



Increasing efficiency and saving costs with new SCAMPI approaches

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Agenda

- ◆ Brief background of the MSE organization
- ◆ Perceived problems to jointly solve
- ◆ Targeted improvement areas
 - Planning
 - Organizational and data sampling
 - High maturity evidence approach
 - Team composition and events
 - Tooling

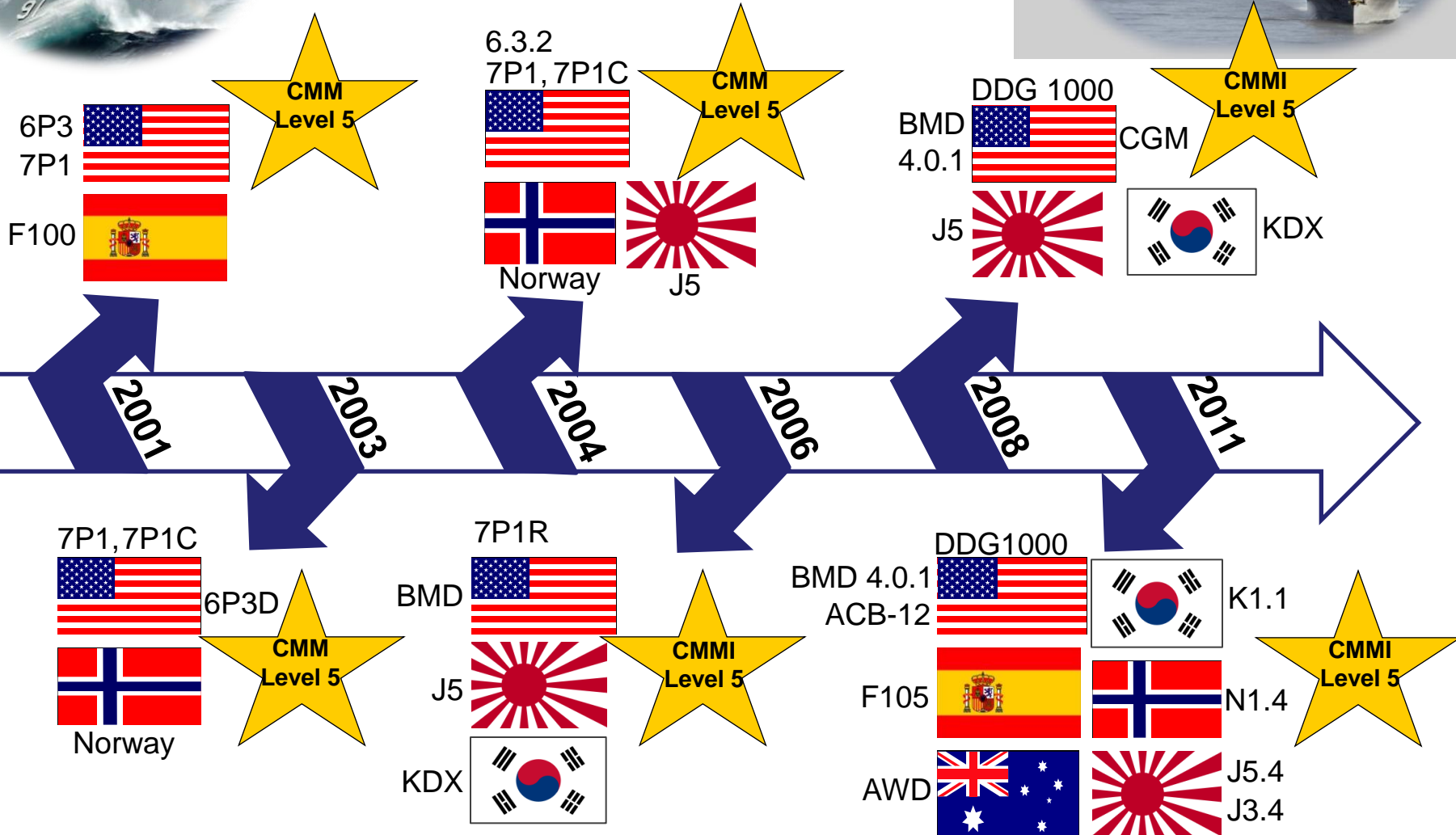
This presentation includes planning activities that pre-dated the official release of SCAMPI V1.3 – projected concepts were used that are totally in concert with the intent of the method as released.

