

# CMMI Re-Appraisal

## Moving Barriers & Making Strides





# Overview

United Space Alliance (USA) Launch Processing System Software Development organization received a CMMI-DEV + IPPD Level 3 rating in September 2009

- Employed a lean approach to appraisal activities resulting in >50% cost and schedule reduction
- Proved that appraisals can be done faster, better, cheaper

**Focused – Innovative – Trailblazers**

This presentation provides:

- Company CMM/CMMI history and background
- Objectives, challenges and results of the recent CMMI appraisal
- Methodology and examples of lean appraisal practices
- Advice for others wishing to embark on a similar journey



# Who We Are . . .

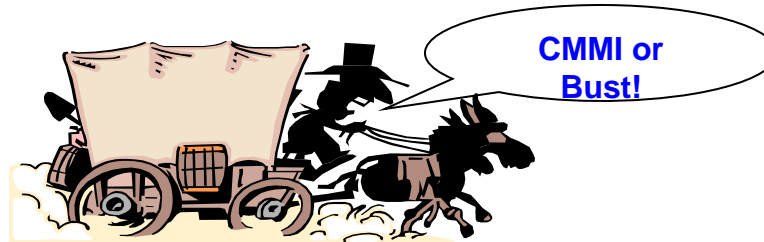
## United Space Alliance



### History

- ❑ **2002**--USA began its journey towards CMM Level 3.
- ❑ **2003**--A mini-assessment was conducted across USA elements to determine readiness for a CMM Level 3
  - A common software process and appraisal at the company level was deemed not achievable
  - Decision was made for each element to develop their own framework and conduct individual assessments
- ❑ **2004**--LPS Software Development achieved SW-CMM Maturity Level 3
- ❑ **2006**--LPS Software Development completed CMMI-DEV (v 1.1) Maturity Level 3
  - No prior CMMI experience
  - Pathfinder for the entire company
  - All of the other business units benefited from the knowledge and expertise gained by LPS Software Development
- ❑ **2009**—LPS Software Development completed CMMI-DEV+IPPD (v 1.2) Re-Appraisal Maturity Level 3
  - LPS Software Development organization was the pathfinder for the entire company in re-appraisal activities

# Where we started



## Background

- ❑ Demonstrated compliance with CMMI-DEV v1.1 Maturity Level 3 in March 2006
- ❑ Business decision was made to forego any further appraisal activities
  - CMMI rating expired in March 2009
- ❑ Business shift with the possibility of Shuttle Program extension and the need for a current CMMI v1.2 rating in order to bid on future contracts
  - Decision for LPS Software to conduct a CMMI v1.2 re-appraisal (early April 2009)



# Why we did it



## Main objectives of the re-appraisal:

- ❑ Ensure the software development process remains compliant with
  - Shuttle customer requirements (NSTS)
  - CMMI-DEV Maturity Level 3 framework
- ❑ Ensure the LPS Software Development processes meet the customer requirements for the Constellation Program in preparation for future work
- ❑ Compliance with version 1.2 of the CMMI-DEV model
- ❑ Enhance the software development framework to
  - Improve and refine the processes
  - Ensure continued improvement in the quality and reliability of delivered products



# The Road Ahead



## Challenges

- ❑ Sense of urgency with the pending release of the Exploration Ground Launch Services (EGLS) Request for Proposal (RFP) for the Constellation Program
- ❑ Concern from NASA with the amount of time invested for appraisal activities versus contractual obligations and value add for the customer
- ❑ Lack of work during transition from Shuttle to new Constellation program for re-appraisal activities
- ❑ LPS Software Development was challenged to conduct the re-appraisal in:
  1. Under \$150K for external Lead Appraiser services (paid for by the company)
  2. \$125K for appraisal team members (paid for by the company)
  3. PIID preparation by project personnel at an effort of 1680 labor hours (paid for by Shuttle Program).
  4. Schedule challenges...calendar year, before RFP—moving target



