Carnegie Mellon
Software Engineering Institute
Pittsburgh, PA 15213-3890

Lessons Learned from Adopting CMMI for Small Organizations

Sponsored by the U.S. Army Aviation and Missile Research, Development & Engineering Center (AMRDEC) Software Engineering Directorate (SED)

Authors:
SuZ Garcia, SEI
Sandra Cepeda, SED/CSSA
Mary Jo Staley, SED/CSC
Gene Miluk, SEI

Presenters:
Sandra Cepeda, SED/CSSA
Jack Conway, ASI

CSSA
Cepeda Systems & Software Analysis, Inc.

CSC

Carnegie Mellon
Software Engineering Institute

Agenda

- CMMI Overview
- Pilot Overview
- Adoption of CMMI by ASI and Lessons Learned
- How Pilot Artifacts Can Help Small Businesses

CSSA
Cepeda Systems & Software Analysis, Inc.

CSC

Carnegie Mellon
Software Engineering Institute

What is the CMMI Model?

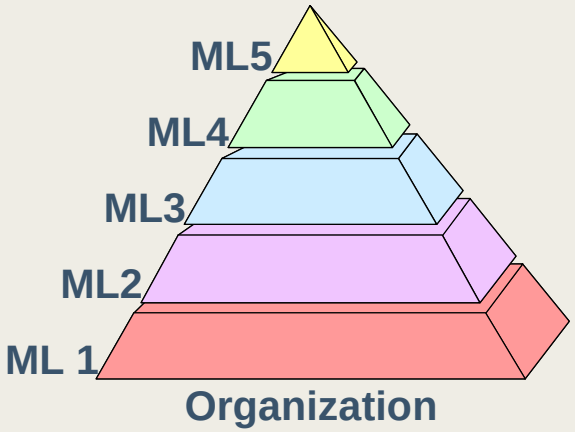
- CMMI Is a Process-Improvement Model that provides a set of Best Practices that address productivity, performance, costs, and stakeholder satisfaction
- CMMI Is *NOT* a set of "Bolt-On Processes" that last only as long as the wheel is squeaking. CMMI provides a consistent, enduring framework that accommodates new initiatives
- CMMI focuses on the total-system problem, unlike other predecessor CMMs
- CMMI facilitates enterprise-wide process improvement, unlike single-discipline models

CSSA
Cepeda Systems & Software Analysis, Inc.

CSC

CMMI In A Nutshell

Staged



Maturity Level 5 OID, CAR

Maturity Level 4 OPP, QPM

Maturity Level 3 RD, TS, PI, VER, VAL, OPF, OPD, OT, IPM, RSKM, DAR, OEI, IT, ISM

Maturity Level 2 REQM, PP, PMC, MA, PPQA, CM, SAM

Process Areas (SE/SW/IPPD/SS)

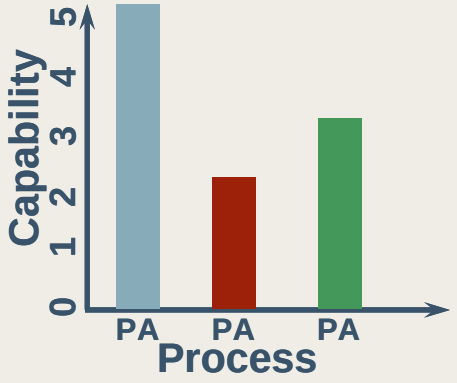
Requirements Management (REQM)
Project Planning (PP)
Project Monitoring and Control (PMC)
Measurement and Analysis (MA)
Process and Product Quality Assurance (PPQA)
Configuration Management (CM)
Supplier Agreement Management (SAM)

