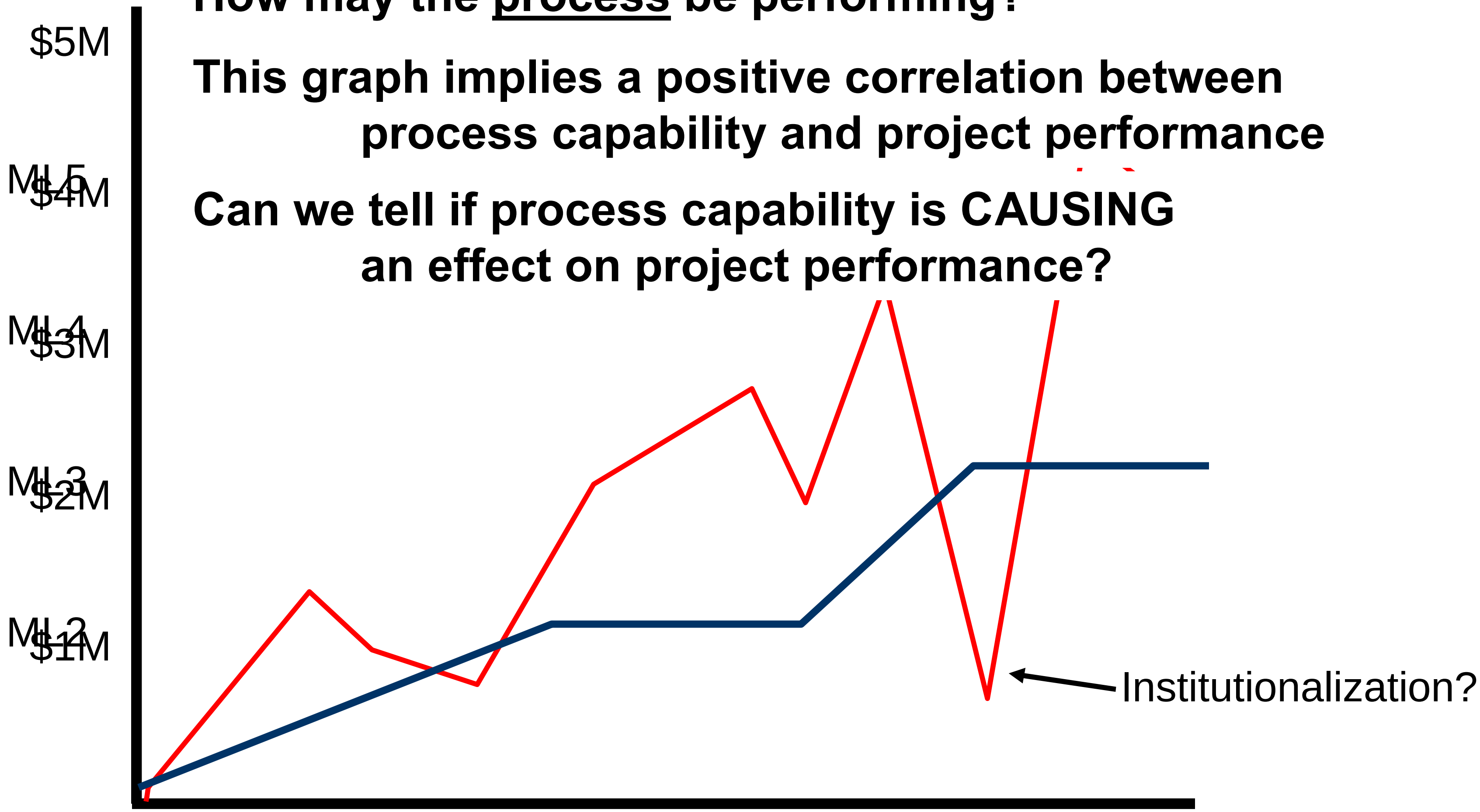
JACOBS

How mature/capable is the process?

How may the process be performing?

This graph implies a positive correlation between process capability and project performance

Can we tell if process capability is CAUSING an effect on project performance?



Normalized Per Project Profitability (constant dollars)

JACOBS

Degrees of Coupling….
(between process capability and project performance)

- Completely unknown and uninvestigated relationship between process capability and project performance
- Multi-variate correlation of process capability and project performance
  - Heuristic at ML 2 and 3
    - (perhaps gross correlations to CL or ML)
  - Statistical at ML 4 and 5
    - (performance/quality attribute to sub process capability)
- Causal analysis of project performance based in part on process capability
- Process capability DRIVEN by project performance goals
  - and enabled by ORGANIZATIONAL process-performance

JACOBS

(added)

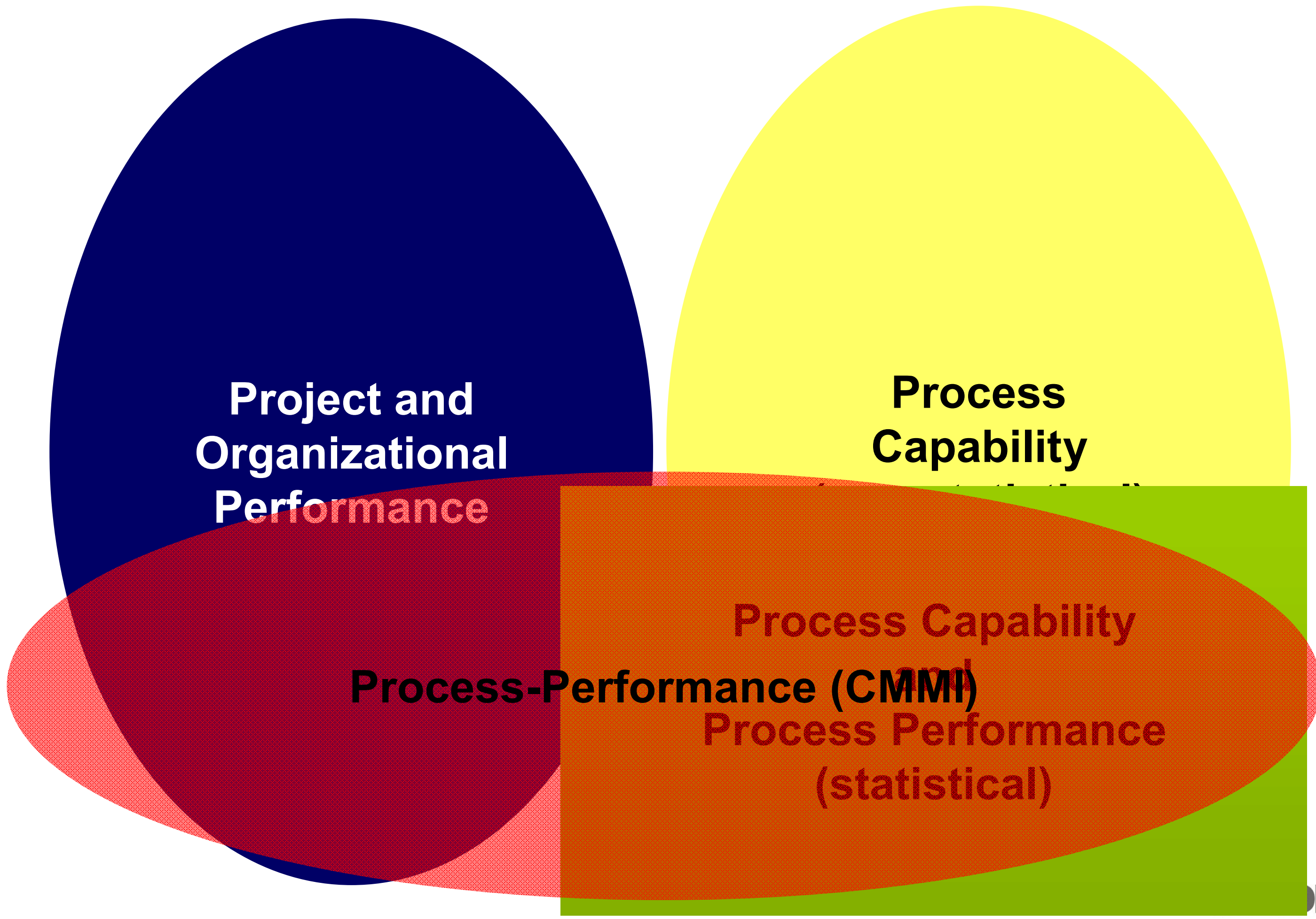
ML 1

ML 2

ML 3

ML 4

ML 5



Relationships Between Process & Performance

So what are the basic relationships between process capability and project performance?

Å Projects can perform well without mature or capable processes
  ï Just not consistently

Å Capable processes are NO guarantee of project performance
  ï (even at ML 4 and 5)

Å To guarantee that our process improvement effort will result in improvements in project performanceé
  ï We are led to what conclusion?

PROCESS IMPROVEMENT SHOULD BE TIGHTLY COUPLED TO PROJECT PERFORMANCE

Project Performance Needs → Should drive → Process Improvement

How can Lean help?

Link project performance to process capability early?

Å Lean (Kaizen) rapid improvement events

- ï Are based on initial and target performance measures
- ï Are driven by the customer view
  - Å (i.e. reflect business needs from the projectôs perspective)
- ï Include project workflow performance measures
  - Å Current state
  - Å Goal state
  - Å Ideal state

Map to process capability?

Å Examples of Lean project performance measures:

ï Product cycle time	**Process Performance**
ï Defect profiles (life cycle phase/time in system)	**Product Performance**
ï Degree of synchronization	**Process Performance**
ï Waste eliminated (dollars/life cycle)	**Process Performance**

ntegrated SCAMPI Appraisals

Å Alternative practices

ï ñLeanedòspecific or generic practices are supported

ï May end up with a greater number of SPs

Å (e.g. Project Planning)

Å Process-performance (High Maturity)

ï Process-performance baselines

ï Process-performance models

ï Could well include lean process-performance

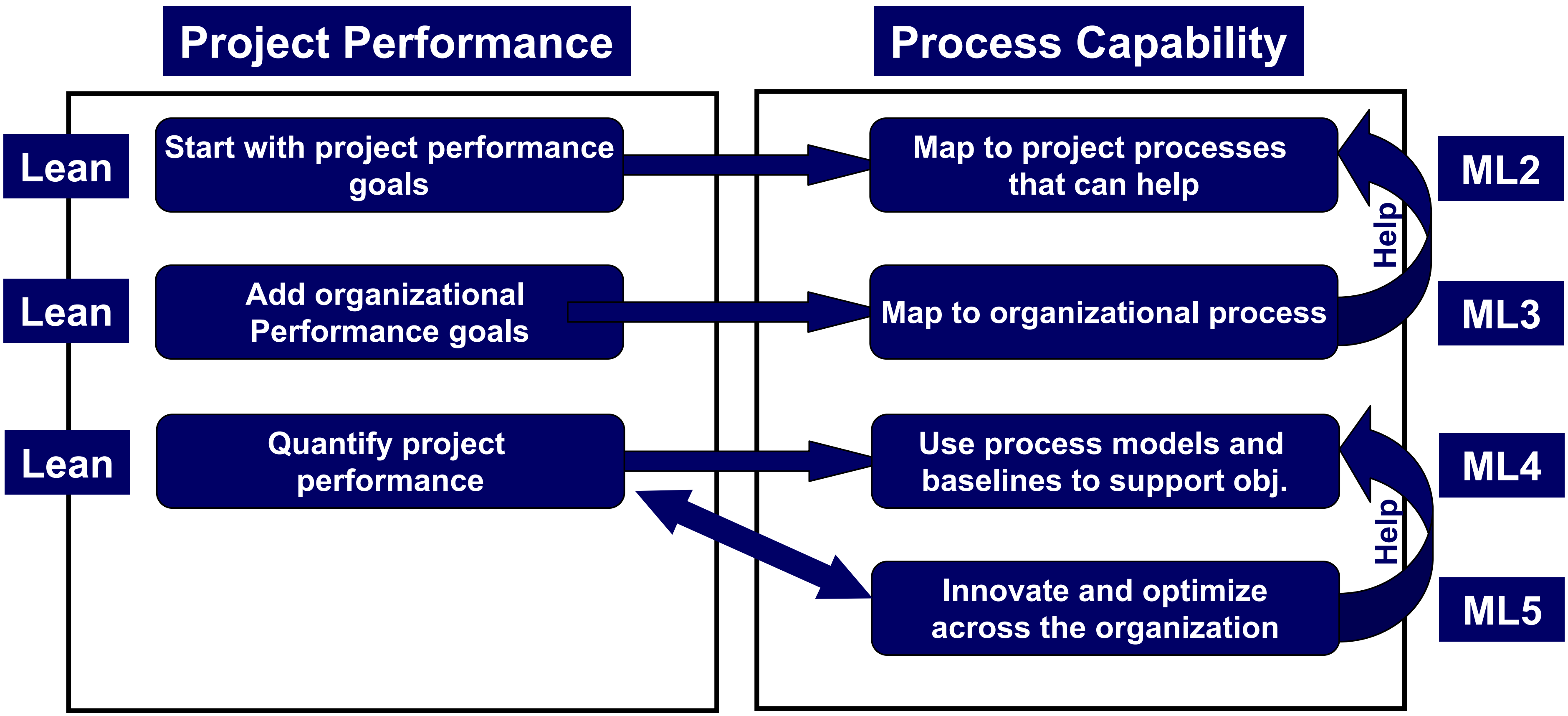
Å Non-model findings

ï Lean attributes

Å Consistency of iterations

Å Waste identified

Dynamic Relationships



Soé how do we do this?

Å ML 2 Managed
- ï Project process capability begins to mature

Instill (Lean) project performance goals early – may be out of process scope

Å ML 3 Defined
- ï Organizational processes are defined (Lean as well?)
- ï Relationship between organizational and project processes is first established

Ensure the organization enables lean projects to perform ï all in scope

Å ML 4 Quantitatively Managed
- ï Statistically stable processes
- ï Process-performance baselines and models are established at organizational level (OPP)
- ï Process-performance is managed at project level (QPM)

Statistical control of processes and coupling to process-performance

Å ML 5 Optimizing
- ï Process-performance is continually improved

Optimizing ï boundless opportunities to improve process-performance

What does Lean/CMMI integration do for us?

- Puts process capability and project performance in the same space/time continuum (at ML1)
  - Forces us to pay attention to both at the same time
  - Before process-performance considerations at CL/ML 4 and 5
- Allows us to relate process capability and project performance BEFORE CL/ML 4 and 5
  - Which means we deal with process architecture issues much earlier
  - Which means our processes perform better earlier (heuristically)
  - Which means we pay attention to project PERFORMANCE from Day 1 (as a driver?...)

Summary

Å Lean supports integration of project performance considerations at ML1, ML2, and ML3
- ï Focus and priorities for process improvement effort
- ï Includes product quality as well as project performance

Å Lean provides direction for process-performance models and baselines
- ï Lean organization will help projects perform better
- ï Lean organization will help projects produce higher quality products

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ing My Organization for an Appraisal, but I'm Not Really Sure I Understand this PIID Thing.

Should I worry?"

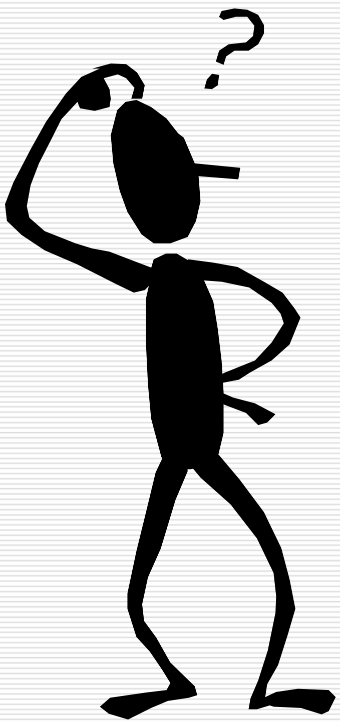
Sam Fogle
ACE Guides, LLC

YES!!!!!!

Agenda

- Why?
- What?
- How?

Why?



Appraisal Checklist

- ❑ Secure Lead Appraiser
- ❑ Confirm Other Team Members
- ❑ Reserve Rooms
- ❑ …
- ❑ Arrange for Snacks
- ❑ Create PIID
- ❑ Get Flip Chart and Markers

Misconceptions

- "Creating a PIID looks straightforward, I'll have our summer intern do it the week before the Readiness Review."

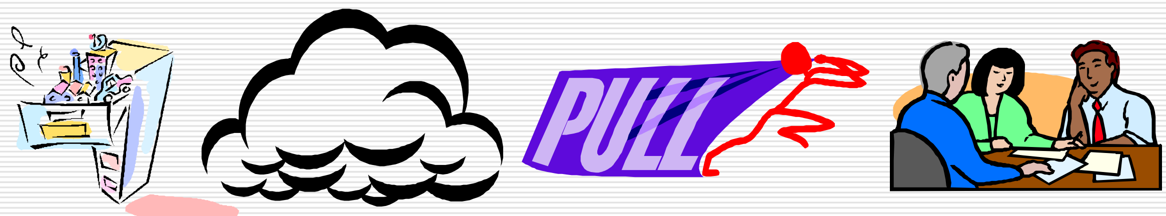
- "This is just a guide anyway. Even if it is wrong, it is the appraisal team's duty to find the right stuff."

- "If 2 pieces of evidence per practice is good, 10 pieces should be 5 times as good."

Appraisal Models

1. Push

2. Pull
   (Discovery)



Discovery requires that the team do a search for evidence for each practice

SCAMPI pilots took more than a month

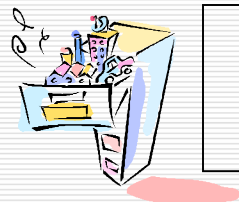
Process needed to be streamlined

Appraisal Models (2)

Accuracy

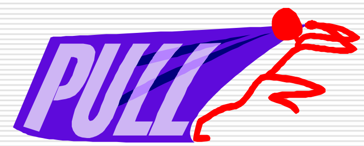
Time (Cost)

Appraisal Models (3)

3. Verification 

Mapping

(PIID)



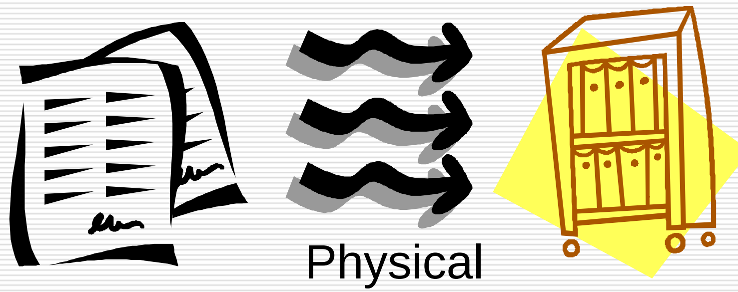
Verification has the organization provide a map that indicates what evidence is appropriate for each practice

The appraisal team reviews the evidence and only needs to search when the data provided is not clear or convincing

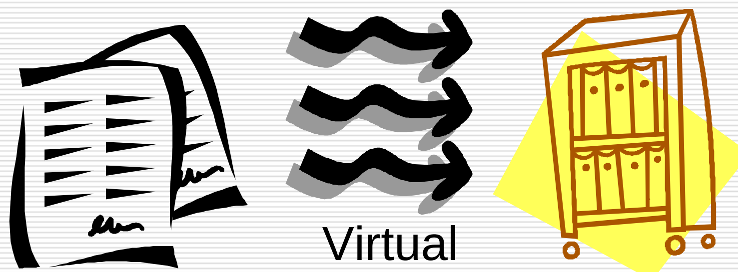
What?

es a PIID Look Like?

- Paper



- Electronic*



*Strongly recommended when not prevented by security/access issues

Window Help | Type a question for help

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Reply with Changes... End Review...

A1

Project Planning

Row	Status		Key Practice / Notes	Source of OE	Document (s)	Comments	ORG	Project 1	Project 2	Project 3	Project 4	Direct	Indirect	Affirmation	Information Needed	Rating (FI, LI, PI, NI, NY)
4		SG1	Estimates of project planning parameters are established and maintained.													
5		SP1.1	***Establish a top-level work breakdown structure (WBS) to estimate the scope of the project.***													
6			**Appraisal Considerations:** - Determination of WBS usage for this practice must be based on top-level WBS only, not its fully elaborated and expanded form as referenced in subsequent practices of this PA - Top-level work breakdown structure should be driven by and linked to specified product requirements. (See Requirements Management PA) - See Supplier Agreement Management process area for more information about acquiring work products from other sources external to the project - Level of supporting documentary evidence will vary based on project size/duration. Larger projects may have minutes from estimation meetings, estimation teams, and tools use, etc. Smaller may have none. Appraisal team will need consensus on the WBS elements that will be expected. See PP SP1.4-1 for derivation of detailed work breakdown structures from top-level work breakdown structures.													
7			**Direct Artifact Example:** - Work Breakdown Structure - Top-level WBS revision history													
8			**Indirect Artifact Example:** - Task descriptions - Work product descriptions - Product requirements, product roadmaps - Organizational standard WBS template - Identification of work products (or components of work products) that will externally acquired.													
9		1														
10		2														
11		3														
12		4														
13		5														
14		6														
15		7														
16		PF														

Instructions / REQM / PP / PMC / SAM / MA / PPQA / CM / RD / TS / PI / VER / VAL / OPF

Ready NUM

Data Types

- Direct Evidence – needed for every practice
- Indirect Evidence – not necessarily for EVERY practice*
- Quiz 1: What type of evidence is a set of meeting minutes? It Depends
- Quiz 2: How many do you need of each type? It Depends

*Talk to your Lead Appraiser

An appropriate set of artifacts?

- Enough to convince the team that a practice has been fully implemented*

- But NOT everything you can think of

*Talk to your lead appraiser

How?

Who should build your PIID?

What kind of knowledge is needed?

- Understanding of the CMMI practices
- Understanding of the SCAMPI method
- Understanding of how the project’s data is organized

Do you have one person with all 3?

If not, then you need a team

Tool Questions

- Does your Lead Appraiser have a tool that they recommend?
- Will you use the data for internal purposes?
- How easy is it to put data in and get it out?
- How easy is it to correct/update the data?

Quality Tips

- Involve team members in quality checks
- Don’t wait for Readiness Review to check the quality of the PIID
- Evolve PIID over a series of appraisals
- Effort devoted to PIID (including quality checks) should be proportional to the importance of achieving the ratings

Remember: having an inaccurate PIID does not just make it harder to find the correct data, it may convince the team that appropriate data does NOT exist

Time & Cost

- PIID development can be the major driver of total appraisal cost
- Data collected over a set of appraisals where the organization tracked internal effort, showed PIID preparation to be ~60%
- Total PIID effort (development, quality, rework, quality, …) can run to ~40 hours per PA per project
  - Level 2, 3 projects => 5 person months
  - Level 3, 3 projects => almost a person year

Potential Work Saver

Is standard process detailed enough so that it will be fairly consistent from project to project where a specific type of data will be found?

Provide the projects with a PIID that already tells them where to find the evidence.

e.g.

PP SP 2.2 Identify Project Risks

see section 3.4 of the project Risk Management Plan

[illegible]paration

If done poorly

- Can consume vast resources to prepare
- Will reflect a poor understanding of what is needed
- Will cause appraisal to proceed very slowly
- Can confuse the true state of the practice

If done well

- Will require limited restarts or rework
- Accurately reflects the work done in the organization
- Provides an efficient means for an appraisal team to find appropriate evidence
- Identifies appraisal risks by uncovering holes in implementation

Questions

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NDIA 7th Annual
chnology Conference and Users Group
November 2007

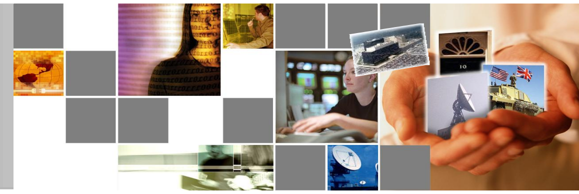
How to Kick Start a Process Improvement Project to Achieve a CMMI Rating

Brenda F. Hall
Computer Sciences Corporation (CSC)

EXPERIENCE. RESULTS.

Background:

- A decision has been made by the Powers that Be that a particular program should "get a CMMI level 3 ratingñ
- A search is made for a Process Engineer to lead this effort and make this happen
- You get the assignment
- Now what?
- The purpose of this presentation is to guide you on how to **kick start this effort**
- ***Process Engineer: START YOUR ENGINE***



EXPERIENCE. RESULTS.

ÅYour first ***task*** is to determine what it means, exactly, to "get a CMMI level 3 rating".

ÅAs the Process Engineer, not only must you decipher the goal and rephrase it into laymen's terms that are ***actionable*** and ***achievable***, but you must also determine what needs to be done to satisfy this goal in terms of :

ï Resources, including Consulting Support from Corporate Management

ï Teams, Boards, Steering Committee

ï Plans, schedules, procedures

ï Baselines, databases, tools, working aids

ï Training

ÅThat's just to name a few basics for getting started

ÅBut, the first ***question*** that must be answered with a resounding "YES" is:

Do you have Executive Sponsorship?

ÅSenior Management must sponsor and champion this cause or there is no way it can be successful.

ÅSo, if the answer is NOT Yes, then you really do not have authorization to proceed, nor should you.

ÅBut, if the answer IS Yes, you have a lot of work to do.

ÅLet's examine the activities, tasks and support that must be initiated to ***kick start this effort*** and

institute an infrastructure

for implementing a process improvement project

to achieve a CMMI rating.

EXPERIENCE. RESULTS.

ÅEstablish a Process Team to Facilitate the Process Improvement Project

- ï Assign the Process Engineer as Chairperson
- ï Assign Process Team Members
  - Å Subject Matter Experts
  - Å Support Organizations
  - Å Relevant Stakeholders

ÅDevelop a Project Schedule

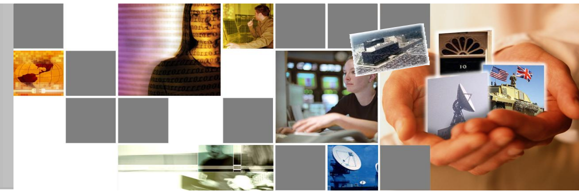
ÅEstablish a Measurement Program

ÅEstablish the Process Improvement Infrastructure

- ï Process Baseline
- ï Change Request Systems
- ï Measurement Repository
- ï Meeting Minutes and Action Items
- ï Corrective and Preventive Actions
- ï Practice Implementation Indicator Descriptions (PIIDs)

- Establish Governance
  - Program Directives
  - Process Improvement Plan and Schedule
  - Steering Committee
  - Configuration Control Board (CCB)
- Align Process Improvement Activities with Parent Organization and Corporate Organization
- Formally Introduce the Process Improvement Project and Team to the entire program

Planning

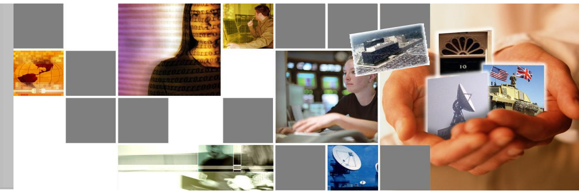


Å Ensure Process Team members are trained in:
- ï the CMMI ï formal, instructor-led, 3-day class
- ï Process Architecture and Modeling
- ï Process Concepts
  - Å Institutionalization
  - Å Process Maturity
  - Å Process Capability
  - Å Process Performance

Å Ensure Program Leadership receives a CMMI overview

Å Ensure Program Staff Members receive a CMMI in-depth briefing

Å Address Process issues:
- ï How do we begin the process improvement effort with our current process assets?
- ï What measures are needed in addition to the ones we are currently collecting, analyzing and reporting?
- ï What information exists throughout the company that we can leverage?



