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Growing Up with the CMMI: It's Not (Just) about the Level!

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CMMI® Workshops

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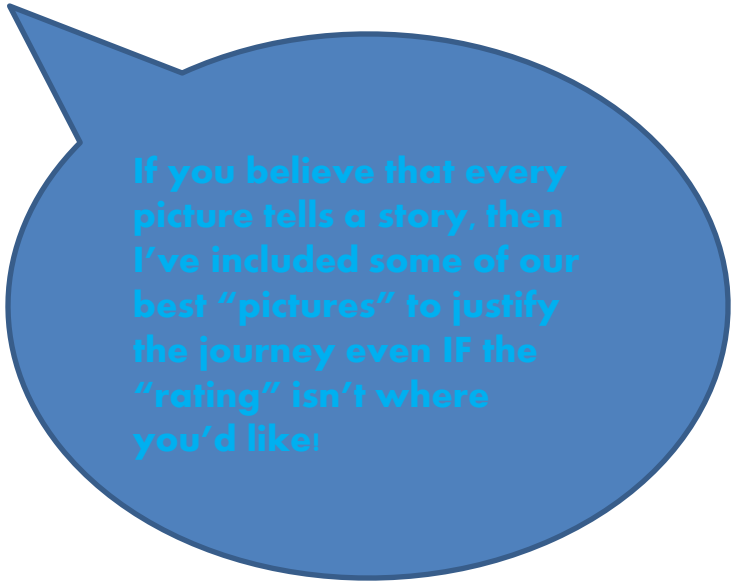
Abstract & Topics



Topics:

- Getting Started under the SW-CMM®
- The Role of SQA / PPQA
- Measurements and Estimation
- Tailoring
- Results
- Recent Activity
- Language Adoption
- Corporate Impacts
- Steps to Minimize Intended Results
- Journeys are Different

Abstract: The CMMI® model is often used to express an organization's maturity or capability. The impact and benefits of the CMMI as a continuous improvement framework are often touted, though less frequently highlighted. The impact of a thirteen-year journey (it's a journey, not a destination - right?) of the SW-CMM, and more recently the CMMI-DEV at a large national laboratory is the focus of this presentation. The journey includes successes and trials, progress and delay. Nonetheless, the maturing of activities across an organization of 9,000 aren't revealed only in SCAMPI℠ results. Rather, process adoptions, appraisal model influences, organizational structures, measurement discussions, and policy impacts are far more reaching and far more numerous than a small sect (or should I suggest "cult") of advocates might suggest.

The Business Environment was the Early Driver for our Process Improvement Efforts

From the beginning . . . To improve the quality of life of the staff and management throughout the Center.

To honor the confidence that our customers entrust to us regarding expected costs, schedule, and product performance.

To reduce the cost of defect recovery in delivered products which, includes reputation with our customers.

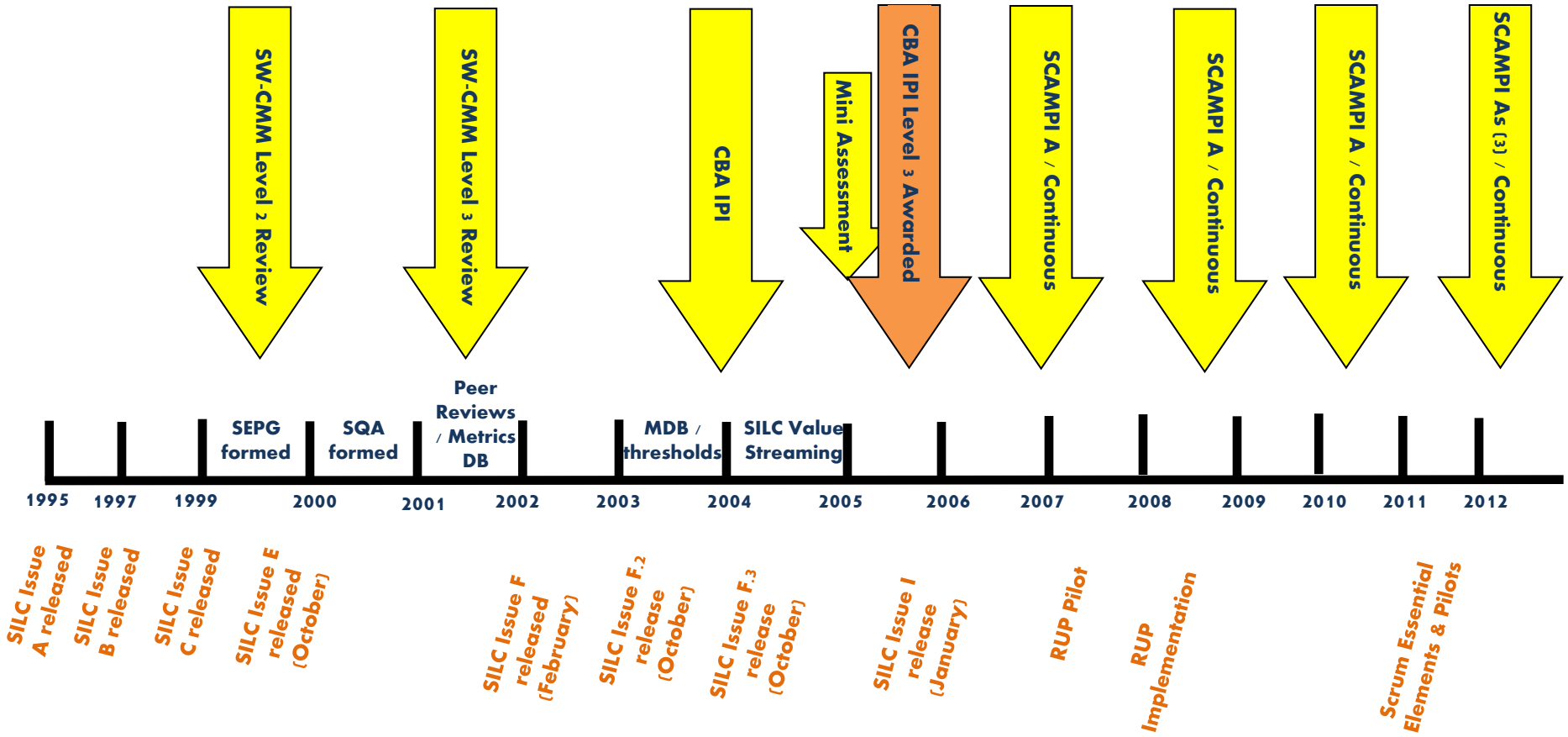
To recognize, understand, manage, and where possible mitigate the risks associated with product delivery.

To provide the customer with the quality product that they and the institution deserves.

To insulate staff from evolving management style "preferences" and shifting priorities.

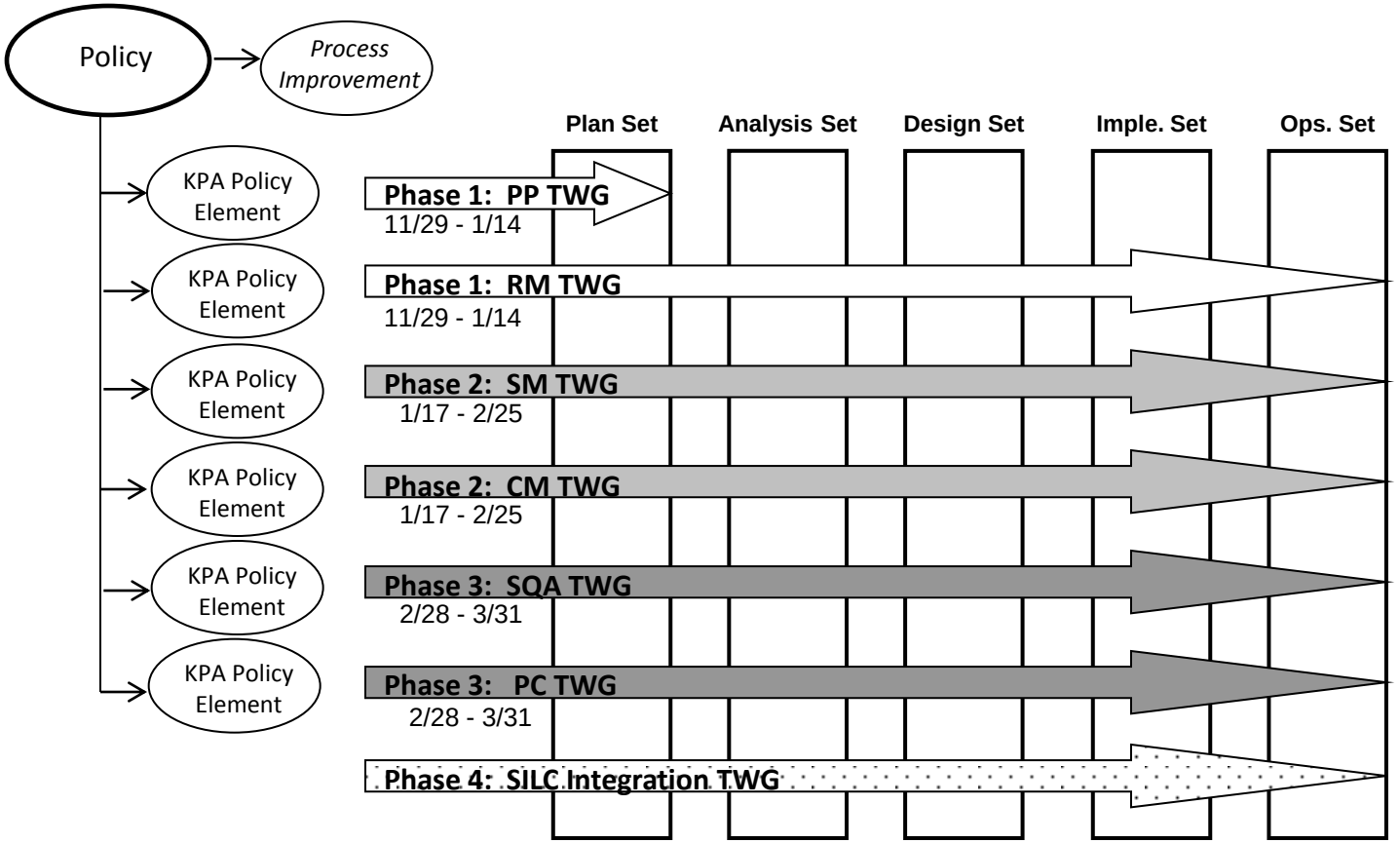
"We get brilliant results from average people managing and improving brilliant processes. Our competitors get mediocre results from brilliant people managing around broken processes. When they get in trouble, they hire more brilliant people." **Toyota**