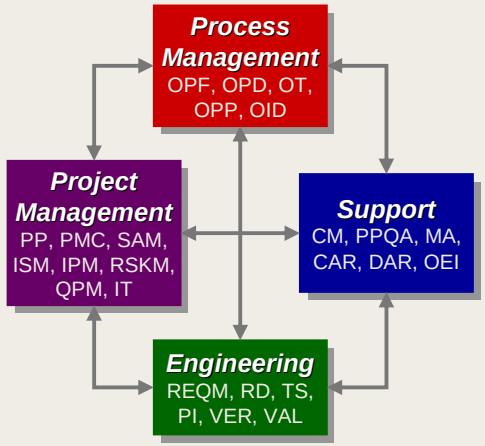
Requirements Development (RD)
Technical Solution (TS)
Product Integration (PI)
Verification (VER)
Validation (VAL)
Organizational Process Focus (OPF)
Organizational Process Definition (OPD)
Organizational Training (OT)
Integrated Project Management (IPM)
Risk Management (RSKM)
Decision Analysis and Resolution (DAR)
Organizational Environment for Integration (OEI)
Integrated Teaming (IT)
Integrated Supplier Management (ISM)

Organizational Process Performance (OPP)
Quantitative Project Management (QPM)

Organizational Innovation & Deployment (OID)
Causal Analysis and Resolution (CAR)

Continuous





- ***Two Representations Per CMMI Model***
- ***One Appraisal Method (SCAMPI SM)***

SM SCAMPI is a Service Mark of Carnegie Mellon University

Carnegie Mellon
Software Engineering Institute

Pilot Overview

Carnegie Mellon
Software Engineering Institute

Pilot Project Overview

A joint project performed by the partnership between the Software Engineering Institute (SEI) and AMRDEC SED to establish the technical feasibility of developing guidance and other special-purpose transition mechanisms to support adoption of CMMI by small and medium enterprises (25 to 250 employees in Huntsville)

Selected 2 Pilot companies: Analytical Services, Inc. (ASI) and Cirrus Technology, Inc. (CTI)

- Presentation today focuses on ASI lessons learned

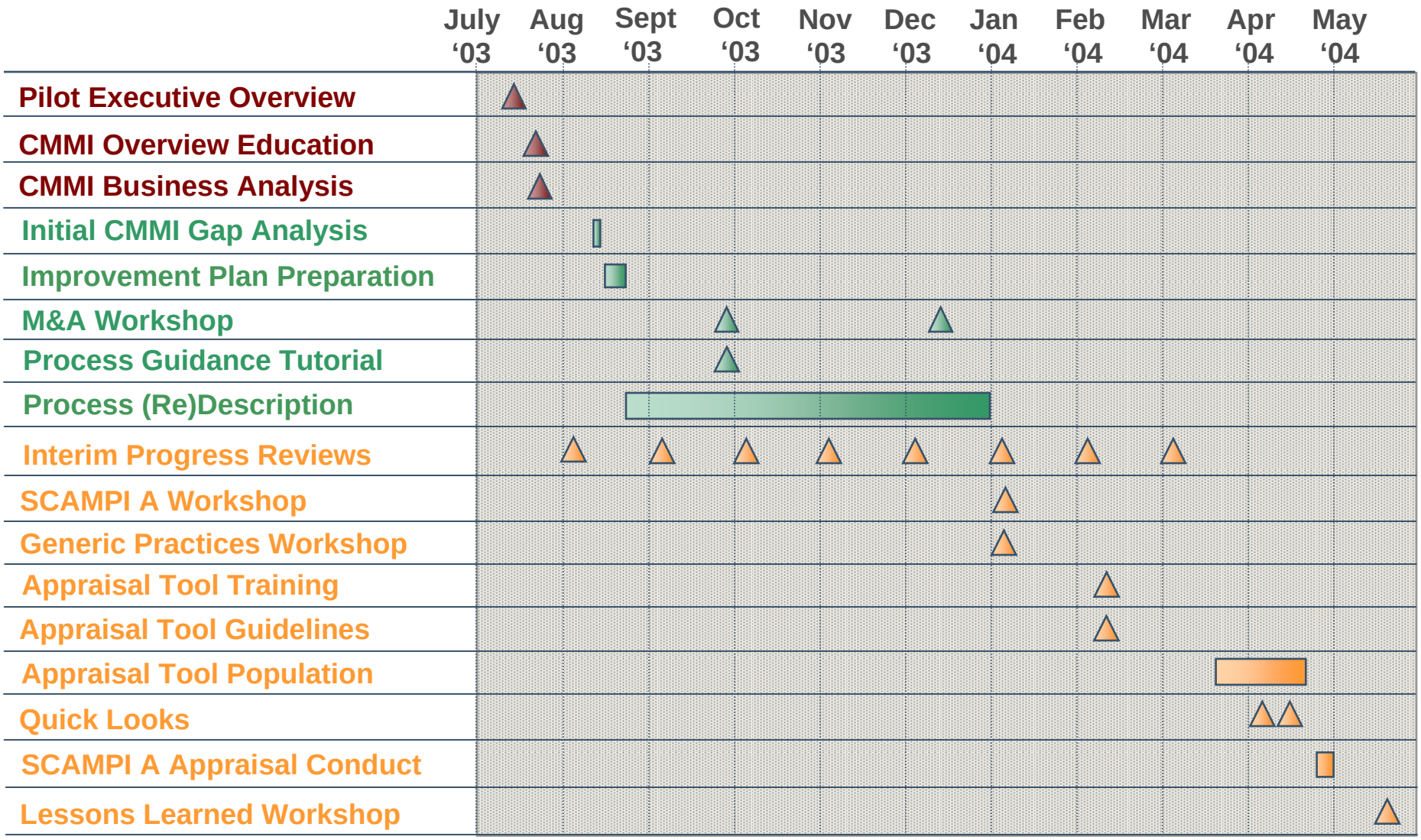
Pilot artifacts will be available at the SEI website by the end of the year