ÅResolve Interpretation Issues
- ï Determine the organizational elements, processes and practices that will be in scope
- ï Determine *"alternate practices"*

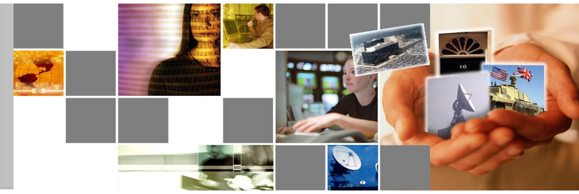
ÅApply the CMMI
- ï Conduct a gap analysis (or a series of gap analyses) of the CMMI against existing processes and practices
- ï Develop action plans for closing gaps

ÅImplement the PIP and the action plans

ÅPopulate the PIIDs with evidence

ÅPrepare for appraisals

Communicate, Communicate, Communicate



Interpretation Issues - <u>Scope</u>

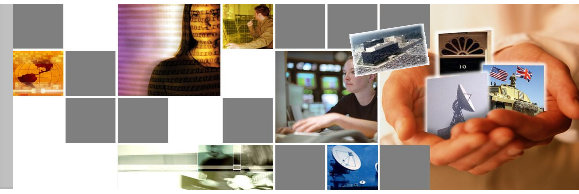
Å**What element(s) of the organization can be considered a “project”?**

- ï Develop a Program Profile document that contains information about all projects.
- ï Determine from the profile which elements of the organization can be considered a project
- ï Based on the work being performed, security issues, etc. select the candidate projects and any other participating elements (e.g., the PMO).

ÅBased on the work performed on the program:

- ï **What processes are being followed? Customer processes? Your Company processes? Subcontractor Company processes?**

This will determine what processes are in scope and what processes are out of scope



Interpretation Issues - <u>Scope</u>

- Requirements Issues
  - **What are requirements?**
  - **What constitutes a Requirements Traceability Matrix?**
  - **What evidence exists to show bidirectional traceability of requirements?**
- Planning Issues
  - **How do we estimate size, effort, cost and schedule?**
  - **Are the methods in which risks are being identified, analyzed and tracked sufficient?**
  - **Do we develop a WBS for each organizational element?**
  - **If not, what constitutes a WBS?**
- Supplier Agreement/Procurement Issues
  - **Does the SAM PA apply?**
  - **If so, based on the work performed on the program, is the procurement of labor in scope (purchasing labor services)?**
- What practices may be considered “*alternate practices*”?

Å Conduct a gap analysis of the CMMI against existing processes and practices

Å Develop action (***get well***) plans for closing gaps
- ï Build the actions into the Project Schedule
- ï Monitor and track the completion of all
- ï actions

Å Manage the implementation of the PIP
- ï Process Team-manage the activities with the guidance of the Steering Committee
- ï CCB-review and disposition changes to the process baseline

Å Populate the PIIDs with evidence

Å Prepare for appraisals

ctors

EXPERIENCE. RESULTS.

ÅExecutive Sponsorship

ÅDedicated, CMMI trained Process Improvement Project Staff

ÅProcess Baseline

ÅRegular, frequent communication about progress and needs

- ï Process Team Meetings
- ï Steering Committee Meetings
- ï CCB Meetings
- ï All Hands Meetings
- ï Status Reports
- ï Newsletters, Posters, Flyers, Broadcast email messages, mementos, etc.

ÅRecognition and Reward Program

ÅFeedback on progress (internal reviews, SCAMPI C, SCAMPI B)

- Engage the SCAMPI Lead Appraiser in the early planning stages and continue communication until the rating is achieved
- Ensure that your organization has a representative on the SCAMPI Team
- Begin preparation for evaluations at least two months in advance and manage the logistics
- Ensure that Senior Management is aware of any barriers or obstacles

Sound the Alarm

ÅAs a Process Engineer responsible for preparing a program to achieve a CMMI rating, it is important that you realize that this effort may take 18-24 months of project activities.

ÅThe guidelines in this presentation should help you get started.

ÅQuestions????

Sponsored by the U.S. Department of Defense

The Process In-Execution Review (PIER) After Three Years

Dale Swanson, MITRE
Lynda Rosa, MITRE
Jennifer Hoberman, MITRE

November 2007

SM **SCAMPI is a service mark of Carnegie Mellon University**
® **CMMI and Capability Maturity Model are registered in the US Patent and Trade Office**

MITRE

Approved for Public Release – Distribution Unlimited

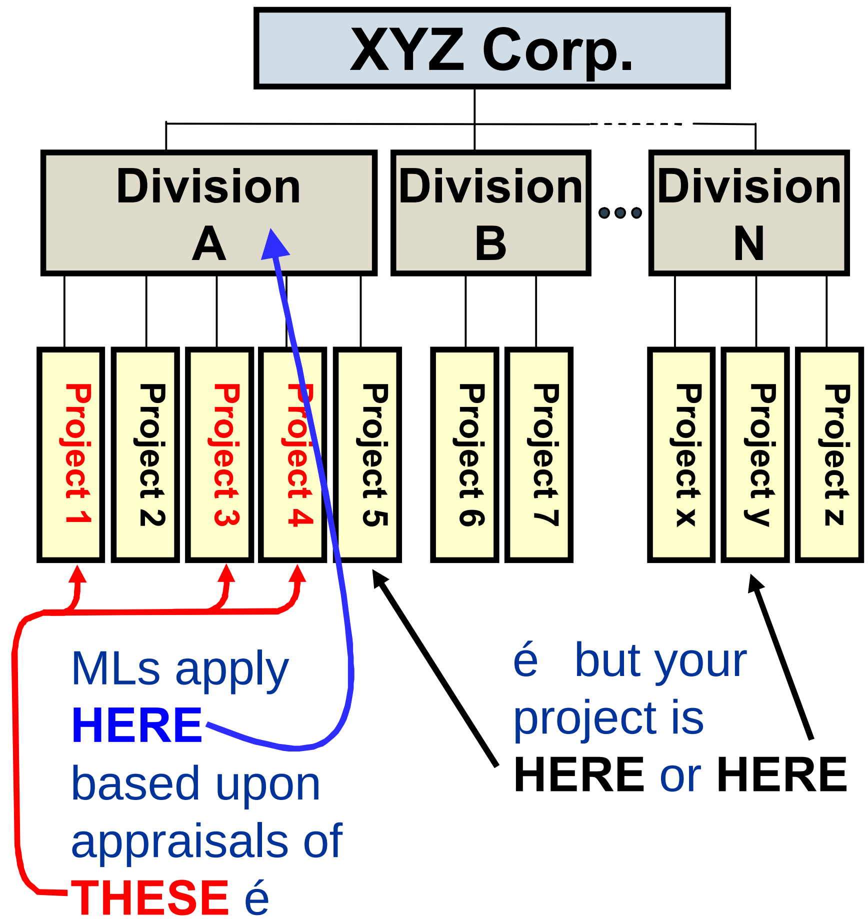
- Original Problem Statement
- Overview of the PIER
- Experiences and Lessons Learned
- Outlook for the future

blem Statement

- Most DoD contractors claim high Maturity Levels (Level 3 and above) as measured by the Capability Maturity Model Integration (CMMI), yet performance of individual projects does not reflect that maturity.
- How can the Government leverage the CMMI to close the performance gaps on their programs?

Organizations → High Maturity Projects

- **Maturity Levels are indicators of organizational *potential performance*.**
- **They describe how the next project *may perform* based on a *sampling* of existing projects.**
- **Maturity Levels reside at the organizational level and are *not* an indication of how an individual project *is performing*.**
- **Project instances may be situated in a *different time frame* and in a *different part* of the organization.**



MITRE

- Original Problem Statement
- Overview of the PIER
- Experiences and Lessons Learned
- Outlook for the future

troduced in 2004 for ESC

- Process In-Execution Review (PIER)
  - Adapts the SCAMPI B/C method for assessing development contractor process performance during source selection and contract execution
  - Applies to specific projects versus organizational level
  - Exposes risks to project execution – early or “leading” indicator
  - Tailored to focus on process areas of most interest
  - Considers the appropriateness of the process for the program
    - Our observation is that this is a major difference between SCAMPI and PIER
- Goals
  - Execute projects at higher maturity levels
  - Improve overall cost, schedule, and technical performance
  - Tie process improvement goals and accomplishments to earned value and award fee to reinforce desired behaviors

sessment Needs

SCAMPI Method A
- Institutionalization
- Organizational focus
- Rigorous, expensive
- Ratings

- *Resource intensive*
- *Limited utility for full and open source selection*

SCAMPI Method B
- Deployment and execution
- Evidence of implementation
- What they are doing

- *Contract monitoring*
- *Competitive downselect*
- *Limited utility for full and open source selection*

SCAMPI Method C
- Approach
- Plan for execution
- What they will do

- *Contract Monitoring*
- *Full and open source selection*

dology

- Assess risks associated with process development/tailoring and execution pre-contract award
- Assess risks associated with process tailoring, execution, adherence, and capability during contract performance
  - Select process areas relevant to project's timing and activities
  - Assess process appropriateness
- Follow SCAMPI Methodology
  - Interview questions based on model tailored as appropriate
  - Artifact examination based on performance, quality, specific program process requirements, and risk
  - Observe strict confidentiality – non-attribution
  - Team, contractor, sponsor only
- Results in actionable findings by Program Office and/or Contractor
- Approach PIER collaboratively whenever possible

MITRE

- Original Problem Statement
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… Problems Found During PIERs

- Contractor proposed tailoring for specific processes
  - Government later discovered that tailoring meant “tailor out” processes that were appropriate and applicable for the program (e.g., configuration management)
  - Project specific plans and processes not developed when needed; out of date or boiler-plate content obviously not used
- In depth look into execution of processes, evidence provided by program artifacts, and staff interviews tell a different story than is often represented in management reviews
  - Need to check up on corrective actions
- Software development processes inadequate
  - Lack consideration of program specific risks especially for software assurance
  - Lack firmware development plans especially for programmable devices

Problems Found During PIERs (continued)

- **Product quality and completeness is secondary to "on time" delivery**
  - **Management unresponsive to quality reports and audits especially during development activities**
- **Development configuration control is often inadequate or non existent**
  - **Software builds especially before critical design reviews**
  - **Documentation**
  - **Work products driving the design not reviewed, signed, final or under configuration control**
- **Inadequate risk management programs**
  - **Abandon process**
  - **Not full team participation/filtered risks**
- **Contractor not taking benefit of lessons learned from other programs**
- **Inadequate stakeholder planning and involvement**

MITRE

… Problems Found During PIERs (concluded)

- **Program information and materials at risk**
  - Security and back up systems
- **Not getting the best out of engineering tools**
  - Not implemented well or at appropriate point in the program
  - Personnel not sufficiently trained in use
- **Critical trade studies, design decisions and rationale not documented or explained in accordance with documented organizational processes**
- **Inadequate or ineffective program planning and control**
  - Not recording all time worked – skews historical information for estimation
  - Booking credit for incomplete work packages – roll problems forward
  - Schedule planning results in periods of substantial contractor and Government overload for reviews and meetings
  - Inadequate staff planning results in critical shortfalls

...rned – PIER Process

- Variability of process execution and performance varies widely
  - From contractor to contractor
  - Among contractor teams
  - For different contractor operating locations or programs
- Performance is directly related to process execution
  - Periodic checks on contractor increases probability of good process execution on individual programs
- Conduct of PIERs provides insight not otherwise available to Government Program Manager
  - Conduct when artifacts are available and time exists to correct identified risks
    - Between requirements review and design review
- Plan PIERs so as to minimize program disruption and maximize participation
  - Between System Requirements Review and Design Reviews

arned – PIER Process (continued)

- Program Manager must act on the information resulting from the PIER in a timely manner
  - Capture observations and trends to isolate potential systemic problems
  - Improvements required for contractor and Government
- PIER teams should be led by individuals with CMMI, SCAMPI, technical, and program management background
  - Especially important to have some knowledge of the program and topic area
  - Certified SCAMPI B/C Team Lead or Lead Appraiser PIER teams should have a mix of technical backgrounds relevant to program
  - One contractor team member from outside the program (and preferably the organization)
- Consider the type of program, the stage of development, and asserted organizational maturity level in selecting process areas

arned – PIER Process (concluded)

- Contract execution PIERs for process improvement
  - Independent Team Lead
  - Mix of contractor and program office team in collaborative environment
  - At least one team member independent of program
  - Team training to include site coordinator
- Contract execution PIERs for Award Fee
  - Government team
- Acquisition organization must have a consistent approach to conducting PIERs
  - Need guidance, templates, and training to ensure consistency of PIERs
- Government needs a method for collecting PIER results (non-attribution) to isolate systemic problems in acquisitions
- PIERs are mentally and physically challenging but worth the effort

- Original Problem Statement
- Overview of the PIER
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the Future

- Add financial management and Cost Account Management
  - Assess execution of Earned Value Management System (EVMS) practices especially in correlating product maturity and performance to earned value
  - May integrate with the Integrated Baseline Review (IBR) process
- Deeper look into product quality
  - Technical maturity and product performance using models, simulations, prototypes, and early functional assessments
  - Identification and implementation of Technical Performance Measures
- Modify PIER for CMMI v1.2 for Development
  - Adjustments based on CMMI-ACQ when available
  - Adjustments based on CMMI-SVC when available
- Apply PIERs to Government as well as Government/ contractor teams

- **ESC has conducted about 18 PIERS for various programs**
- **The SCAMPI-based PIER provides valuable insight into contractor capability on a project-by-project basis, supplementing technical activities, and providing a basis for risk assessment, performance feedback, incentive management, and program office commitment**
- **The PIER is gaining acceptance in the acquisition community, being integrated into past and present program plans**
- **Planning for future PIERS will leverage current lessons, and will adapt as the CMMI changes**

We're watching you…

s

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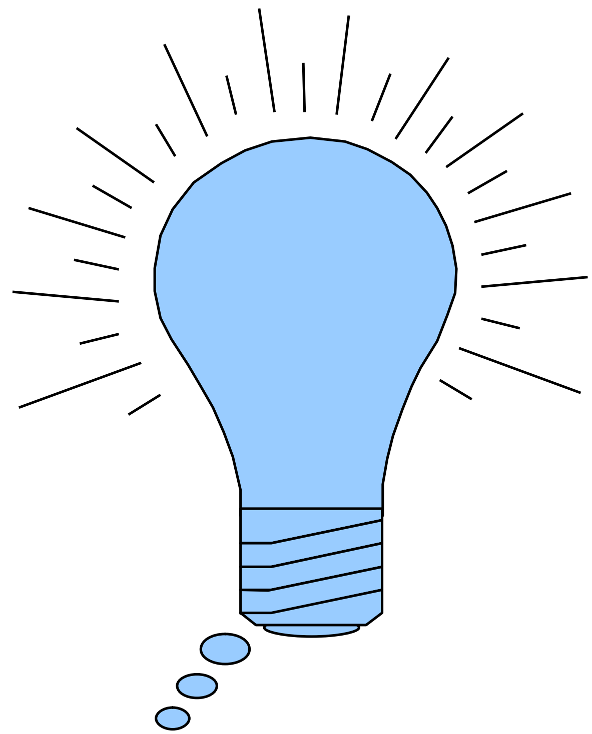

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Appraisal Program Quality Report

Software Engineering Institute
Carnegie Mellon University
Pittsburgh, PA 15213

Will Hayes
November, 2007

Contents / Agenda

Required Use of SEI Appraisal System

- Advance Setup Requirements
- Timely Closure Requirements

High Maturity Appraisals

- Certification Requirements
- Reporting Requirements
- Auditing and Data Analysis

Questions and Answers

- Managing Conflict of Interest
- On Site Appraisal Auditing
- Continuing Professional Education

SEI Appraisal System:

Expectations for Usage

Required Use of SEI Appraisal System

Recent Policy Announcement

- All SCAMPI appraisals must be setup in advance of Phase II (Onsite)
  - Specified items from Appraisal Input 30 days in advance
  - Remaining items from Appraisal Input 7 days in advance
  - All elements of the Appraisal Plan 1 day in advance
- Business cycles are sometimes shorter than 30 days
  - Exceptions will be handled routinely
    - These are not waivers, but expected occurrences
    - Exceptions are not intended to be the norm
  - Discussing how to handle this within SAS, rather than email.

Required Use of SEI Appraisal System$_2$

Constructive Feedback We've Received

- Concern about limited value for <u>requiring</u> B&C setup in advance
  - We agree, this does seem excessive – we will change it
- Wording of the communication is needlessly overly complex
  - "… no later than 30 days prior to the start of …"
  - Simpler to say "… at least 30 days prior …"
- The policy does not address closure of SAS records in a timely way
  - Contract language says all data must be submitted within 30 days
    - We will require complete SAS record within 30 days of the end of phase II (onsite)

Required Use of SEI Appraisal System$_3$

What About SEI Response Time?

- We are committed to make a determination within 30 days
  - The quality review clock starts when the LA has successfully hit the “submit button” – all required fields are complete
  - Within 30 days we will report either:
    - The SAS record has passed our quality review
    - There is an issue that requires attention from the LA
  - The routine things take less than 30 days
    - Appraisal program manager is tracking this cycle time
- Most LAs are very timely in their responses to our follow-ups

High Maturity Appraisals:

Certification, Reporting and Auditing

Certification

A Maturing Profession

- We want to protect your investment, and the investment of many others
- Raising the floor, not pushing the envelope
  - Base all appraisals outcomes on common criteria
  - Assure that organizations realize intended benefits
  - Improving the engineering practice is our mission

Confluence of Many Stakeholder Voices

- SEI is balancing many legitimate inputs
  - Optimal technical solutions are not always obvious to everyone
  - We are working to be inclusive, and many have contributed
  - Valuable advice and technical input received at every step

Reporting High Maturity Appraisals

Increase Confidence in Reported Results

- Requiring supplemental information increases transparency
- Transparency serves people operating in good faith the most

Compliance to Reporting Requirements Has Been an Issue

- Not every LA seems to be aware of the specific requirements
- Motivation behind requirements may not be obvious to some

We are working on this to make it easier for all parties, and to better achieve our objective.

Reporting High Maturity Appraisals$_2$

The Stated Requirements:

SCAMPI Method Definition Document – Page II-119 (3.1.1 Parameters & Limits)

If the appraisal resulted in capability or maturity level 4 or 5 ratings, the organizational processes or subprocesses and the corresponding PAs that were determined to be under statistical control must be included in the final findings.

SCAMPI Method Definition Document – Page II-130 (3.2.2 Parameters & Limits)

For high maturity appraisals (capability or maturity level 4 or 5), the appraisal team leader must validate that a substantial portion of the organization's and projects' quality and process-performance objectives and statistically managed subprocesses can be mapped directly to and support: (1) the established business objectives as stated and disseminated to key employees of the organization, and (2) the needs and priorities of customers, end users, and other stakeholders. This validation is required to prevent the granting of high maturity ratings for trivial improvements.

Reporting High Maturity Appraisals$_3$

Appendix A: Appraisal Disclosure Statement Template:

Additional Information for Appraisals Resulting in Capability or Maturity Level 4 or 5 Ratings

Describe which processes or subprocesses are under statistical management and were included in the objective evidence for this appraisal. Also list the PA(s) and organizational quality and process-performance objective(s) these processes or subprocesses pertain to.

Process/Subprocess	Process Area(s)	Quality/Process Performance Objective(s)

Reporting High Maturity Appraisals$_4$

SAS User's Guide, Page 11:

Beneath the model display, you will see fields to enter the Assigned Maturity Level. If you are assigning a Maturity Level 4 or 5, there is a comment box provided for your description of the critical subprocesses under statistical management that have earned this rating.

Describe which processes or subprocesses are under statistical management and were included in the objective evidence for this appraisal. Also list the PA(s) and organizational quality and process-performance objective(s) these processes or subprocesses pertain to.

An acceptable response in this field will identify the following:

- The process/subprocess being statistically managed
- The process area(s) quality/process
- The performance objectives being met

* QUALITY NOTE: * The data input into the SAS record will be displayed exactly as entered on the ADS and on the PARS website. Entering references to the Plan or other submitted artifacts will not present your appraisal data in a positive way. It will be questioned during our Quality review and will require the appraisal to be reopened for you to correct the data.

Reporting High Maturity Appraisals$_5$

Three Items of Information Are Required

- Subprocess
- Process area
- Goal served through statistical management of the subprocesses

Serving Business Goals is the Most Important Thing

- The motivation for asking is to assure that ‘trivial’ applications of statistical techniques are not accepted as evidence
  - The intent is to rigorously manage the things that have impact
  - Level 4 is not about analysis of large amounts of data
  - Level 5 is not about ‘one-off’ six sigma projects

Reporting High Maturity Appraisals$_5$

Common Issues Encountered:

- No mention of subprocesses
- No mention of business goals
- No mention of process areas
- Very high-level goals mentioned
- Providing just a list of measures or analyses
- Very large amount of information, often relating to other topics
  - Process Performance Baselines
  - Process Performance Models
  - History of process improvement

Questions and Answers:

Questions Receiving Attention

Answers Being Developed

Managing Potential Conflicts of Interest

Some Things Are Very Clear

- "Do not appraise your own work"
- Authoring the process means you can't appraise it

Where is the Boundary?

- How much coaching do you have to do before you cross the line?
- How much training is too much to maintain objectivity?
- Can we really maintain an objective view if we do a series of informal appraisals leading up to the benchmarking appraisal?
- Is it acceptable to be a team member on an A where you've consulted?

SEI Policy Will Be Enhanced

On-Site Auditing – Increasing Level of Activity

SEI Auditing Program is About to Expand

- We are hiring new senior level staff
- We are budgeting for more on-site audits

Good Experience To Date

- Mentoring-focused audits have been well received
  - Helping Lead Appraisers to see improvement opportunities
  - We were received in the spirit of improvement
- Site visits following appraisals are very challenging

Audits Will Now be “Real Time” During Appraisal Events

- Random as well as event-driven audits will be done
- The goal is to assure quality practices - not to mentor, per. se.

Continuing Professional Education

Maintaining Authorization and Certification is Important

- A maturing profession requires a focus on competencies
  - SLA-BOK work has been very well received
  - CLF calls out a lifecycle of developing competencies
    - This lifecycle does not end when certification is achieved
    - Maintaining credentials must be an active process
    - Developing deeper capabilities are required

SEI Work Continues Under the Leadership of Steve Masters

New Member of Our Team

A new member has joined the Appraisal Program Quality Team

- This person is charged with helping to bring continuity and consistency to the processes we use, and to the workload we manage.
- An advocate for effective communications among stakeholders in the process – SEI staff, as well as Partners and Lead Appraisers.
- We are pleased to welcome

Darlene Moore

dmoore@sei.cmu.edu

Software Engineering Institute | Carnegie Mellon

Integrated System Framework (ISF®) for Excellence

Paul D. Byrnes
Principal, ISD
Renato Chaves Vasques
ISF for Excellence Author
ISD Brasil

SEIPartner

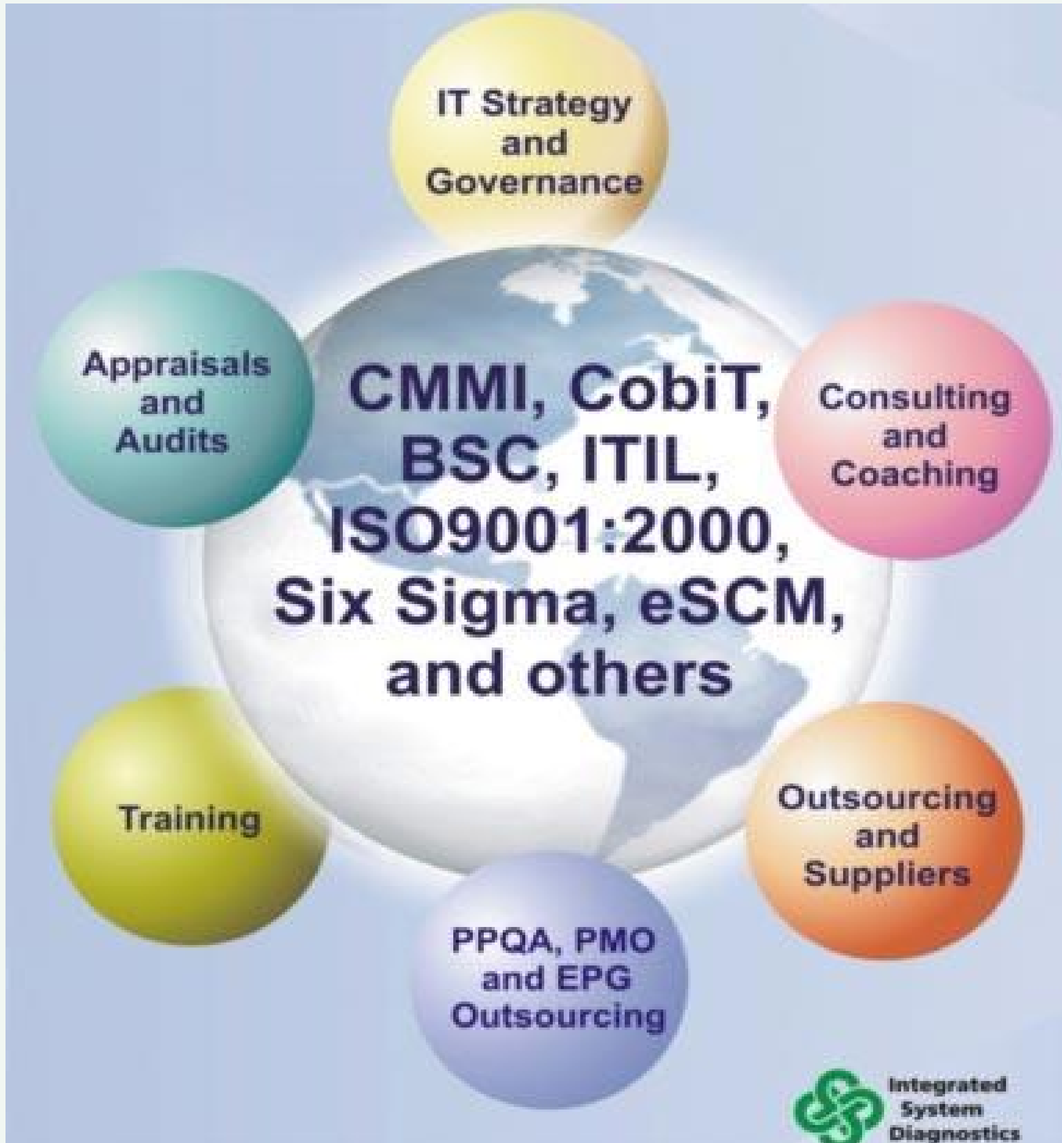
ITSqc Authorized

Presentation to the 7th Annual CMMI® Technology Conference

SD - Where We Operate

- ISD Offices world wide
  - Cape Cod, MA
  - Melbourne, FL
  - Lisbon, Portugal
  - Sao Paulo, Brasil
  - Hong Kong, China

ISD - What We Do



Agenda

- **What is the current problem state?**
- What is the correlation between business needs and improvement frameworks?
- What is the Integrated System Framework (ISF) and how will it help?
- Next steps? Questions?

…pening Thoughts – “*Frameworks* …*ire*” – The quest for a “single model” is lost

- Process standardization and improvement efforts are expanding across the entire enterprise.
  - Process models and frameworks are proliferating to focus on different domains/disciplines within an enterprise.
  - The impact and implementation is global.
  - Compliance requirements levied by customers using these frameworks is driving costs in the opposite direction of management desires.

- Domain and business area specific reference models and frameworks
  - Directly address process needs of specific sub-communities on both the client and provider sides.
    - Can cause sub-optimal investments in process
    - Can cause counter productive implementations
    - Produce large expense side inefficiencies
  - *Can* be successfully integrated into an enterprise improvement effort.

ISD - Who We Are

Integrated System Diagnostics (ISD) is a multinational company dedicated to process improvement, quality and performance management.

ISD is one of the largest *Software Engineering Institute (SEI) Partners* and has been working together with the institute in researching, developing and delivering services (consulting, training and audits) related to several best practice models (SW-CMM, CMMI, People CMM) and appraisal methods (CBA-IPI, SCE, SCAMPI).

ISD is also an *IT Services Qualification Center (ITSqc) Partner* for delivering services (consulting, training and audits) related to eSCM-SP and eSCM-CL (IT-Enabled Sourcing Capability Models).

