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DEFINING THE FUTURE

A Quantitative Comparison of SCAMPI A, B, and C

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Background

- **SCAMPI B and C appraisal methods were recently defined to compliment the existing SCAMPI A method**

- **Selecting the right method involves several factors – cost, schedule, accuracy, efficiency, tailoring, desired results, etc.**

What you should consider in selecting a method?

What is the difference in accuracy between an A, B, and C?

How does the selection influence organizational buy-in?

SM SCAMPI, SCAMPI Lead Appraiser, and SEI are service marks of Carnegie Mellon University.
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Characteristics of CMMI Appraisal Classes

The ARC (Appraisal Requirements for CMMI) defines appraisal classes

- A guide to inventors of appraisal methods, and their customers

Key differentiating attributes for appraisal classes include

- the degree of confidence in the appraisal outcomes
- the generation of ratings
- appraisal cost and duration

Appraisal Requirements for CMMI, Version 1.1, CMU/SEI-2001-TR-034

Characteristics	Class A	Class B	Class C
Amount of Objective Evidence Gathered (relative)	High	Medium	Low
Ratings Generated	Yes	No	No
Resource Needs (relative)	High	Medium	Low
Team Size (relative)	Large	Medium	Small
Appraisal Team Leader Requirements	Lead appraiser	Lead appraiser or person trained and experienced	Person trained and experienced

SCAMPI is simply a family of possible appraisal methods
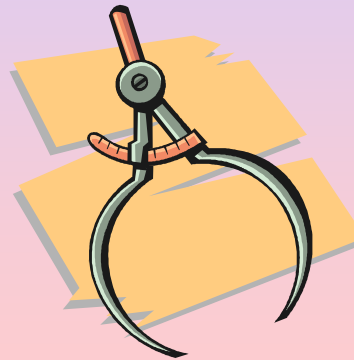
SCAMPI-A   SCAMPI-B   SCAMPI-C

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Impacts Classified

Cost & Schedule

Accuracy

Buy-In

Phase 1 – Plan and Prepare for the Appraisal

Requirement	SCAMPI A	SCAMPI B	SCAMPI C
Led by SEI-authorized Team Lead	Yes	Yes	Yes
Communications between Team Lead and Sponsor	Yes	Yes	Yes
Sponsor approves Appraisal Input and any changes	Yes	Yes	Yes
Sponsor approves Appraisal Plan	Yes	Yes	Yes
Team members complete Intro to CMMI and some form of Team Training	Yes	Yes	Yes
Some form of Readiness Review	Yes	Yes	Yes
Objective Evidence Collection Plan	Yes	Yes	Yes
Criteria for team experience in engineering and management	Yes	Yes	No
Minimum Team Size	4	2	1

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Minimum Team Size

- **Cost is composed of:**
  - Team costs – goes up with team members
  - Organizational costs (interview, presentations) – largely fixed regardless of size
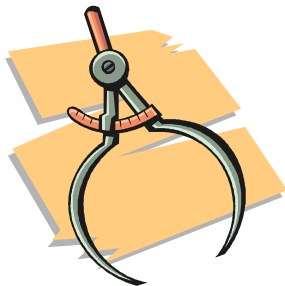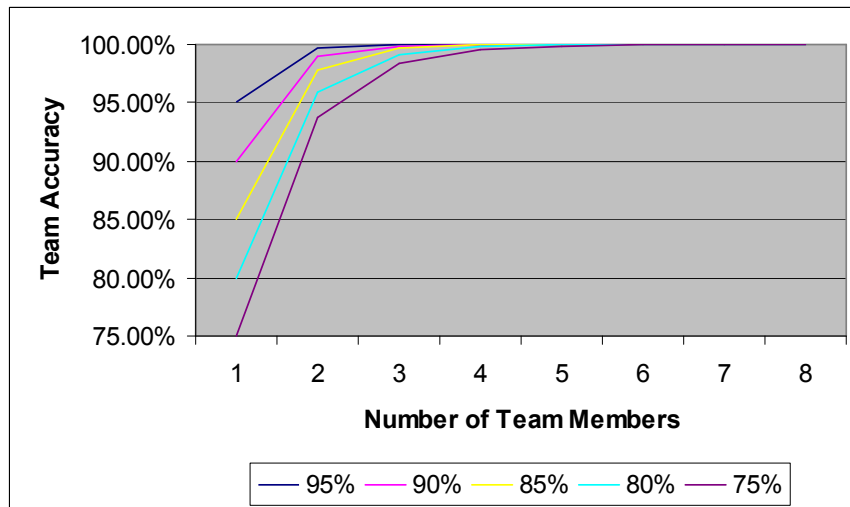
- **Accuracy goes up with as team size increases**