- Toolkit
- Experience reports (one for each company)

CSSA
Cepeda Systems & Software Analysis, Inc.

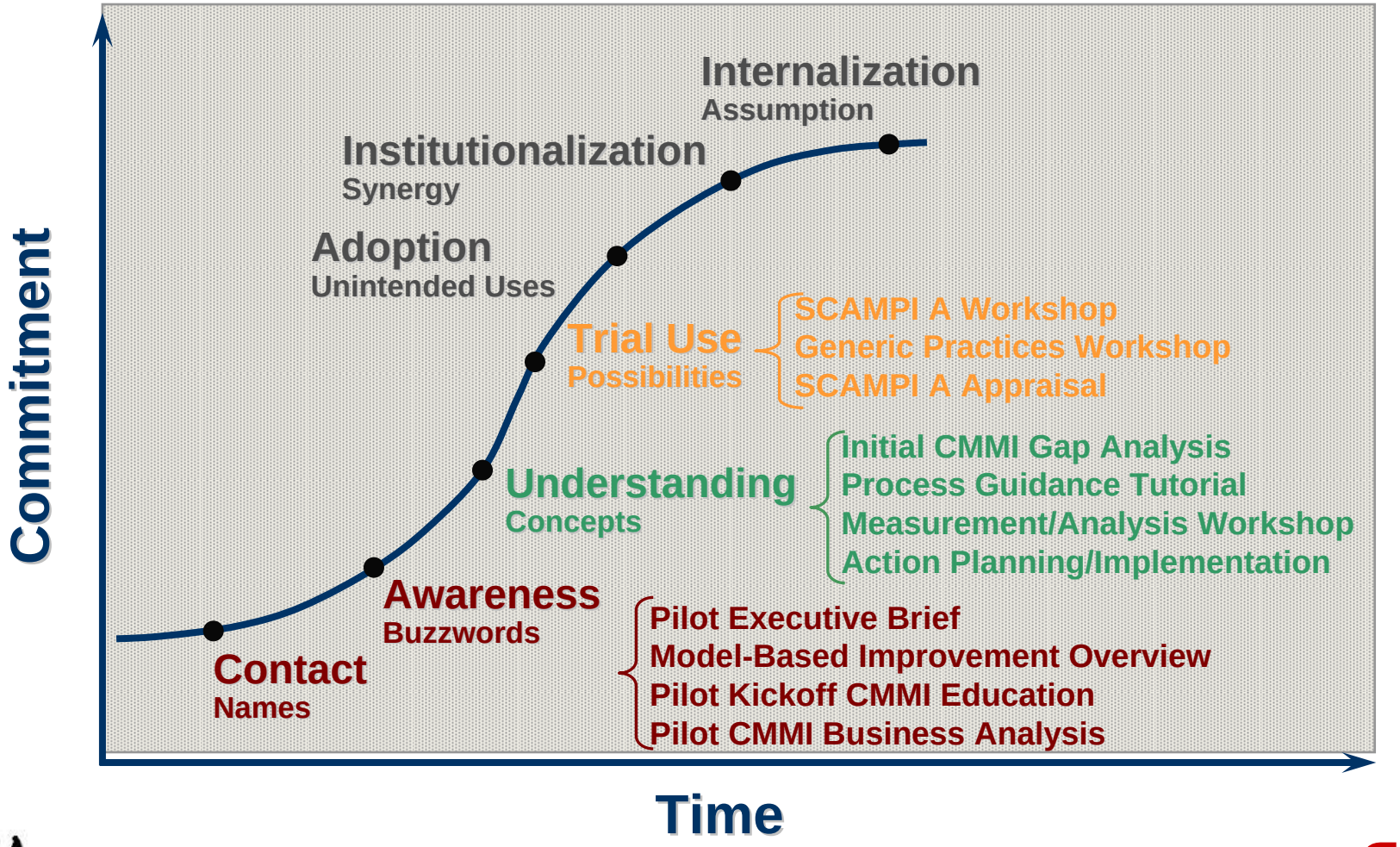
CSC

CMMI Small Business Pilot Schedule



Carnegie Mellon
Software Engineering Institute

Summary of Materials Provided by Pilot



Adapted from Patterson & Conner, "Building Commitment to Organizational Change", 1982.

CSSA
Cepeda Systems & Software Analysis, Inc.

CSC

Carnegie Mellon
Software Engineering Institute
Pittsburgh, PA 15213-3890

Adoption of CMMI by ASI and Lessons Learned

Jack Conway

Vice President Systems Management

CMMI Pilot Project Coordinator

