

Small Project Challenges of CMMI in Large Organizations

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Agenda

- Introductions
- Overview of **Our Company**
- Describe the **Challenges** we faced
- Describe how we categorized projects
- Show how we tried to "**Address the challenges**"
- Closing comments



Our Company – Concurrent Technologies Corporation (*CTC*)

- An independent, nonprofit, applied research and development professional services organization
- Staff of 1,500+ professionals
- More than 35 locations
- Approximately 900,000 sq. ft., including laboratories and demonstration facilities
- Federally compliant contractor
- Concurrently certified to **ISO 9001/14001** in August, 1998
- Assessed at **Maturity Level 3** of the Capability Maturity Model Integration Systems Engineering/Software Engineering (CMMI-SE/SW®), Version 1.1 in March, 2003 for systems and software engineering activities
- Certified to **AS9100** in April, 2005 for aerospace activities



CTC Locations



CTC location

Annapolis Junction, MD • Bremerton, WA • Charleston, SC* • Columbia, SC • Crystal City, VA • Dayton, OH
Fayetteville, NC • Fort Leonard Wood, MO • Greenville, SC • Hamilton, ON, Canada • Harrisburg, PA
Jacksonville, FL • Johnstown, PA • Largo, FL • Panama City, FL • Pensacola, FL* • Pittsburgh, PA* • San Diego, CA
Stuttgart, Germany • Washington, DC*

* CTC location and CTC on-site location

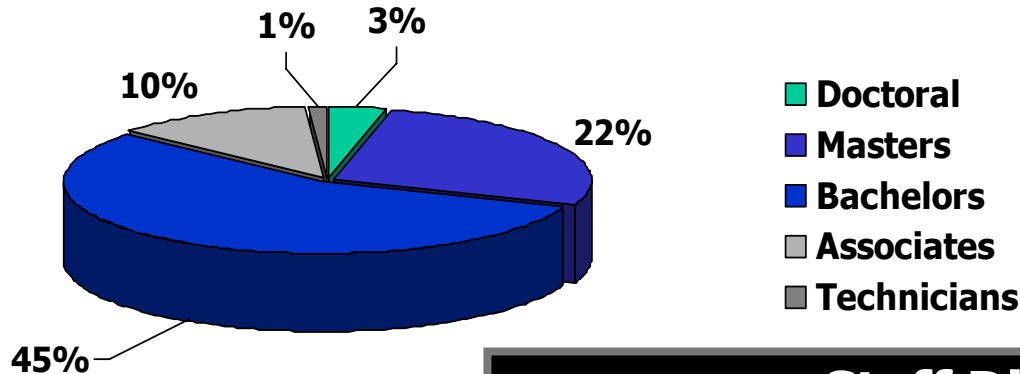
CTC on-site location

Albany, GA • Alexandria, VA • Camp Lejeune, NC • Fort Bragg, NC • Fort Dix, NJ • Indiana, PA • Lackland AFB, TX
Morgantown, WV • Mountain Home AFB, ID • New Carrollton, MD • Norfolk, VA • Philadelphia, PA • Shalimar, FL
Tampa, FL • Tobyhanna, PA • Virginia Beach, VA • Warner Robins, GA • Wright Patterson AFB, OH

Our Growth Profile



Staff Make-up



- Doctoral
- Masters
- Bachelors
- Associates
- Technicians

Staff Disciplines

Electrical & Mechanical Engineering	14%
Computer Science & Mathematics	21%
Communications Technology	23%
Environmental & Chemical Engineering	9%
Metallurgical & Materials Engineering	3%
Engineering & Science	9%
Business & Others	21%



Selected Services and Capabilities

- Advanced Coatings and Coatings Removal
- Advanced Distributed Learning
- Advanced Materials and Processes
- Automation, Controls, and Data Acquisition
- Command and Control Systems
- Communications and Outreach
- Corrosion Prevention and Control
- Environmental Technology Demonstration and Validation
- Fuel Cell Test and Evaluation
- Information Assurance
- Intelligence Analysis
- Logistics Optimization
- Management Systems
- Manufacturing Improvement
- Modeling and Simulation
- Supply Chain Integration
- Sustainability
- Systems Design and Analysis
- Systems Integration
- Systems/Software Engineering
- Technology Management
- Visualization



Challenges We Face

CTC Project make-up

- Number of People: 1500
- Number of Projects: 230
- Average Project Size 5 FTEs
- Typical Large Program: 35 FTEs
- Typical Small Program: 1 FTE

So What?

- Although it looks **Large** it's **small**
- Processes need to tailor to projects of varying size
- We realized this impacts how we do business



Challenges We Face Multiple Disciplines

- Disciplines
 - Engineering
 - Sciences
 - Construction Management
 - Communications
 - Education and Training
 - Business (program management and other)
- **Variety of tools and templates required to support**
- Different terminology used in each field

So What?

- Broad types of projects
- Intelligent staff with strong opinions
- **Not practical** to implement **one size fits all**
- We realized this impacts how we do business



Challenges We Face

Multiple Standards

- ISO 9001
- AS 9100
- ISO 14000
- VPP – Voluntary Protection Program
- CMMI – across the company

So What?