- **Buy-in is driven by the confidence the organization's members has in the appraisal process and appraisal team**
 - Larger teams can increase the likelihood that a respected person is on the team

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Team Accuracy vs. Team Size

- **Team accuracy vs. team size, for given individual accuracies**

- **As team size goes up, team accuracy rapidly increases (assuming the right answer is obvious once presented)**

- **Teams of greater than 4 provide little increase in accuracy**

- **Same, assuming 90% leader accuracy**
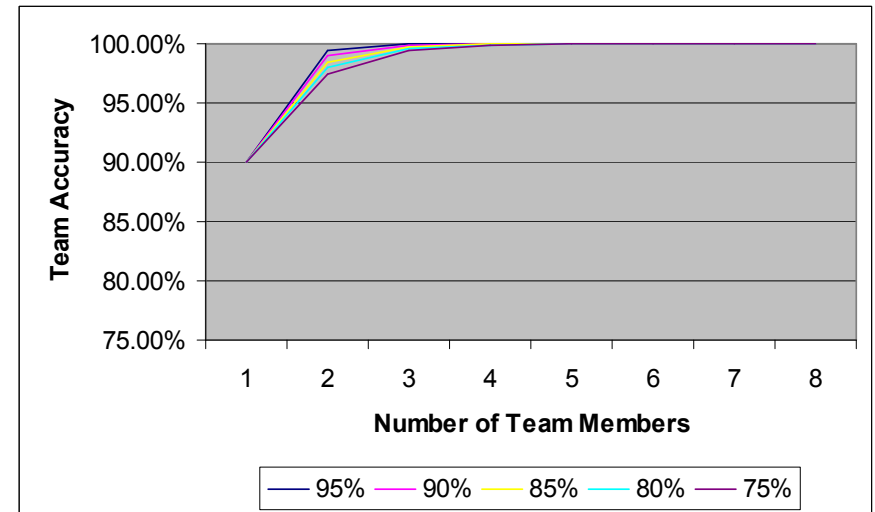
- **If the team leader is 90% accurate, additional team members add little accuracy**

- **Adding team members does give a chance for them to learn**

**Appraiser accuracy, not team size, is critical**

Phase 2 - Conduct Appraisal

Requirement	SCAMPI A	SCAMPI B	SCAMPI C
Data annotated with model and OU information	Yes	Yes	Yes
Direct Artifacts, Indirect Artifacts and Affirmations identified	Yes	Yes	Yes
Gaps in OU implementation with respect to model identified	Yes	Yes	Yes
Final Findings include Strengths and Weaknesses	Yes	Yes	Yes
Direct Artifacts Reviewed	Yes	Yes	No*
Interviews conducted	Yes	Yes	No*
Sources of objective evidence (interviews, documentation, instruments)	2	2	1
Observations corroborated	Yes	Yes	No
Validation of preliminary findings	Yes	Yes	No

* One type of objective evidence collection is required

Sources of Objective Evidence

- **Evidence review takes 1-2 times the length of interviews**
  - If evidence is not reviewed, easy to answer "correctly" in the interviews
  - If interviews are not conducted, evidence may be faked (not really in use) - normally easy to spot
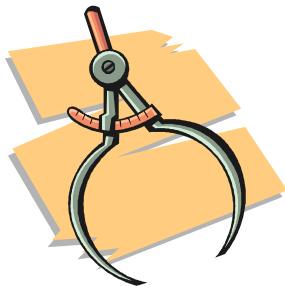
- **Accuracy increases significantly with evidence review**