Mission Solutions Engineering (MSE) – Who We Are

- ◆ MSE, LLC is headquartered in Arlington, VA with operations in Moorestown, NJ
- ◆ 600+ personnel / \$90M+ annual revenue
- ◆ 40+ years of success in mission systems development
- ◆ Originally a division of CSC, MSE was acquired by ASRC Federal Holding Company in October 2010
- ◆ Domain and Functional Expertise – Real time combat system software development
 - Command and control (C2)
 - Weapons control
 - Display systems
 - Radar control

10 Years of Outstanding Process Maturity

21 Baselines Evaluated at Level 5



CMMI Level 5 systems engineering processes mitigate program risk and ensure a culture of innovation.

Proven Performance

- ◆ Delivered Results
 - Fielded systems in over 110 surface combatants
 - Delivered over 48 capability baselines
 - Developed and support over 95 million SLOCs
- ◆ 20% productivity increase since 2000
- ◆ 55% decrease in first pass test failures since 2001
- ◆ 100% increase in CPCR/STR productivity since 2000
- ◆ 50% decrease in defects for developed code since 2000
- ◆ 80% decrease in defects for delivered code since 2000
- ◆ 3% increase in SPI
 - 25% increase in SPI within 1% of 1 over all EVMS contracts



Problem Statement

MSE had a long history of performing successful SCAMPIs (and CBA IPIs and SCEs before that dating to the early '90s). The legacy:

- ◆ **Inordinate amounts of effort** and resources preparing for and conducting a SCAMPI A (via PIID generation and very large teams)
- ◆ Each appraisal was treated as an independent end item – a once every three years approach - “regenerating” data and **“new” PIIDs**
- ◆ **Appraisal preparation and evidence collection** was performed separately from team and Lead activities – not integrated
- ◆ **“All or nothing”** Class A rules motivated this organization to provide “the kitchen sink” evidence approach – way too much.
- ◆ Old V1.2 rules **limited project participation**, and...
- ◆ **Practice based appraisals were not “natural”** for a HM organization
 - PIIDs got in the way of seeing how work really gets done...
 - Practice by practice decomposition artificially fragmented a highly complex integrated set of activities.
 - Generic practices coupled with evidence rules vastly expanded the quantity of data required.

The Goal: Transition to a More Cost Effective Effort Profile Without Increasing Risk

“Old” effort profile – all effort sucked into the black hole of appraisal prep in direct relationship to time remaining until Day 1 of the Class A onsite

“New” View of an improved effort profile – more time in interim improvement events; benchmark a “fait accompli”

Class A start

- Overall effort reduced
- Stress lower
- Risk mitigated
- Quality higher
- Utility better

Class B

RR start

Class C

Class A start

Lifecycle costs matter – view it as a combination of internal preparation and appraisal team effort

Time from appraisal project start to beginning of benchmark event

Time from appraisal project start to beginning of benchmark event

An Alternative Solution Implemented

- ◆ Used a more **expert driven, incremental, managed evolution of data collection and review tasks** to make the outcomes **both** significantly more efficient **and** improved the quality and utility of the data. Summary approach and outcomes:
 - *New sampling rules allowed for much greater participation*
 - *Managed Discovery and Phased Data Collection –Incremental data evolution and reuse used through the appraisal lifecycle.*
 - *Easier to collect data for the organization, and easier to review, understand, and analyze for the team*
 - *Reduced emphasis on PIID preparation*
 - *A set of events was integrated into a single plan. Used interim events to manage risk and costs*
 - *Implemented a concept of “threads” to present the data. HM data primarily presented data by “topics,” rather than “practices”*
 - *Ensured results and effort expended reflected event goals*