A Center's Journey to SW-CMM Maturity Level 3 and Path to CMMI® ML 4



The Journey Begins with a High Level Map

A Suggested Framework for Establishing TWGs for Organization 9999's SPI under the SEPG



Consider:

- Design Reviews
- Quarterly Reviews
- Risks
- Tailoring
- Other TWGs
- TWG Policy (use template)
- TWG policy checklist
- Toolkit with artifact template(s)
- Training
- Architecture

Develop:

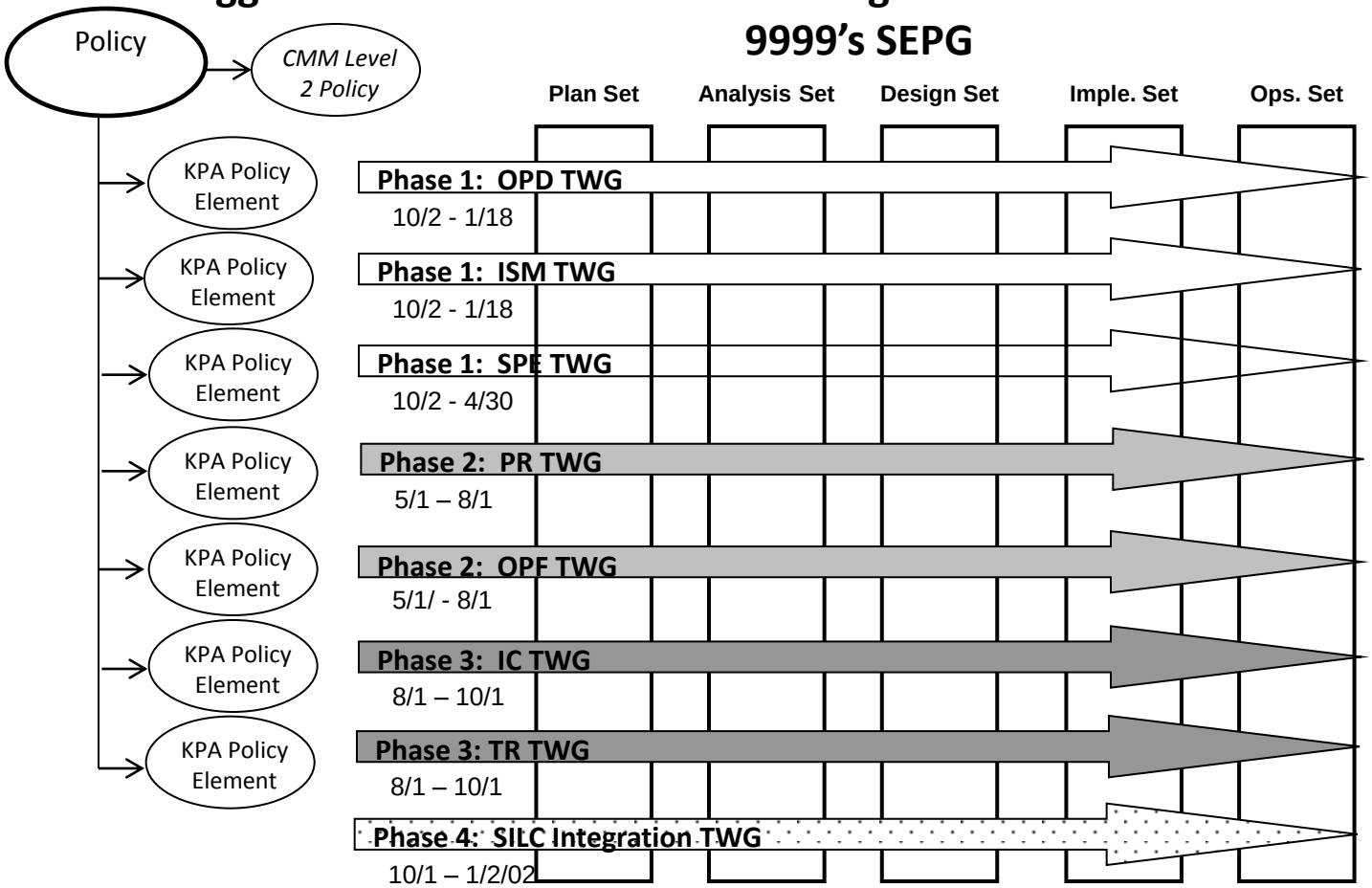
- Organizational Plan (RM, SQA, CM)
- Candidate measures
- SILC (process) Updates

TWGs are chartered with a Statement of Work by the SEPG. Each TWG is Chaired by the KPA Owner. SEPG Members recommend TWG participants. Each TWG member is expected to serve 20 hours towards each TWG; exceptions are pre-approved by the SEPG.

The Journey Begins with a High Level Map

(cont'd)

A Suggested Framework for Establishing CMM Level 3 TWGs for Organization 9999's SEPG



Consider:

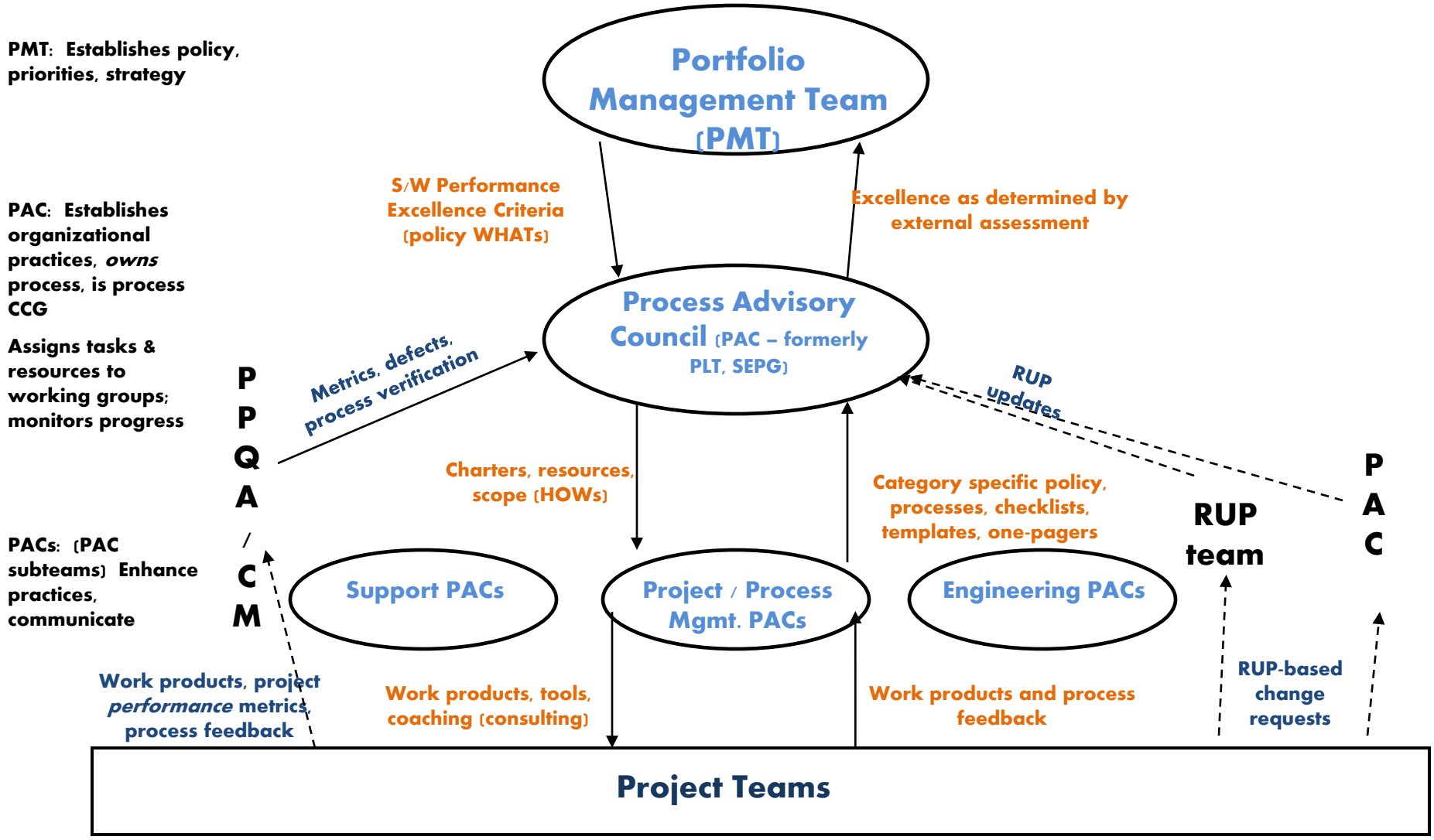
- SOW
- SILC & Reviews
- Risks
- Tailoring
- Other TWGs / overlap
- Document guidance on CMM homepage
- Architecture

Develop:

- Organizational Policy
- Organizational Process
- TWG Checklist
- Template(s)
- Candidate measures
- SILC (process) Updates
- Training needs
- Artifacts

TWGs are chartered with a Statement of Work by the SEPG. Each TWG is Chaired by the KPA Owner. SEPG Members recommend TWG participants. Each TWG member is expected to serve 20 hours towards each TWG; exceptions are pre-approved by the SEPG.

Roles and Information Flows

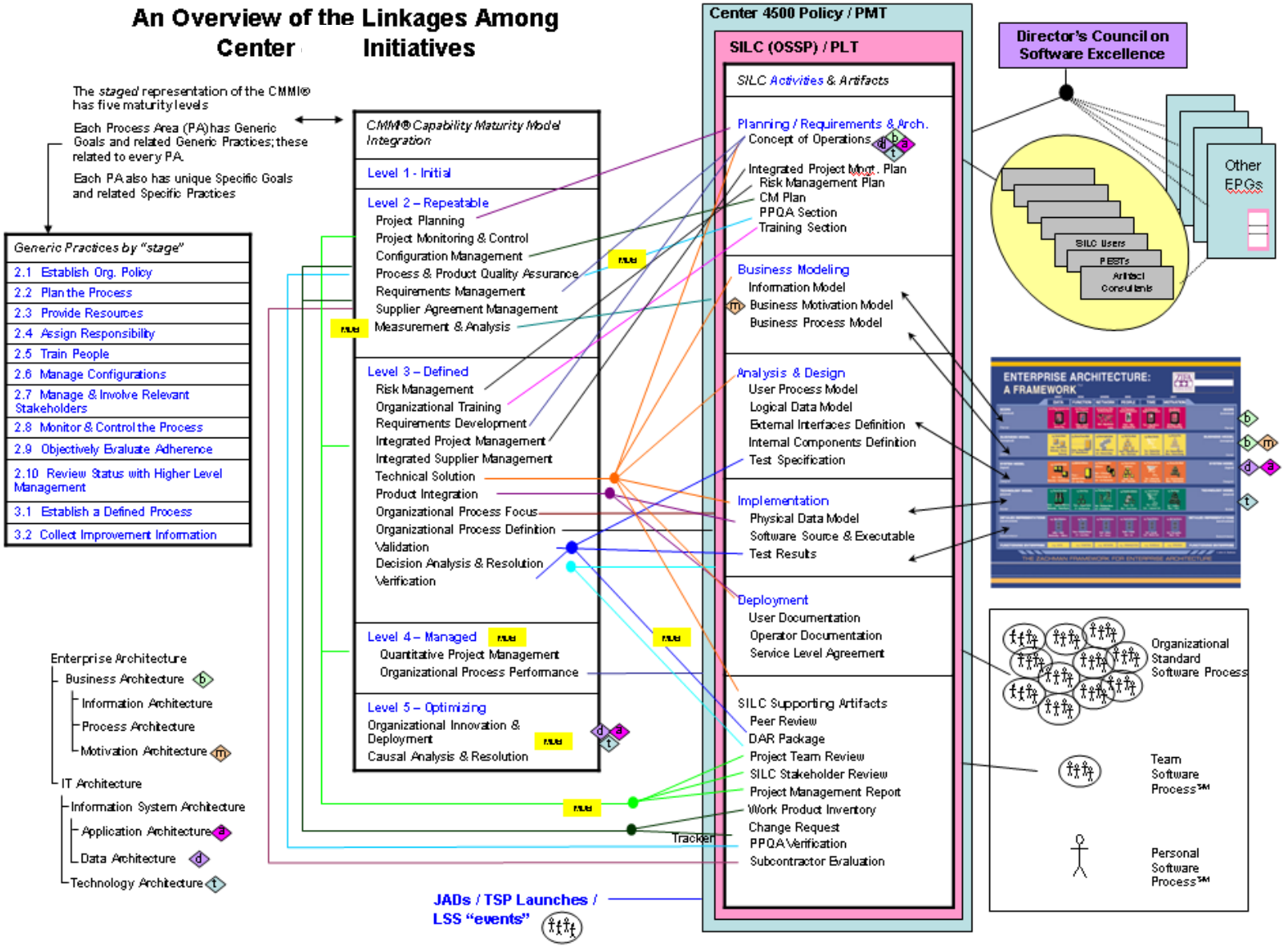


A Process Representation (and Process Asset Library Entry)

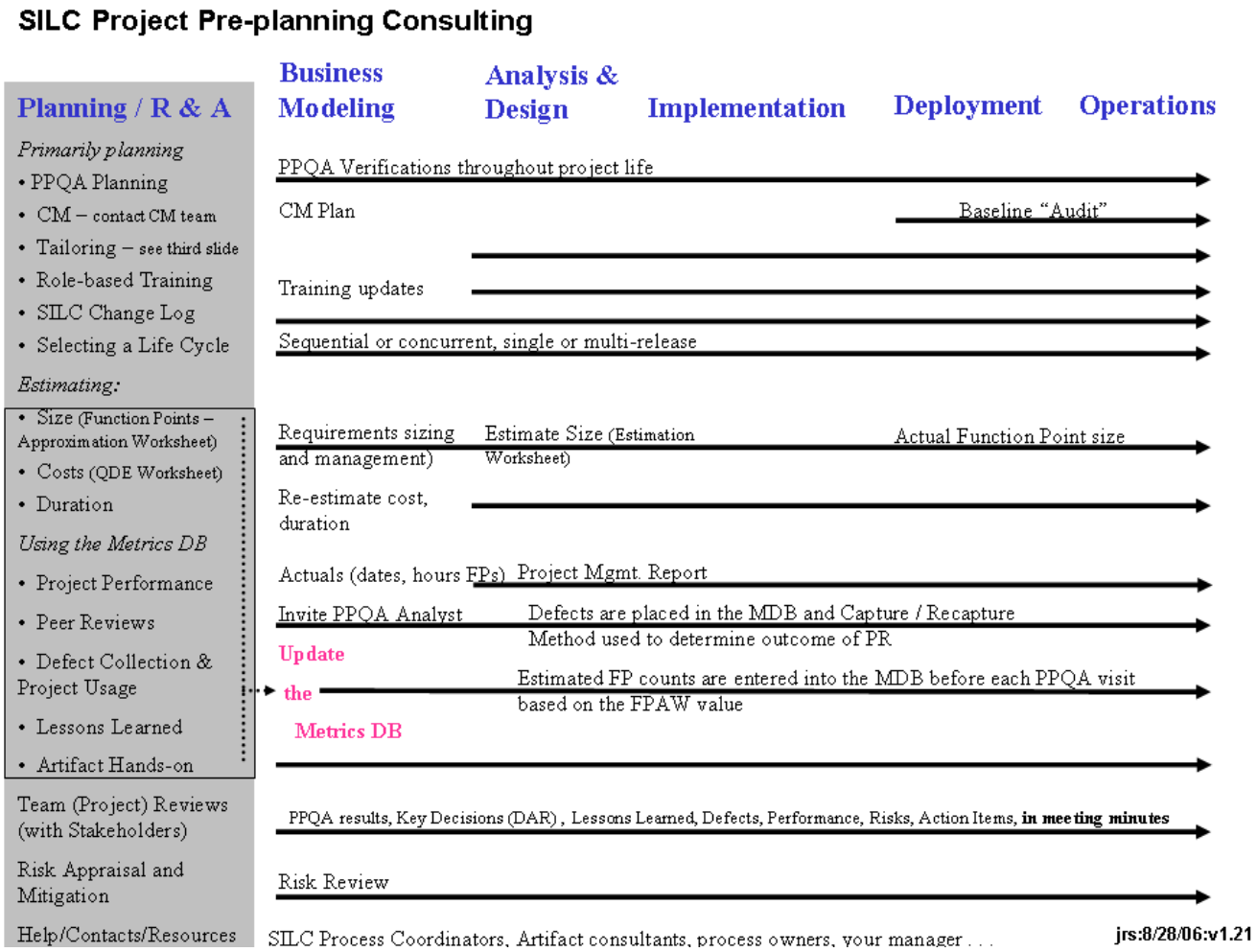
SILC I Planning Step-by-Step (no rigid sequence or chronology implied but these steps are performed *before* project planning is complete)