- **Validation takes little time and often increases accuracy 20-30%**

- **Buy-in is greatly increased by validation**
  - Nothing decreases buy-in faster than a "weakness" that everyone knows is wrong

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Phase 3 – Report Results

Requirement	SCAMPI A	SCAMPI B	SCAMPI C
Designated appraisal results provided to stakeholders	Yes	Yes	Yes
Appraisal record delivered to sponsor	Yes	Yes	Yes
Appraisal data package submitted to SEI	Yes	Yes	Yes

* One type of objective evidence collection is required

Conclusions

- **SCAMPI cost, accuracy, and buy-in are driven more by the choice of tailoring options than by the selection of SCAMPI B and C**

- **SCAMPI A's limit the choices, promoting accuracy**
  - This is why SCAMPI A is the only method that results in a maturity or capability level

- **The flexibility permitted by SCAMPA B's and C's can result in inaccurate results and lack of organizational buy-in, especially if conducted by untrained, inexperienced personnel**

Guidance

- **If conducting B's and C's, ensure that team members have sufficient knowledge and experience, and emphasize evidence review**

- **SCAMPI A's can be conducted at similar costs if the method is tailored appropriately**

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Applying Six Sigma To Appraisals

- **Several Six Sigma projects were conducted to optimize the SCAMPI appraisal process**
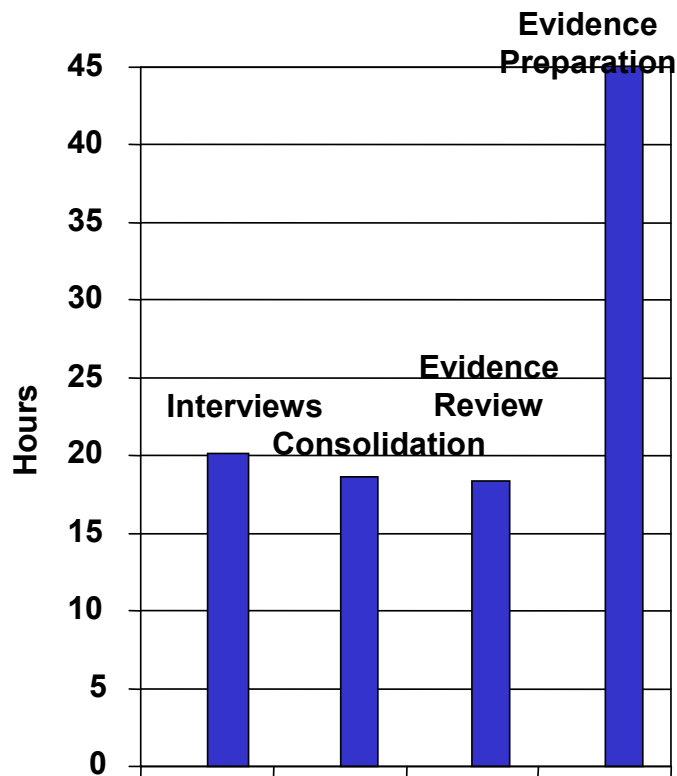

- **Collected metrics on time spent on various appraisal activities, defects**

- **Used Pareto chart to identify bottlenecks, opportunities for improvement**

- **Used individuals charts to study variation in the appraisal process**

- **Used fishbone charts and other causal analysis methods to identify potential improvements**