“Real” Organization Sampling Example

Selected Sampling factors

Relative percentages

Selected Sampling Factor	Size	Customer Location	Work type	Lifecycle	Customer	Benchmarking period		Subgroup size	
Project	Large (>zzz), Medium (>yyyy<=zzz) Small (<=aaa)	Foreign or Domestic	Legacy or New	Devel or Maint	Customer (A, B, C, D)	July 2010 SM (Actual)	Feb 2011 SM (Projected)	ROM % in each subgroup	Notes
A	Large	D	New	Devel	Customer A	8.0x	5.0x	41%	All PAs
B	Large	F	New	Devel	Customer B	1.5x	1.5x	12%	All PAs
C	Medium	D	Legacy	Maint	Customer C	1.0x	.68x	21%	Levels 4-5 PAs
D	Medium	D	New	Devel	Customer A	0x	.67x		start fall 2010 end fall 2012
E	Medium	D	New	Devel	Customer D	.67x	.75x		Levels 2-3 PAs
F	Medium	D	New	Maint	Customer A	0x	0.5x		Ending fall 2010
G	Medium	F	Legacy	Maint	Customer B	.12x	1.0x	23%	
H	Medium	F	Legacy	Maint	Customer B	.075x	0.5x		
I	Medium	F	New	Maint	Customer B	1.0x	0.5x		Smattering of PAs
J	Medium	F	New	Maint	Customer B	0.3x	0.6x		
K	Medium	F	New	Maint	Customer B	0.5x	0.5x		
L	Small	D	New	Devel	Customer D	0.2x	0.15x		Too small. Not in scope
M	Small	D	New	Maint	Customer A	0x	0x		Too small. Not in scope
N	Small	F	Legacy	Maint	Customer B	0x	.25x		Too small. Not in scope
total						Large	Large		overall size roughly the same

High level data plan

Company had defined rules for large, medium, and small projects
 Company had defined policy for what CMMI based processes were applicable to
 Company would be considered "large" by SEI Class A SAS reporting data
 X in Staff Months (SM) above is normative to understand relative size.

Other factors considered but weren't relevant:

Work Location
 Funding Source
 Contract type
 Application Domain
 Functional Area

Other sampling factors evaluated

This example is a sanitized real example that was completed prior to the formal SCAMPI V1.3 sampling rules being defined.

“Real” Data Sampling Example

This is the data sampling plan for the fourth subgroup on the prior slide (the 4th and 5th color bands combined into one subgroup)

	Projects					Comments
Process Area Count	3	4	4	4	3	
Process Areas	A	B	C	D	E	
Organizational Process Focus - OPF	Org	Org	Org	Org	Org	
Organizational Process Definition - OPD	Org	Org	Org	Org	Org	
Organizational Training - OT	Org	Org	Org	Org	Org	
Organizational Process Performance - OPP	Org	Org	Org	Org	Org	Maintenance Model
Organizational Innovation and Deployment - OID	Org	Org	Org	Org	Org	
Project Planning - PP				X		
Project Monitoring and Control - PMC				X		
Supplier Agreement Management - SAM	Org	Org	Org	Org	Org	
Integrated Project Management - IPM		X				
Risk Management - RSKM		X				
Quantitative Project Management - QPM			X			Development SPC
Requirements Management - REQM				X		
Requirements Development - RD				X		
Technical Solution - TS	X					alternate practice?
Product Integration - PI		X				
Validation - VAL	X					
Verification - VER	X					
Configuration Management - CM					X	
Process and Product Quality Assurance - PPQA			X			
Measurement and Analysis - MA			X			
Decision Analysis and Resolution - DAR			X		X	
Causal Analysis and Resolution - CAR		X - B			X - A	
Subgroup: Medium, Foreign, Maintenance, Legacy						
Legend						
Level 2						
Level 3						
Level 4						
Level 5						

This answers the question, “Now that we know the subgroups and the participating projects, who will provide what data?”

This sampling plan assumed that both artifacts and affirmations were collected from each basic unit or support function for their identified areas.

Positive Sampling Outcomes

- ◆ Using sampling factors was in line with the way the organization did process tailoring so it “made sense.”
- ◆ Some factors originally thought to be important turned out not to be. The SCAMPI V1.3 process improved the overall organizational analysis.
- ◆ Small projects always got “costed out” of participating in V1.2 SCAMPIs. The new rules allowed other projects to participate – ***the Sponsors, Projects, and Process Group were all very pleased with this result.***
- ◆ Increased organizational coverage from:
 - 50% of **people** in 2008 to **81% in 2011**
 - 25% of **projects** in 2008 to **64% in 2011**

Data Collection Approach

- ◆ **Managed Discovery** – Used through a set of incremental appraisals. Added additional, smaller events to the 2010-11 flow relative to the 2008 appraisal lifecycle.
 - Class C
 - Appraisal Consulting
 - Class B1
 - Class B2 (virtual) and B3 (virtual)
 - Readiness Review
 - Class A

- ◆ *The data collection plan was refined after each event, requiring less and less additional preparation effort and subsequent team effort.*

Data Collection Plan Improvements

◆ The Data Collection Plan (DCP)

- The DCP was a subsidiary plan to the Appraisal Plan.
- The set of events noted on the prior page (the appraisal lifecycle events) were all documented in a single appraisal plan
- The plan was initialized at the start of the flow, and added to and evolved over the duration.
- The detailed plan data was maintained in an excel workbook to facilitate cohesion and easier maintenance.
- Outputs from the appraisal tool (Appraisal Wizard®) were direct inputs into the plan, increasing synergy and reducing redundant effort.