Steps	Who	*Inputs	*Outputs / Artifact	Supporting Processes
Initiate PPQA discussions	• Project Leader • PPQA Group	• PPQA Project Consulting • Estimation Process: FPAW, QDE, . . .	• Project Estimates • PPQA activities for Integrated Project Management Plan	• Product & Process Quality Assurance (PPQA) • Project Planning
Conduct preliminary discussions	• Project Leader • Project Manager • Customer • Requirements Engineer • Project Architect	• Thoughts • Ideas • Integrated Project Management Plan Template • Concept of Operations Template	• Concept of Operations • Integrated Project Management Plan ✓ Early Function Point Estimates / Approximations ✓ WBS / Schedule estimates ✓ Cost estimates	• Project Planning • Integrated Project Management
Conduct planning discussions including the proposal, risk, subcontract needs, tailoring, service group providers, team training needs, decision analysis, requirements, and peer reviews.	• Project Leader • Team • Requirements Engineer • Project Architect • Project Manager • Stakeholders • PPQA Group	• Integrated Project Management Plan Template • Risk Management Worksheet • Subcontractor SOW Template • Artifact Tailoring Options • Training Plan Template • Peer Review Plan Template • Lifecycle tailoring • Concept of Operations	• Integrated Project Management Plan & Appendices ✓ Risk Management ✓ Subcontractor Statement of Work (SOW) ✓ Guidelines for Issues Needing Formal Evaluation ✓ Training Plan ✓ Tailoring Strategy ✓ Updated WBS / Schedule & Cost ✓ Peer Review Plan (Section of IPM Plan)	• Project Planning • Requirements Management • Supplier Agreement Management • Organization Process Definition • Decision Analysis and Resolution • Quantitative Project Management • Integrated Project Management
Initiate Configuration Management discussions	• Project Configuration Manager • Enterprise Configuration Management	• Configuration Management Plan Template • Work Product Inventory List Template • Configuration Management Change Request Template	• Configuration Management Plan • Configuration Management Work Product Inventory List	• Configuration Management • Change Management Process • System Release Process • Version Control Process
Peer Review the Integrated Project Management Plan	• Project Leader • Peer Review Team	• Integrated Project Management Plan • Peer Review Script	• Peer-Reviewed Integrated Project Management Plan • Updated Metrics DataBase	Peer Review
Apply guidelines for issues management and formal evaluation	• Project Leader / Team • Customer • Stakeholders • Subject Matter Experts	• Established guidelines • Potential Issue(s), alternative solutions • Requirements, weighted criteria / rationale • Risks & Assumptions • Evaluation methods to be used	• Decision made, or • Execution of formal evaluation process • Recommended alternative • Updated risk assessment	• Decision Analysis and Resolution • Risk Management
Consider requirement change discussions	• Customer • Stakeholder	Configuration Management Change Request Template	Change Request disposition	
Conduct Periodic Team Reviews	• Project Leader • Team • Project Manager	• Planning artifacts • Lessons Learned discussions • Peer Reviews / defects / Lessons Learned • Project Team Review Template	• Project Team Review Results • Work Product Inventory • Updated Metrics DataBase	• Project Monitoring & Control • Estimating Process & worksheets

It really does fit together



SQA Became a Resource to Teams to Accelerate Their Start-ups



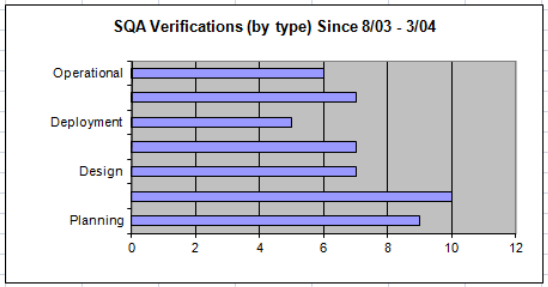
SQA activities were about improving consistency in process use, not about surprises

The Metrics Database (MDB) became an integral part of collection, analysis, and estimation

Measurements Revealed Needed Improvements We May Not Otherwise Have Discovered

Post

Verifications by "activity"	
Planning	9
Analysis	10
Design	7
Implementation	7
Deployment	5
Post-Deployment	7
Operational	6

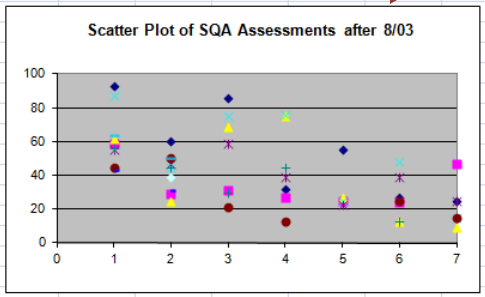


	P	A	D	I	D	PD	O
	93	60	86	32	55	27	25
	59	29	31	27	25	24	47
	62	25	69	75	27	13	9
	87	45	75	76	25	48	15
	55	47	59	39	23	39	25
	45	50	21	13		25	15
	56	45	30	45		13	
	43	31					
	64	50					
		39					

^ removed a value where most artifacts were tailored out!

	Mean	62.67	42.10	53.00	43.86	31.00	27.00	22.67
Standard Deviation		17.07	10.97	25.50	23.82	13.49	12.85	13.47
	CV	0.27	0.26	0.48	0.54	0.44	0.48	0.59
	Sum	564	421	371	307	155	189	136
	Total minutes	2143						

SQA review duration analysis led to consistent process performance



A Monthly Snapshot of Expected Reviews Got Leadership's Attention

Project names "cropped" to avoid unintended disclosure

"Links" to review evidence were helpful for appraisals and also for management drill down