Analytical Services, Inc.
Huntsville, Alabama

Company Profile
Analytical Services, Inc.

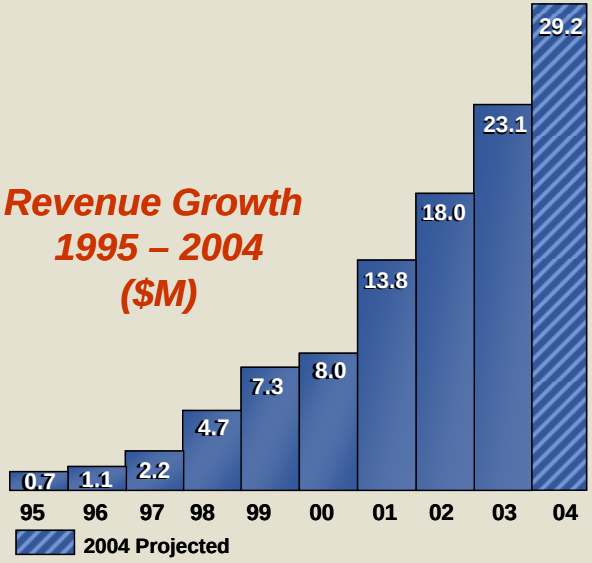
- Management and Technical Services Company
- Incorporated in 1992
- Hispanic, Woman-Owned, Small Disadvantaged Business
- ISO 9001:2000 Registered/Successful CMMI SCAMPI A Appraisal
- Top Secret Facility

Core Competencies

- Information Technology
- Systems Engineering/ Program Management
- Engineering and Scientific Analysis
- Professional and Organizational Development

Employee Growth 1995 - 2004

Revenue Growth 1995 – 2004 ($M)



ASI Analytical Services, Inc.