# Did We Meet Our Challenges?



# Results-Cost Savings

## Overhead Cost Assessment

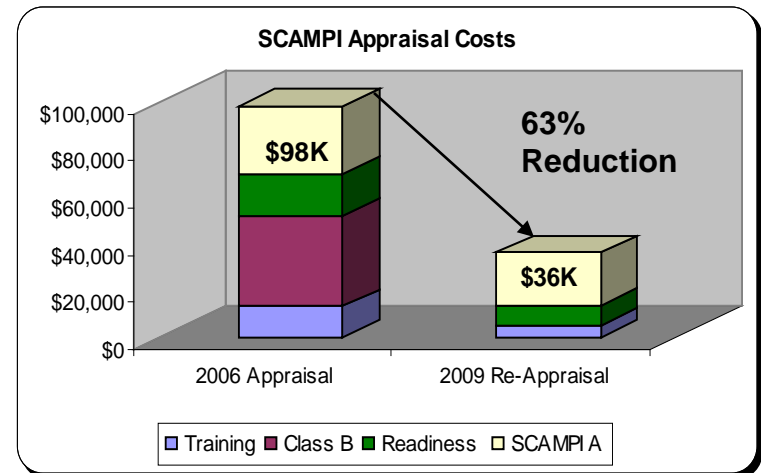
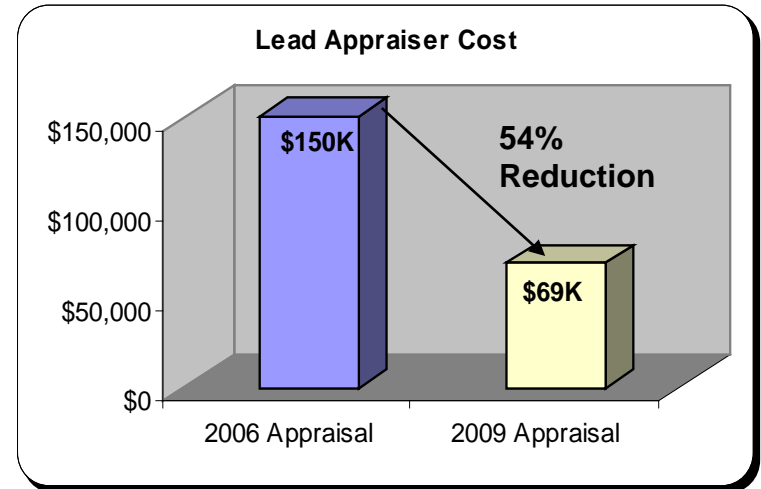
### Lean Re-Appraisal Approach

- ❑ Less training required (experienced team)
- ❑ Removal of Class B
- ❑ Condensed Readiness Review
- ❑ Condensed SCAMPI A
- ❑ \*PIID implementation

### Resulting in

- ❑ Reduced Lead Appraiser cost by **54%**
- ❑ Reduced SCAMPI activity cost by **63%**

★ Met Challenges 1 & 2 ★





# Results-PIID Productivity

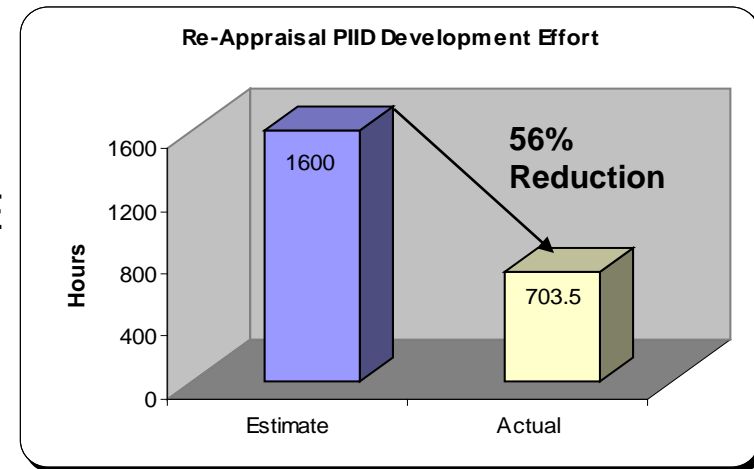
## PIID Effort Assessment

### Lean Re-Appraisal Approach

- ❑ Reused PIID format with minimal changes
- ❑ Reused Model interpretation of required OE
- ❑ Experienced PIID team members