Report Link	Planning Verification	Planning Review	Analysis Verification	Analysis Review	Design Verification	Design Review	Implementation Verification	Implementation Review	Deployment Verification	Deployment Review	Post Deployment Verification	Operatio
4/29/03		5/27/03										
1/28/03	1/30/03	1/28/03	1/30/03	3/13/03	4/1/03	4/29/03	4/30/03	4/29/03	4/30/03			
7/2/03												
12/14/00	**	1/16/01	**2/23/00	2/7/01			**3/19/01	**	**	**	4/2/03	
12/14/00	**	1/16/01	**2/23/00	2/7/01		*2/26/2002	2/27/02	**	**	9/25/02		
4/15/03	4/16/03	6/18/03	6/19/03	7/23/03	7/24/03	8/26/03						
4/16/03												
6/19/03												
2/18/03	2/18/03	3/5/03	3/18/03	3/20/03	4/3/03	6/6/03						
3/27/02	5/16/02	3/27/02	5/16/02	7/11/02	7/22/02	9/19/02	9/30/02					
2/11/02	3/13/02	*3/7/2002	3/13/02	6/13/02	6/14/02	9/24/02	9/26/02					
12/12/02	1/19/03	3/10/03	4/7/03	7/31/03								
11/28/01	11/28/01	12/13/01	12/17/01	1/8/02	3/13/02	3/21/02	*5/31/2002	6/10/02	**	**	10/24/02	
11/15/02	1/9/03	2/28/03	1/30/03	2/28/03	1/30/03	2/28/03	1/30/03	2/28/03				
05/14/03		*5/14/03		*5/14/03		5/14/03		5/14/03	6/19/03			
	1/9/03	*7/3/2003	6/19/03	7/3/03	6/19/03	7/3/03						
12/12/01	12/19/01	*1/21/02	2/19/02	5/6/02	5/9/02	9/30/02	10/1/02	10/2/02	10/3/02			
2/6/02	2/7/02	2/13/02	3/5/02	3/19/02	4/11/02	5/10/02	5/14/02		**			
7/3/03												
3/11/03	3/25/03	3/12/03	3/25/03	4/11/03		8/12/03						
9/25/02	10/2/02	10/15/02	11/11/02	12/17/02	1/21/03	3/28/03	3/28/03	3/28/03				
3/11/03	3/3/03	3/21/03	2/21/03	5/6/03	4/12/03	5/6/03	5/6/03	5/27/03				
5/23/03	6/11/03	8/27/03										
2/11/03	2/12/03	4/3/03										
1/8/03												
1/6/03	1/8/03	5/19/03	5/22/03									
10/19/01		10/24/01		*10/25/01		*10/25/01		**	**	11/27/02	11/27/02	
2/27/01	3/1/01	4/17/01	4/19/01	5/21/01	5/22/01	9/26/01	9/26/01	**	**	11/27/02	11/27/02	
4/15/02	5/2/02	4/15/02	5/2/02	7/22/02	7/22/02	7/22/02	7/22/02	**	**	3/5/03		
11/13/02												
10/5/01	3/19/01	10/5/01	4/17/01	10/5/01	4/17/01	4/22/02	10/24/01	**	**	4/22/02		
6/27/02	6/26/02	6/27/02	6/26/02	6/27/02	6/26/02	7/22/02	7/22/02	**	**			
11/13/02	1/14/03	11/13/02	1/14/03									
10/5/01	3/19/01	10/5/01	4/17/01	10/5/01	4/17/01	5/9/01	10/24/01	**	**	4/22/02	4/8/03	
1/22/02	2/13/02	1/22/02	2/13/02	1/22/02	2/13/02	*1/22/02	2/13/02	**	**	*1/22/02	*2/24/03	
2/26/03	3/4/03	5/13/03										
8/6/01	8/6/01	8/6/01	8/6/01	10/15/01	10/11/01	10/15/01	10/11/01	**	**	7/8/02		
11/30/01	11/30/01	11/30/01	11/30/01									
4/2/02	4/3/02	4/2/02	4/3/02	6/17/02	6/5/02	6/17/02	6/17/02	**	**			

Estimation and Measurement

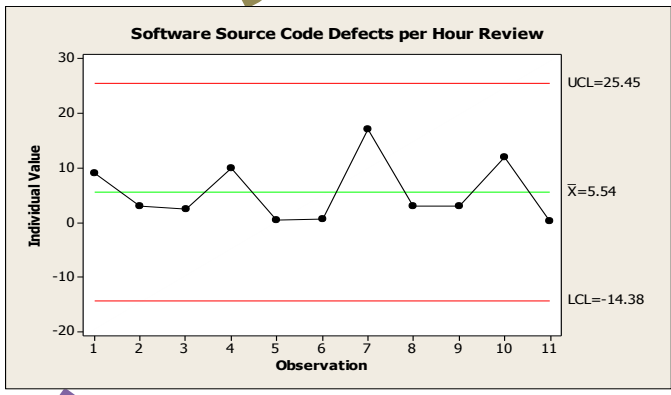
- How long will it take?
- How much will it cost?
- What do I get?
- How good is it?

Requirements Volatility

Latent Defect Prediction

Burn down rate

Base measures



completely

Training effectiveness

Function Points Per Person Month

Variance reduction

Defect density

Cost per story point

Derived measures

Estimated time per use case

Function Points Were the Size "base measure" for a Project's Measurement Lifecycle

	FPAW	QDE	Estimation Worksheet	FP Counting Worksheet
Purpose	Rough size value in Function Points	Rough size, cost, and FTE values	Firm size and resource estimate	Tally and document Function Point counts
Triggers are	Proposal, CRs, Enhancements	Proposal in lieu of detailed project planning data	Data Model, External Interfaces Definition	Product Release for actual Data Model & External Interfaces Definition for estimates
When in Lifecycle	During early plan and throughout lifecycle when requirements change	Planning	Design	Design through Operations
Risk Impact to Project	Higher risk due to uncertainty about product	Higher risk due to uncertainty about product	Minimal risk as functionality is solidified	No risk as product is finished - values are used to improve future estimates
Typically used by	Trained project leader	Trained project leader	Trained project leader	Trained FP counter in conjunction with project team

FP – Function Points

FPAW – Function Point Approximation Worksheet

QDE – Quick 'n Dirty Estimate

Estimation Became a Process with Multiple Approaches and Less Guesswork

Function Point Approximation Worksheet

Contact: Questions concerng this w orksheet may be directed to Joe Schofield

Purpose: This approximation (approximate w hen you aren't quite ready to estimate) w orksheet supplements the SILC estimation w orksheet by providin estimate for the product requirements using Function Points. No know ledge of Function Point counting is required!

The values generated by this w orksheet are used in conjunction w ith the approximation w orksheet as a second dimension to approximating product siz

When to use: As part of planning / replanning and w hen the project team has an understanding on the types of objects / entitties that the product w ill s and the functions that are likely to be needed in the product.

How to use: (the derived values in this spreadsheet use medium complexity values, IFPUG 4.2 2004)

Enter in the Logical Files column the logical data groupings (call these entities or objects) from the customer's perspective, that w ill be maintained (adde

For each logical data set, identify the likely functions to be performed on the logcial data groupings Enter a "y" under the column for Create, Update, De

Enter in the Logical Files column the logical data groupings (call these entities or objects) from the customer's perspective, that w ill be interfaced from o for editing or reporting.

For each logical data set directly above, enter a "y" under the column for Read.

What you'll get: An approximated Function Point count that w ill treat your input as medium complexity Function Point types. This number w ill NOT likely in the Approximation Worksheet since your requirements understanding is still likely yet to evolve.

Limitations: This spreadsheet is designed to w ork for up to 80 data sets; though it could be easily changed to accommodate more.

6	2	4	1	3					
		Data Functions				Your Approximated Function Point Coun			
Logical Files	**Create**	**Update**	**Delete**	**Read**					100
Hotels				y					
Car Rentals		y	y						
Trips	y	y		y					
Travelers									
Reservations	y								
Airlines									

- **The Metrics DataBase is the repository for Function Point counts as projects make their way through activities.**
- **The change in Function Point size is the derived metric known as Requirements Volatility.**

A Glimpse into the MDB

		Planning and R & A		Business Modeling		Analysis and Design		Implementation		Deployment		Operational	
Metric Name	Data Type	Estimate Value	Actual	Estimate Value	Actual	Estimate Value	Actual	Estimate Value	Actual	Estimate Value	Actual	Estimate Value	Actual
Date of Phase Review	Text												
Effort for Phase In Hours	Floating point												
Requirements Added	Integer												
Requirements Changed	Integer												
Requirements Deleted	Integer												
Size of: Function Points	Integer												
Size of: Other	Integer												
Basis of Other Size Measure	Text												

Input My Estimates Reset Form

- **Measurement repository "derived measures" feed estimation models**
- **Function Points enabled quantitative results**

Quick 'n Dirty Estimates Provided Ball Park Confidence

		QDE (Quick & Dirty Estimate (Approximation)) Worl	
Note: the resulting numbers derived from this worksheet will expose your project to some level of risk			
until detailed estimates are derived using the SILC Estimating Worksheet.			
Enter Indirect Labor Dollars	100000.00		Use this value to approximate given only a labor dollar
Approximated Function Point Size	500.00		this value is derived using the MDB Values
Approximated Cycle Time needed	17.00	person months	this value is derived using the MDB Values
Enter Person Months	20.00		Use this value to approximate given only a FTE level
Approximated Function Point Size	575.00		this value is derived using the MDB Values
Approximated Labor Dollars	300000.00		this value is derived using the MDB Values
Enter Function Points	100.00		this value comes from the FPAW
Approximated Labor Dollars needed	40000.00		this value is derived using the MDB Values
Approximated Cycle Time needed	3.50	person months	this value is derived using the MDB Values

Estimated values are based on historic organizational performance

Measurements Were More Precise Once Specific People Resources Were Identified

Project Plan Estimating Worksheet

Steps: input attributes are shaded

1. person experience levels
2. person participation levels
3. duration in years
4. person labor rates
5. SILC phase reliability variance (.4, .3, .2, .1, or 0)
6. estimated size of project
7. other costs (optional)

In return you receive:

a. person experience efficiency
b. FP contribution efficiency
c. person & team cost rates
d. estimated team FPs per month
e. estimated cycle time
f. estimated product costs (compare to planned)
g. optimistic and pessimistic variance range