About ASI

- **Customer base:**
  - Army
  - Air Force
  - National Aeronautics and Space Administration (NASA)
  - Defense Information Systems Agency (DISA)
  - Defense Finance and Accounting Services (DFAS)
  - Missile Defense Agency (MDA)
  - Office of the Secretary of Defense (OSD)

2003 - NASA's Woman Owned Business of the Year

2002 - BBB Torch Award for Marketplace Ethics

2001 - National Minority Business of the Year by the U.S. Small Business Administration in Washington D.C.

ASI
Analytical Services, Inc.

ASI's Process Improvement History

Development of our Quality System

- Until '02, written corporate policies - few written processes
- 2002 - Began investigation of Quality Systems – ISO 9001-2000
  - Worked with consultants from local university
  - Mentor Protégé Program provided guidance
- Nov '02 – Mar '03 - Established Quality Management System (QMS)
- Feb '03 - Pre- Assessment NQA Audit (external)
- Mar '03 - External certification audit for ISO 9001-2000 Registration -NQA
- May '03 - Selected to participate in CMMI Small Business Pilot Project
- Jun '03 - ISO Audit - 3 Month Registration Surveillance Audit
- Aug '03 - Initiated CMMI Pilot Project – (Continuous Representation)
- Apr '04 - ISO Audit - 2nd Surveillance Audit
- Apr/May '04 - Completed Pilot - SCAMPI A Appraisal of **5** process areas.
  - Achieved Target Capability Level Profile
- Oct '04 - ISO Audit - Oct '04 - 3rd Surveillance Audit

ASI Analytical Services, Inc.

ASI CMMI Adoption

- Selected to participate in CMMI Small Business Pilot Project – May ‘03
- Initiated CMMI Pilot Project – Aug ’03
  - Project Planning (PP)
  - Requirements Management (REQM)
  - Measurement and Analysis (M&A)

- Completed Pilot in May ‘04 – Culminated with SCAMPI A Appraisal
- Appraisal of **5** process areas with addition of:
  - Organizational Training (OT)
  - Organizational Process Focus (OPF)
- Achieved Target Capability Level Profile

ASI
Analytical Services, Inc.

ASI Adoption Objectives

- Must be affordable!
- Fit with Quality Management System (QMS)
- Adopt without dedicated overhead
- Useful for mission objectives and customer work
- Non interference with customer projects
- Recognized by customers
- Benefits and measurable pay-off
- Achievable within time frame
- Broader application than just software
- Long term benefit
- Additional revenue

ASI
Analytical Services, Inc.

Adoption Approach

Used for Pilot Project

- Assigned to single business unit with multiple direct customer programs.
- Focus on systems engineering and application development
- Multi-level team: technical, managers, quality coordinator and executive.
- Develop processes to address real situations, using real data
- Listen to the consultants!
- Experiment with tools offered.
- Action, action, action.
- Stay on schedule!
- Regular sessions – weekly phone cons/monthly sessions.
- Use action lists and minutes to hold ourselves accountable.
- Readjust when overcome by events.

ASI
Analytical Services, Inc.

Adoption Activities & Statistics

ASI Pilot Program

	Total	Team Mtngs.	Telecons	Process Develop	Training & Awareness	Implemen-tation	Appraisal Prep	Appraisal
Exec. Lead	286	96	80	40	24	10	20	16
PM	240	80	60	40	24	20	12	4
PM	252	96	80	40		20	12	4
SW Eng.	312	96	80	60		30	40	6
Prog Analyst	144	60	50	20		10		4
SW Developer	124	60	50			10		4
SW Eng.	134	80	50					4
QA	206	60	50		24		40	32
QA	50	30	20					
Prog Control	30					20	4	6
SW Developer	42				12	30		
Executive	76	35				33	4	4
Workforce	45	25						20
Total Hours	**1941**	**718**	**520**	**200**	**84**	**183**	**132**	**104**
% of Hours		**37%**	**27%**	**10%**	**4%**	**9%**	**7%**	**5%**
Total Cost	**$138,833**	**$52,219**	**$36,662**	**$15,621**	**$5,510**	**$13,348**	**$8,753**	**$6,719**
% of Cost		**38%**	**26%**	**11%**	**4%**	**10%**	**6%**	**5%**

ASI
Analytical Services, Inc.