SEI and ITSqc are entities of Carnegie Mellon University
SEI – Software Engineering Institute
ITSqc – IT Services Qualification Center

Sponsor's Appraisal Nightmare

Scenario – Organization X

- ISO9001 certified
- ISO20000 certified
- CMMI Level 3
- CobiT oriented

This organization will go through:

- 5 to 7 appraisals / audits a year
- 10 to 14 appraisals / audits in 2 years
- 25 to 35 appraisals / audits in 5 years

Å **Imagine a company with 5 organizations like this one!**

izational, Strategic, and Operational hallenges Magnify the Problem

- How is the organization defined
  - How to identify/communicate with stakeholders
- Multi-national and Multi-geographic
  - Norms, culture, and values
  - Languages, time zones, locations
- Operational/Time Constraints
  - Business pressure
  - Management pressure
  - Stockholder pressure

- Many affected groups
  - Large scope and risk adds complexity, which leads to longer deployment.
  - Outsourcing impacts more groups, adding more points of potential ñfailure.ò
  - Different targeted groups
    - adds to cultural and legacy complexity.
    - exhibit varying levels of process maturity.

Some slide content adapted from Paul ByrnesôINCOSE 2000 presentation

ovement Program Risks Magnify the Problem

Risk	Factors
Insufficient senior management commitment	**Caused by turnover or mergers** **Based on disillusionment with results** **Resulting from shifting investment priorities** **Due to inadequate resource allocation**
Middle management resistance	**Overriding pressure for project performance; Incentives on delivery, not quality** **Doubt about seriousness of senior leadership**
Inappropriate improvement goals	**Level 5 in 1 year** **75 business units to be assessed by year end**
Unrealistic expectations	**The great productivity gap related to managing change** **The technology adoption curve and change management awareness** **Lack of motivation for or continuous focus on process improvement**
Crash implementations	**No plans or long-term perspective, and lack of following through on improvement efforts** **Termination of activities before they are institutionalized**

Slide from Paul Byrnesô2nd ISD Customer Conference presentation

non Goals – Current Issues

Common Goal	Sub-Goal	Current State, Issues
Ensure results	Contribute directly to business improvement Comparable across companies/organizations	Benchmark events less so than interim events More so when externally driven needs and teams (benchmarks)
Optimize value to sponsors	Support business objectives Optimize cost and minimize disruption	Multiple requirements must be satisfied Can be more costly without changes in approach
Ensure appraisal reliability	Create repeatable processes ï standardize Make results predictable and differences explainable Results independent of team composition	Too many improvement frameworks?? Benchmarks (if any) not standard Objectivity an issue for both outsourcer and service provider

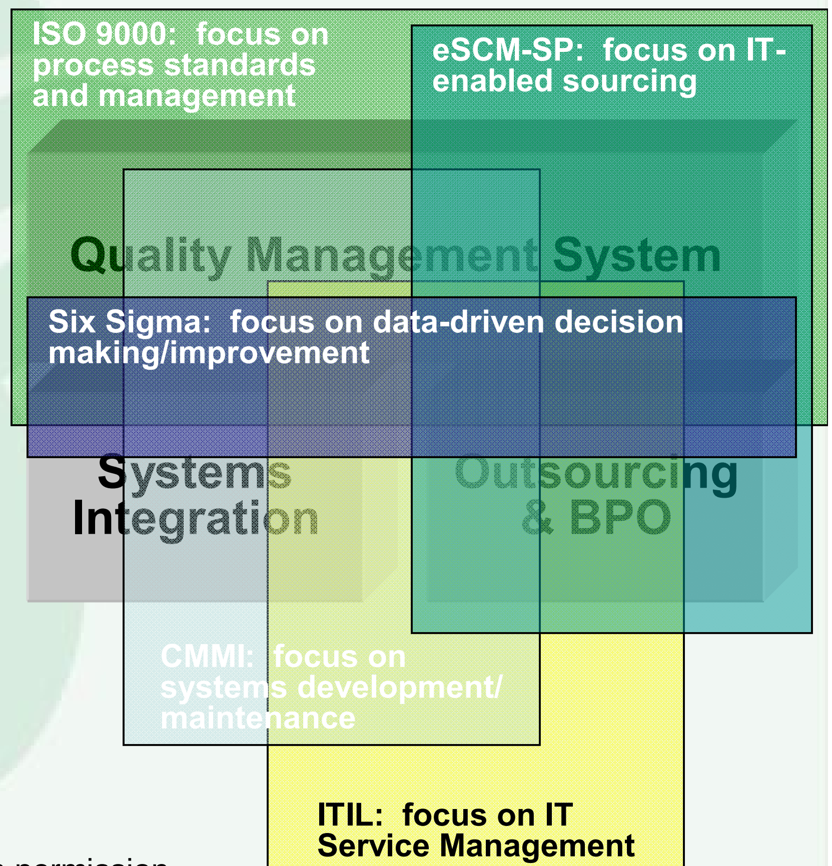
Slide adapted and updated from presentations by Mr. Byrnes while managing the appraisal project at the SEI.

® Purpose and Objectives

- Address a global, systemic enterprise problem of implementing, managing, maintaining, and complying with multiple process models, frameworks, and methods.
- The Integrated System Framework® provides one part of a technical solution to client requirements for
  - Optimizing cost to effectively demonstrate ongoing process adherence to multiple standard models.
  - Leveraging process investments across the enterprise to increase effectiveness of process improvement efforts.
  - Increasing synergy across business areas to improve process implementation efficiency
- Contribute to the professional model based process improvement community and positively influence its future.

Overlap of Key Models

- Most standards/models have content overlap
  - Often based on Total Quality Management (TQM) and Deming's plan-do-check-act principles
  - Some core topics show up in most models
- Each industry standard/model has a "sweet spot" for particular area of focus. For example:
  - CMMI is particularly focused on systems development and maintenance
  - eSCM-SP is focused on IT-enabled sourcing
  - COPC is focused on customer care
  - ITIL is focused on IT Service Management



Source: Accenture. Used with permission

ss Model Integration: EDS view

Source: EDS. Used with permission

parative Model Coverage (Example)

	eSCM-SP	CobiT	ISO 9001	BS 15000	CMMI	COPC
Knowledge Management	●	◑	◕	◕	◑	◑
People Management	●	◕	◕	◑	◑	◕
Performance Management	●	◕	◕	◕	◑	◕
Relationship Management	●	◕	◕	◕	◑	◑
Technology Management	●	◕	◑	◕	◑	◑
Threat Management	●	◕	◑	◕	◑	◕
Contracting	●	◑	◑	◑	◑	◑
Service Design & Deployment	●	◑	◕	◕	◕	◕
Service Delivery	●	◕	◕	◕	◑	◕
Service Transfer	●	○	◑	○	○	○

● = fully ◕ = largely ◑ = partially ○ = not covered

Slide courtesy of ITSqc at Carnegie Mellon University

Agenda

Å What is the current problem state?

Å **What is the correlation between business needs and improvement frameworks?**

Å What is the Integrated System Framework (ISF) and how will it help?

Å Next steps? Questions?

IT Governance Areas

IT strategic alignment and execution ï know your business and align with it

IT Performance Management ï manage your performance qualitative and quantitatively

Innovation Strategic Projects ï select and manage the right projects and add value to the organization

Risks and Operations ï manage your risks and operations and take preventive and corrective actions in incidents

Structured and Facts-Based Decision ï take decisions appropriately (time and discipline)

Suppliers and Sourcing ï use the best balance between insourcing and outsourcing, and manage your external and internal suppliers

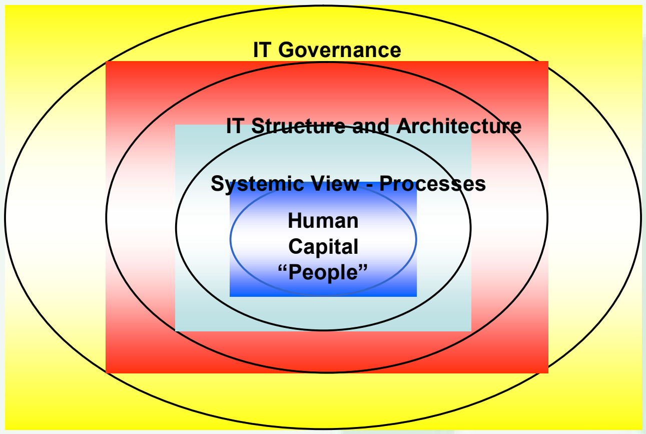
Resource Management ï minimize costs and make the best use of all resources

Management Process and Systemic View ï continuously improve your value chain and grow!

People Management ï cultivate, manage and retain your talents

o not Reinvent the Wheel!

IT Governance Architecture



IT Governance themes

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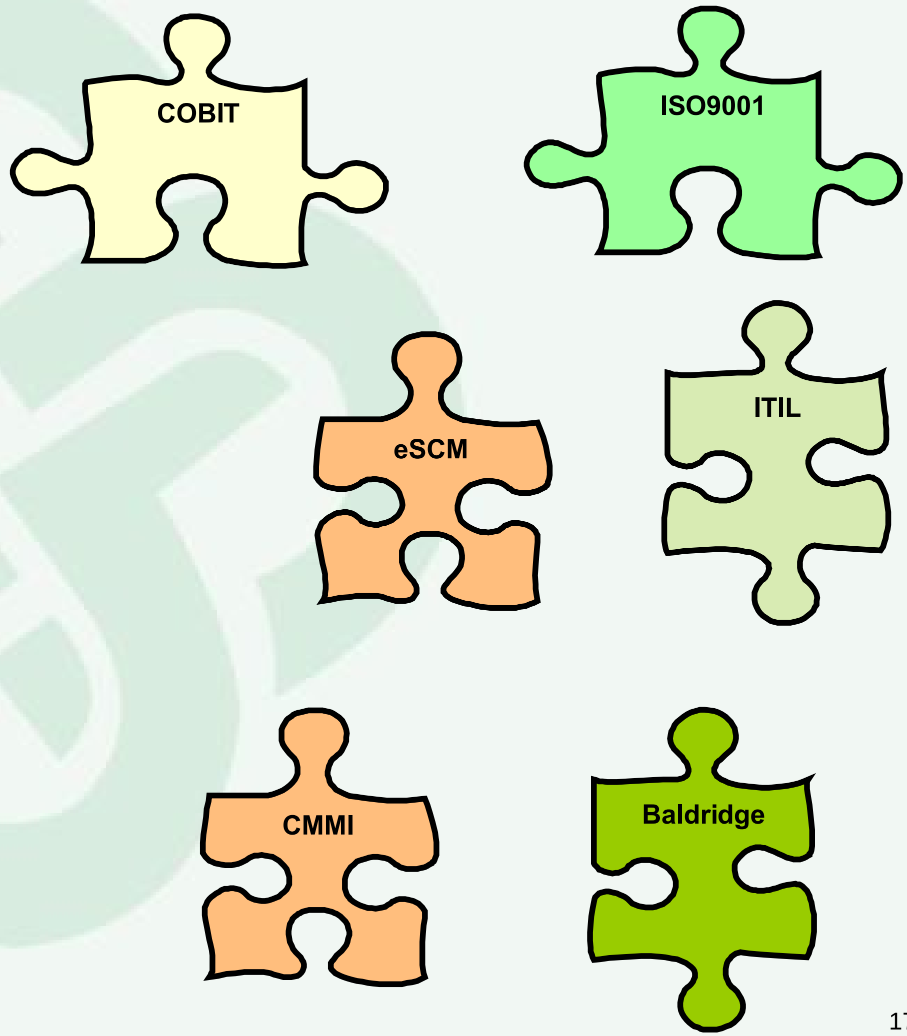
World of Best Practices



or Excellence – Bringing It Together

IT Governance Themes

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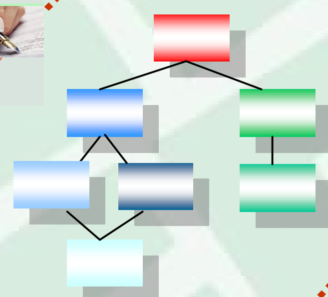
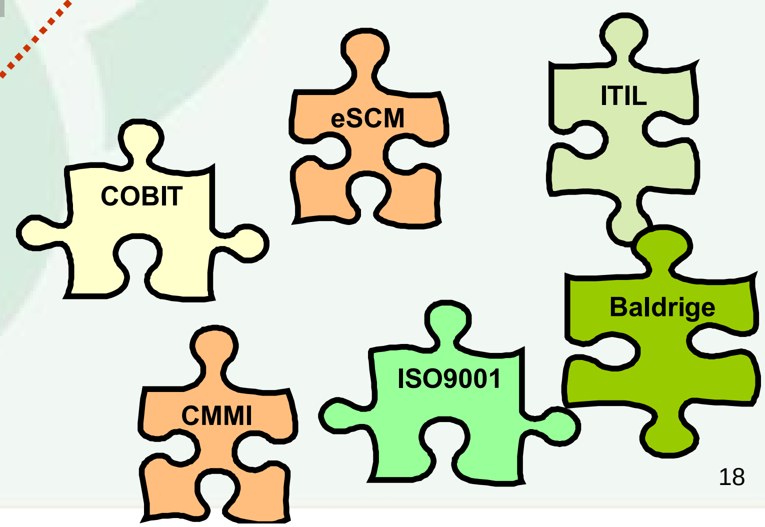
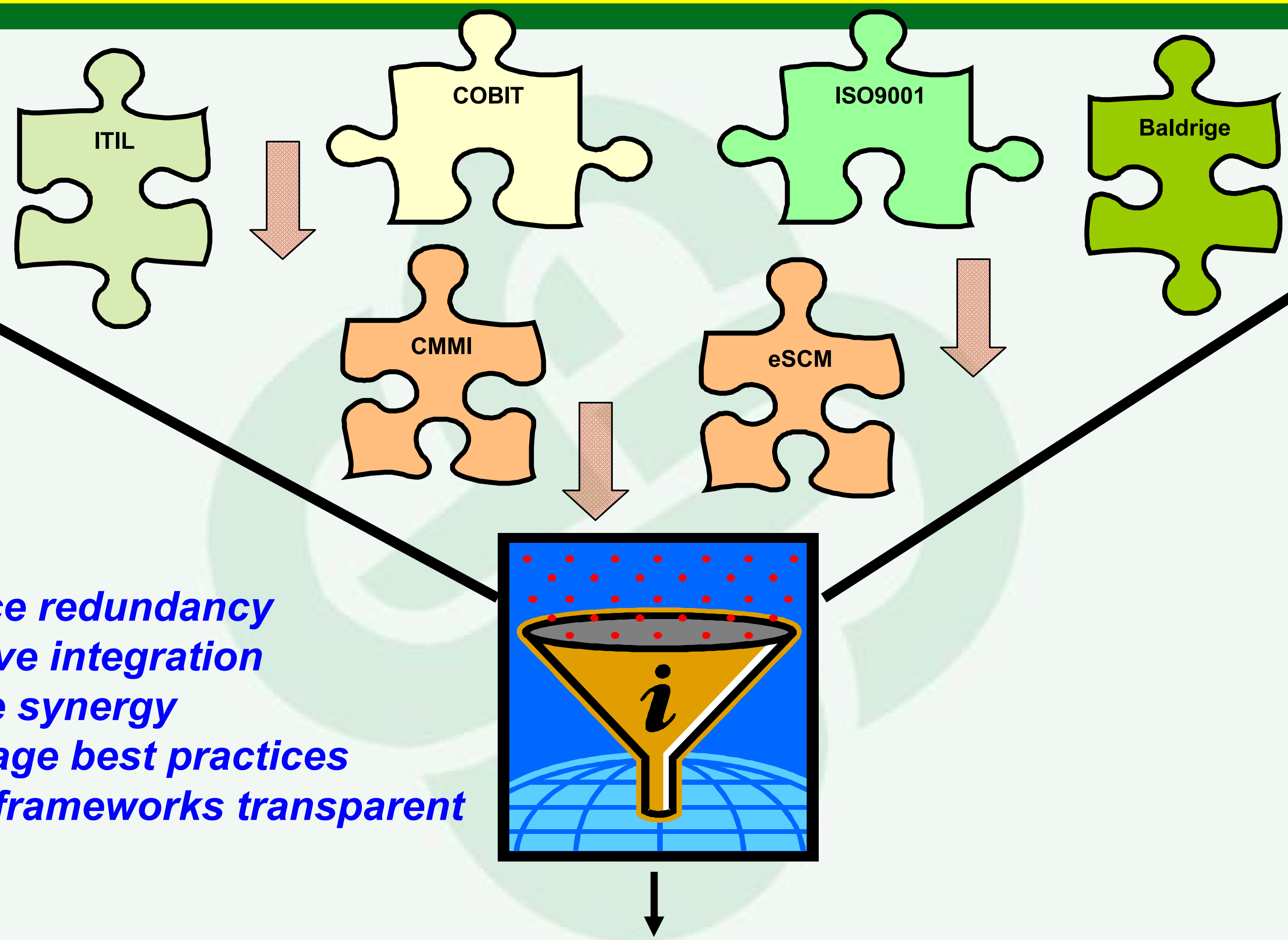
ISF *for Excellence*



World of Best Practices



Need to Put the Pieces Together !!



Reduce redundancy
Improve integration
Create synergy
Leverage best practices
Make frameworks transparent

ISF !

Agenda

- What is the current problem state?
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- **What is the Integrated System Framework (ISF) and how will it help?**
- Next steps? Questions?

allenge - How Do We Integrate All the Models?

Most of the models, frameworks, and best practices share a common set of principles, process areas, and practices

Å *Senior Management Commitment*

Å *Leadership*

Å *Costumer Focus*

Å *People Focus*

Å *Systemic View Focus*

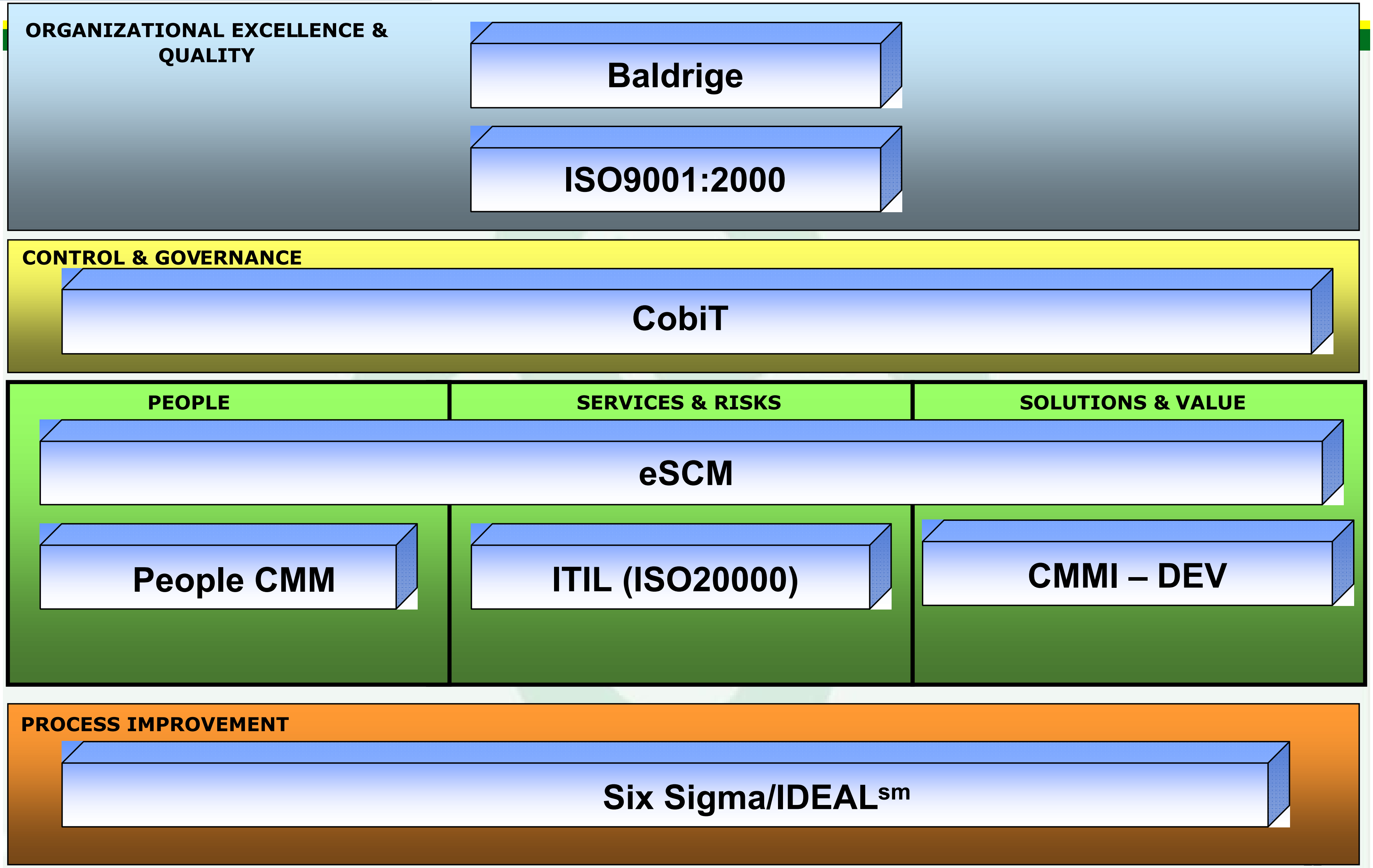
Å *Management by Process*

Å *Decisions Based on Facts*

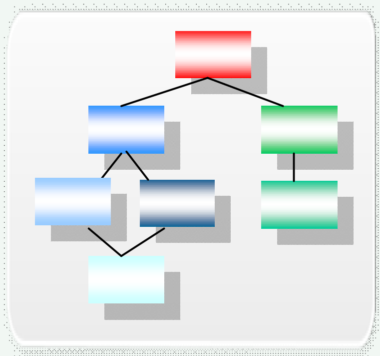
Å *Learning*

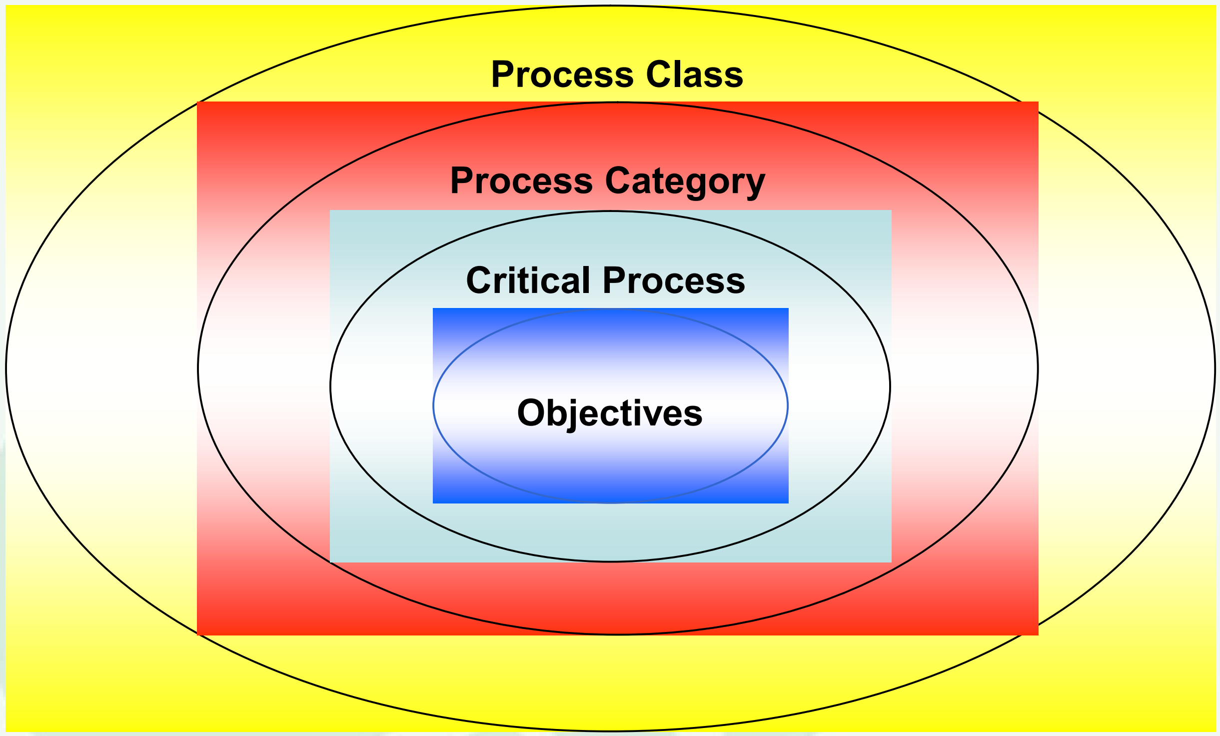
Å *"Win-Win" Partnership*

for Excellence – Relationship View



SF *for Excellence* Architecture



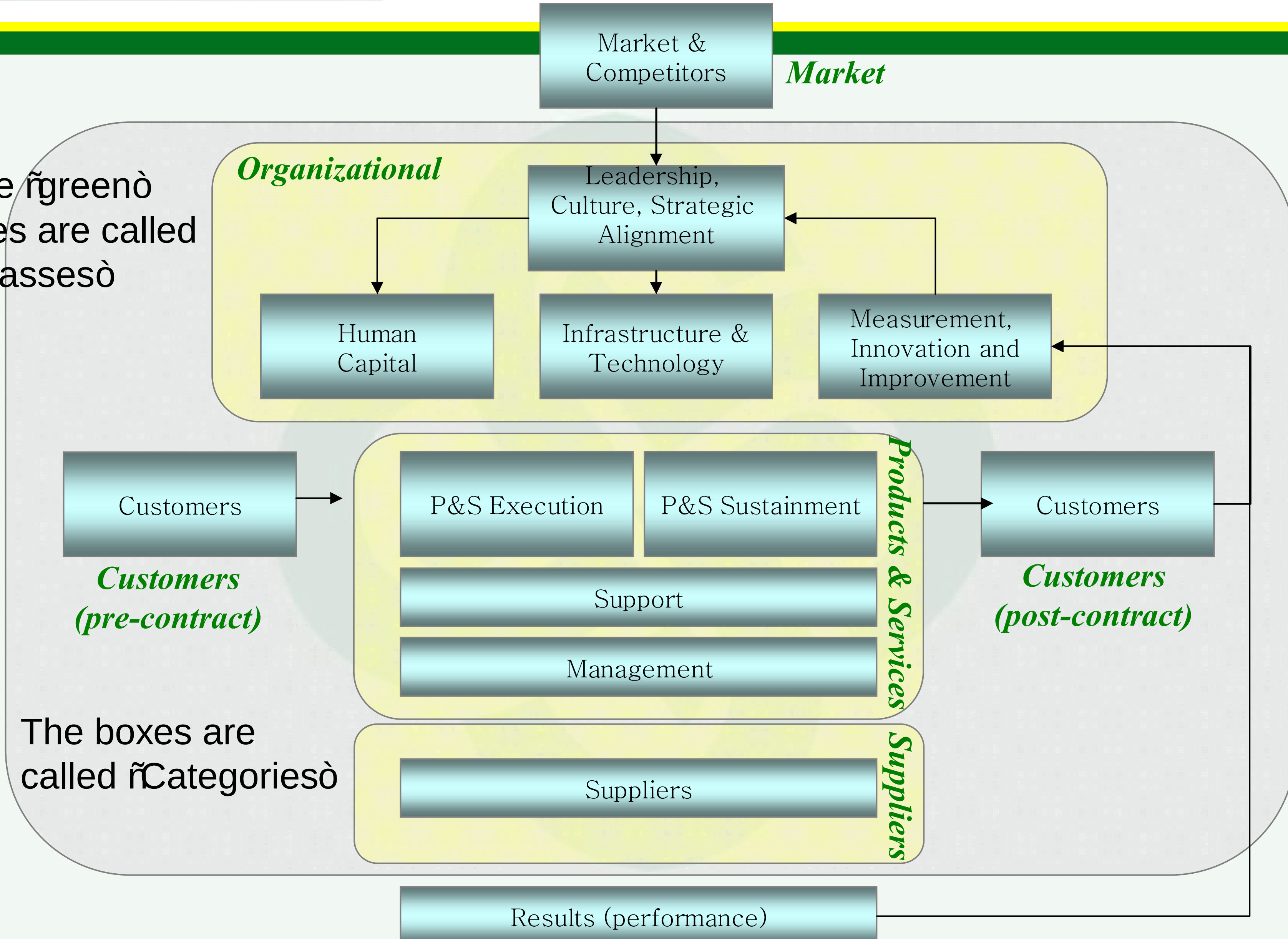


For each process "class" and "category" there will be an unique set of "CPP" (critical process for the performance) that will address (map) all the models and best practices minimizing or eliminating redundancy and respecting the overlaps.