Team Training and Qualification

◆ Training

- Method training (refresher in this case) was performed as a just-in-time activity. A little bit before each event.
- Team training sessions with all team members present were performed prior to each event (it didn't look and feel like "training")
- Additional training in CMMI High Maturity practices was delivered.
- Training in the designated appraisal tool (Appraisal Wizard®) was also performed and then refreshed at each event.

◆ Qualification

- Team experience excluding the Lead Appraiser far exceeded method requirements (experience). The technical approach really needed this.
- A qualifications table was added to the appraisal plan workbook to verify requirements were met

Team Composition

- ◆ Team membership changed slightly during each event. Team members (count) changed (reduced) after each event.
- ◆ **Conflicts of Interest (COI)** were explicitly addressed in the team qualification section of the appraisal plan workbook.
 - The Lead only performed training and appraisal related tasks, not internal consulting.
- ◆ **Affiliation:** members were selected to ensure at least half the team was totally external to the Organizational Unit.
 - Actually we exceeded this target.
 - We mixed people with past experience with this OU with people who were “new” to get fresh perspective
 - We matched up “external” people with “internal” people to minimize conflicts
 - We documented mini-team outputs in a way that supported adjusting the mini-teams over the set of events

Team Comp Table by Event

Class C	Class B	Class B2	Class B3	RR	Class A	Organization
Paul Byrnes	Paul Byrnes	Paul Byrnes	Paul Byrnes	Paul Byrnes	Paul Byrnes	ISD, SEI Certified HM Lead Appraiser, Team Lead
Jack Lawrence	Jack Lawrence			Jack Lawrence	Jack Lawrence	ISD, SEI Certified HM Lead Appraiser
	Barbara Spence			Barbara Spence	Barbara Spence	CSC NPS BPMO/PREMO
Joe Ryan	Joe Ryan	Joe Ryan	Joe Ryan	Joe Ryan	Joe Ryan	MSE
Patricia Brencher	Patricia Brencher	Patricia Brencher	Patricia Brencher	Patricia Brencher	Patricia Brencher	MSE
	Mel Wahlberg			Mel Wahlberg		CSC NPS BPMO (Class B and RR only). Certified Lead Appraiser.
	Bill Decker					CSC NPS BPMO/PREMO (Class B only)

Team Qualifications Table

Name	Organization	Appraisal Role	Field Experience (Group Average 6; Group Total >=25)		
			Project Management (GT >=10; I >=6)	Engineerin g	Process Managemen t
Paul Byrnes	ISD	Team Lead - HM	20	10	21
Jack Lawrence	ISD	Team Member - HM	12	20	15
Mel Wahlberg	CSC NPS	Team Member	28	37	25
Barbara Spence	CSC NPS	Team Member	17	27	15
Bill Decker	CSC NPS	Team Member - HM	2	33	15
Joe Ryan	MSE	Team Member - HM	22	31	15
Pat Brencher	MSE	Team Member	7	24	12
			112	182	118
			16.0	26.0	16.9

Note: Years can overlap between categories – do not add up to total years – we are not that old! (i.e., you could be doing project management and process at same time)

Other Technical Approach Differences

- ◆ Documentation links were entered directly into the appraisal database (Appraisal Wizard®) and generally went to folders rather than specific documents.
- ◆ We made maximum use of the 90 day clock. Document review during the Readiness Review was done with a purpose to reuse data wherever possible.
 - Reviewed documents resulted in findings (gaps) and we generated preliminary practice characterizations
 - Guidelines for what could be reused, and how re-review of data was to be performed were documented in Team Norms
 - The technical approach implemented in effect started the main event during the Readiness Review.

