Techniques for Shortening the Time and Cost of CMMI® Appraisals

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Topics

- Appraisal cost problem, and related cost drivers
- Review of SCAMPI concepts to control appraisal cost
- Proposed appraisal cost and time-saving techniques
- Case Study
- Summary

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CMMI Appraisals Problem

- CMMI ® is significantly larger than its legacy source models

	SW-CMM	CMMI SE/SW v1.1 Staged
Model Size Maturity Level 3	Key Process Areas = 13 Goals: 37 Practices: Key = 229	Process Areas = 18 Goals: Specific (40) + Generic (36) = 76 Practices: Specific (136) + Generic (216) = 352
Data Items (for 4 projects)	1,574 items (Factors = 2 data sources)	2,486 items minimum (Factors = 1 direct and 1 indirect evidence minimum)

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CMMI Appraisals Problem (cont.)

- Conducting CMMI appraisals is challenging
    - Minimizing use of resources
    - Minimizing the impact on appraisal teams and appraised organization
    - Maintaining a high degree of accuracy for benchmarking
    - Ensuring that all involved have the needed level of understanding of how data will be evaluated

Addressing the Appraisal Cost Concern

- Pilots by Software Engineering Institute sized the time bounds

- Investigated appraisal method changes to meet a target of 100 hrs. or less appraisal on-site time (Maturity Level 3)

- Resulted in SCAMPI^{SM} V1.1 key concepts

  – Verification vs. discovery

  – Focused investigation

  – More rating rules

Key SCAMPI 1.1 Method Concepts

Verification   vs.   Discovery

- Organization submits evidence vs. appraisal team asks

- Shifts evidence gathering burden to the organization

- Uses Practice Implementation Indicators (PIIs) (consequences of implementing the practice)

  – Direct artifact – result of doing the practice

  – Indirect artifacts or affirmations – substantiating indicators of doing the practice (corroboration evidence)

- Less observations

Key SCAMPI 1.1 Method Concepts (cont.)

- Focused investigation
  - Continually consolidate data until practices sufficiently covered
  - Promotes more focused interviews

- Data collection, rating, and reporting
  - Weakness focus
  - No gratuitous strengths
  - Mini-teams for related process areas (PAs)
  - Rating rules direct appraisal team judgments where most needed

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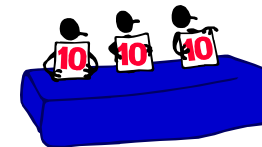
What Appraisal Experiences Tell Us

- PIID identification and collection cost is high
    - Two types of expertise is required
        - What to include – process group knowledge (map processes to model, identify artifact types)
        - Where to find it – project knowledge (which particular project artifact is appropriate)
    - Examples
        - Project effort
            - One project, 16 PAs – 600+ hours
            - Three projects, 20 PAs – 1,600+ hours
   - Almost equal amounts of process group effort

# What Appraisal Experiences Tell Us (cont.)

- Appraisal team experience/training is key
  - Introduction to CMMI training
  - SCAMPI appraisal team training
    - SEI materials
    - Training on interpreting controversial and Generic Practices (GPs)
  - Process knowledge experience
    - How site processes relate to one another (integrated)
    - How site processes map easily to CMMI objectives
    - Acknowledgement vs. discovery of Alternative Processes
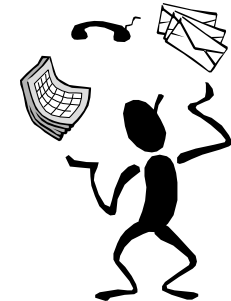
What Appraisal Experiences Tell Us (cont.)

- Too much corroborating evidence
  - High goals are set for indirect artifacts for all practice instantiations
  - SCAMPI requires face-to-face affirmations for a significant % of practices

- Wide range of appraisal times estimated or proposed for appraisals of similar scope
  - Variations due to
    - Risk (Discovery vs. Verification)
    - Knowledge of Customer processes
    - Low-Ball Estimates to 'Buy Appraisal Business'
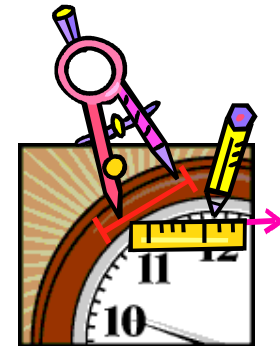
Fixed vs. Variable Costs

- Costs are driven by appraisal scope
  - Appraised organization size (number of representative projects)
  - Number of PAs
- Fixed costs
  - Planning, reporting, travel
- Variable
  - Appraisal team training
  - Filling in the PII database (PIIDB)
  - Appraisal team and participants' time
  - Verification vs. discovery (information needs)

Cost of Appraisal

Appraisal Cost = Cost of Planning + Preparation + Execution + Reporting

- Cost of Planning (Fixed)

- Cost of Preparation (Variable)

  – Cost of filling in PIIDB (researching Objective Evidence and entering data)

  – Cost of appraisal team training (CMMI and method)

  – Cost of PIIDB quality reviews

- Cost of Execution (Variable)

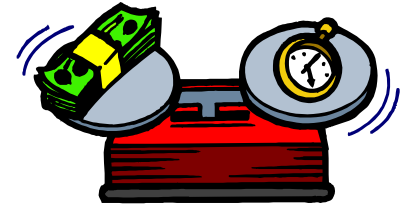 – Cost of team members' and participants' time

- Cost of Reporting (Fixed)

Reducing time = Reducing cost

Looking at Possibilities to Reduce Appraisal Costs?