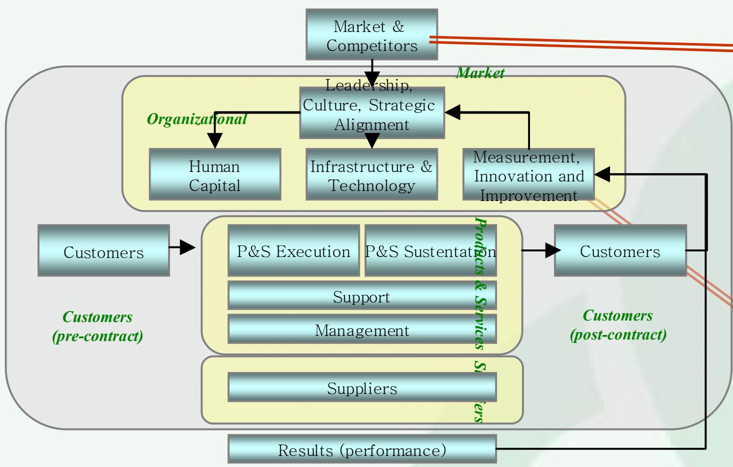
for Excellence – Systemic View

The ñgreenò titles are called ñClassesò

The boxes are called ñCategoriesò



SF *for Excellence* – CPP Examples



Category: Market and Competitors

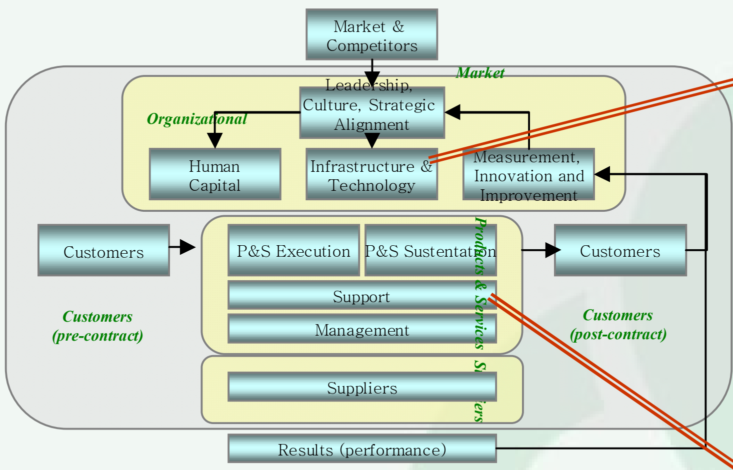
- Benchmarking
- Brand Management
- Market Knowledge
- Stakeholders Management

Category: Measurement, Analysis and Improvemen

- Measurement and Analysis
- Performance Management
- Continuous Improvement Management
- Process Assets Management
- Innovation and Performance Management
- Causal Analysis and Resolution
- Knowledge Management

Critical Process Performance (ñCPPsò) streams are similar to the concept of ñprocess areas.ò

SF *for Excellence* – CPP Examples



Infrastructure and Technology

- Capacity Management
- Continuity Management
- Availability Management
- Security Management
- Portfolio Management
- Infrastructure Management
- Financial and Cost Management

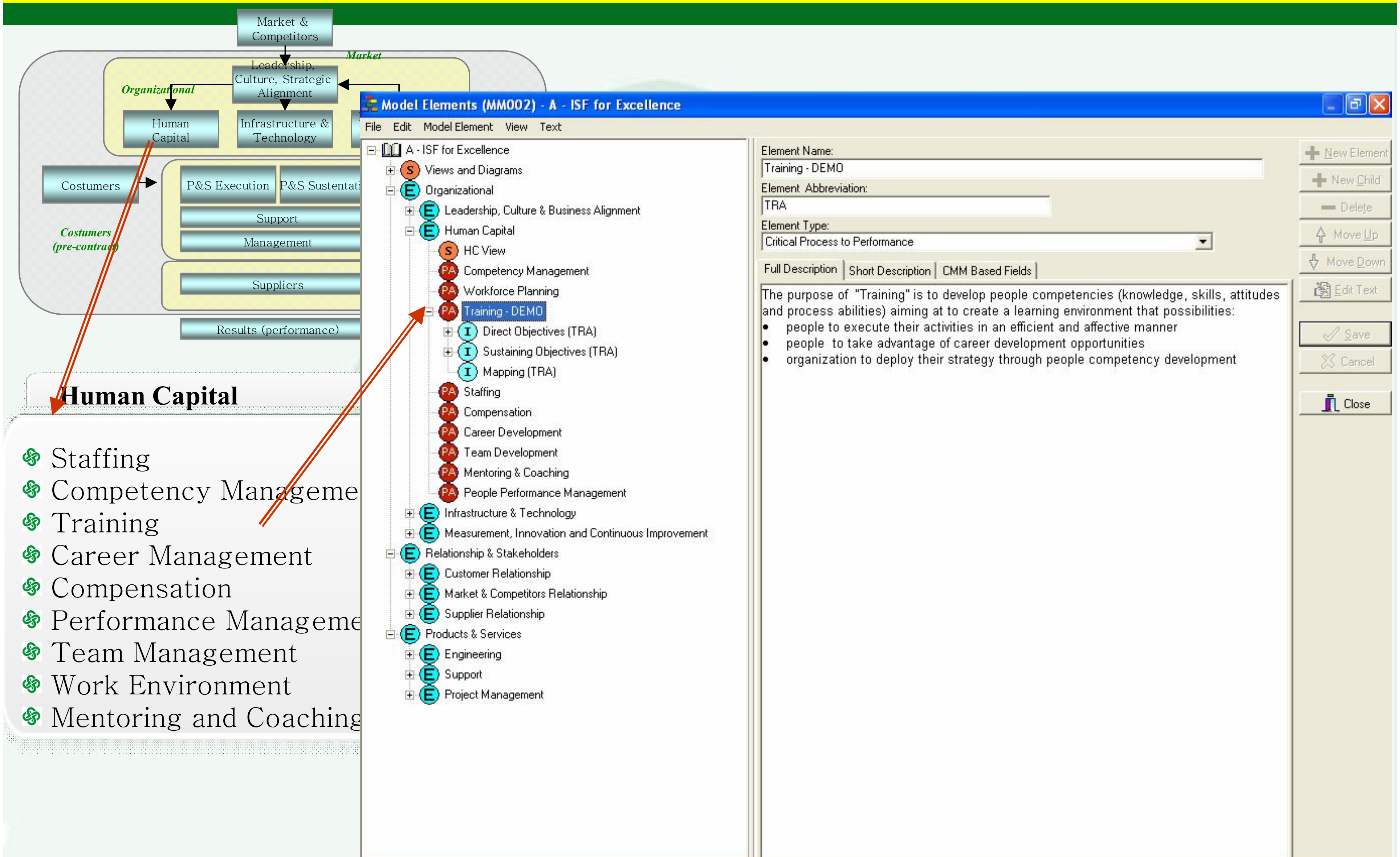
Support

- Incident Management
- Problem Management
- Configuration Management
- Release Management
- Change Management
- Quality Assurance Management

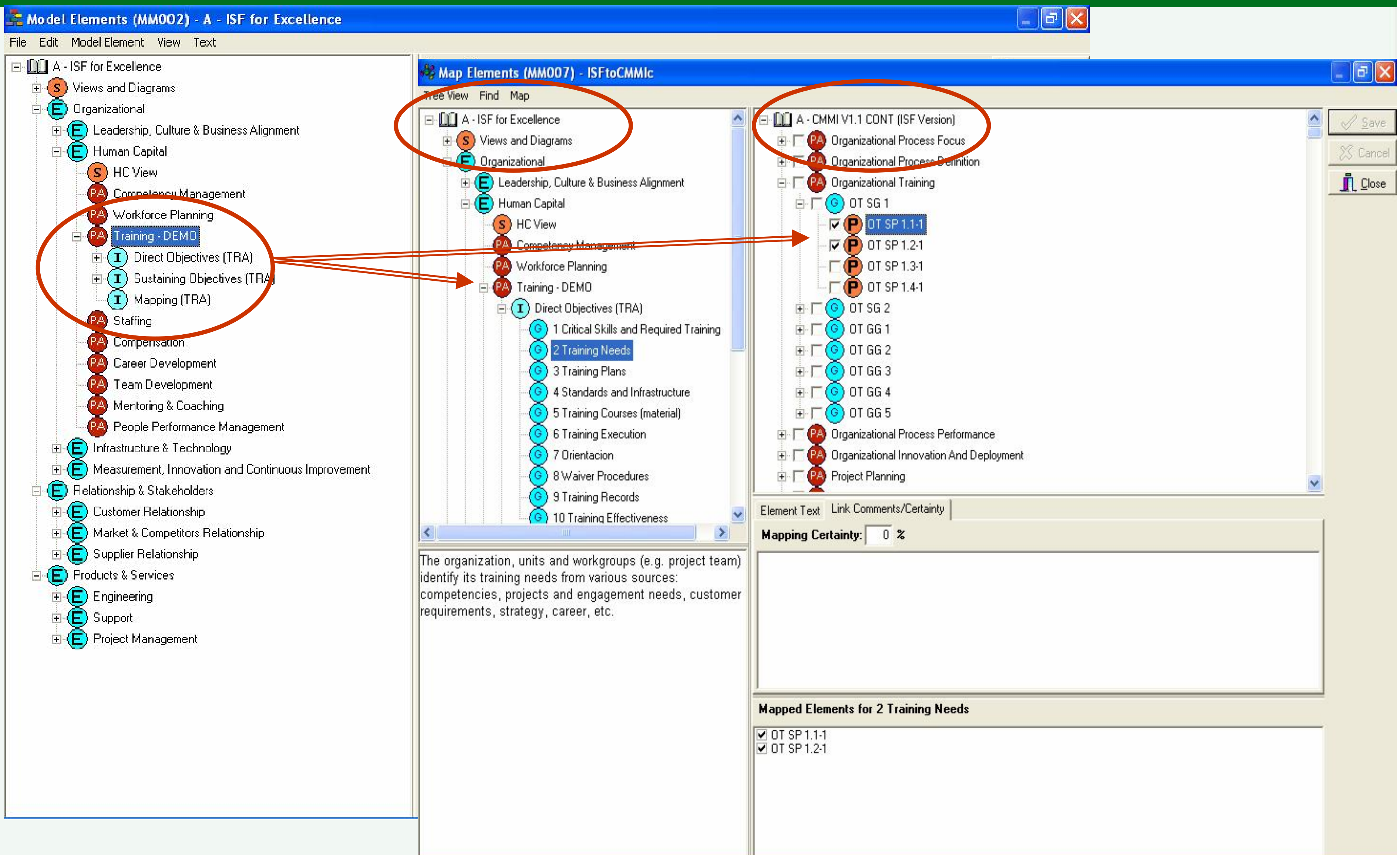
Critical Process Performance (ñCPPsò) streams are similar to the concept of ñprocess areas.ò

HOW TO EVALUATE YOUR PERFORMANCE AGAINST THE ISF?

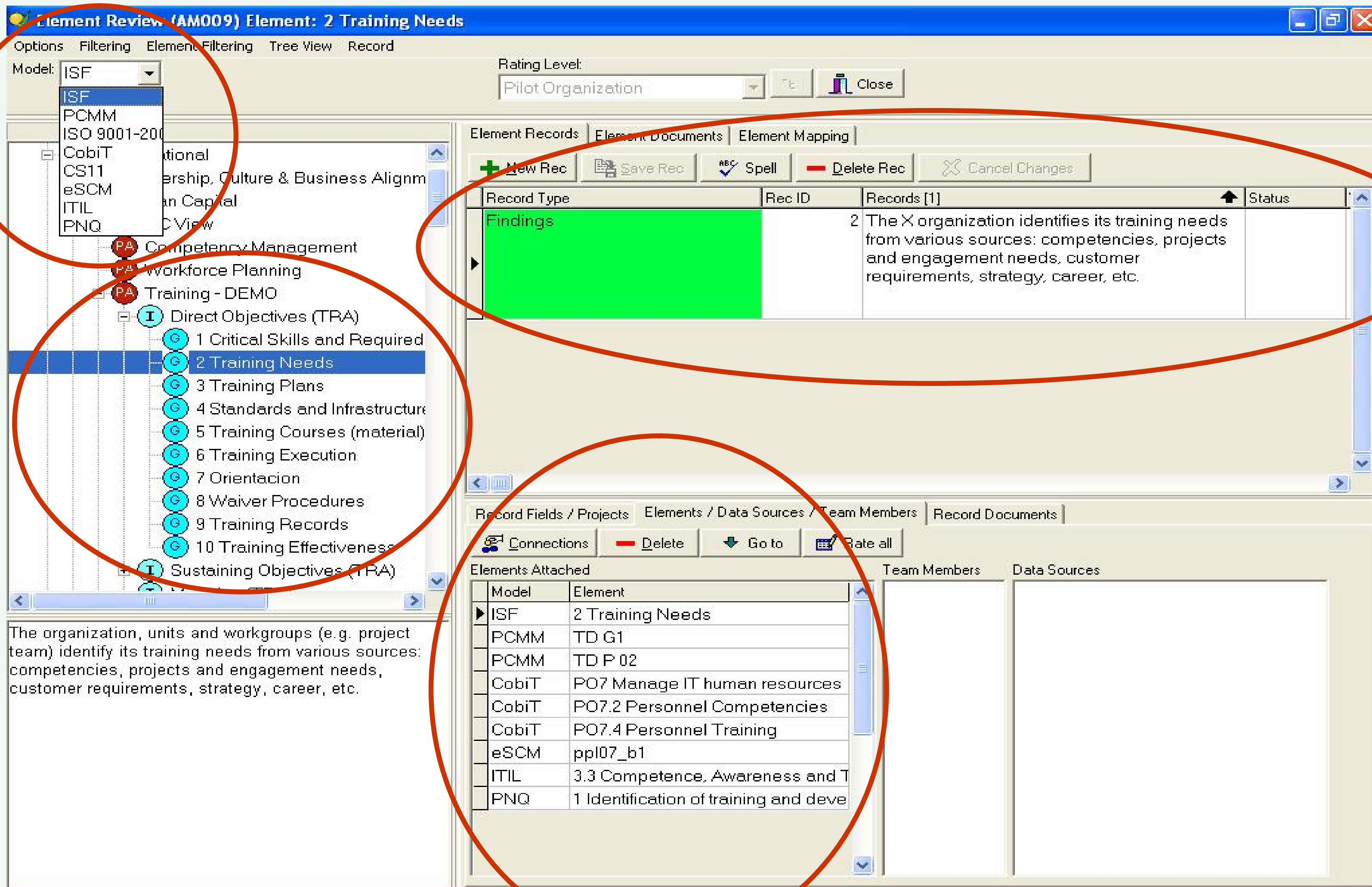
for Excellence – Automated Tooling (*Model Wizard* ™)



for Excellence – Automated Tooling (Model Mapper™)



for Excellence – Automated Tooling (*Appraisal Wizard*™)



Agenda

Å What is the current problem state?

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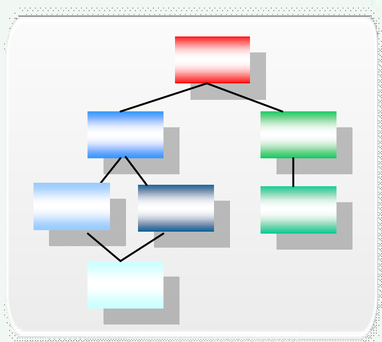
ur "System Approach"

4 important system components:
ÅProcess Model
ÅAppraisal Method
ÅImprovement Approach
ÅAutomated Tooling

Comprehensive Appraisal Method (CAMsm) ï Integrated Appraisal Method

ISF® ï Meta-Model Framework

Enterprise Process Improvement/Appraisal Life Cycle Implementation Model



Appraisal WizardÊ and Model WizardÊ ï Operational Tool Suite

...em Component Positioning

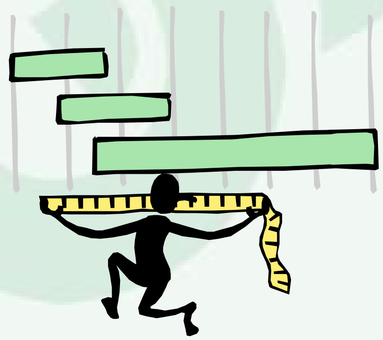
System Component	Positioning
The Integrated System Framework®	Is a conceptual vehicle to relate an organizationâs process architecture to multiple standard models; and Helps to maintain and measure process compliance across multiple models simultaneously.
The Comprehensive Appraisal Method (CAM[SM])	Provides a integrated, tailorable, rigorous, extensible, model-ñneutralò appraisal method for use across models Is suitable for conducting Process Assurance, Project Progress Tracking, Enterprise Process Oversight, and Formal Benchmark compliance determinations/audits.
Appraisal Wizard™/Model Wizard™ V7	Provides robust support for operationalizing the conceptual framework, and Enables conducting Process Assurance monitoring and Formal Benchmarking compliance activities in an effective, efficient, automated manner.
Enterprise Process Improvement/Appraisal Life Cycle Implementation Model	Provides a framework for integrating often disparate internal process management activities [e.g., quality audits, project process status reporting, gap analyses, interim appraisals, benchmark assessments]

Near Term Plans

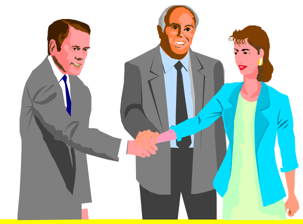
- ISF has been in joint development between ISD Brasil and PUC (a Brazilian University) since mid-2006.

- ISF V0.5 full scale pilot(s) with several base models and maps Q2/3 2007 (partial to full AW tool and CAM method support)

- ISF V1.0 initial release with more base models and ñapprovedòmaps Q4 2007/Q1 2008 (full AW tool and CAM method support)



, Directions, and Opportunities



Issues	Distribution and/or importation/integration support for models (IP questions, permissions; not a technical issue) Definition, coordination, acceptance, and maintenance of the model maps (more a political than technical issue)	Status: ISD had obtained rights to distribute CMMI models, eSCM, and ISO in Appraisal Wizard Status: ISF itself, although ISD registered, is expected to be in the public domain.
Directions	Continue technical development and piloting with current interested parties (e.g. CMU ITSqc; global clients with current CMMI and ISO requirements; SSCI) Continue to investigate and develop solutions to legal and political ñssuesòin collaboration with specific large influential clients, industry groups, and ñstewardsò	Status: Engaged 3 global clients already regarding pilot appraisals and development tasks (adding client specific models of concern to ISF). Status: Discussing collaboration in an SEI SPRC (Europe) initiative.
Opportunities	Direct sponsorship and collaboration Collaboration invitations from Consortium / Industry Association / Government working groups Participation in independent AW user group with subcommittees Creation and/or participation in a new cross community consortium	Status: Joined the new Enterprise SPICE initiative as part of Steering Group and Development team. Status: SSCI sponsored AW User Group meeting scheduled for November 2007. Follow on ISD sponsored AW User Group meeting scheduled immediately afterwards.

Closing Thoughts

Process standardization, modeling, and improvement efforts are expanding.	❖ Process models and frameworks proliferation will continue. ❖ Independent model/framework bodies/owners are not really interested in giving up their ñspace.ò ❖ The enterprise cost impacts are significant ❖ Increased customer drivers for compliance is driving costs higher when lower is desired.
Domain and business area specific reference models and frameworksé	❖ Directly address process needs of specific sub-communities. ❖ Do have positive impacts within their constituencies and niche areas. ❖ Buté Can cause sub-optimal investments in process, cause counter productive implementations, and produce large expense side inefficiencies
Mechanisms being developed and implemented by ISD accept and address reference model realities and synergies	❖ ISF®, appraisal life cycle model, Appraisal WizardÊ and Model WizardÊ V7, and CAM℠.
The models *can* be successfully integrated to improve enterprise performance.	❖ Improve both the quality and efficiency of enterprise process improvement (standardization, implementation, management oversight, appraisals)

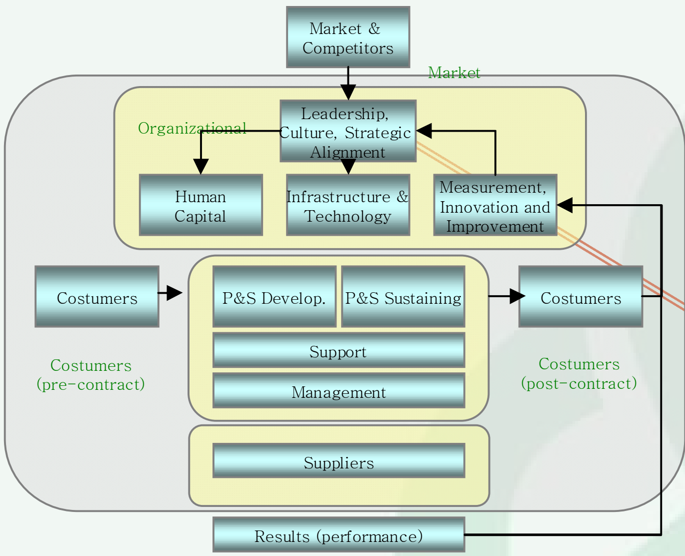
for Excellence Benefits

Operationalize an Enterprise Improvement Strategy	Provides an enterprise strategy to implement best practices from multiple models.
Reduce compliance costs	Leverages the commonalities among models to reduce overall costs of compliance.
Increase efficiency	Appraisals can be conducted using multiple models simultaneously.
Provide a unified implementation approach	Provides management a common, unified ñroadmapòto achieve high maturity, high performance goals.

Back Up Material

- For Enterprise SPICE, see the following web site, under "Initiatives/Enterprise SPICE"
  - www.spiceusergroup.org
- For Sarah Sheard's current contact info:
  - Principal, Third Millennium Systems LLC; sheard@3MilSys.com
- For ISD technical papers or AW download demo
  - http://www.isd-inc.com/
  - http://members.isd-inc.com/resources.papers/
  - http://members.isd-inc.com/support.downloadArea/

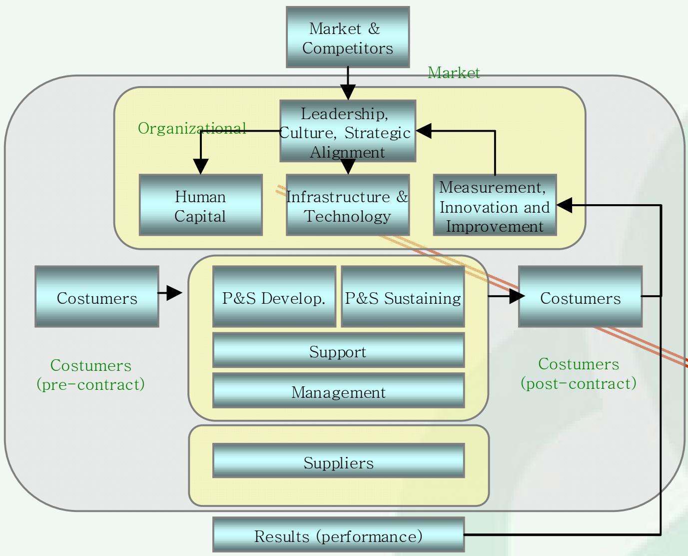
or Excellence – CPPs Examples by Category



Leadership, Alignment e Culture

- Social Responsibility and Ethics
- Leadership
- Governance
- Strategic Planning
- Strategic Execution
- Culture of Excellence
- Decision and Analysis Resolution
- Audits

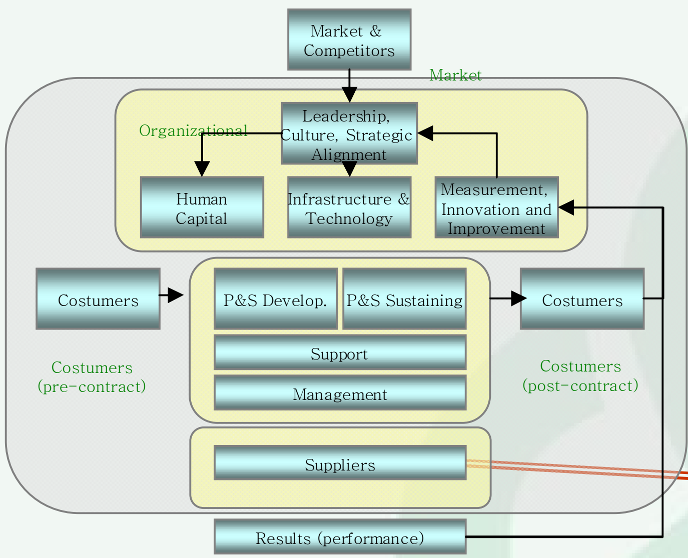
or Excellence – CPPs Examples by Category



Human Capital

- Staffing
- Training
- Career Management
- Compensation
- Performance Management
- Team Management
- Work Environment
- Mentoring and Coaching

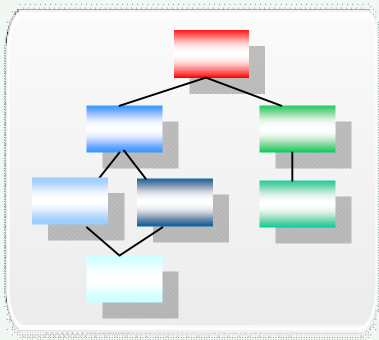
for Excellence – CPPs Examples by Category