### Resulting in

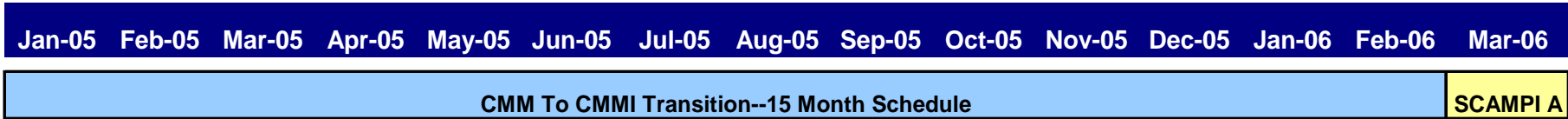
- ❑ Reduced PIID preparation activities by **56%**



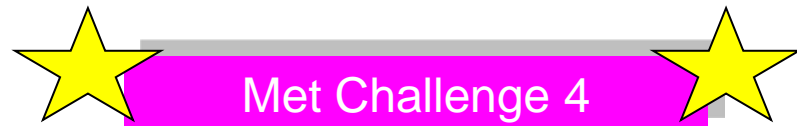
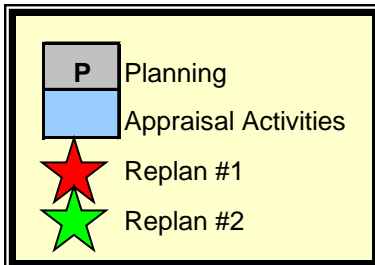
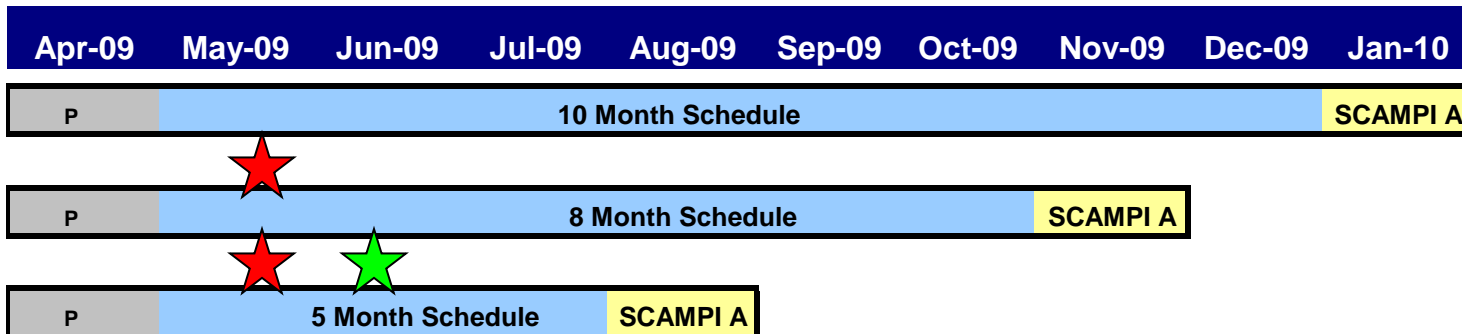
★ Met Challenge 3 ★