Experience Factors:	Expert	Mature	Rookie
Technology	0.80	1.00	1.30
Methodology	0.80	1.00	1.30
Application	0.80	1.00	1.30

	Experience with . . .									
Resource	[1]Technology	[1]Methodology	[1]Application	[a]Experience Efficiency	[2]Participation	[b]FP Contribution Efficiency	[3]Duration of Participation in Years	[4]Average Labor Rate	[c]Annual Person Rate	[c]Total Person Cost
Person1	1.30	1.30	1.00	1.69	0.08	0.90	0.25	180,000	14,400	3,600
Person2	1.30	1.30	1.00	1.69	0.16	1.80	0.25	180,000	28,800	7,200
Person3	1.00	1.30	1.00	1.30	0.68	9.94	0.25	180,000	122,400	30,600
Person4	1.00	0.80	1.00	0.80	0.12	2.85	0.25	180,000	21,600	5,400
Person5	0.80	0.80	1.30	0.83	0.03	0.57	0.25	180,000	4,500	1,125
Person6	1.00	1.30	1.00	1.30	0.37	5.41	0.25	180,000	66,600	16,650
Totals					1.44	21.47		1,080,000	258,300	64,575
Team Avg. Monthly Efficiency						14.96				

	[g]Optimistic	Nominal	[g]Pessimistic
[5]Project Phase Reliability Variance		0.4	
[6]Project Size (Estimated Function Point	84	140	196
Historic FPPPM Metric	19	19	19
[d]Calculated team FPs per month (predi	21	21	21
[e]Cycle time (months - predicted)	4	7	9
[f]Product Cost (predicted)	84234	140389	196545
[f]Product Cost (planned)	64575	64575	64575
[7]Other Costs	0		0

Reliability Variances	
SILC Phase	
Plan	0.40
Analysis	0.30
Design	0.20
Implement.	0.10
Operations	0.00

ILF = 28 FPs

EIF = ~72 FPs

- **Values are subject to change as the project changes!**
- **People resources "graded" with three experience factors**
- **Ranges became the norm for estimating**

Actual Values Were Collected When the Product Was Released

	Low	Average	High	Total	**14 System Characteristics** (use IFPUG Counting Practices Manual 4.1)			
[1]Internal Logical Files				0	Data Communications		Online Update	
					Distributed Data Processing		Complex Processing	
[2]External Interface Files				0	Performance		Reusability	
					Heavily Used Configuration		Installation Ease	
[3]External Inputs				0	Transaction Rate		Operational Ease	
					Online Data Entry		Multiple Sites	
[3]External Outputs				0	End-User Efficiency		Facilitate Change	
[3]External Inquiries				0				
Total Unadjusted Function Points (UFPs)				0				
[4]Total Function Points				0				

Usage:

Contact the SQA Group immediately if you don't know how to complete any of the information on this worksheet!

Use this worksheet to estimate Function Points given identified SILC artifacts AND upon project completion to derive an "actual" size.

Enter the number of low, average, & high Function Point types (ILFs, EIFs, EIs, EOs, EQs) - The worksheet will generate the totals

[1]These values are derivable from the information model.

[2]These values are derivable from the external interface model.

[3]These values are derivable from the presentation layer.

[4]Use this number for estimating the Function Point size on the Estimation Worksheet.

Enter a value between 0 and 5 for each of the 14 System Characteristics - The worksheet will sum these as multiply them against the UFPs

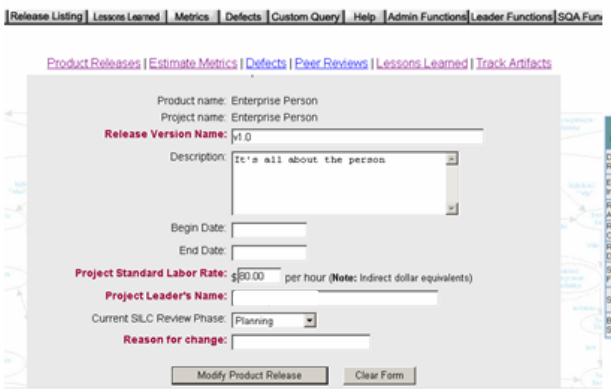
(Optionally) Enter additional values below to calculate some key project metrics:

Enter project labor costs		$ per FP:	#DIV/0!
Ent			
Ent			

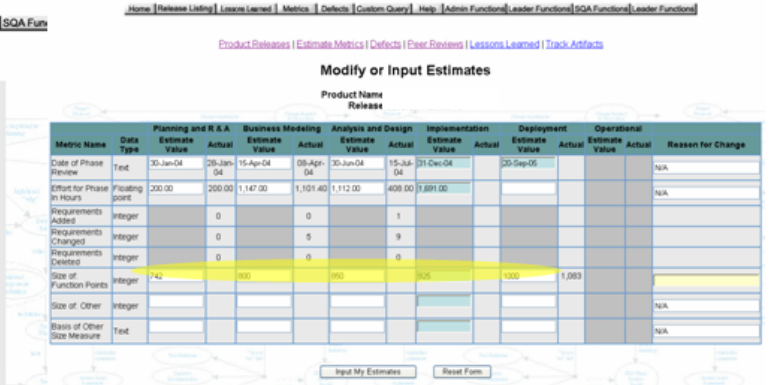
Actuals can be compared to estimates to determine variance, noting approved changes to baselines where applicable.

The "metrics database" Grew to Contain Peer Review Data, Defects, and Lessons Learned

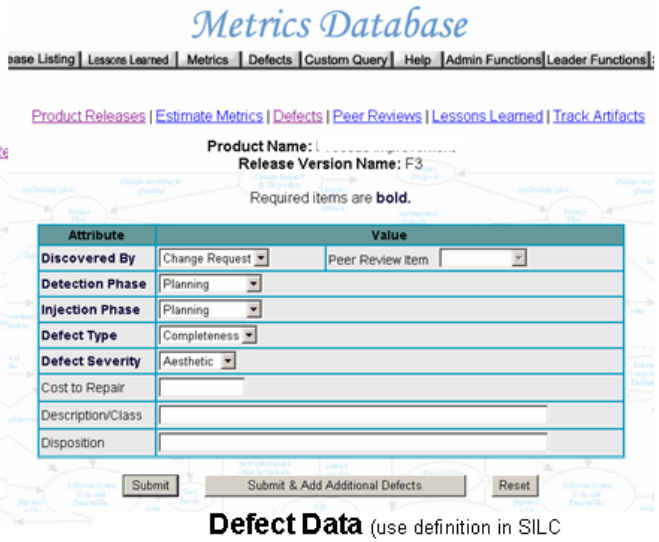
Initial Project Data



Requirements Sizing (use FPAW to size requirements and changes for each activity; aka Requirements Volatility)



Peer Review Data (use Capture / Recapture to derive outcome of Peer Review)



Defect Data (use definition in SILC Glossary to determine *cost to repair*)

Capture / Recapture Became an Exit Criteria for Peer Reviews

1. Place a check mark (*check*) in the appropriate cells and count the defects discovered by participating reviewers.
2. Count the defects that each engineer found (*Counts* for Engineer A, B, and C).
3. In Column A, check and count all of the defects found by the engineer who found the most unique defects. 5
4. In Column B, check and count all of the defects found by all of the other engineers. 4
5. In Column C, check and count the defects common to columns A and B. 2
6. The estimated number of defects in the product is AB/C. Round to the nearest integer. (5 * 4) / 2 = 10
7. The number of defects found in the inspection is A+B-C. 5 + 4 – 2 = 7
8. The estimated number of defects remaining is the estimated number of defects in the product minus the number found. (AB/C) – (A+B-C). 10 – 7 = 3

Use team "thresholds" to determine whether or not to repeat the Peer Review.
More "informational" notes on script.