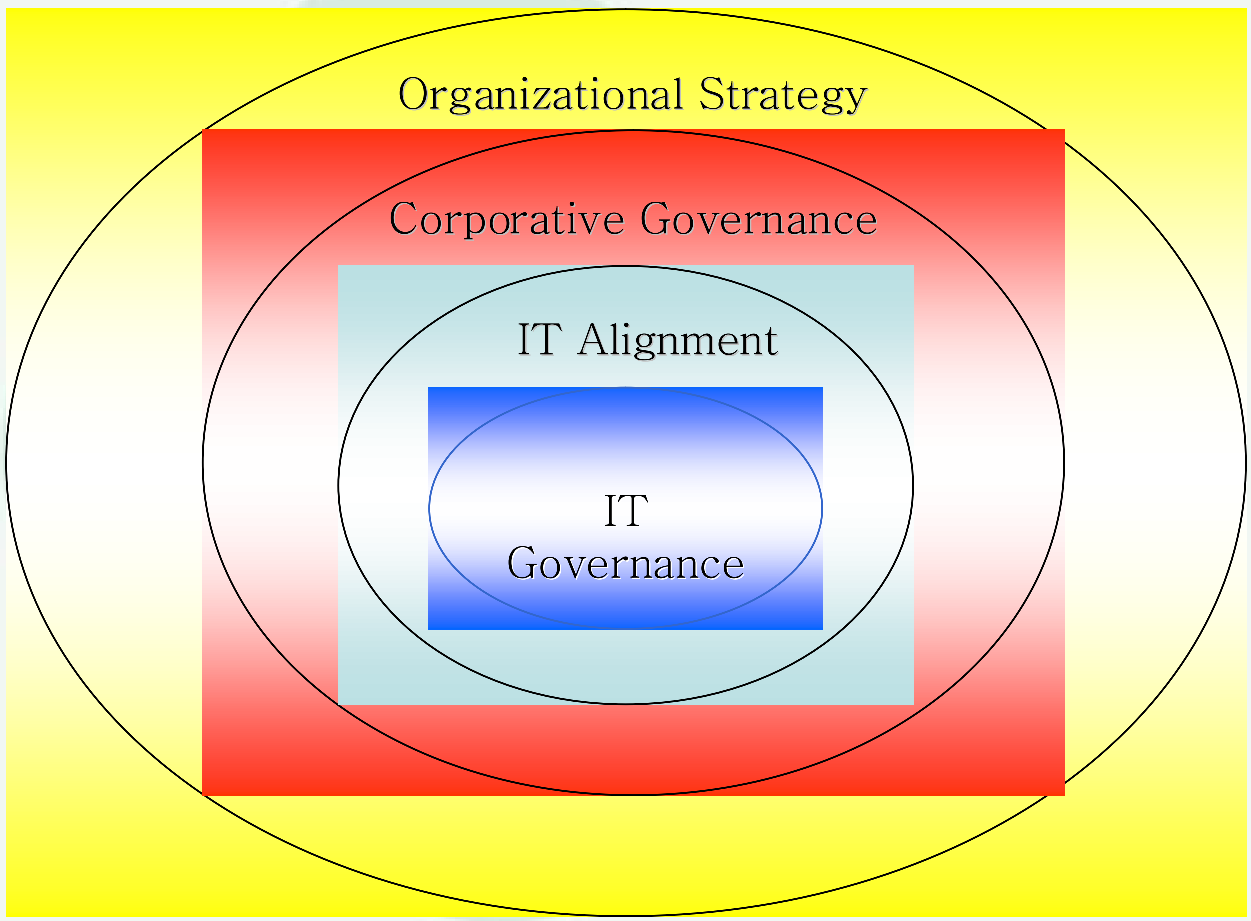


Suppliers Management

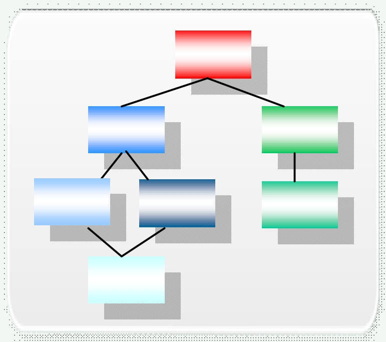
- Sourcing Strategy
- Opportunity Analysis
- Sourcing Planning
- Supplier Selection
- Supplier Management
- Quantitative Supplier Management
- Transition

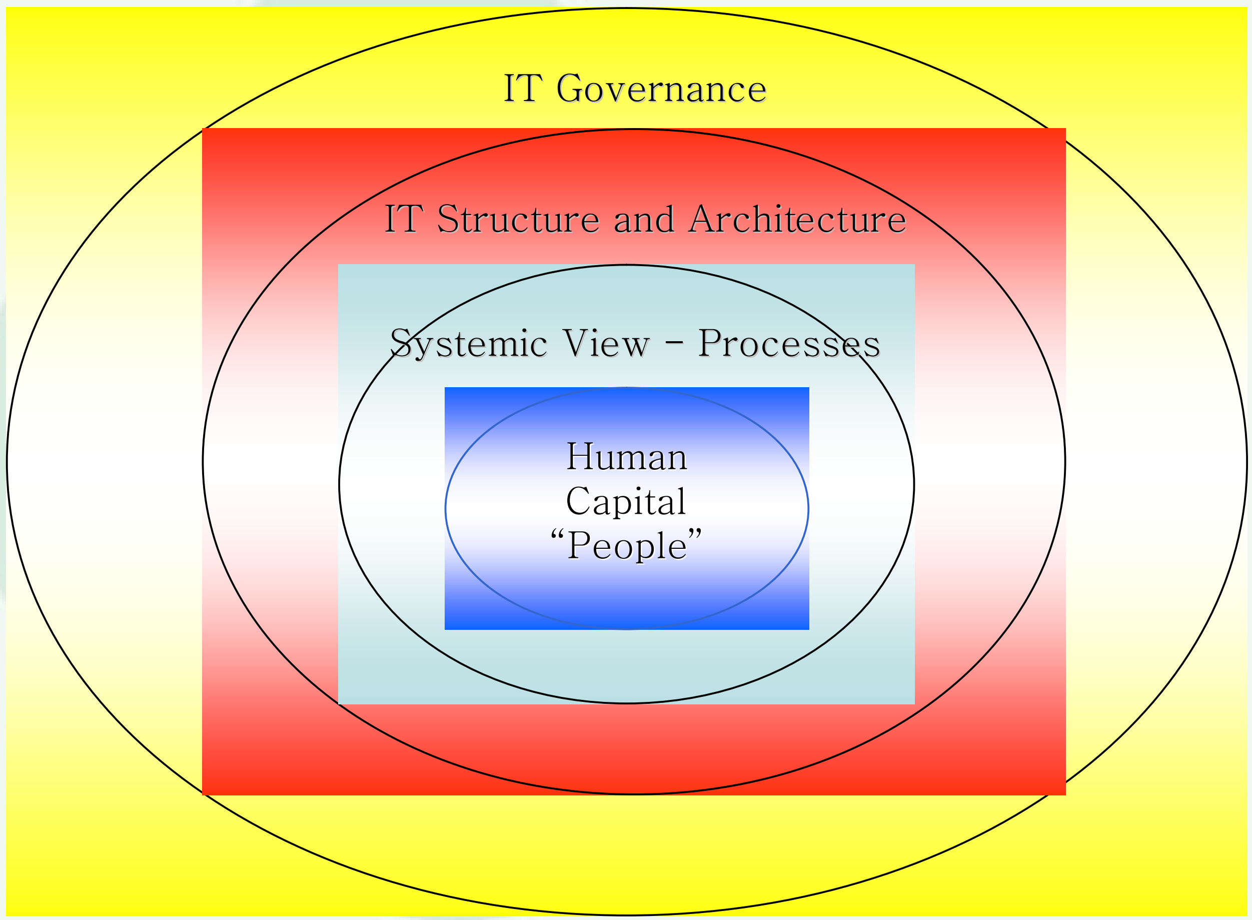
Organizational Architecture





IT Governance Architecture



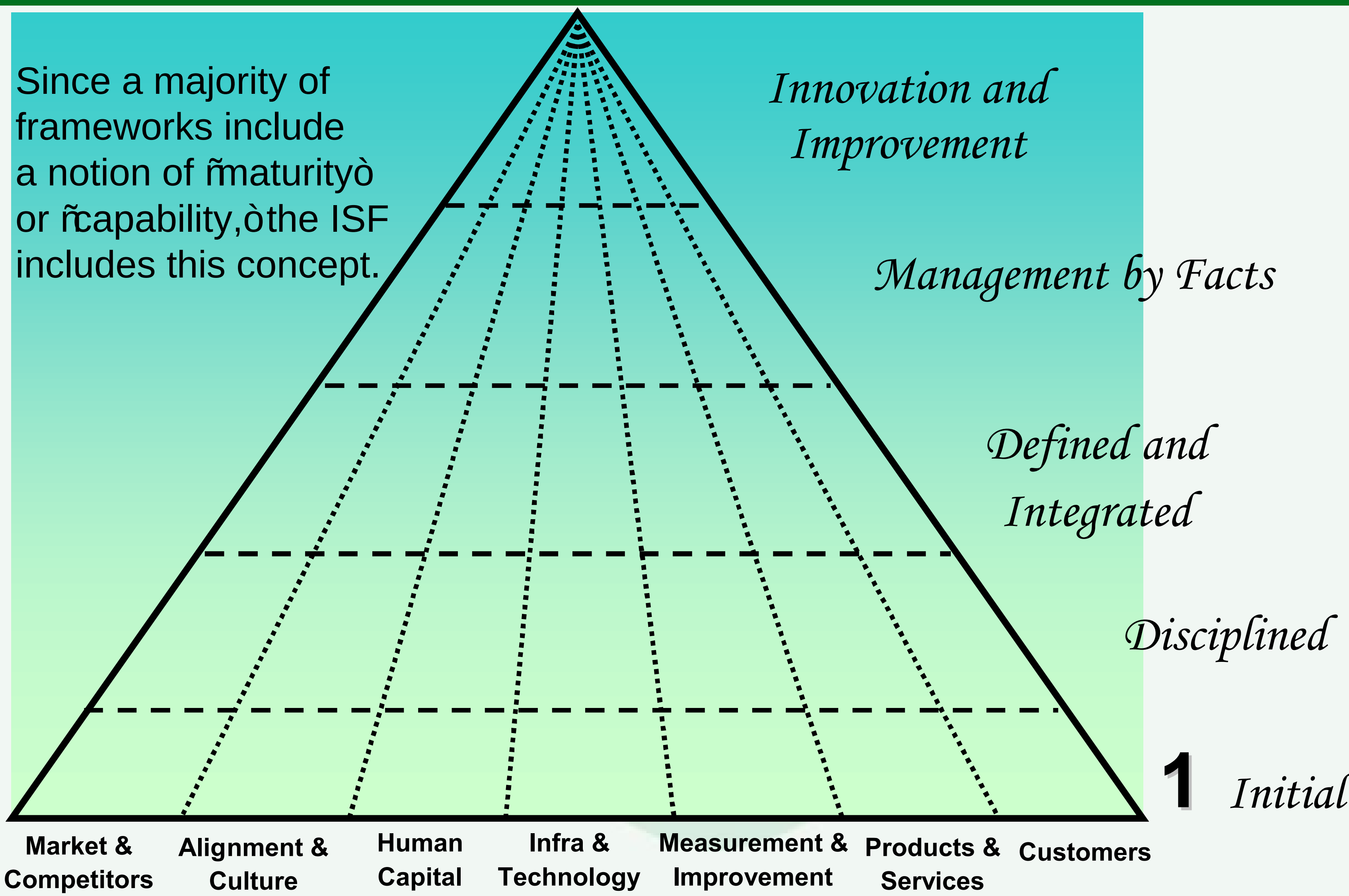


Some important definitions

PURPOSE OF AN ORGANIZATION	**Maximize shareholders wealth**
CORPORATIVE GOVERNANCE	**Control mechanisms and incentives so that the agents of a company may have an adequate behavior aligned with the shareholders needs**
INFORMATION TECHNOLOGY GOVERNANCE	**1) Decision rights and responsibilities framework which encourage IT adequate behavior** **2) Consists of leadership, structure and processes to make sure that IT will add value to business and organizations' strategies in a controlled (risks) and effective (ROI) way**
SUMMARY	**IT will help the organization to maximize shareholders value, having, for such a purpose, adequate behavior**

Excellence – **Maturity/Capability Levels**

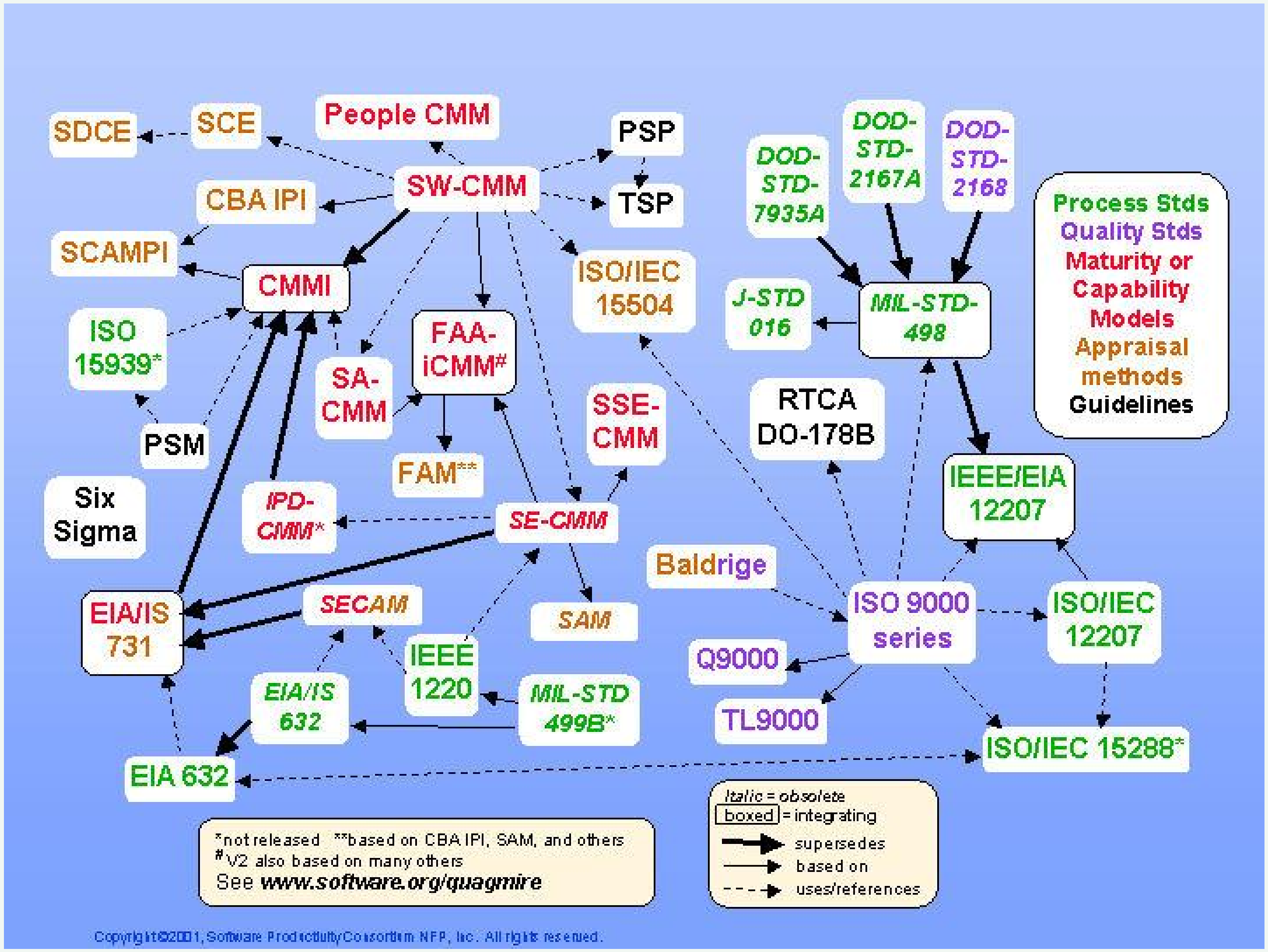
Since a majority of frameworks include a notion of ĩmaturityò or ĩcapability,òthe ISF includes this concept.



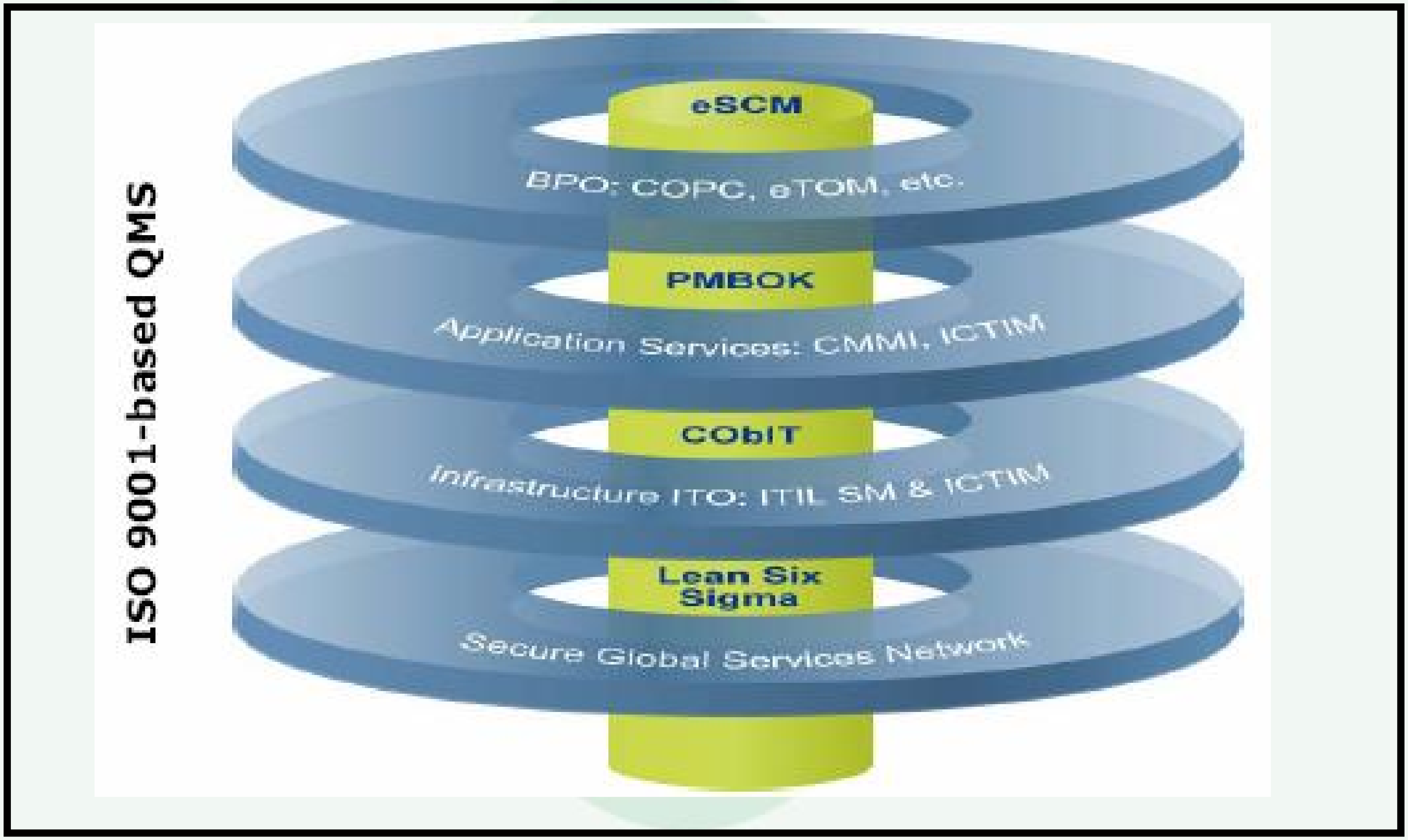
Excellence – Maturity and Performance

'*Frameworks Quagmire*" Revisited

From: *The Frameworks Quagmire, A Brief Look,* by Sarah Sheard of SPC, now SSCI



ss Model Integration: EDS View



Source: EDS. Used with permission

MI®-Based "System Architecture"

Process Management

Organization Process Focus (OPF)

Organization Process Definition (OPD)

Training Program (OT)

Organization Process Performance (OPP)

Organization Innovation and Deployment (OID)

Project and Supplier Management

Project Planning (PP) and Project Monitoring and Control (PMC)
Supplier Agreement Management (SAM)
Integrated Project Management (IPM) and Risk Management (RSKM)
Quantitative Project Management (QPM)

Pre-Development Processes

Concept Exploration
System Allocation (RD, TS)

Proposal Management
Project Initiation (PP)

Product Mgt.

Requirements Mgt. and Development (RD)

Product Engineering (TS, PI)

Verification, Validation, (VER, VAL)

Post-Development Processes

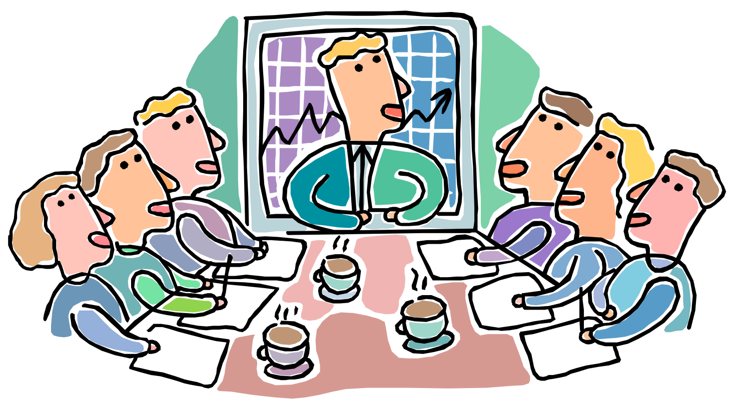
Tailoring
Environment
Conversion
Installation
Operation
Support
Maintenance
Retirement

Integral Support Processes

Quality Assurance (PPQA), Config. Management (CM), Measurement and Analysis (MA), Decision Analysis and Resolution (DAR), *Causal Analysis and Resolution (CAR)*

Aligning CMMI & ITI

here Am I and hich ay Do I Go



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- Where Am I?
  - Current Situation
  - Process Improvement Objectives
- How Do I Get There?
  - CMMI
  - ITIL
  - Mapping, Commonalities, Differences
- What Do I Do Now?
- Conclusions

here Am I

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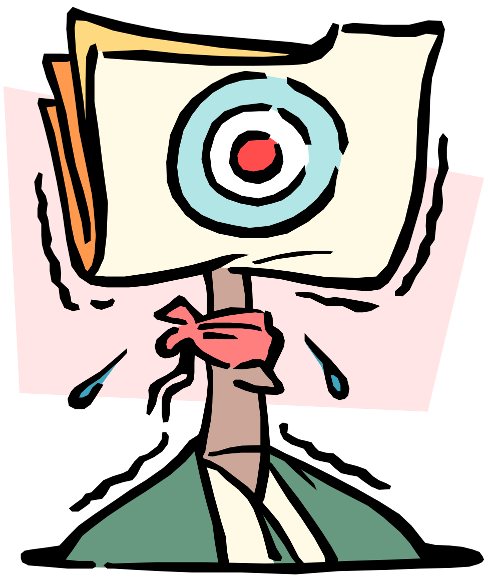
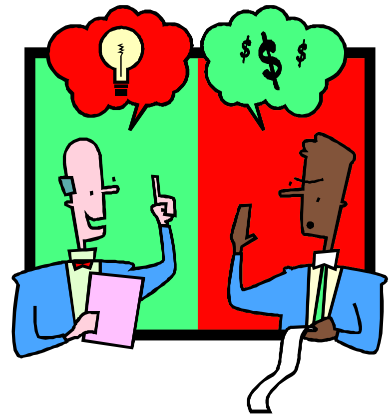
on

Satisfying market pressures:



Improve Customer Satisfaction



Increase quality of product and service delivery and support while reducing costs

on

Proliferation of "quality" groups

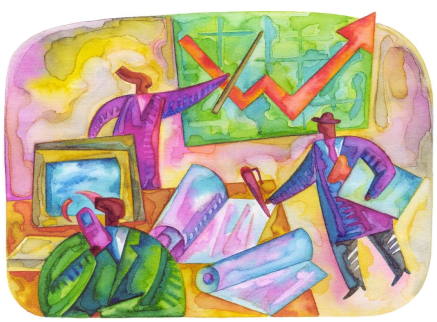
that

Focus on their own model, standard, regulatory mandate

Compete for limited corporate resources & udgets

while

acking communication & coordination with others



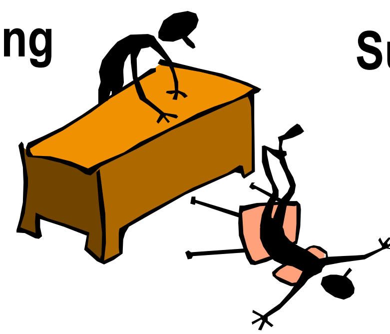
Ignoring linkage to usiness goals

Creating uni ue process repositories, architectures, data stores

mandate

Training

Surveys



Assessment

Metrics Collection

vement O ectives

- Standardized approach to process definition and implementation in a variety of environments (product and service development)
  - Alignment to business needs
  - Proven best practices that deliver measurable results
  - Organizational structure for development of processes and procedures
  - Common language both internally and externally

ow Do I Get There

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- A structured collection of practices that describes the characteristics of effective processes
- Integration of common elements and best features of multiple CMMs, providing
  - Common terminology
  - Training
  - An integrated appraisal method (SCAMPI*)
- CMMI enables a functional integration of all disciplines required to develop a product **<u>or service</u>**

- **SCAMPI℠ Standard CMMI Appraisal Method for Process Improvement**

e – Maturity evels

Continuously Improving Process

5: Optimizing

Predictable Process

4: Quantitatively Managed

Standard, Consistent Process

3: Defined

Disciplined Process

2: Managed

1: Initial

e know uantitatively in advance when pro ects are going well or not, and we intelligently ad ust and improve.

All of our pro ects follow similar processes. e know what to do when.

Things are getting under control – our schedules and plans now include most of what we have to do.

hat Process

f CMMI

- System & Software Development
  - Entire lifecycle or part thereof
  - All types of lifecycle methods
  - Including sustainment aspects of system development
    - Logistics, training, etc
- System & Software Maintenance
- Providing services
  - Training
  - Delivery/transportation
  - Infrastructure and Operations

- The "Information Technology Infrastructure Library" guidelines
- The 'library' has evolved to it's current version, ITIL v3. The five volumes are:
  - ITIL Service Strategy;
  - ITIL Service Design;
  - ITIL Service Transition;
  - ITIL Service Operation;
  - ITIL Continual Service Improvement,
  - which can be obtained from the publishers, TSO Books (www.tsoshop.co.uk)

- The ITIL volumes make up a comprehensive, non-proprietary and publicly accessible process-related library in the IT field. It covers:
  - Descriptions and definitions of the various ITIL practices and disciplines
  - Organizational structure and skill requirements
  - Best practices and processes for planning, provision and support of IT services
- ITIL is a registered trademark of the UK Government's Office of Government Commerce (usually known as the OGC)

ife Cycle Phases

Service Strategy

Services eeds ased on Business Goals, tility and arranty

Service Design

Development of Services & Service Management Processes

Service Transition

Capa ilities for transitioning new changed services into operations

Service Operations

Capa ilities for managing service operations

Continual Service Improvement

Quantitative understanding of services, ad usting and improving

es in Each ife Cycle

Service Strategy | Service Design | Service Transition | Service Operations | Continual Service Improvement

ITI Processes

Service Design	Service Transition	Service Operations	Continual Service Improvement
•Service evel Mgmt. •Capacity Mgmt. •Availa ility Mgmt. •Continuity Mgmt •Service Catalogue Mgmt. •Information Security •Supplier Mgmt.	•Transition Planning & Support •Change Mgmt. •Asset & Config. Mgmt •Release & Deployment Mgmt. • alidation & Testing •Evaluation • nowledge Mgmt.	•Incident Mgmt. •Pro lem Mgmt. •Event Mgmt. •Re uest Fulfillment •Access Mgmt. •Operational Activities Covered in other Phases	• Step Improvement Process •Service Reporting •Service Measurement •ROI for CSI •Business Questions for CSI •Service evel Mgmt.

Policies

Principles for Each Phase

Technology Considerations

Organizational Considerations

Challenges, Critical Success Factors & Risks

•Blue denotes new in ITI v

pping

CMMI Process Areas

Service Strategy

- Re uirements Mgmt.
- Re uirements Dev.
- Pro ect Planning, Pro ect Monitoring & Control
- Integrated Pro . Mgmt.
- Quant. Pro . Mgmt
- Meas. & Analysis
- Org. Process Focus
- Org. Process Definition

Service Design

- Re uirements Mgmt.
- Re uirements Dev.
- Technical Solution
- alidation
- Decision Analysis & Resolution
- Integrated Pro . Mgmt.
- Supplier Agree. Mgmt.
- Configuration Mgmt.

Service Transition

- Configuration Mgmt.
- Product Integration
- erification
- alidation
- Product & Process Quality Assurance

Service Operations

- Pro ect Monitoring & Control
- alidation
- Causal Analysis & Resolution

Continual Service Improvement

- Measurement & Analysis
- Product & Process Quality Assurance
- Org. Process Focus Definition
- Org. Process Performance
- Quantitative Pro ect Mgmt.
- Causal Analysis & Resolution
- Org. Innovation & Deploy.
- Integrated Pro ect Mgmt.