# Results-Schedule

## 2006 Appraisal Timeline



## 2009 Re-Appraisal Timeline





# How We Did It . . .

**CMMI**  
**Re-Appraisal or Bust!!!**



# Lean Methodology

Lean Factors	Appraisal	Re-Appraisal	How
Team Makeup	8 Appraisal Team Members (ATM)	6 Appraisal Team Members (ATM)	Reduced PIID OE
	4 ATMs had no previous experience	All ATMs had either PIID or CMMI appraisal experience	Leveraged USA ATM Experience
Appraisal Time	5 Day Readiness Review activity	3 Day Readiness Review activity	Lean Concept Applied
	10 Day SCAMPI A	8 Day SCAMPI A	Experience & Lean Concepts
PIID Reuse	New PIID format/tool	Reused general PIID format/tool	Experience
	All model practices had to be interpreted in relation to the organization	Practice interpretations were reviewed and reused 85% of the time	Leveraged Previous PIIDs
	Separate objective evidence (OE) for project and tasks	Effective techniques for project/task OE combinations	Lean Concept Applied
	4 Projects with 4 Focus Tasks	3 Focus Projects with 3+ Tasks	Model Interpretation Maturity & Experience
Training methods	PIID workshop used canned SEI examples/formats activities	PIID workshop used previous appraisal ornaizational PIIDs	LA Creative Approach
	Appraisal team training used canned SEI training exercises	Appraisal team training used current PIIDs for exercises	



# Lean Methodology<sup>2</sup>



## Reduction of required PIID evidence

- ❑ Artifact reuse
  - Replaced 2006 evidence with current version of same artifact.
    - Estimate 85% of evidence types were reused
  - Reduced unique artifacts by 37%
- ❑ Direct evidence reduced by 22%
- ❑ Minimal Indirect evidence provided
  - Reduced by 62%
  - 1 piece of evidence per project per goal



## Leveraging interviews for objective evidence

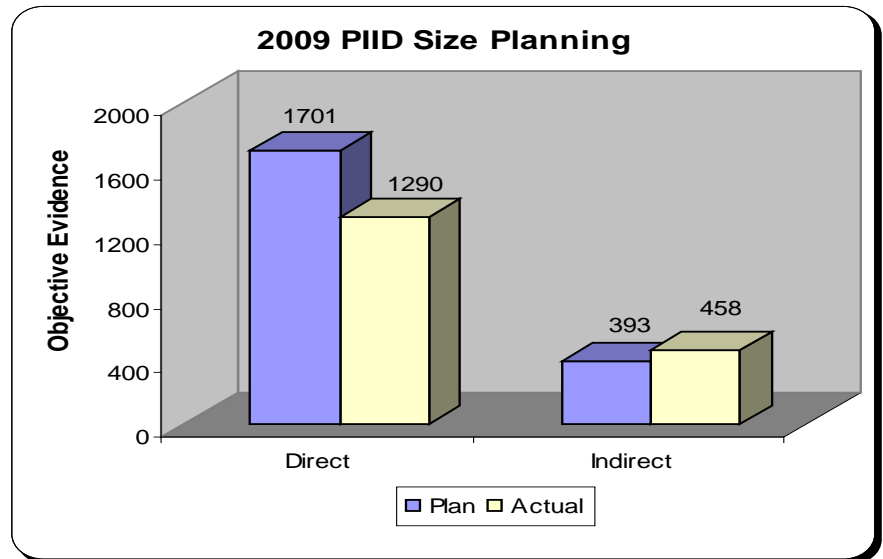
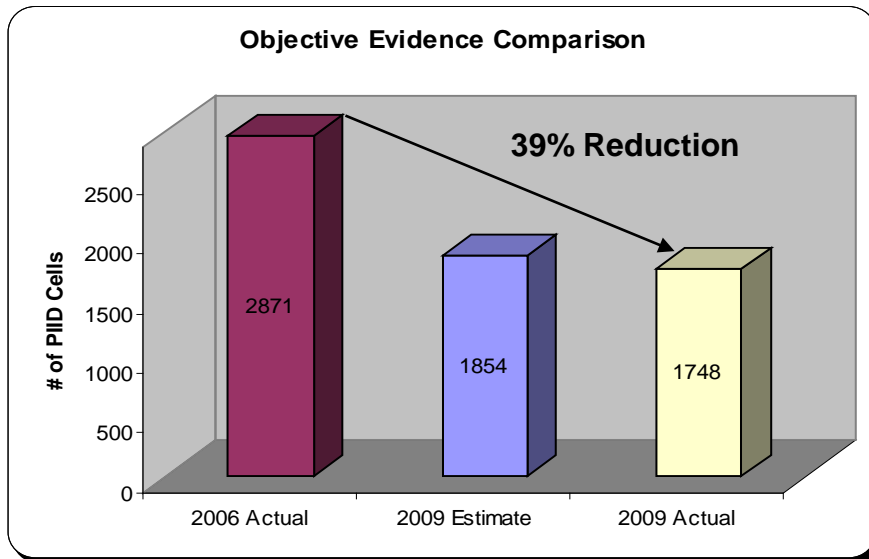
- ❑ Affirmations were required for model coverage (not relying on indirect evidence)
- ❑ LA provided generic scripts customized for organization.
  - Scripted questions were mapped to model practices
  - Reduced Appraisal team time for script preparation and note tagging