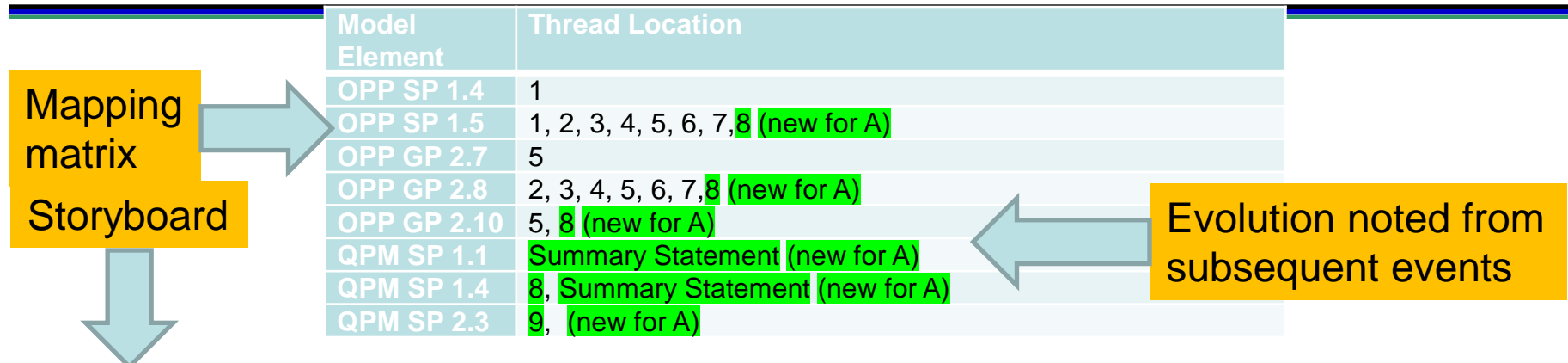
Evidence Threads

- ◆ Data (high maturity in particular) was presented as integrated “stories” spanning time rather than individual documents in separate practice buckets.
 - Much more “natural” and “integrated.”
 - Much easier for PIID maintenance.
 - Much easier to see both legacy and evolution.
 - Easier for the team to decide what and how much to review



Microsoft Word
Document

Sample CR Productivity Thread



Summary Statement:

New for SCAMPI A: The “CR Closure Rate (Dev)” and “CR Closure Rate (Maint)” metrics are defined in ORG Standard Process <xyz> with the performance objective “decrease cycle time”. The objective is correlated to Strategic Plan Goal number 1 - <insert goal statement>. (QPM SP 1.1) The Quality Compliance yield SPC slides are presented to management as the means of monitoring the performance against the goal and assessing the QPPO. (QPM SP 1.4). One of the activities in the ORG Process Improvement Plan (PIP) is to expand beyond the set of models ORG currently uses and develop additional models. The Metrics Group created a CR Productivity Model. This model uses historical performance characteristics to predict the number of CRs that will be implemented per staff month for the CR work packages provided by the customer....Inputs into the CR Productivity Model are the predicted CRs from the Development and Maintenance Defect Models.

This thread covers CR Productivity models of both development and maintenance CRs....

Activity Details:

- Prior to November 2009 - CR Productivity rate of <#> CRs per staff month was used when bidding on contracts. (OPP SP 1.4, 1.5, 2.3, 2.7, 2.8, 2.10, 2.11, 2.12, 2.13, 2.14, 2.15, 2.16, 2.17, 2.18, 2.19, 2.20, 2.21, 2.22, 2.23, 2.24, 2.25, 2.26, 2.27, 2.28, 2.29, 2.30, 2.31, 2.32, 2.33, 2.34, 2.35, 2.36, 2.37, 2.38, 2.39, 2.40, 2.41, 2.42, 2.43, 2.44, 2.45, 2.46, 2.47, 2.48, 2.49, 2.50, 2.51, 2.52, 2.53, 2.54, 2.55, 2.56, 2.57, 2.58, 2.59, 2.60, 2.61, 2.62, 2.63, 2.64, 2.65, 2.66, 2.67, 2.68, 2.69, 2.70, 2.71, 2.72, 2.73, 2.74, 2.75, 2.76, 2.77, 2.78, 2.79, 2.80, 2.81, 2.82, 2.83, 2.84, 2.85, 2.86, 2.87, 2.88, 2.89, 2.90, 2.91, 2.92, 2.93, 2.94, 2.95, 2.96, 2.97, 2.98, 2.99, 3.00, 3.01, 3.02, 3.03, 3.04, 3.05, 3.06, 3.07, 3.08, 3.09, 3.10, 3.11, 3.12, 3.13, 3.14, 3.15, 3.16, 3.17, 3.18, 3.19, 3.20, 3.21, 3.22, 3.23, 3.24, 3.25, 3.26, 3.27, 3.28, 3.29, 3.30, 3.31, 3.32, 3.33, 3.34, 3.35, 3.36, 3.37, 3.38, 3.39, 3.40, 3.41, 3.42, 3.43, 3.44, 3.45, 3.46, 3.47, 3.48, 3.49, 3.50, 3.51, 3.52, 3.53, 3.54, 3.55, 3.56, 3.57, 3.58, 3.59, 3.60, 3.61, 3.62, 3.63, 3.64, 3.65, 3.66, 3.67, 3.68, 3.69, 3.70, 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Some Outcomes