Generic Practices – Example Policies; Training

Organizational Training – by Role

Project Planning, Tracking and Control (PP, PMC)

Risk Management

ote Mapping is not comprehensive – only ma or items

CMMI vs. ITI

ITI	CMMI	
✓	✓	Em odies years of product or service development
✓	✓	Contains tried, tested and enhanced practices
✓	✓	Esta lishes process & process improvement policy
✓	✓	Deals with roles and responsi ilities
✓	✓	Ensures training and skills of resources
✓	✓	Provides guidance to measure performance
✓	✓	elps to set process improvement o ectives & priorities
✓	✓	elps to ensure sta le, capa le, and mature processes
✓	✓	Guides improving pro ect & organi ational processes
✓	✓	ith an appraisal audit method to determine maturity compliance for registration – oth indicators of a ility to deliver products and services

MMI vs. ITI

ITI	CMMI	
✔	✓	Strategi e a usiness service definition and catalog to drive process design, transition, operations and improvement
✔	✔	Esta lish and define process improvement infrastructure
✔	✓	Provide descriptive tools, technologies, techni ues & standards
✔	✓	Defined roles and responsi ilities with skill descriptions and training re uirements
✔	✔	Plan and develop products services
✔	✓	Integrate, deploy and transition product services
✔	✔	Measure and improve product service delivery
	✔	Benchmark via maturity or capa ility level
✔	✓	Provide industry recognition through registration

CMMI Process Areas (Project Management)	Related Business O ectives of Services Organi ations	ITI ife Cycle Phase
Project Planning	Maintain detailed service plans that include the budget and schedule needed to support the customer	Service Strategy
Project Monitoring & Control	Manage the costs and schedule associated with the service	Service Strategy
Supplier Agreement Management	Effectively manage suppliers of tools or resources vital to the success of the service	Service Design
Integrated Project Management	Integrate the delivery of the service with other projects and stakeholders	Service Strategy; Service Design
Risk Management	Plan for current and future risks to the service project	All
Quantitative Project Management	Establish predictability in their services	Service Strategy; CSI

Adapted from CM SEI T

CMMI Process Areas (Support)	Related Business O ectives of Services Organi ations	ITI ife Cycle Phase
Configuration Management	Control technical and management work products	Service Transition
Process & Product Quality Assurance	Ensure their services meet quality objectives and customer requirements	CSI; Service Transition
Measurement and Analysis	Understand measures of cost, profitability, & cost of quality	Service Strategy; CSI
Decision Analysis and Resolution	Make informed and justifiable selections of products or techniques for their customers	Service Design
Causal Analysis and Resolution	Track service issues to root causes and eliminate them	Service Operation; CSI

Adapted from CM SEI T

CMMI Process Areas (Engineering)	Related Business O ectives of Services Organi ations	ITI ife Cycle Phase
Requirements Management Requirements Development	Develop and manage their service requirements	Service Strategy; Service Design; (Service. Operations)
Technical Solution	Provide services that provide technical stability and support all aspects of product development and fielding	Service Design; (Service Operations)
Product Integration	Ensure that interfaces are compatible prior to their integration	Service Transition; Service Operation
Verification	Confirm that performed services satisfy their service requirements	Service Transition; (Service Operation)
Validation	Evaluate the suitability of acquired products & services	Service Design; (Service Transition & Operation)

Adapted from CM SEI T

CMMI Process Areas (Process Management)	Related Business O ectives of Services Organi ations	ITI ife Cycle Phase
Organizational Process Focus	Build and maintain a service culture	Service Strategy; CSI
Organizational Process Definition	Implement and improve processes to support predictable successful execution	Service Strategy; Service Design; CSI
Organizational Training	Train staff members to perform service functions	All
Organizational Process Performance	Measure effectiveness & performance of processes	Service Strategy; CSI
Organizational Innovation & Deployment	Introduce new service methods, technologies, & functions	Service Strategy; CSI

Adapted from CM SEI T

hat Does It All Mean
hat Do I Do ow

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o ects" at Several evels

To use CMMI and ITIL together,

- Define an "Project" at three levels
  1. Creation of Service Offering – treat your service catalogue and service portfolio as its own project (ITIL & CMMI)
  2. Definition of a development project (CMMI)
  3. Manage service operations – identifying the service catalogue item(s) as project
     - ITIL to define
     - CMMI to appraise

cture for Implementing "Pro ects"

Minimum Delivera les Ta le

Lifecycle Phases and Associated Core Processes	Work Products: Large Projects > 1000 hours - New Engagement | Service Catalog Entry	Medium Projects (200 - 999 hours, App Enhancement, Incident | IM/AM Combined | Contract Amendment	Small Projects (< 200 hours), Service Requests | IM Projects | IM/AM Combined
Initiating Phase • Change Management Procedure • Project Planning Procedure • Product Engineering Procedure • Risk Management Procedure • Measurement & Analysis Procedure	✓ High level estimate (with rationale) ✓ High level Requirements/Design ✓ Risk log, Meeting minutes ✓ Project contract (e.g., SOW, SOS) ✓ Peer review (estimate, rqts, designs, risks) ✓ CQ or Change ticket	✓ High level estimate (with rationale) ✓ High level Requirements/Design ✓ Risk log, Meeting minutes ✓ Project contract (SOW, SOS, pool hours) ✓ Peer review (estimate, reqts, design, risks) ✓ CQ or Change ticket	✓ CQ ticket or Change ticket ✓ Meeting minutes
Planning Phase • Project Planning Procedure • Integrated Teaming Procedure • Requirements Mgmt Procedure • Risk Management Procedure • Configuration Mgmt Procedure • Knowledge Management Procedure • Supplier Management Procedure • Environment Mgmt Procedure • Project Monitoring Procedure • Quality Assurance Procedure • Measurement & Analysis Procedure • Change Management Procedure	✓ Project Mgmt Plan (PMP) (with project glossary, lifecycle, tools, project schedule, WBS, risk plans) ✓ Project Monitoring and Control Plan (could be incorporated into the PGP) ✓ Configuration Management Plan ✓ Detailed project estimate (effort, schedule, cost, size) ✓ Peer review records for PGP, Configuration Management Plan, and Detailed estimate ✓ Project budget ✓ Meeting minutes, Issues Log, Risk Log	✓ Project Mgmt Plan (PMP) (with project glossary, lifecycle, tools, project schedule, WBS, risk plans) ✓ Project Monitoring Plan and Control Plan (could be incorporated into the PGP) ✓ Configuration Management Plan ✓ Detailed project estimate (effort, schedule, cost, size) ✓ Peer review records for PGP, Configuration Management Plan, and Detailed estimate ✓ Project budget ✓ Meeting minutes, Issues Log, Risk Log	✓ Project Mgmt Plan (PMP) (e.g., annual plan, service line) ✓ Configuration Management Plan (e.g., annual plan, service line) ✓ Peer review records for PGP, Configuration Management Plan, and estimate ✓ CQ ticket or Change ticket ✓ Meeting minutes

- Think of commonalities of CMMI and ITIL instead of the differences – great synergy
- Think of the CMMI as the "what" and ITIL as the "how"
  - ITIL - where it provides detailed processes, techniques, templates and tools
- Keep "Maturity" as the goal (or Capability)
  - Utilize CMMI process improvement infrastructure (e.g., Executive Steering Committee, Process Engineering Group, etc.) to facilitate continual service improvement – as defined in CSI volume
  - Use CMMI to assess what is being done

ITIL Pages

- ITIL Online; the official ITIL Page http://www.itil.co.uk
- OGC Office of Government Commerce http://www.ogc.gov.uk
- The ITIL and ITSM Directory http://www.itil-itsm-world.com/
- IT SMF Forum http://www.itsmf.com/
- ITIL Portal http://www.interpromusa.com/
- Service Management Institute http://www.itsmi.com
- EXIN ITIL Examination Institute http://www.exin-exams.com/
- Where you can get the ITIL books http://www.itilbooks.com/
- ITIL Community www.itilcommunity.com

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uantitative Models for Predicting Pro ect Success

Philip Paul, Unlimited Innovation, Inc.

Dean Caccavo, Rick efner, evin Schaaff, Diane Miller
Northrop Grumman Corporation

CMMI Technology Conference User roup
November 12-15, 2007





Background

- **Predictive modeling is an essential skill at CMMI Levels 4 and 5**
  - Organizational Process Performance requires predictions based on statistical analysis of the organization's standard process
  - Quantitative Project Management requires predictions based on statistical analysis of the project's defined process
- **Predictive modeling relies on historical program performance data (predictive analytics) in conjunction with a forecasting algorithm model to predict future outcomes**
  - Ranges from simple extrapolation techniques to sophisticated Neural Network based models
- **This presentation will discuss the principles of predictive modeling, outline the fundamental methods and tools, and present typical results from applying these techniques to project performance**

Agenda

- ✓ **What is Predictive Analysis?**
- Recent Trends
- Application to Program Performance
- Summary

Empowering Your Enterprise

What is Predictive Analysis?

- ***Could this network packet be from a virus attack?***
  - Predict likelihood of the network packet pattern
  - ➔ **Anomaly detection (outlier detection)**
  - Similar questions:
    - Are the hospital lab results normal (Adverse drug effect detection)
    - Is this credit transaction fraudulent? (fraud detection)
- ***Will this student go to college?***
  - Based on Gender, ParentIncome, ParentEncouragement, IQ, etc.
  - E.g., if ParentEncouragement=Yes and IQ>100, College=Yes
  - ➔ **Classification (prediction)**
  - Similar questions:
    - Is this a spam email? (spam filtering)
    - Recognition of hand-written letters (pen recognition)
- ***What is the person's age?***
  - Based on Hobby, MaritalStatus, NumberOfChildren, Income, HouseOwnership, NumberOfCars, …
  - E.g., If MaritalStatus=Yes, Age = 20+4*NumberOfChildren+0.0001*Income+…
  - ➔ **Regression (prediction)**

Agenda

- What is Predictive Analysis?
- ✓ **Recent Trends**
- Application to Program Performance
- Summary

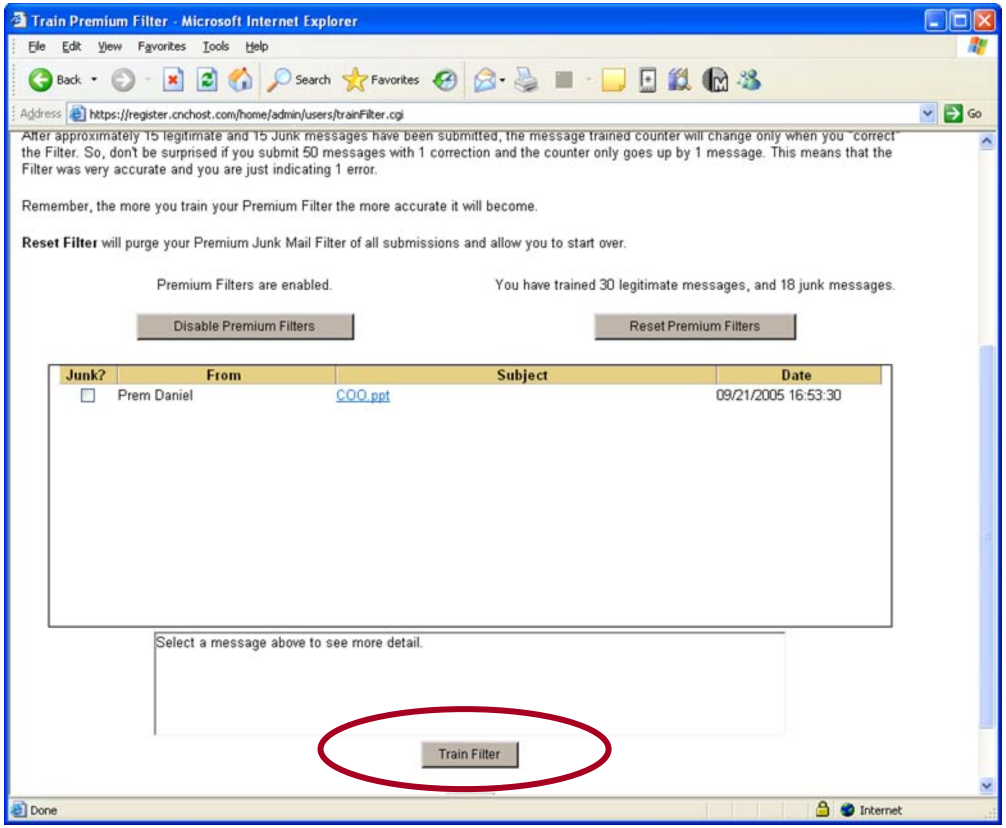
Predictive Analysis Trends – Adoption is on the rise

- Predictive Analysis is becoming more prevalent and integrated in business applications
  - o *Example: Disease management and evidence based care, based on historical diagnosis and procedure codes of patients*
  - o *Example: E-Mail filtering using predictive analysis*

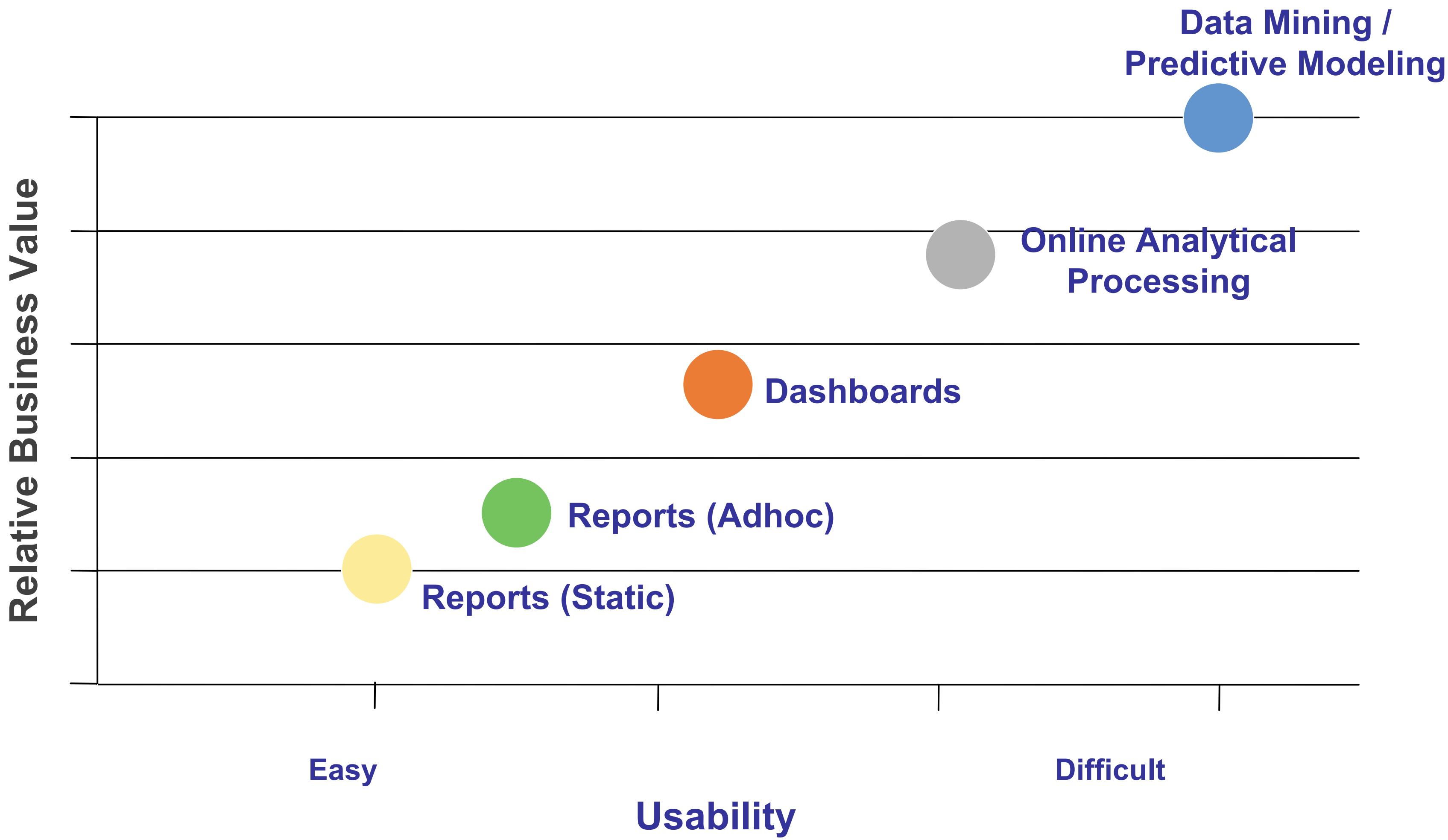
- Predictive Analysis algorithms are being integrated into existing databases, data mining tools
  - o *Example: Microsoft SQL Server 2005 has predictive analysis algorithms*

Example:

Premium predictive analysis based filtering on e-mail, available to any e-mail user



Predictive Analysis Trends – Tools are becoming easier to use



Predictive Analysis Trends – Model development is more structured

Define a Model

Train the Model

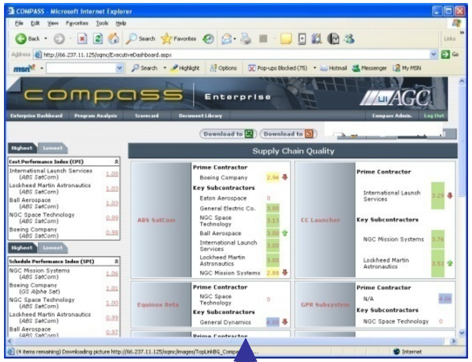
Training Data

Test the Model

Test Data

Prediction using the Model

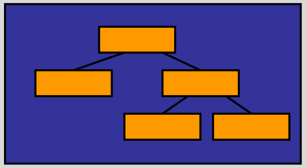
Prediction Input Data



Off-the-shelf or Proprietary Predictive Analysis Engine

Third Party Predictive Analysis tools

Off-the-shelf or proprietary Predictive Analysis Model



- Executive understanding of the creation, training and testing of the model is critical to success
- The Model gets more powerful and accurate as the volume of data fed into the model increases

Predictive Analysis Trends – Algorithms are available for use

Decision Trees	Na ve Bayesian	Clustering	Sequential Clustering	Time Series	Association rules	Neural Network	
1	2	2	2		2	1	Classification
1	2	2	2			1	Regression
		1	1			2	Segmentation
1	1	2	2		1	1	Association Analysis
		1	1			2	Anomaly Detect.
			1				Sequential Analysis
				1			Time series

1 - First Choice **2 - Second Choice**

Data Mining Vendors & Tools

- SAS (Enterprise Miner)
- IBM (DB2 Intelligent Miner)
- Oracle (ODM option to Oracle 10g)
- SPSS (Clementine)
- Insightful (Insightful Miner)
- KXEN (Analytic Framework)
- Prudsys (Discoverer and its family)
- Microsoft (SQL Server 2005)
- Angoss (KnowledgeServer and its family)
- DBMiner (DBMiner)
- Many others

Agenda

- What is Predictive Analysis?
- Recent Trends
- ✓ **Application to Program Performance**
- Summary

Mission Assurance Continuum

Program Performance Oversight **Industry Minimum**	Program Analysis Reporting **Industry Best Practice**	Predictive Program Health **Industry Innovators**
Proactive Program Management Program Portfolio Management	**Reports based on current and passed performance data of portfolio programs, programs, and subcontract reports**	**Predictive Analysis based on Program Performance Modeling**

Approach and Scope

• Self reported Program Portfolio includes critical and high visibility programs • Standard Program Management Metrics collected on a periodic basis	• Self Reported Program metrics collected periodically and at specific program milestones • Reporting analysis performed as needed	• Self reported program metrics, organizational data, personnel data and customer reported metrics collected at regular intervals • Predictive models developed using historical data (leading indicators rationalized) • Models validated against historical data

Infrastructure and Breadth

• Program data maintained by individual programs • Summary information provided to enterprise repository	• Program data collected periodically into an enterprise-wide program management repository • Program, Enterprise and Subcontracts performance reports available	• Holistic enterprise wide approach to program execution • Models continually refined using current program performance data • Sophisticated predictive measures provided to programs and enterprise

Data Requirements

• Very few metrics collected from programs • Key program metrics (cost performance, schedule performance, technical performance, CPI, SPI etc.) • Standardized program taxonomy information like customer, contract type etc.	• 25 – 100 metrics collected from programs • Key program metrics collected at all specified Program Milestones.	• 50 – 75 metrics collected from programs and refined to include only the few relevant metrics • Adaptive approach to qualitative and quantitative performance indicators • Direct and Indirect metrics collected for the programs; qualitative information is mined • Proactive responses based on predictive analysis of ongoing and historical performance

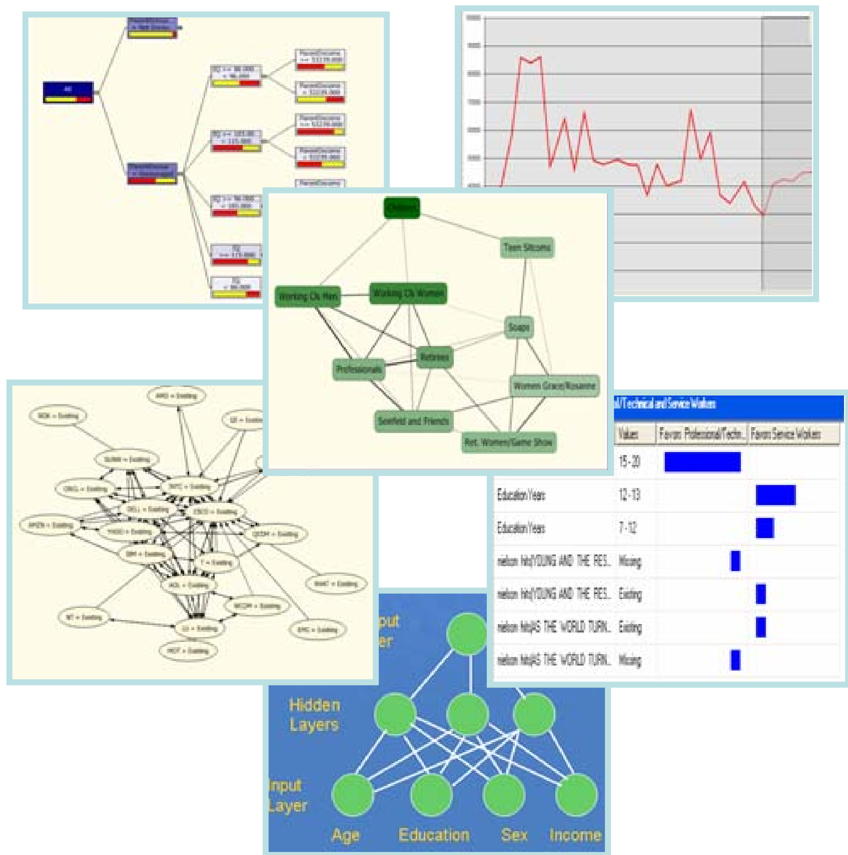
Overarching Objectives for Predictive Modeling

- Provide program management staff with Predictive Models to "test-their-gut" against enterprise experience data before making strategic program decisions
- Develop Predictive Models that provide insight into identifying "headlight metrics" that influence Schedule and Cost realism during program execution
- Leverage existing enterprise information to develop Predictive Models for programs
- Ensure that models are extensible and automatically calibrated with additional data from the program and enterprise

Potential Areas for Predictive Analysis

Potential Predictive Analysis Models for Program Management and Subcontractor Management

- Schedule Risk at WBS level based on past performance
- Cost Risk at WBS level based on past performance
- Technical Risk at WBS level based on past performance
- Spending and staffing profile for the program life cycle
- Subcontractor risk profile based on past performance
- Sub-tier quality at subcontract and WBS level
- Defect/Aberrations for the program life cycle
- Mission Assurance models based on program category



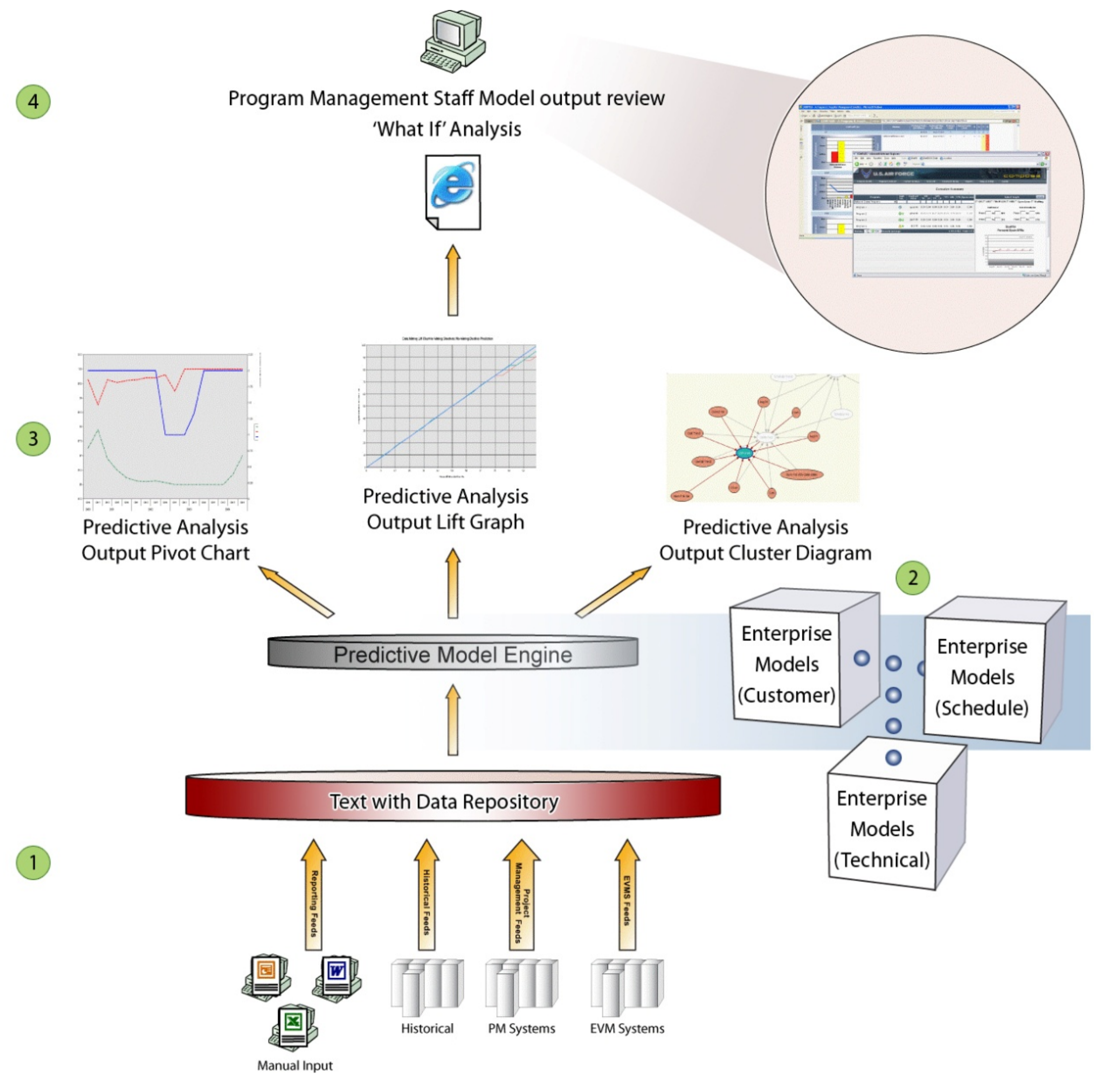
Predictive Analysis Algorithms

- Decision Trees
- Naïve Bayesian
- Clustering
- Sequence Clustering
- Association Rules
- Neural Network
- Time Series
- Custom Model

Predictive Analysis High Level CONOPS

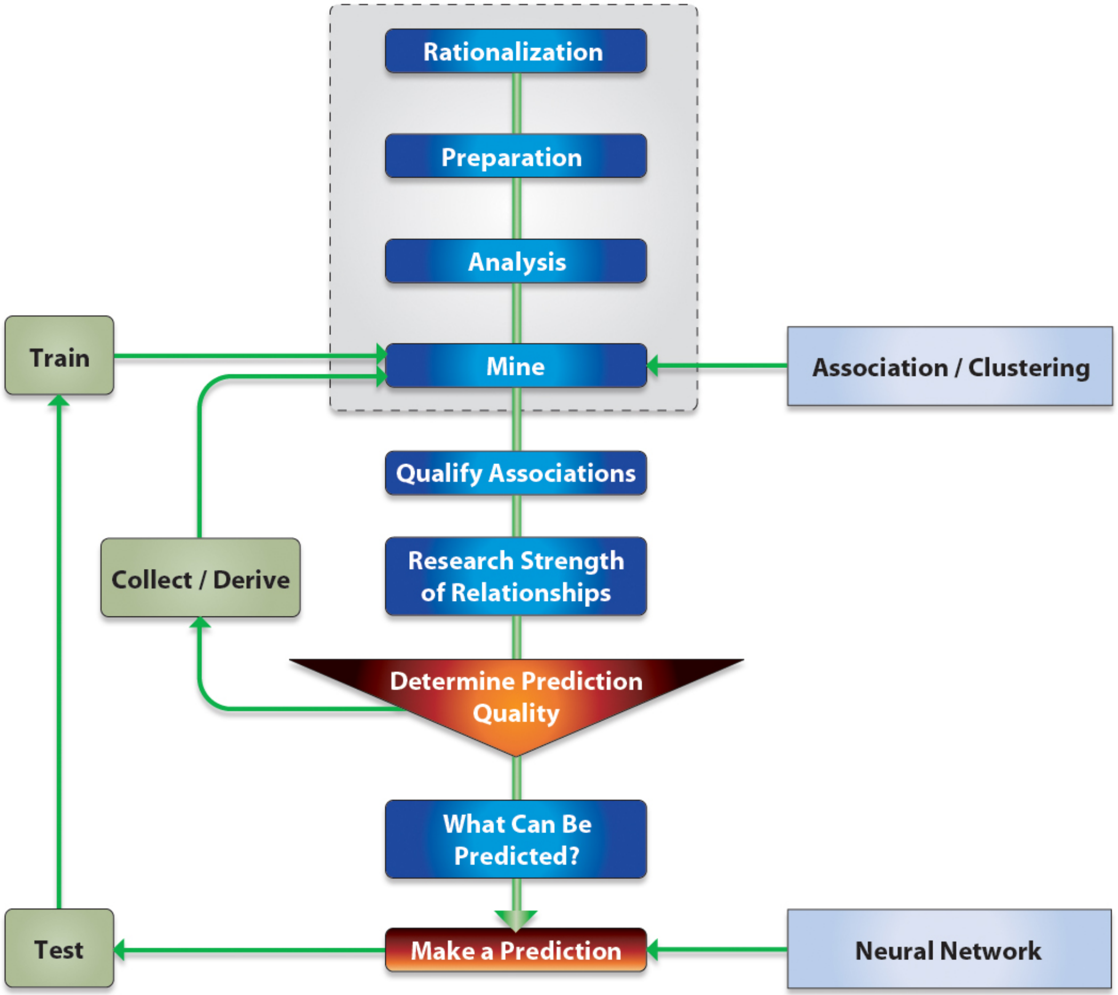
1) Enterprise data is mined and analyzed
2) Enterprise models are defined by Analysts
3) Enterprise model outputs are defined by Analysts and customized by PM staff
4) PM staff use models interactively

Key Benefit:
Leverages enterprise experience data and sophisticated algorithms into predictive models for cost and schedule realism checks during program execution



The Predictive Modeling Process

- Explore the Data
- Understand Data Relationships
- Derive/Enhance the Data
- Use the Data to Predict
- Train the Model



What can be Predicted with Reasonable Accuracy?