# Lean Methodology<sup>3</sup>

## PIID Size Assessment

### Resulting in

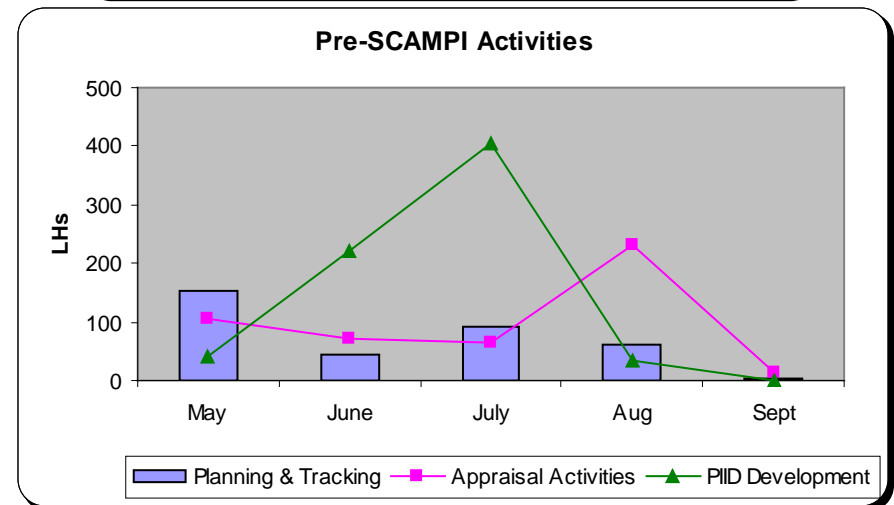
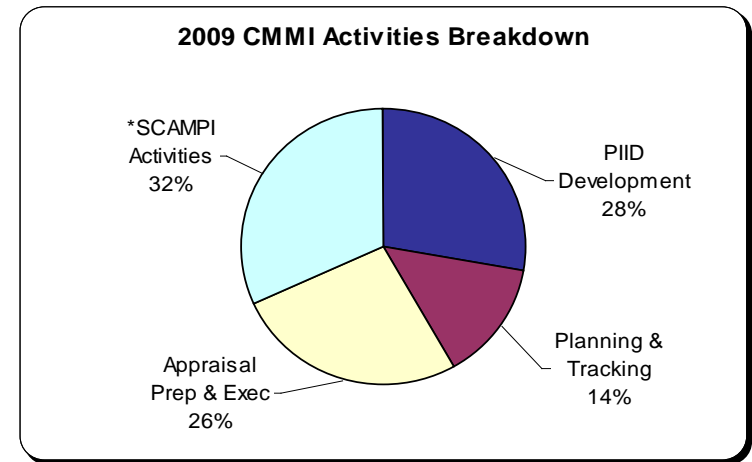
- Reduced number of PIID cells populated by **39%** from 2006 to 2009



# Lean Methodology<sup>4</sup>

## Appraisal Activity Assessment

- Decision was made to track types of appraisal activities using USATS
  - Appraisal Planning
    - Planning
    - Tracking
      - Schedule
      - Status Reporting
      - CM of PIID Artifacts
  - Appraisal Execution (internal personnel involved in interview and meeting support)
  - Process Compliance Audits (PIID Review & Development)
    - By Process Area (PA)
  - SCAMPI Activities
    - Appraisal Team Training
    - Readiness Review
    - SCAMPI A