"Minimizing SCAMPI Costs via Quantitative Methods, "
R. Hefner and Ron Ulrich, CMMI Technology
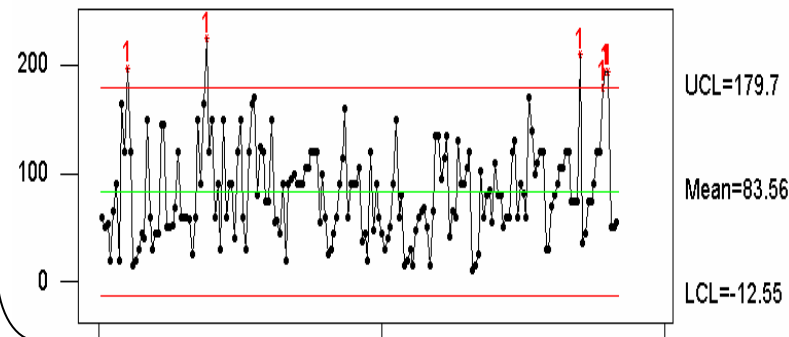Conference & User Group, 17-20 November 2003

Reducing Variation in Evidence Review

inexperienced

experienced

time for review mins
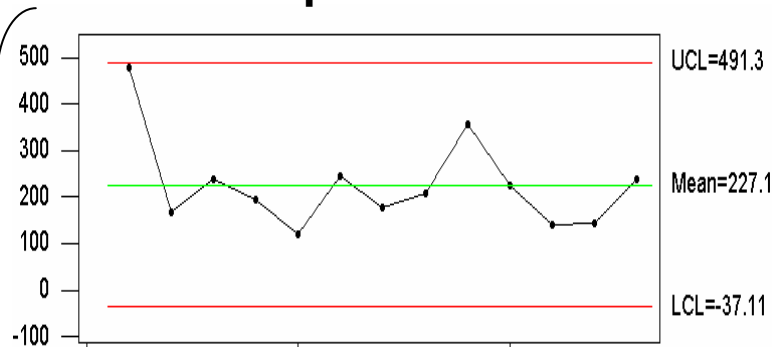
- **The time is takes to review evidence is predictable**
  - Some variation by process area

- **The mean review time and variation is much higher among inexperienced appraisers**
  - At least half of the appraisers on the team should be experienced

- **Review time is driven by the clarity with which evidence is assembled and mapped to the CMMI practices**
  - Ensure thorough evidence scrub prior to on-site period
  - Bad evidence ("defects") causes unexpected schedule overruns

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Reducing Interview Costs

- **To reduce cost:**
    - Use pre-scripted interview questions
    - Conduct interviews simultaneously in mini-teams (Remember that more than 3-4 people don't increase accuracy much.)
    - Schedule one interview per practice & instantiation (no SCAMPI requirement for multiple interview sources like in CBA IPI)

- **Maintain appraisal accuracy by emphasis on direct evidence**
    - Interviews simply confirm that the evidence is "real"
    - Interviews are <u>not</u> a test of how well someone remembers the practice

Reducing Consolidation Time

Crafting observations

- **Voice of Customer data indicates organizations and projects simply want to know which practices they do not comply with**
  - Consistent with Verification mode
  - No need to wordsmith charts
- **We created an Appraisal Findings tool to capture the ratings at the instantiation level (every project, every practice)**
  - Simplifies data consolidation, team discussion

Reviewing as a team

- **Most of the time is spent arguing about how to interpret a few CMMI practices**
  - Especially Generic Practices
- **We created "CMMI Interpretation" training which clarifies how ambiguous practices will be evaluated**
  - Driven by areas where disagreement occurred
  - Useful in reaching team (and organizational) consensus

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Measured Success

- **Northrop Grumman Mission Systems is typically conducting Level 5 SCAMPI A appraisals in 5-6 days**
  - Based on over 60 SCAMPI A appraisals
  - 3-4 projects, 6-9 appraisers, 3 mini-teams, 10 hour days
  - Post-appraisal follow-up indicates >95% accuracy rate

Conclusions

- Regardless of the choice of method (A/B/C), the appraisal process should tailored to yield accuracy, efficiency, and buy-in

- Selection of experienced, knowledgeable appraisers will significantly effect all 3 factors

- The flexibility permitted by SCAMPA B's and C's can result in inaccurate results and lack of organizational buy-in, especially if conducted by untrained, inexperienced personnel

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