Program Lifecycle Stage

	Limited Number of Programs	**Enterprise Experience**
Large volume of historical data	▪ Likelihood or return to acceptable performance ▪ Predictive Program Performance **1**	▪ Quadrant 2 predictions ▪ Quadrant 3 predictions ▪ Early warning “headlight indicators” ▪ Higher accuracy based on enterprise experience **3**
Limited Historical data		▪ Cost, schedule realism ▪ Phase realism ▪ WBS Accuracy **2**
	Low	**High**

Volume of “Like” Programs

Derivation of Data & Data Relationships

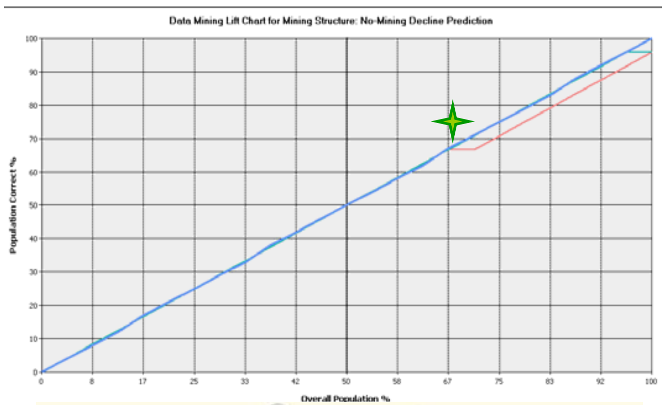
- **Examples of Derived Data**
  - Number of Outstanding Program Issues (with and without recovery dates)
  - Variance in program Cost/Schedule/Technical health from month-to-month
  - Program Cost/Schedule/Technical health trend from month-to-month
  - Variance in VAC from month-to-month taken as a percentage of the current EAC

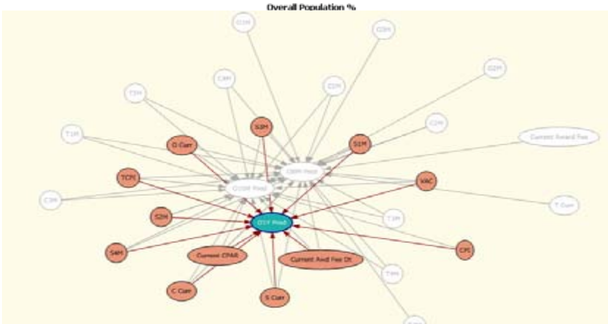
- **Examples of Discovered Relationships**
  - Schedule Health is a good indicator of program Overall Health recovery
  - Cost and Technical Health are good indicators of program Overall Health decline

Better understanding of the data allows for organization and enhancement of the dataset

Model Development & Calibration

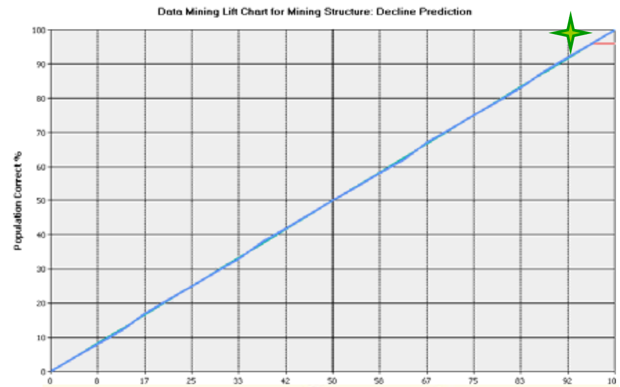
Model

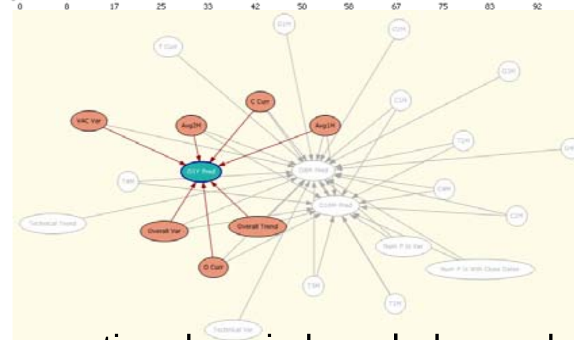




- Modeling without applied domain knowledge or calibration resulted in lower accuracy
- Association models able to determine relevant data attributes

Calibrated Model



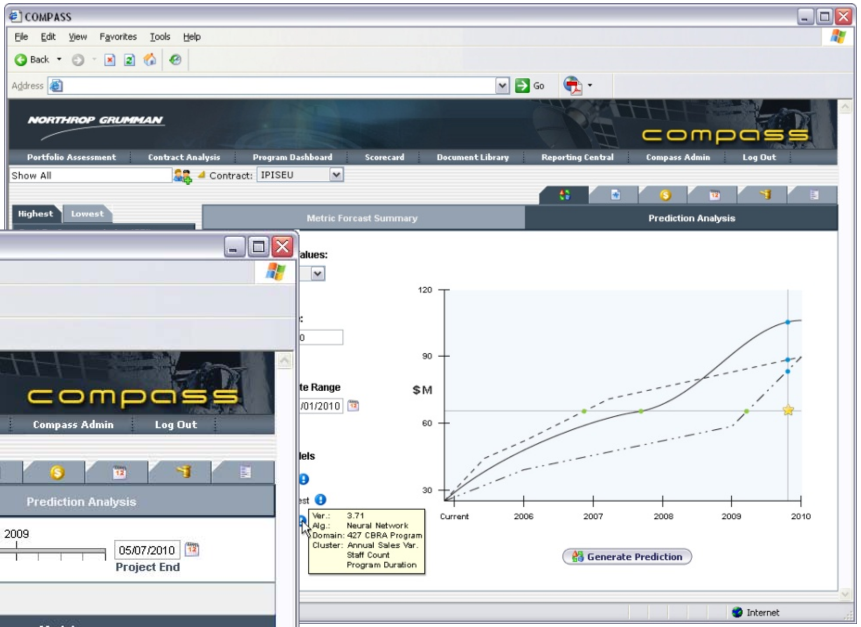


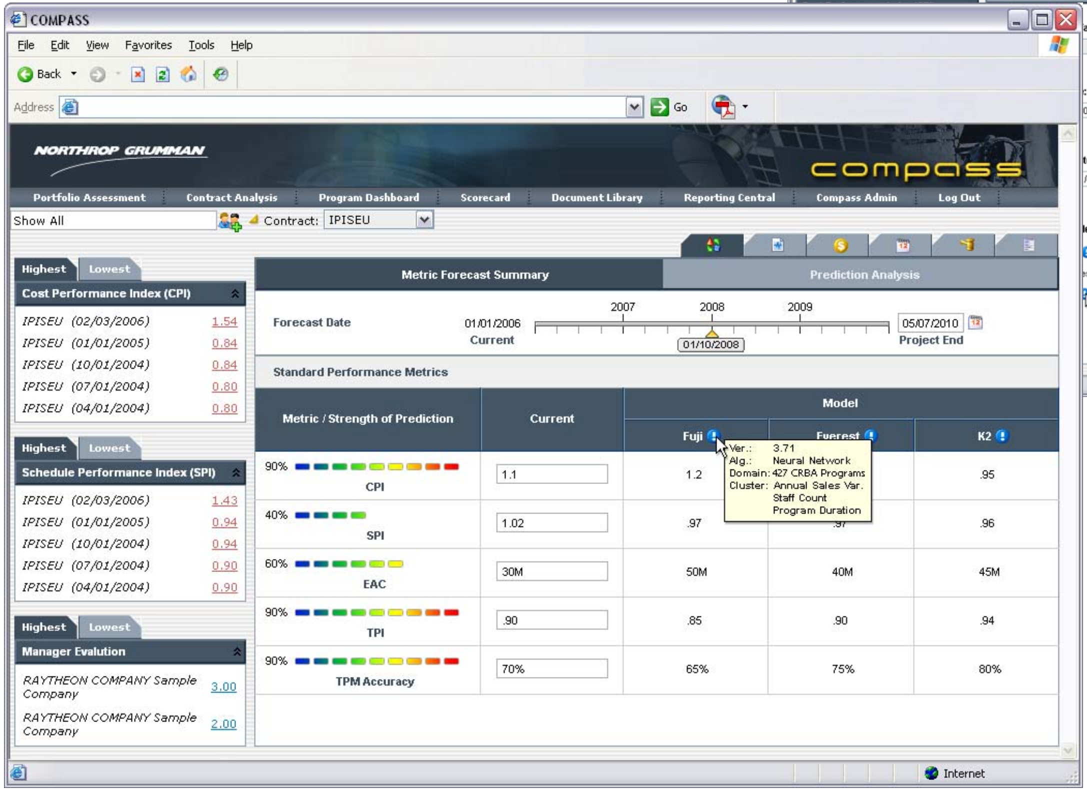
- Incorporating domain knowledge and calibration into data mining resulted in higher accuracy
- Data relationships are more clearly defined

Domain knowledge & calibration applied to data mining can enhance the predictive model

Presentation of the Results from the Models

Ability for Programs to review the predictive output from multiple models to “test-the-gut” before making strategic program decisions

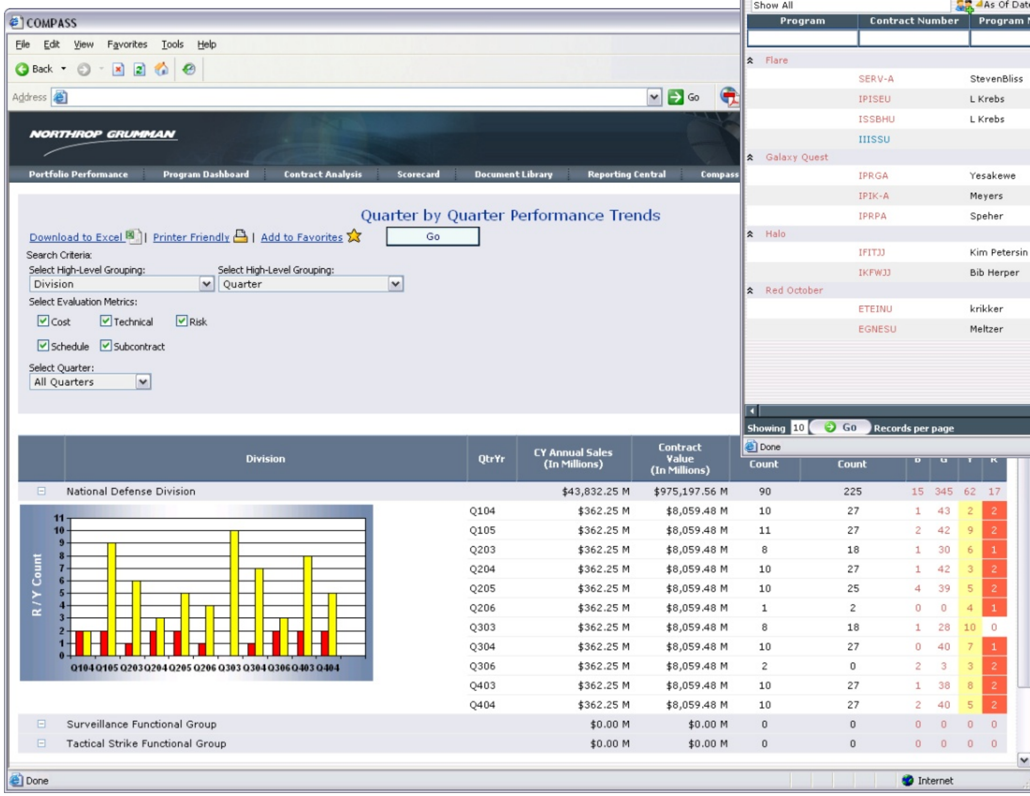


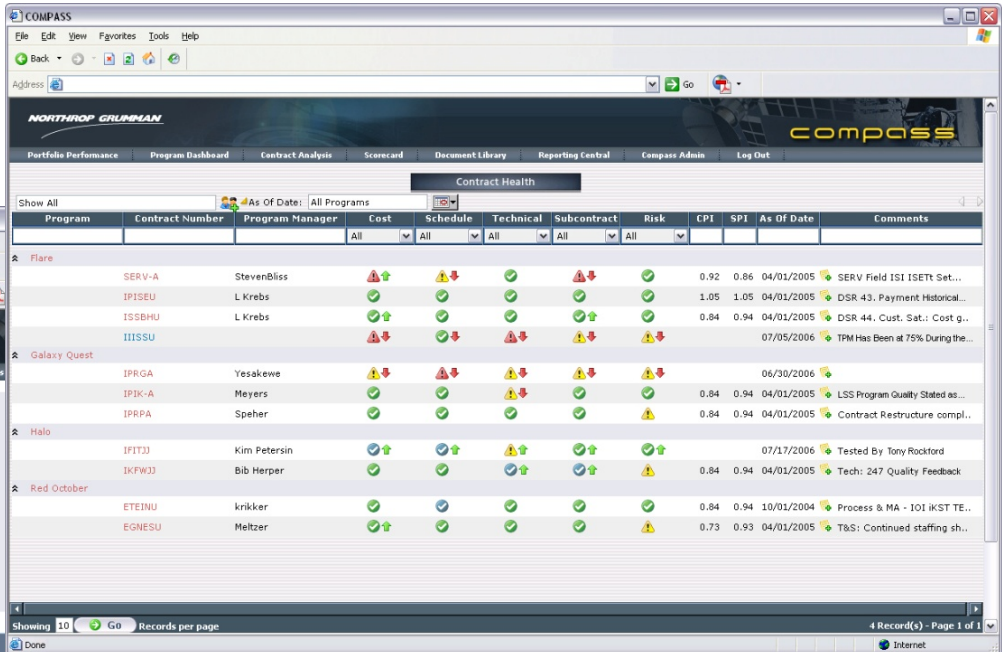


FICTIONAL DATA

Presentation of the Results from the Models

Ability for staff to review status and trends across the portfolio of programs, across a variety of categories





FICTIONAL DATA

Algorithm References

- Decision trees (classification/regression):
  - ftp://ftp.research.microsoft.com/users/surajitc/icde99.pdf
  - http://www.research.microsoft.com/research/pubs/view.aspx?tr_id=81
  - http://research.microsoft.com/~dmax/publications/dmart-final.pdf
- Association rules:
  - Apriori algorithm (see Data Mining concepts and techniques)
- Clustering
  - EM:http://www.research.microsoft.com/scripts/pubs/view.asp?TR_ID=MSR-TR-98-35
  - K-means (see Data Mining concepts and techniques)
- Sequence clustering
  - ftp://ftp.research.microsoft.com/pub/tr/tr-2000-18.pdf
- Time series:
  - http://research.microsoft.com/~dmax/publications/dmart-final.pdf
- Neural network
  - Conjugate gradient method (see Data Mining concepts and techniques)
- Naïve Bayesian
  - See Data Mining concepts and techniques

More Information

- OLE DB for DM specification
  - http://www.microsoft.com/downloads/details.aspx?FamilyID=01005f92-dba1-4fa4-8ba0-af6a19d30217&DisplayLang=en
- Plug-in
  - http://www.msnusers.com/AnalysisServicesDataMining/Documents/Files%2FSQL%20Server%20Data%20Mining%20Plug%2DIn%20Algorithms%20%28Beta%202%20%2B%2B%29.zip
  - A white paper, tutorial, and complete sample code for Pair-wise Linear Regression
- SQL Server 2005:
  - www.microsoft.com/sql/2005
- Community:
  - Microsoft.public.sqlserver.datamining
  - Microsoft.private.sqlserver2005.analysisservices.datamining
  - Groups.msn.com/AnalysisServicesDataMining
- msdn.microsoft.com (search “data mining”)

Agenda

- What is Predictive Analysis?
- Recent Trends
- Application to Program Performance
- ✓ **Summary**

Summary – Critical success factors

- Executive and Enterprise support and understanding of long-term strategic benefits
- Understanding of the types of data and the correlation between the data
- Understanding of the various constituents in the value chain and the tools/processes for each constituent
- Prototypes or mockups that depict the results of the model
- Sound and robust technical architecture
- Delivery mechanism that shields the complexity of the model from the end users

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LOCKHEED MARTIN

Jump Starting Multi-Organizational Teams for High Process Capability

NDIA Technology Conference

November 13, 2007

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Corporate Engineering & Technology
SSRC Center for Process Improvement Excellence

Mary Lynn Penn
Lockheed Martin
Information Systems & Global Services

Agenda

- Problem Statement and Need for High Capability/Maturity Processes
- Critical Success Factors and Drivers
- Process Definition Comparison
- Key Steps
- Views of Candidate Team Processes
- Summary

lem Statement - 1

- Mature CMMI® organizations, teamed together, do not automatically yield a mature program team
  - ML3 org + ML3 org + ML3 org Í ML3 team
- Immature organizations tend to drive down mature organizations
  - Immature organizations may not have the qualifications to participate in mature organizational behaviors
  - Unless all team members participate, there may be ñattritionò

The ñteamõs maturityò will most likely start out at level 1!

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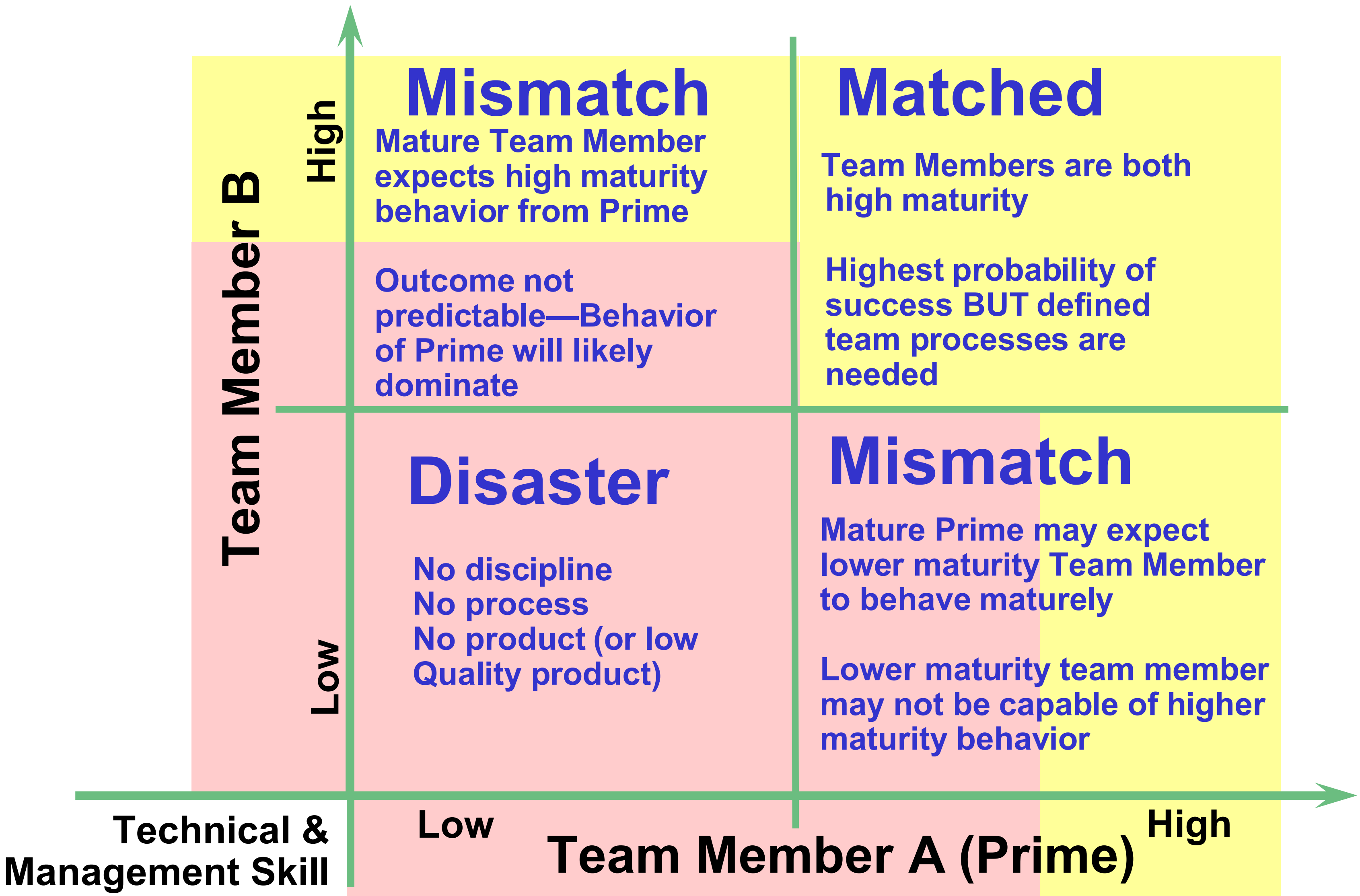
er Process Capability Mismatch



Note: Adapted from an SEI chart

blem Statement - 2

- A mature program team needs a defined program process but the source isnôt obvious
  - Each team member will likely have its own Organizational Standard Process
  - Dictating using the Primeôs process is usually not feasible and introduces unnecessary risk
  - Formulating a brand new process, never deployed by any team member, is also risky

Whatôs the best choice for a multi-organizational teamôs process?

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...lem Statement - 3

- The problem is exacerbated if team members are at different CMMI maturity levels
  - Behavior differs, depending on the maturity level
  - Team members at lower maturity levels may not understand, appreciate or expect higher maturity behaviors
  - Failure to integrate subcontractors can result in lack of commitment for end item responsibility, depending on subcontractor's role/integration
  - Stakeholders with varying maturity have different expectations

The problem can be amplified if customers are on the team.

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The Need

- Well-defined program processes are critical to a program teamôs success
- Customers increasingly expect team processes to be common, integrated and mature
- A well-defined approach for program process definition is needed when forming teams of individually mature organizations
- Common processes minimize risk and promote a quality product/service
- A mature program approach to process enables ñproactiveò management

cal Success Factors for ganization Team Processes

- Program process definition based on
  - Shared objectives
  - Shared process needs
  - Shared vision
  - Clearly defined roles and responsibilities
- Common process infrastructure
- Clearly defined interfaces between common and unique processes
- Program process measurement in areas critical to program success

n Process Definition Drivers

- Program needs and objectives
- Program risks and opportunities
- Customer requirements (RFP, award fee, schedule/cost, etc.)
  - Could include critical processes or Process Areas
  - CMMI compliance
  - Other defined standards compliance
- Program management needs
  - Program reviews
  - Program reporting (cost, schedule, etc.)
  - Measurement (performance, productivity, phase specific, etc.)
- Suppliers and Subcontractors
  - Integrated Team
  - End Item responsibilities
- Work environment
  - Co-location versus virtual

The Challenge: Translating drivers into the “right” Integrated Team Process

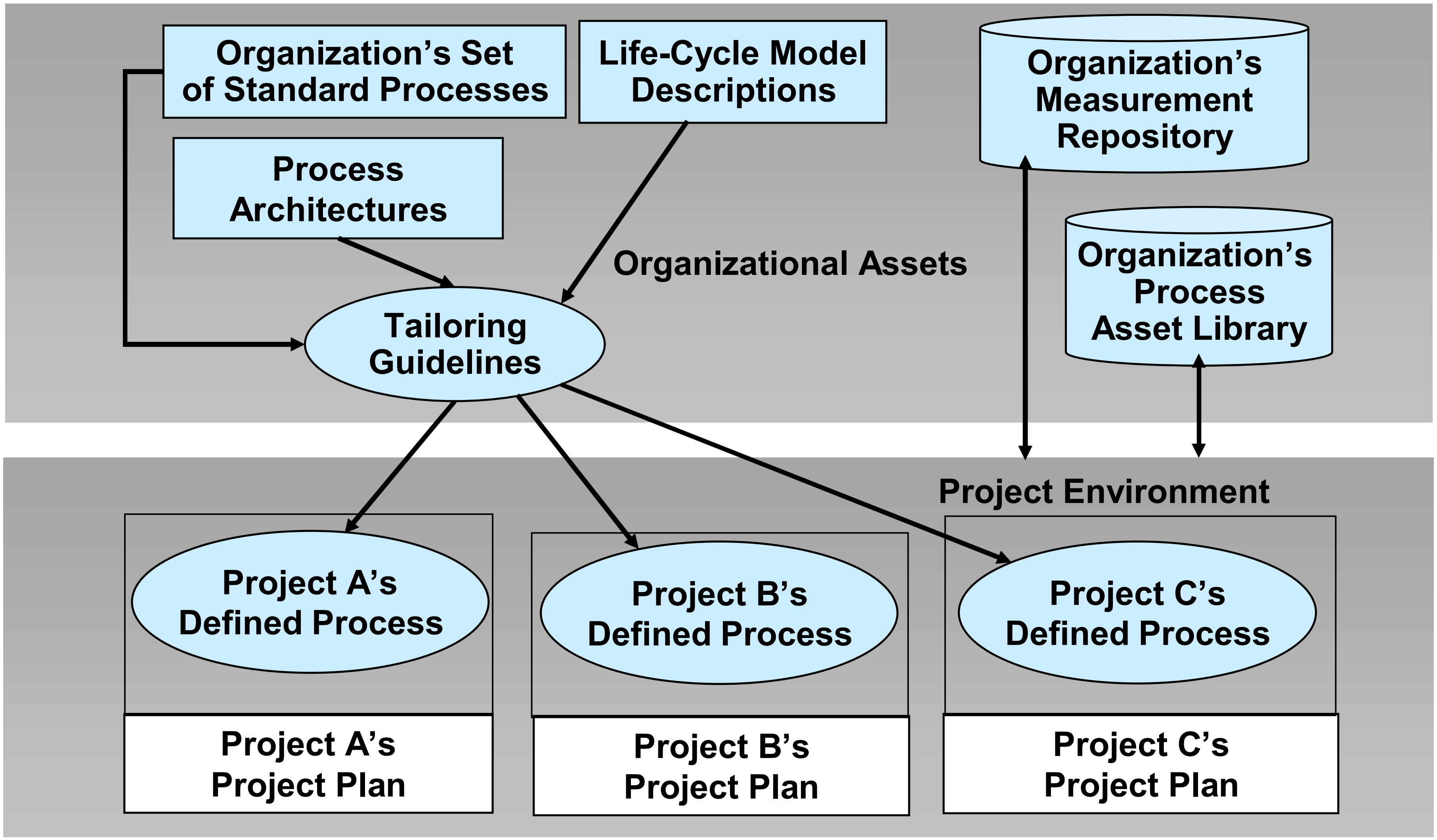
s the “Right” Process?