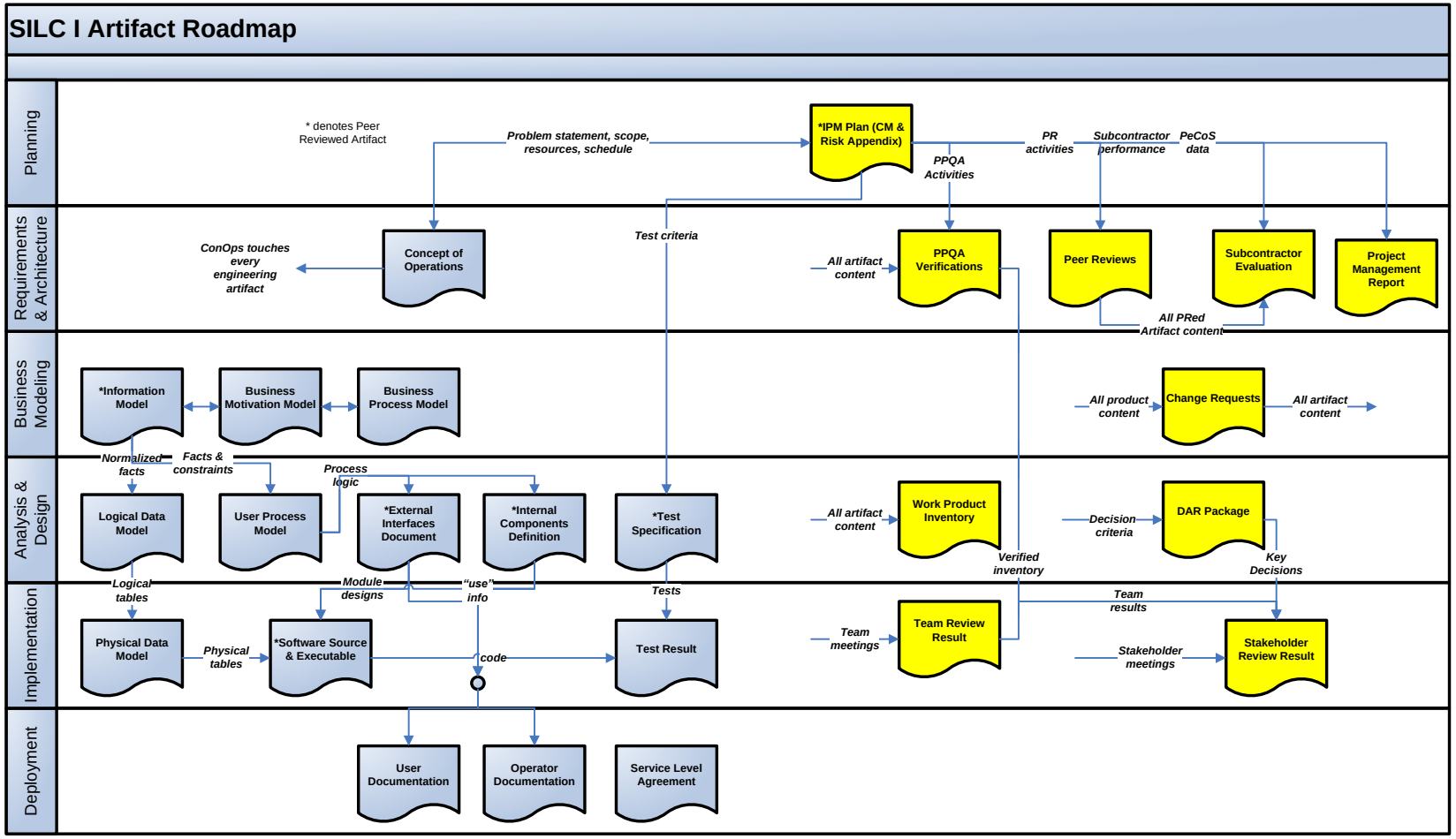
Even Larry, Curly, and Moe could complete this chart . . .

Defect No	Engineer Larry	Engineer Curly	Engineer Moe	"Column A"	"Column B"	"Column C"
1	✓			✓		
2	✓			✓		
3			✓		✓	
4	✓	✓		✓	✓	✓
5	✓			✓		
6	✓		✓	✓	✓	✓
7		✓			✓	
Counts	5	2	2	5	4	2

The capture-recapture method (CRM) has been used for decades by population biologists to accurately determine the number of organisms studied. LaPorte RE, McCarty DJ, Tull ES, Tajima N., Counting birds, bees, and NCDs. Lancet, 1992, 339, 494-5.

See also Introduction to the Team Software Process; Humphrey; 2000; pgs. 345 – 350

Artifact / Work Product Relationship Diagram



This diagram seemed to be displayed in most office spaces

Product (blue) and process (yellow) views are incorporated

Taking Tailoring to a *Different* Level

Artifact Tailoring Summary

The following text summarizes considerations and boundaries for tailoring of SILC processes and their associated artifacts. While other possibilities may exist for tailoring (and this is still between the project team and the line manager), teams cannot go beyond the boundaries identified in this document.

Concept of Operations

- *Consider when tailoring*: Consider Stakeholder and PPQA review with IPM Plan
- *Do not tailor these aspects*: Cannot eliminate sections

Integrated Project Management (IPM) Plan

- Main body of the IPM Plan
  - *Consider when tailoring*: The one-pager, template, and instructions & tools are provided for project managers, leaders, and teams to have guidance and structure on what typically nee be considered, evaluated, recorded, and monitored as aids in ensuring a successfully mana and completed project. Therefore, all sections must be addressed; however, the form the s is less important as long as they satisfy the content and traceability requirements in the rec information to satisfy reporting requirements (such as for Project Management Reports and Metrics DataBase).
  - *Do not tailor these aspects*: The Project Team selects the format of the sections in this Plan Some sections may have no content but should include a brief explanation as to why this m so.
- Customer Contract (a part of the IPM Plan)
  - *Consider when tailoring*: Approval page: The listed roles are the suggested approvals. Per y group's documented policy or practice, add or delete signatures except for the minimum rec Include sufficient content so the project leader has traceability of content to the specific pro and the funding Customer is confident about approving the contract. Some of the listed cont the template can be addressed in a master document because it is common to every projec

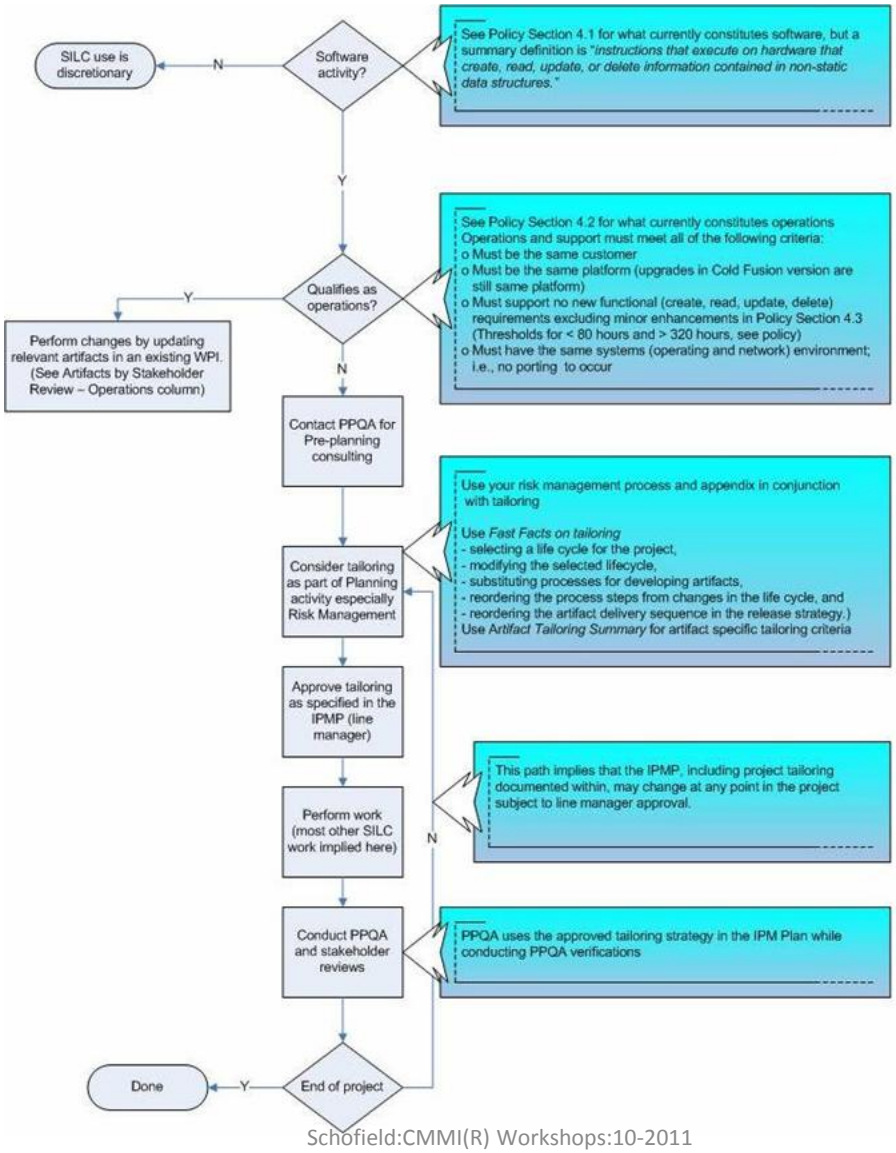
Risk-based tailoring is conducted during planning.