Benefits from CMMI Adoption

- Participation in Pilot extremely beneficial for ASI
- CMMI Adoption has been worth investment
  - CMMI adoption enhanced and improved our QMS
  - Natural follow-on to ISO and provides continuous improvement
  - Improved ability to organize and communicate status of projects to customers and other stakeholders
  - Addresses customer projects with processes
  - Reduced training time for new employee
  - Prevented requirements creep and ensured on-time and below budget project completion
  - Supports company objectives
  - Provides path for taking the company to the next level

ASI
Analytical Services, Inc.

Lessons Learned – Small Business Implementation

- Small Business needs to realize pay off quickly
- Customer driven requirements are significant (de)motivator
- Small businesses do not have staff dedicated solely to CMMI implementation – customer requirements take priority and can cause delays
- There is not a lot of functional organization to leverage from in a small business
- CMMI is easier to interpret for product development than for services – Small Businesses are typically more service oriented

ASI
Analytical Services, Inc.

Lessons Learned –Small Business Implementation

- ISO 9001-2000 and CMMI can be compatible and complementary
- “The customer rules” – Many small organizations adopt/adapt business practices directly from their customers or primes
- State of company quality systems has major impact on implementation effort, for good or ill
- Less formal organizational structure means fewer barriers to “knock down”; leadership involvement is not difficult to obtain
- Just In Time Training is critical for small organizations
- Eliminating intimidation factor of CMMI is essential

ASI
Analytical Services, Inc.

Carnegie Mellon
Software Engineering Institute

How Pilot Artifacts Can Help Small Businesses

CSSA
Cepeda Systems & Software Analysis, Inc.

CSC

Carnegie Mellon
Software Engineering Institute

Using CMMI in Small Businesses

- CMMI Provides a Set of Best Practices From Which Small Businesses Can Benefit
- The Continuous Representation of the CMMI Allows Small Companies to Focus on Improvements That Have the Highest Payoff for the Company
- Aligning Improvement With Business Goals Is Particularly Important for Small Businesses
- Simple CMMI-Based Improvements Can Have a Significant Impact in Small Organizations
- "Changing" the Practices Isn't Necessary in Most Cases; Finding Alternative Practices Is Often Relevant
- Both CMMI and SCAMPI A Scale Down to Fit Small Settings

✓ ***The Greatest Challenge for Small Businesses Is the Affordability of Subject Matter Experts, and the Implementation and Appraisal Costs***

CSSA
Cepeda Systems & Software Analysis, Inc.

CSC

How the Pilot Artifacts Can Help Small Businesses

Three artifacts from the pilot will be available on the SEI website

- Toolkit
- 2 Experience reports

The CMMI for Small Business Pilot artifacts should prove useful in helping small businesses

- Focus their improvement efforts
- Figure out how and where to get started
- Tie their improvements to business goals
- Train their staff
- Realize payoffs early in the improvement
- Improve their ability to prepare for appraisals

Carnegie Mellon
Software Engineering Institute

Contact Information

Sandra Cepeda (CSSA / SED)

Voice: (256) 876-0317
Email: sandra.cepeda@us.army.mil

SuZ Garcia (SEI)

Voice: (412) 268-9143
Email: smg@sei.cmu.edu

Jack Conway (ASI)
Voice: (256) 890-0083 Ext 132
Email: conwayj@asi-hsv.com

CSSA
Cepeda Systems & Software Analysis, Inc.

CSC