- ◆ **Planning** started sooner (in this case, approximately 17 months in advance of the Class A on site start)
 - More time with the Lead reviewing organizational data to determine the most appropriate sample to meet sponsor objectives.
 - More time allocated to designing and “right sizing” each interim event – appropriate interview sessions (size, scope, type, etc.)
- ◆ **Team composition** changed – more external members, “reuse” of trained personnel, distributed team activity, specialized training.
- ◆ **Managed Discovery** shifted the balance of effort from site personnel back to the team, but not terribly so – the whole approach was done in a more joint, collaborative manner.
- ◆ **Automated tooling (Appraisal Wizard®)** was essential and extremely beneficial. It facilitated our ability to effectively pinpoint issue areas, data needs, maximize data reuse and collaboration.

Evidence Review Outcomes

- ◆ Interim appraisals were used to *incrementally “build” the appraisal database.*
- ◆ Reused appraisal data. *Appraisal events and data were not treated as “one-time,”* but as an integrated set leading to the next.
- ◆ Characterization and rating – When are you “conducting” the appraisal? *It was on-going...*
- ◆ Appraisal Wizard® *enabled efficient application* of these approaches.



Outcomes – Team Conduct

- ◆ Lead more of a **facilitator** rather than “all knowing” expert
- ◆ Mini-teams with “inside-outside” membership **maximized objectivity** while benefiting from “insider” knowledge and **minimizing conflicts**
- ◆ Much more targeted, **parallel effort** was implemented (interview sessions, remote review, more virtual activity, greater use of 90-day window).



Outcomes – Effort and Cost

- ◆ **Total cost** of 2011 evaluation effort (including the SCAMPI B, Readiness Review, and SCAMPI A) was **9% less** than the cost of the 2008 events (in normalized dollars.)
- ◆ **Reduced total staff effort** of conducting events by **25%** between 2008 and 2011. This is the sum total of external (ISD and CSC) consultants and internal resources for all events (SCAMPI B & A in 2008 and SCAMPI B, A, and Readiness Review in 2011)

Event	Date	Evaluator Consultant Days	CSC Evaluator Consultant Days	MSE Staff Days	MSE Preparation Staff Months
2008 SCAMPI					
SCAMPI Class B	Feb-08	20	50	30	12
SCAMPI Class A	May-08	10	15	10	4
Totals		30	65	40	16
2011 SCAMPI - Actual					
SCAMPI Class B	Nov-10	10	15	10	9.5
SCAMPI RR	Mar-11	10	10	10	4.26
SCAMPI Class A	May-11	14	7	14	3
Totals		34	32	34	16.76

And this included additional events *and* additional external people!!

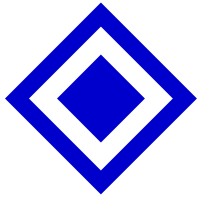
Questions and Answers



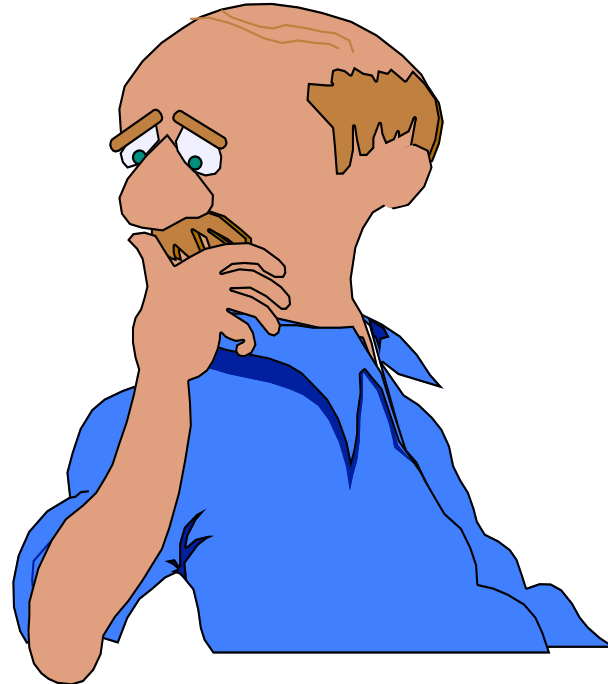
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