# Lean Methodology<sup>5</sup>

## Appraisal Activity Assessment

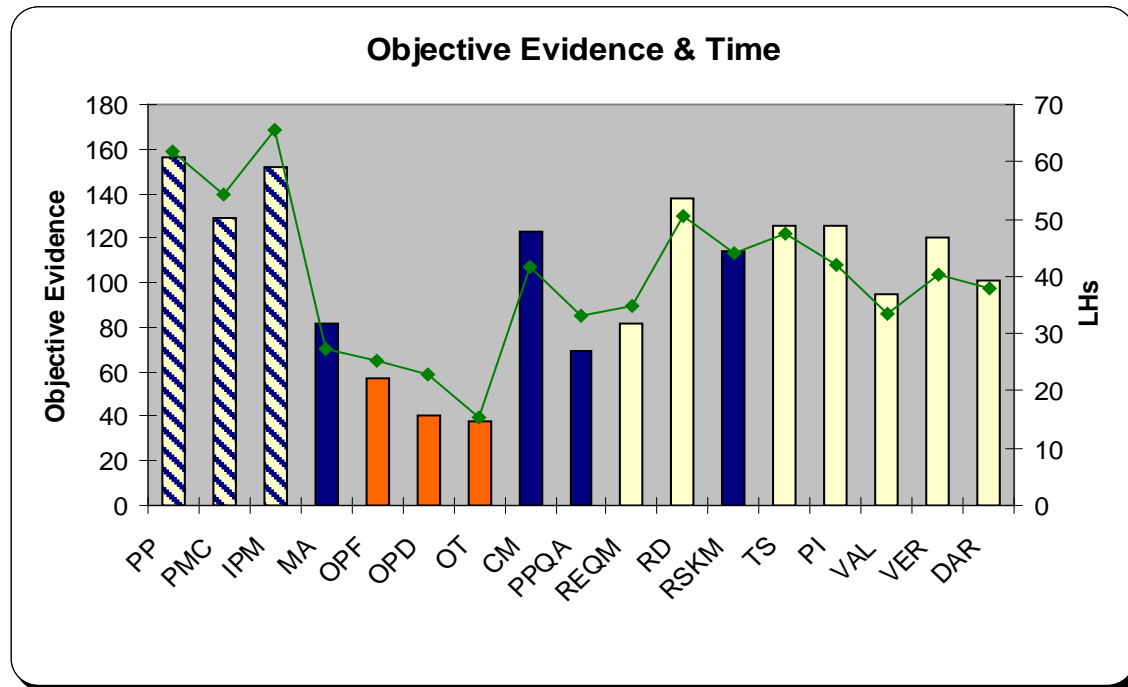
- CMMI Process Areas

- For each process area (PA) a unique USATS stat code was created which allowed effort to be tracked at a lower level than just PIID work

- Each PIID PA contained:

- Project Data (or)
- Task Data (or)
- Both Project and Task Data (or)
- Organizational Data

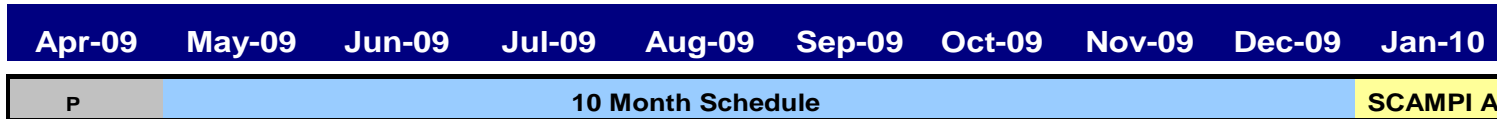
Legend:





# Re-Appraisal Milestones

## 2009 Re-Appraisal Timeline



**Assumptions:** Based on 2006 information & contract business needs  
 Normal SEI path (Class C, Class B, Readiness Review, SCAMPI A)  
 Available work to appraise on shuttle work  
 Grade A mentality--No risk