The ñrightòprocess is one that

- Meets requirements, including standards
  - From the customer
  - From the team membersôorganizations
- Is appropriately suited to the domain and program
- Contains necessary and sufficient process elements
- Is integrated across the disciplines and team members
- Is tailored from one of ñtheòorganizational standard processes of mature team members or defined by the program team
- Is measurable
- Supports development of a quality work product

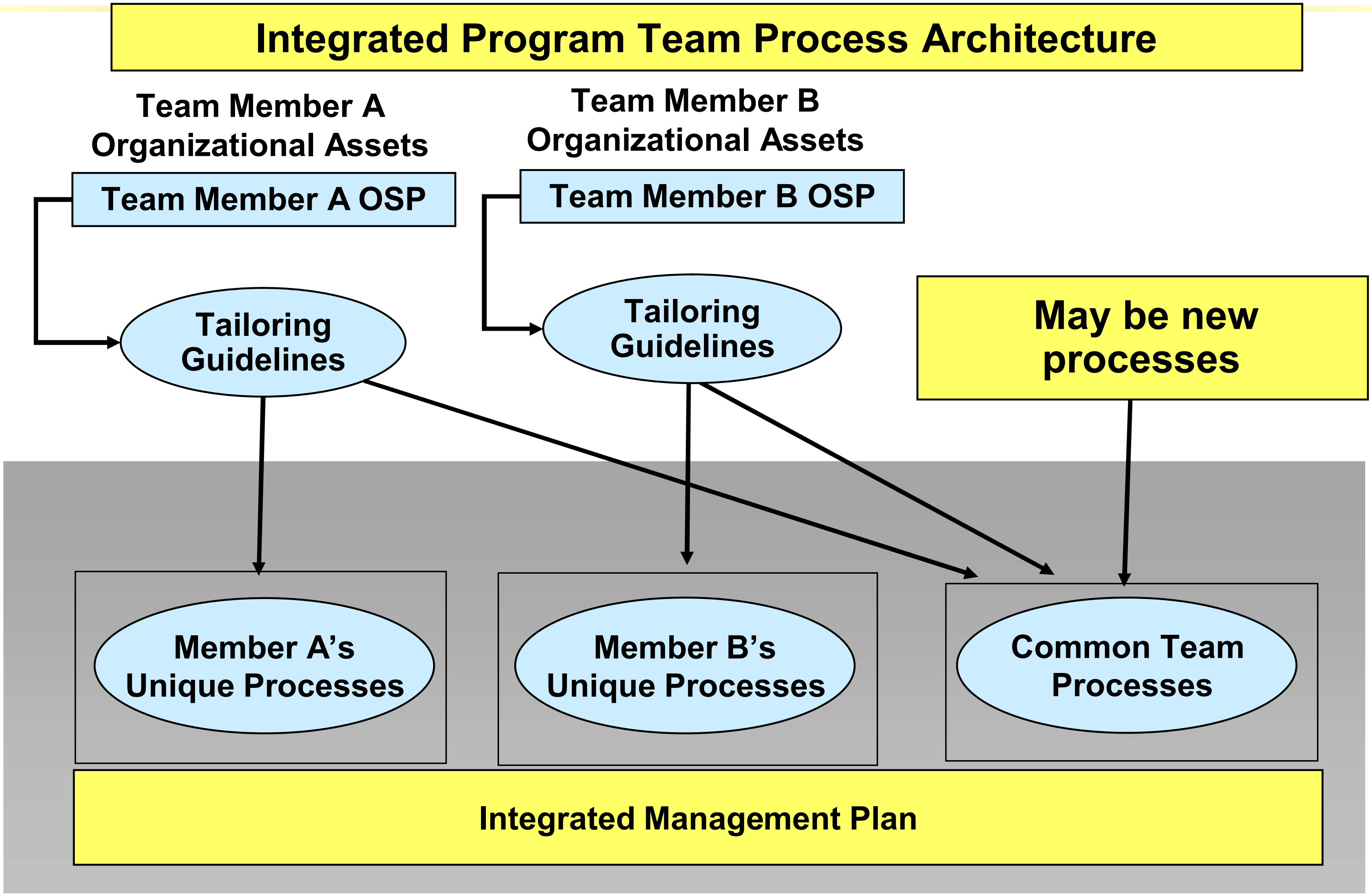
Blue additions are new requirements for multi-organizational team processes

ject Process Definition Approach

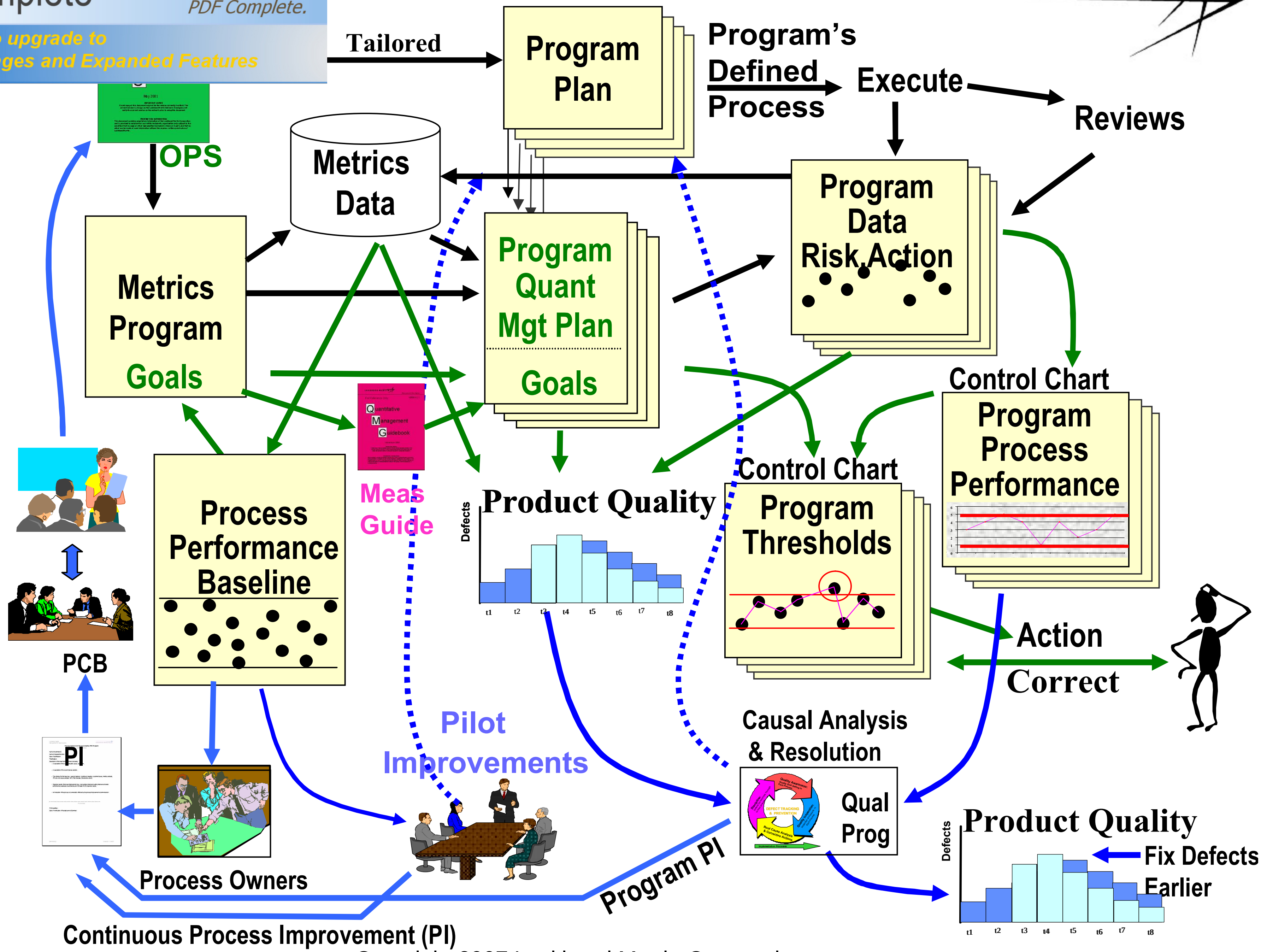


Adapted from an SEI chart

nizational Team Process Definition Approach -- Example

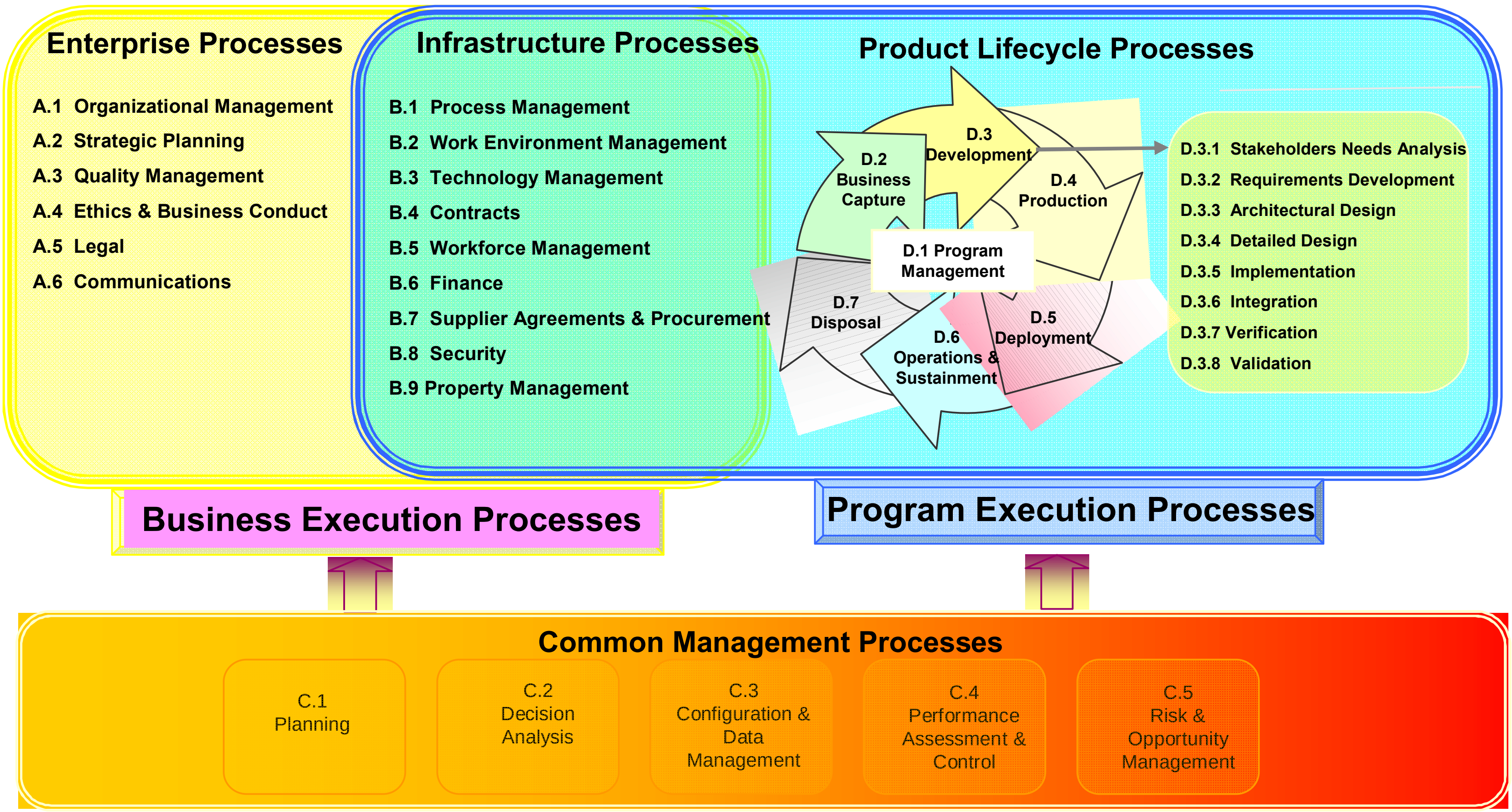


ram Process Infrastructure



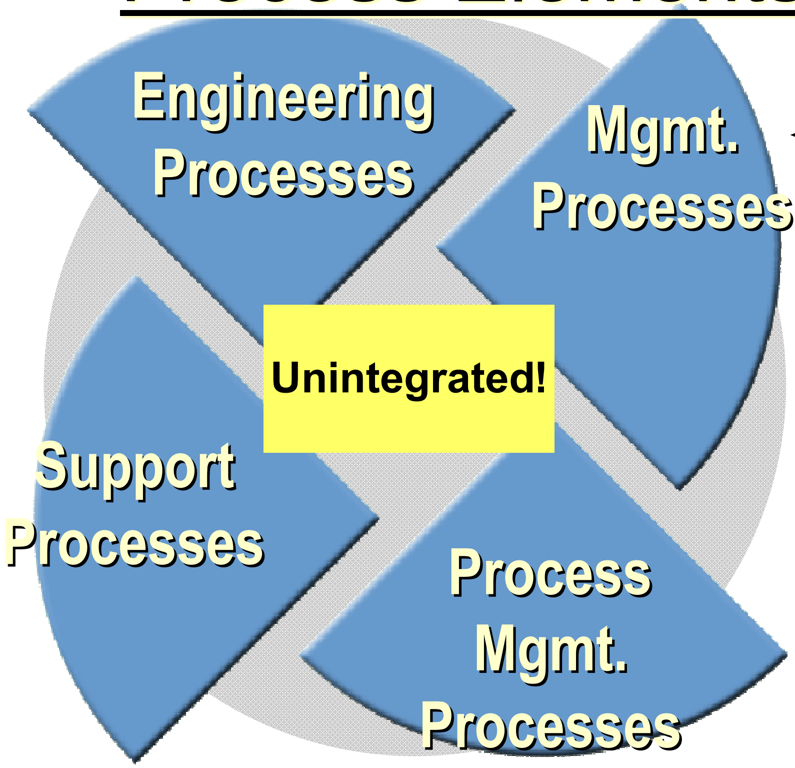
Lockheed Martin
erprise Process (LM-IEP) Architecture

A comprehensive enterprise architecture serves as the foundation for an Integrated Team Process Architecture



am Process Interfaces

Unintegrated Process Elements



Team Member Influences

"My process is best"

That process was "not invented here"

Not trained in new/different process

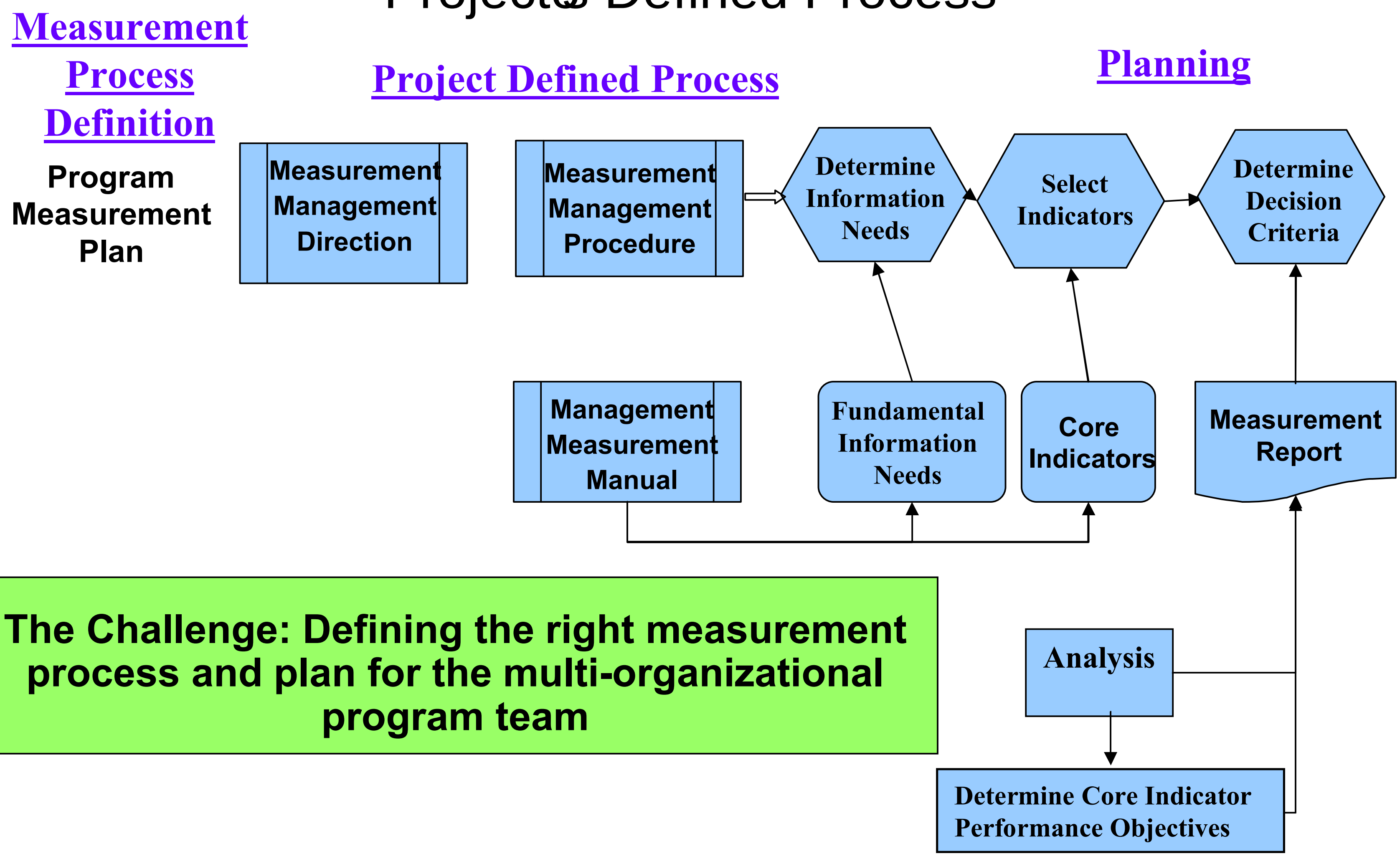
"Use my process architecture"

"We're different"

The Challenge: Seamless process interfaces for the Integrated Team Process

...m Process Measurement

Requirements Flowdown from the OSP to the Projectôs Defined Process



The Challenge: Defining the right measurement process and plan for the multi-organizational program team

s for Integrated Program Team cess (IPTP) Definition - 1

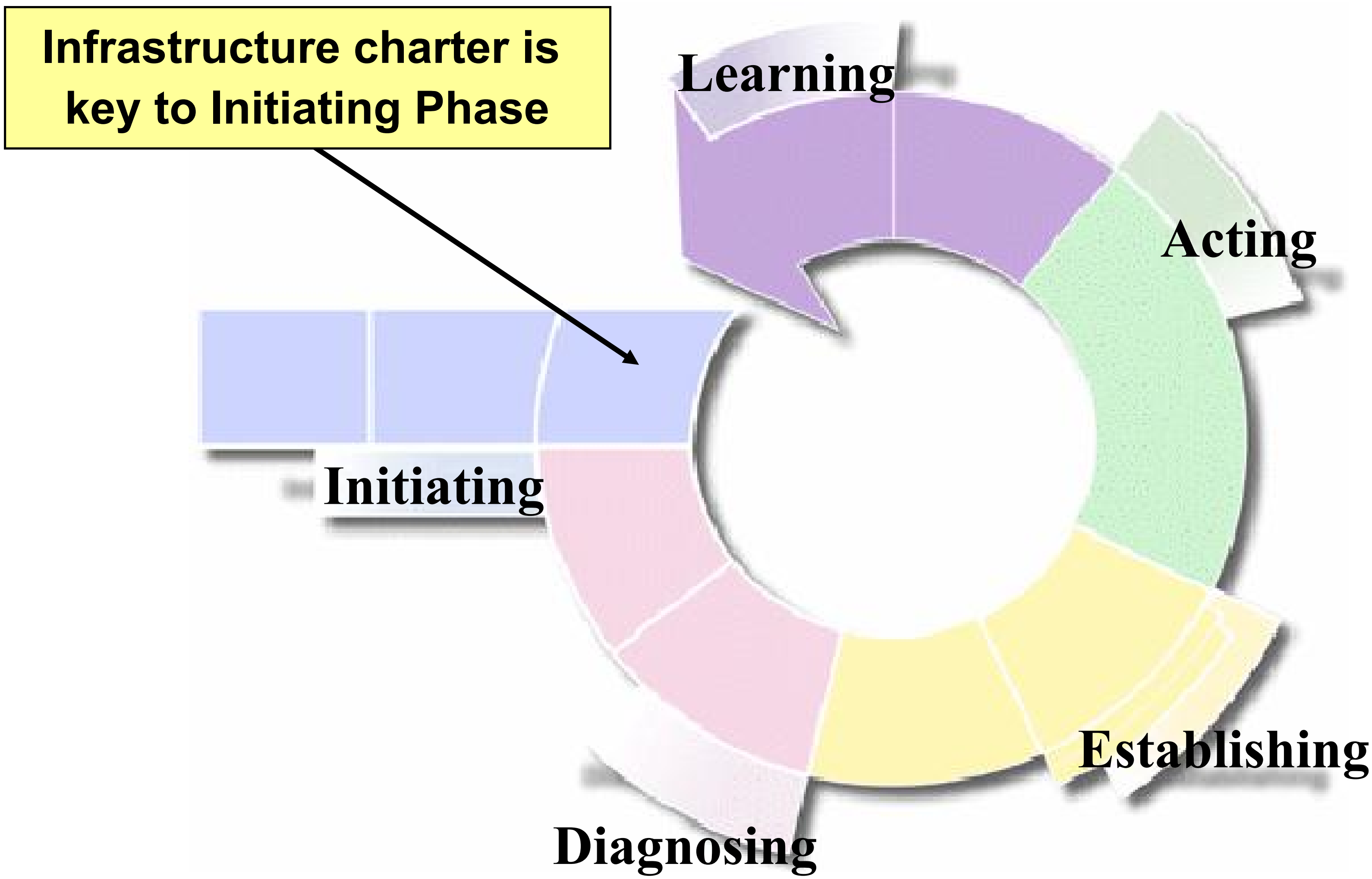
- Understand individual team member process capability (e.g., based on CMMI appraisals)
- Identify, for possible leveraging, any prior instances of the same team members working on multi-organizational program teams
- Define program process needs, objectives and drivers
- Identify candidate process architectures for use (from team members)

s for Integrated Program Team cess (IPTP) Definition - 2

- Convene process group leaders from each team member to
  - Formulate the IPTP architecture
  - Identify needs for common and unique processes
  - Identify source(s) for common processes
  - Define interfaces across common and unique processes
  - Define process infrastructure needs
- Establish mechanism for collective objective evidence for appraisals
- Use IDEAL[SM] model and common infrastructure to improve the IPTP
- If the team is not co-located then
  - Establish a focused program process training program
  - Establish a process quality audit program that visits each site
  - Assign a responsible engineer at each site to monitor process

[SM] IDEAL is a service mark of Carnegie Mellon University.

The IDEAL Model



…P View of Common Team …ber-Unique Processes – 1

IEP Structure	IEP Process Specification	Candidate Common Team Processes	Team Member Unique Processes
Product Life Cycle	Program Management		
	Business Capture		
	Development	If applicable	
	Production	If applicable	
	Deployment	If applicable	
	Operation & Sustainment	If applicable	
	Disposal		
Common Management	Planning		
	Decision Analysis		
	Configuration & Data Management		
	Performance Assessment & Control		
	Risk & Opportunity Management		

Indicates likely need for integrated team processes

…P View of Common Team …mber-Unique Processes – 2

IEP Structure	IEP Process Specification	Candidate Common Team Processes	Team Member Unique Processes
Infrastructure	Process Management		
	Work Environment Management		
	Technology Management	If applicable	
	Contracts		
	Workforce Management		
	Finance		
	Supplier Agreements & Procurement		
	Security		
	Property Management	If applicable and co-located	
Enterprise	Organizational Management		
	Strategic Planning		
	Quality Management		
	Ethics & Business Conduct		
	Legal		
	Communications		

/iew of Common Team and nber-Unique Processes

Process Area Category	Process Area	Candidate Common Team Processes	Team Member Unique Processes
Project Management	Project Planning		
	Project Monitoring & Control		
	Supplier Agreement Management		
	Integrated Project Management + IPPD		
	Risk Management		
	Quantitative Project Management		
Engineering	Requirements Management		
	Requirements Development	If applicable	
	Technical Solution	If applicable	
	Product Integration		
	Verification		
	Validation		
Support	Configuration Management		
	Process & Product Quality Assurance		
	Measurement & Analysis		
	Decision Analysis & Resolution		
	Causual Analysis & Resolution		
Process Management	Organizational Process Focus	Org = Program	
	Organizational Process Definition + IPPD	Org = Program	
	Organizational Training	For program-specific	
	Organizational Process Performance		
	Organizational Innovation & Deployment		

e LM21 Approach for
ovement and Process Definition

- This tool gives leadership a strategic look at its value streams and the ability to see waste at a macro level
- Leaders identify and prioritize the improvement events necessary to
  - Eliminate the waste
    - **Kaizen events (an activity where a team is chartered for a period of 3–5 days)**
  - Identify waste for a given process and
  - Implement immediate, sustainable solutions for waste elimination/reduction
    - **Other VSMs, projects - activities that require extensive work and change**
    - **Just Do Its - short term projects**

The result: a plan is in place to strategically identify and eliminate the waste that most interferes with the ability to deliver value to the customer.

Consistently Deliver Value Growth Thru Operating Excellence

ss Infrastructure Components

- Management Steering Group
- Process Group
- Process Control Board
- Configuration Control Board
- Process Asset Library
- Measurement Repository
- Engineering Review Board

Common process infrastructure at the program level with interfaces to team member-unique infrastructure

Summary

- Focusing on multi-organizational team capability needs to begin when teams are initially formed
- Deploying high-capability processes early in the life cycle will enable multi-organizational teams to reap benefits early
  - Process discipline is key when making programmatic decisions committing significant downstream resources
- Ensuring high-capability processes on multi-organizational teams should improve quality of products and services
- Developing guidance and approaches for multi-organizational process team definition and deployment is needed
- This guidance can also be applied to mergers and acquisitions

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