- Investigating the techniques aimed at
  - Reduced preparation cost ⬇
  - Reduced on-site appraisal cost ⬇
 - Tradeoffs between preparation cost and on-site appraisal cost ⬇⬆

- Techniques must stay within the SCAMPI method parameters and limits and not increase appraisal risk
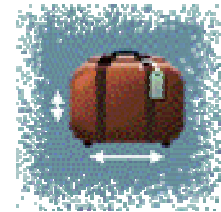
Optimize PI Appraisal Strategy for Cost

- ## Techniques
  - Use of all appraisals classes defined in the Appraisal Requirements for CMMI
    - Class C – get process right
    - Class B – get implementation right
    - Class A - benchmarking
  - Leverage same projects in multiple appraisal events
  - Use ongoing self assessments
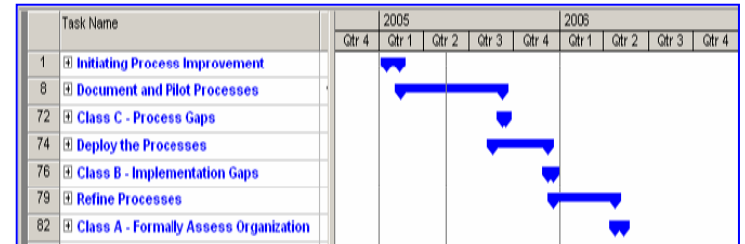
- ## Cost
  - ⬇ Preparation: – through reuse and learning
    - ⬇ Project PIIDB cost
  - ⬇ Onsite: - less discovery time due to higher PIIDB quality

PIID Development – Starting point

- Techniques
  - Process group builds pre-populated PIIDBs based on organization's standard process
    - Projects identify artifact location
    - Projects add project-tailored process artifact information

  - Organizational Process Asset Library or repository directly supports PIIDB evidence collection
  - Projects reuse and modify other projects PIIDBs
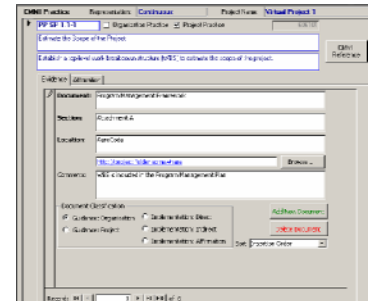
- Cost
  - Preparation: Minimized PIIDB cost
   - Less time to identify the standard artifacts types
    - Project PIIDB cost reduced through reuse

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PIID Development - Expertise

- Techniques

  – Coaches knowledgeable in CMMI and SCAMPI work with project personnel to complete PIIDBs

  – Periodic reviews conducted with Lead Appraiser to validate PIIDBs (i.e. valid interpretation of method and model)
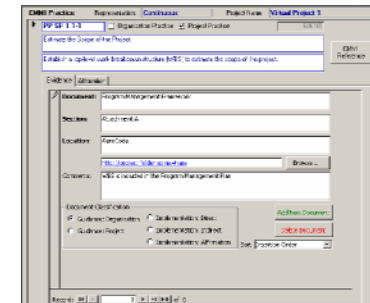
- Cost

  ⬇ Preparation: Minimized PIIDB cost

    ⬆ Cost of PIIDB reviews

    ⬇ Improved efficiency by reducing thrashing in identification of appropriate data

    ⬇ Reduced risk through improved PIIDB quality

    ⬇ Reduced rework

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Appraisal Team Preparation Cost

- Techniques
  - Establish pool of trained candidate appraisal team members
  - Use same appraisal team members in organization's Class C, B, and A appraisals
  - Train appraisal team on interpretation of GPs and controversial practices for consistency
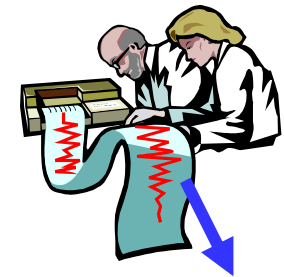
- Cost
  - ⬇ Preparation: Appraisal Team
    - ⬇ Requisite training (e.g. Intro to CMMI and Appraisal Team Training) averaged over '*n*' appraisals
    - ⬆ Upfront training on interpretations
  - ⬇ Onsite: Appraisal team objective evidence review and consensus time reduced

Cost of On-Site Appraisal Team and Participants

- ## Techniques
  - Expand scope of Readiness Review/Team Training to include extensive review of evidence for content and characterization and identify additional evidence needed.
    - Do advanced readiness checks
    - Train with live data
    - Work through entire appraisal life-cycle