**Activities:** Lead Appraiser selected  
 Appraisal Plan drafted



**Trigger:** Need to complete appraisal activities in CY2009

**Activities:** PIID format and changes agreed to  
 Focus Projects and tasks identified  
 Appraisal team personnel identified

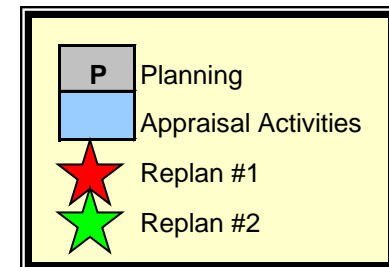
**Replan results:** Started Class C's for PA's with highest risk  
 Gave indication of minimal gaps and drifts  
 Lean Methodology approach discussed (smaller team, fewer appraisal days)  
 All class C's conducted ASAP – reducing possible rework



**Trigger:** Contractual need

**Activities:** Risks were acceptable with mitigation  
 Discussions of business needs and value of SCAMPI B vs SCAMPI A  
 Completed PIID workshops and Class C's  
 DAR performed to assess possibility of schedule reduction

**Replan results:** DAR results provided feasibility to pull schedule to left  
 SCAMPI B removed  
 Grade A mentality change-recognition of weaknesses  
 IPPD included in scope of appraisal  
 4th project added as non-focus task for 2 PA's  
 Provided 100% coverage across entire organization





# PIID Measures

- On average the time spent populating a PIID “cell” is approximately 30 minutes/cell
  - Populating a “cell” means
    - Interpreting CMMI model and identifying type of artifact from organization that provides compliance
    - Providing Black Text artifact name
    - Providing Green Italic Text descriptions
      - How the objective evidence meets the intent of the CMMI model practice
    - Providing associate link to artifact

No matter how much (or little) PIID evidence you need to collect and populate, you can estimate the effort needed to complete PIID work.

# PIID example

Practice	PRJ	PIID Concerns	Evidence			
			Direct	Direct Hyperlink	Indirect	Indirect Hyperlink
SP 1.5 Manage the project using the project plan, the other plans that affect the project, and the project's defined process.	ORG		IDS Organizational Software Process IDS-SEPG-058 Rev J (PS 1.3) <i>Monitoring and Control of the project, including team meetings, formal reviews, audits, etc.</i>	<a href="#">..\Docs_All_Projects\IDS-SEPG-058.pdf</a>	LPS Software Project Management IDS-SEPG-049 Rev G (4.4) <i>Directs the monitoring of the project's progress and status against the approved plans.</i>	<a href="#">..\Docs_All_Projects\IDS-SEPG-049.pdf</a>
	P1 Project		LPS PMR <i>Pages 4-11 (PDF pages 5-12) of the May 2009 LPS Project Management Review (PMR) identify the Application Software Project implementation of the Project Management processes as well as the implementation of the task level processes.</i>	<a href="#">..\LPS_Artifacts\LPS_PMR_052209.pdf</a>		
	P1 Task		AppSw/MathModel Earned Value Variance Report <i>This report shows the variance between planned and actuals (effort and size) at the task level for commitments of the task. (Page 7 of 29, ESR K89569 P1, GLS). The STMs run the variance reports weekly and review them to ensure that tasks have not violated any of the thresholds identified in the projects SPP.</i>	<a href="#">..\JMM_Artifacts\Math Model_VR_Summary_Report.pdf</a>	TrackStudio Monitoring SPI and CPI <i>TrackStudio Action Item #5915 opened as a result of the variance report indicating SPI and CPI were out of tolerance for HYD ESR K89393. The corrective action was determined to be a schedule rebaseline along with a return visit to CCB requesting approval of additional hours.</i>	<a href="#">..\Appsw_Artifacts\06_09_Trackstudio_TaskVariance.pdf</a>

## PIID Format Benefits

### Organizational Rows

Provided mapping of model practice to organizational process documentation.