- Underestimated effort required to train staff
- Large effort required to manage and maintain
- **Not practical** to implement **as multiple quality systems**
- We realized this impacts how we do business



Current Procedure Presentation

- Sequential Listing based on old ISO 9001:1996 sections
- Additions for each new standard
- Need to improve usability of the system
- Numbering scheme not structured to handle new procedures added over time



How we categorized projects

Quality Management System Environmental Health and Safety (QMS/EHS)

- Quality Planning Checklist asks
 - “Is the project designated as a Systems Development project?”
- Systems Development QA Lead determines if project is a system development or service.
 - Below the Threshold - 2100 hours
 - Projects are of two distinct types:
 - **Service Projects**
 - **Systems Development Projects**



What happened

- System definition was misunderstood by staff and management
 - Only for software types
- Projects mixed services and systems
 - Lacked guidance on how to decide
 - People reverted to what they knew to get things done
- Created auditing confusion for staff



Addressing the Challenges

What is the starting point

- Analysis of internal records showed we have a variety of types and sizes of projects
- Took a step back and said “What is *CTC* concerned with?” – **Quality product that meets or exceeds the Clients needs.**
 - Within Budget
 - Controlling Risk
- Reviewed Technical Management Literature on Project Classifications
- Decided to implement a Project Classification Framework based on size and risk



Basis for Framework

- Technical Management research conducted by Wesley J Howe School of Technology Management, Stevens Institute of Technology
 - [Dr. Aaron J. Shenhar](#)
- Ohio State CIO Office
 - http://oit.osu.edu/projmanage/PDF_files/OSUP_MFrmwk_1.00.pdf



Sizing Matrix

Project Classification – Sizing Matrix		
Project Class	Lower Limit	Upper Limit
1	0	\$W
2	\$W+1	\$X
3	\$X+1	\$Y
4	\$Y+1	\$Z
5	\$Z+1	Infinity



Risk Matrix

Risk Factor	Low (0)	Medium (1)	High (2)	Very High (3)
Team Size	<5	5-9	10-14	>15
# Work Groups	1-2	3-4	5-6	>7
Technology / Technique / Process	Expert	Familiar	New to CTC	Cutting Edge / Rocket Science
Complexity	Well defined no problems	Known Some problems	Multiple approaches	Unknown or vaguely defined
Political Profile / Impact	Small Impact	Medium Impact	Large Impact	Very Large Impact

Project Classification - Risk Adjustment

- Risk adjustment
 - 0 to 10 → no affect
 - 11 to 13 → Increase 1 level
 - 14 to 15 → Increase 2 levels
- Size Matrix + Risk adjustment = Project Class



Phases of the "System"

- Proposal Development
- Contract Award
- Planning
- Execution
- Closeout



Configuration Management – Planning (1)

	Project Class				
	1	2	3	4	5
Planning					
Develop Configuration Management Approach					
Version Control – Documents	X	X	X	X	X
Version Control - Hardware		X	X	X	X
Internal CCB			X	X	X
Client Linked CCB				X	X
Formal Configuration Control with CCB					X



Configuration Management – Planning (2)

- Completes the work started in the proposal
- Addresses changes from proposal to award
- Orients the entire team on the process and procedures to be used
- Scaled requirements from simple version control to full up configuration management



Configuration Management – Execution (1)

- Maps back through planning and proposal development
- Provides specific Project Class Activities
- Links directly to the procedures that are applicable
- Informs the project what is assessable and auditable



Configuration Management - Execution

	Project Class				
	1	2	3	4	5
Execution					
Program Management					
Identify/Monitor Risks		X	X	X	X
Maintain Risks in Risk Radar			X	X	X
Configuration Management					
Plan Versioning	X	X			
Plan Configuration Management			X	X	X
Engineering					
Manage Baselines			X	X	X
Version Control of Work Products	X	X	X	X	X

Closing Remarks

- Process must be organized and tailored to suit the needs of the project (within *CTC's* business processes)
- No one size fits all
- Many approaches to process activities – focus on what your company needs
- Classify based on size and risk
- Focus on the amount of process rigor that is needed for the class level of the project



Questions?



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Submitted Abstract (1)

- Small to medium organizations, those with staff between 25 and 250 people <[Lessons Learned from Adopting CMMI for Small Organizations](#), Slide 6>, represent unique challenges when trying to adopt the tenets of the Capability Maturity Model Integration. Some of these challenges have been documented in initial studies conducted by the SEI and its partners. However, no attention has been given to organizations composed of many functional disciplines that have a large overall work force but operate projects supported by smaller working organizations. These types of organizations present unique challenges to adopting many of the process areas in a quantitatively and qualitatively managed manner. To be successful, *CTC's* approach was to recognize that different functional disciplines might require multiple procedures to complete the tasks, possibly different tools, and definitely different terminology.



Submitted Abstract (2)

- The process areas of Configuration Management, Risk Management, and Project Planning are key areas that *CTC* has found that cross these functional disciplines. These areas provide insight into critical differences between sub-organizations. Within CM, several challenges exist even with decades of written works on the subject. What is important under one discipline or within one project may not be in another; how do you define the standards to identify what should be managed? Within Project Planning, how does an organization identify the roles and responsibilities clearly, when they change from contract to contract? Do you force one size to fit all or highlight the unique needs of each functional discipline? Risk Management is standard, but how does a company that has over 280 projects with over 1400 employees that do not have many similarities organizationally analyze them for improvement? The presentation will provide recommendations on how to successfully approach these unique challenges.



Submitted Abstract (3)

- *CTC* is a nonprofit, applied research and development professional services organization with 35 offices.





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