- ## Cost
  - ⬆ Preparation: Cost of readiness checks
  - ⬇ Onsite:
    - ⬇ On-site schedule accelerated – time reduced

Validate Preliminary Findings Cost

- Techniques
    - More focused to key participants (i.e. project and functional leads)
        - Parameters and Limits: 1 representative from project and any associated staff function
    - Run concurrent preliminary findings feedback sessions

- Cost
    - Onsite: appraisal team and organization participants' time reduced

Corroborating Evidence Cost

- Techniques
  - Reduce requirements for identification and review of indirect evidence
    - Rely on affirmations for GPs, indirect artifacts for most specific practices
    - Expand project and organizational in-briefs to cover GPs

- Cost
  - Preparation: PIID cost reduced
  - Preparation: More build time for project and organizational presentations
  - Onsite: Appraisal team time reviewing indirect artifacts reduced
  - Onsite: Appraisal team and participants' cost for interviews and project presentations may be slightly increased

Face-to-Face Affirmation Cost

- ## Techniques
  - Conduct focused on-call follow-up interviews by mini-teams

- ## Cost
  - ⬇ On-site: appraisal team and organization interview participation time reduced

Appraisal Tools

- ## Techniques
  - For large amounts of objective evidence an integrated online appraisal tool set is paramount to
    - Collecting and documenting objective evidence
    - Checking for sufficiency and updating data collection plans
    - Automating characterizations and ratings
    - Generating preliminary findings and final findings presentations

- ## Cost
  - ⬇ Preparation:
    - ⬇ PIIDB preparation cost is reduced
    - ⬇ Readiness Review cost is reduced
  - ⬇ On-site: appraisal team time is reduced
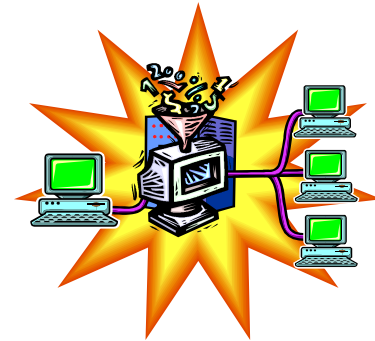
Caution on Appraisal Cost Reduction

- The SCAMPI method strove for a balance of evidence types

- In the extreme, cost reduction techniques could be applied so extensively as to cause an unbalance, and appraisal results may be criticized as:

  - Not truly objective

  - Not repeatable

  - Missing critical process failures and inconsistencies because of "speed" or lack of depth

- Recommendation:

  - In evaluating cost reduction techniques ensure that you also address objectivity, repeatability, and quality concerns

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Case Study

Most of the techniques described here were piloted with one of the Consortium's member companies.

- Organization: General Dynamics Canada (GDC) – Calgary

- Organizational Coordinator: George Gundesen

- Lead Appraiser: Laura Caldwell, Systems and Software Consortium (SSCI)

- Consultant: Sam Fogle, SSCI

- Engagement Duration: Planning began January 2004, SCAMPI Class A completed July 2005

Case Study (continued)

Techniques piloted:

- A series of three appraisals was planned: a Class C in March 2004, a Class B in November 2004, and a Class A in July 2005.

- A philosophy was adopted to try to reuse as many members of the appraisal team as possible. From the B to the A only one team member changed.

- Members of the Process Group worked with the projects to help complete the PIIDBs, and the Lead Appraiser was periodically brought in to review the PIIDB development and answer questions on interpretation.

Case Study (continued)

More techniques piloted:

- A set of automated tools developed by SSCI was used for both PIIDB development and appraisal conduct.

- The Readiness Review/Team Training was done on live data. The quality of the PIIDBs allowed a large portion of document review to be completed during the time reserved for this effort, thereby shortening the onsite period.

Case Study (continued)

More techniques piloted:

- The project and organizational overviews were conducted using templates that elicited affirmations on how generic practices were addressed across all PAs. This eliminated the need to review indirect evidence for GPs. These sessions were interactive, serving as both overviews and interviews.

- All additional Face-to-Face affirmations were obtained in small sessions with only the applicable Appraisal Team Members (those that had questions for that interviewee - minimum of two).

- Preliminary Findings sessions were planned for two parallel tracks with one member of each mini-team in each.

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Case Study (continued)

Case study results:

- The advanced PIIDB checks were very productive and resulted in greatly increased PIIDB quality.

- The Readiness Review/Team Training was conducted over 5 days with no late nights. In addition to completing the training and reviewing the required practices, all of the SPs were characterized and direct artifacts were reviewed for GPs. Also the Organizational Training PA was completed through goal rating.

- The onsite period was shortened to 5 days and some of those ended up being very short days.

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Summary

- Reviewed potential cost and time-saving techniques by CMMI appraisal preparation and on-site phases

- Discussed case study of application of techniques

- We welcome additional feedback on your experience and recommendations to the SSCI staff
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  - Sean Cassell, cassell@systemsandsoftware.org