### Green Text

*Provided explanation of how the OE applies to the model. Resulted in getting everyone up to speed and appraisal team time savings (only looked at applicable document sections)*

# Artifact Checklist Example

Date Received	Requestor	Brief Description of Artifact	Project	Artifact Folder SCAMPI_	Date Scanned	Hyperlink
05/28/2009	Robin Hurst	Integrated Data Systems Configuration Control Board Operations USA004623 Rev 6-Errata	All	Docs All Projects	Softcopy	<a href="..\Docs_All_Projects\USA004623.pdf">..\Docs_All_Projects\USA004623.pdf</a>
05/28/2009	Robin Hurst	LPS System Software Technical Review Panel IDS-SSWA-087 Rev F (	SysSw	Docs All Projects	softcopy	<a href="..\Docs_All_Projects\IDS-SSWA-087.pdf">..\Docs_All_Projects\IDS-SSWA-087.pdf</a>
05/28/2009	Robin Hurst	LPS Application Software Technical Review Panel USA004732 Rev 7 (	Appsw/MM	Docs All Projects	Softcopy	<a href="..\Docs_All_Projects\USA004732.pdf">..\Docs_All_Projects\USA004732.pdf</a>
05/29/2009	Dreama Poff	Verification & Validation Test Plan IDS-VAL-047	SysSw	Syssw Artifacts	Softcopy	<a href="..\Sysssw_Artifacts\IDS-VAL-047.pdf">..\Sysssw_Artifacts\IDS-VAL-047.pdf</a>
05/29/2009	Dreama Poff	System Software Documentation Standards 80K61006 Rev 2	SysSw	Syssw Artifacts	Softcopy	<a href="..\Sysssw_Artifacts\80K61006.pdf">..\Sysssw_Artifacts\80K61006.pdf</a>
05/29/2009	Dreama Poff	System Software Engineering Standards 80K61127	SysSw	Syssw Artifacts	Softcopy	<a href="..\Sysssw_Artifacts\80K61127.pdf">..\Sysssw_Artifacts\80K61127.pdf</a>

## Artifact Checklist Benefits

### Checklist Concept

Provided Configuration Management of all artifacts, identified their requestor, project and storage location. It also provided a quick reference to locating artifact already provided by any person or project.

### Hyperlink

Saved the PIID populators time by being able to copy and paste the link into the PIIDs.

Allowed access to an artifact for ATMs who didn't have it in their assigned PA but needed to reference it.

# Noteworthy Lead Appraiser Traits

- ❑ Availability (to support you)
  - Consultations to determine availability
- ❑ Experience
  - In appraising organizations with similar domains
- ❑ Soft Skills
  - Good Oral & written communication skills
  - Facilitative
  - Knowledgeable of Industry & CMMI Best Practices
    - Understanding cost effectiveness and applicability to organization (not academic)
    - Balancing business needs with compliance
  - Creative
  - Effective leader
    - May need to alter the culture of the organization
- ❑ Expectations
  - What is expected from the organization
  - What is expected from the LA – status reports, etc
- ❑ Resources (tools, training etc)
  - Available training from LA
  - Available consultation from LA
  - Tools LA requires for PIID or appraisal use





# How You Can Do It Too!!



# Advice to Others

It can be done faster, better, cheaper!!

## How?

1. Maintain institutionalization (Duh!)
  - ❑ Aggressive PPQA – avoid “drift” from process
  - ❑ Active SEPG – evolve/improve steadily
2. Don't gold plate SCAMPI
  - ❑ Avoid A+ mentality
  - ❑ External personnel (ATM's and LA) must be reasonable
    - Avoid unnecessary rework from your LA
    - Work within existing PIID format, interpretations, approach
3. Be Lean and **Green**
  - ❑ SCAMPI Optimization (fewer indirects, scripts, etc.)
  - ❑ **Reduce** PIID content,  
**Reuse** experience team members and  
**Recycle** PIID format and scripts.





# Questions??





It's No Big Deal!!