Artifacts by Stakeholder Review

		Stakeholder (by "Phase") Review						Zachman Rows	Zachman Columns
Activity	**Artifact**	Planning / Requirements & Architecture	Business Modeling	Analysis & Design	Implementation	Deployment	Operations		
product activities:									
Planning / Requirements & Architecture	**Concept of Operations**	**B**	**C**	**C**	**C**	**C**	**yes**	**all**	**all**
	Integrated Project Management Plan	**B**	**c**	**c**	**c**	**c**	**no**	**1**	**all**
Business Modeling	**Information Model**	**b**	**B**	**c**	**c**	**c**	**no**	**2**	**1**
	Business Motivation Model	**b**	**B**	**c**	**c**	**c**	**no**	**2**	**6**
	Business ProcessModel	**b**	**B**	**c**	**c**	**c**	**no**	**2**	**2,4**
Analysis & Design	**Logical Data Model**			**B**	**c**	**c**	**yes**	**3**	**1, 6**
	User Process Model	**b**	**B**	**c**	**c**	**c**	**no**	**3**	**2,4,6**
	External Interfaces Definition			**B**	**c**	**c**	**yes**	**3**	**2,3,4,5,6**
	Internal Components Definition			**B**	**c**	**c**	**yes**	**3**	**2,3,4,5,6**
	Test Specification		**b**	**B**	**c**	**c**	**yes**	**3**	**all**
Implementation	**Physical Data Model**				**B**	**c**	**yes**	**4, 5**	**1, 2, 6**
	Software Source Code and Executable				**B**	**c**	**yes**	**4, 5**	**2,3,4,5,6**
	Test Result				**B**	**c**	**yes**	**4, 5**	**all**
Deployment	**User Documentation**				**b**	**B**	**yes**	**6**	**all**
	Operator Documentation				**b**	**B**	**optional**	**6**	**all**

This level of detail was of more interest to some folks than others . . .

How to Classify a Project (Development or Support) Became a Big Issue



Clarifying expectations for project "type" was overdue, especially as part of tailoring

Even SCAMPI Preparations Helped Us Identify Process and Practice Gaps

Practice Implementation Indicator Description (PIID) for OPF: 3/4/2008
Contact is: Joe Schofield, 9501, 844-7977 (81 minutes to instantiate)

Goal / Practice	Description	Direct Artifact	Indirect Artifact Every item here included in Policy.	Notes
SG 1	*Strengths, weaknesses, and improvement opportunities for the organization's processes are identified periodically and as needed.*			
SP 1.1	Establish and maintain the description of the process needs and objectives for the organization.	Process Improvement Plan, see Scope of Work for objectives See policy Sections 1 and 5	Strategic Vision one-pager and Action Plan One of ~100 monthly reports	
SP 1.2	Appraise the processes of the organization periodically and as needed to maintain an understanding of their strengths and weaknesses.	Assessment results	PLT meeting minutes (1 of ~100) – see next steps	
SP 1.3	Identify improvements to the organization's processes and process assets.	SCAMPI Response Team and Action items	Ongoing monitor and control – PLT see page 4	
SG 2	*Process actions that address improvements to the organization's processes and process assets are planned and implemented.*			
SP 2.1	Establish and maintain process action plans to address improvements to the organization's processes and process assets.	See SP1.1-1 and SP1.3-1	See SP1.1-1 and SP1.3-1	
SP 2.2	Implement process action plans.	Updated Glossary based on OPP Measurement Objectives (see SILC / References / Glossary); everything in action column	PEST Worksheets include owners and actors across Center; see top of page 4 – PLT 5 months later	
SG 3	*The organization process assets are deployed across the organization and process-related experiences are incorporated into the organizational process assets.*			
SP 3.1	Deploy organizational process assets across the organization.	RUP home page	RRIP Plan	
SP 3.2	Deploy the organization's set of standard processes to projects at their startup and deploy changes to them as appropriate throughout the life of each project.	See MDB, Lessons Learned and Estimates, Process Improvement, SILC I	Each project using RUP	
SP 3.3	Monitor the implementation of the organization's set of standard processes and use of process assets on all projects.	PPQA verifications	PPQA process	
SP 3.4	Incorporate process-related work products, measures, and improvement information derived from planning and performing the process into the organizational process assets.	Lessons Learned, measurements, feedback (PLUG)	RUP / MDB	
GG 2	*The process is institutionalized as a managed process.*			
GP 2.1	Establish and maintain an organizational policy for planning and performing the organizational process focus process.	See Specific requirements of policy Section 3.1.5 and 3.2.1.5	See Specific requirements of policy Section 3.1.2	
GP 2.2	Establish and maintain the plan for performing the organizational process focus process.	See SP1.1 and SP1.3	Monthly reports – PEP goal on bottom right – one of ~100	
GP 2.3	Provide adequate resources for performing the organizational process focus process, developing the work products, and providing the services of the process.	Process Improvement Plan, see Scope of Work for objectives; see Appendix A – Process Management Activities at a Glance See policy Sections 1 and 5 Monthly reports – funding tracking on top right	PLT meeting minutes – discussion of performance, action items, roles, Center-wide integration of process activities	
GP 2.4	Assign responsibility and authority for performing the process, developing the work products, and providing the services of the organizational process focus process.	SCAMPI Response Team and Action items PEST Worksheets – see Who, Dates, Expected Effort columns	PLT meeting minutes – Ownership at top of minutes, ActionItem ownership tracked, . . .	
GP 2.5	Train the people performing or supporting the organizational process focus process as needed.	See Required Role Training, pg 10, PLT member PLT Process Improvement Mini-Lessons January, April, July, October	PLT meeting minutes – Training activities are a part of every PLT agenda	
GP 2.6	Place designated work products of the organizational process focus process under appropriate levels of configuration management.	Process Improvement Plans (web FileShare – 10 versions)	CM Audits of MDB, an organizational asset	

An "organizational" "PIID"

SCAMPI Preparations cont'd

Practice Implementation Indicator Description (PIID) for RD
Contact is: [redacted] 4501, 844-7977 (2 hours to instantiate)

Goal / Practice	Description	Direct Artifact	Indirect Artifact	Notes
SG 1	*Stakeholder needs, expectations, constraints, and interfaces are collected and translated into customer requirements.*			
SP 1.1	Elicit stakeholder needs, expectations, constraints, and interfaces for all phases of the product life cycle.	ConOps (solutionreq'mts) and IPMP (conduct of work req'mts): Per the process, needs need not be formally documented in an artifact – if they are, they are linked to from requirements in the requirements lists.	RD Process Document page 6. How to Create a SILC Requirements List page 3 Instructions & Tools page 9	The process calls for needs elicitation, but formal documentation of needs is optional. The I&T for ConOps prescribes collection of needs information as part of the process. In "How to create a SILC requirements list" in the I&T, it recommends that requirements be linked to documented needs for "large, critical, or complex projects".
SP 1.2-1	Transform stakeholder needs, expectations, constraints, and interfaces into customer requirements.	ConOps (solutionreq'mts) and IPMP (conduct of work req'mts): Customer requirements	RD Process Document page 7 Instructions & Tools page 9	
SG 2	*Customer requirements are refined and elaborated to develop product and product-component requirements.*			
SP 2.1-1	Establish and maintain product and product-component requirements, which are based on the customer requirements.	ConOps (solutionreq'mts) and IPMP (conduct of work req'mts): Project requirements	RD Process Document page 8 Instructions & Tools page 10 - 11	Much of this is also covered in the Technical Solution process area, as these two process areas work closely together
SP 2.2-1	Allocate the requirements for each product component.	ConOps–project-level solution req'mts are allocated, prior to baseline, to product components via "configuration links". Detailed product component requirements are captured in the body of specification artifacts as the User Process Model, External Interfaces, and Internal Interfaces. They are not otherwise identified or managed because they are too numerous to handle that way.	RD Process Document page 10 How to Create a SILC Requirements List page 2 Instructions & Tools page 11	Much of this is also covered in the Technical Solution process area, as these two process areas work closely together
SP 2.3-1	Identify interface requirements.	ConOps–project-level solution req'mts are allocated, prior to baseline, to interfaces via "configuration links". Detailed interface requirements are captured in the body of specification artifacts as the User Process Model, External Interfaces, and Internal Interfaces. They are not otherwise identified or managed because they are too numerous to handle that way.	RD Process Document page 11 How to Create a SILC Requirements List page 2 Instructions & Tools page 11	Much of this is also covered in the Technical Solution process area, as these two process areas work closely together
SG 3	*The requirements are analyzed and validated, and a definition of required functionality is developed.*			
SP 3.1-1	Establish and maintain operational concepts and associated scenarios.	ConOps: target architecture and	RD Process Document page 12	Much of this is also covered

A project-specific "PIID"

CBA IPI Results

2003

KPA	CO1	CO2	CO3	AB1	AB2	AB3	AB4	AB5	AC1	AC2	AC3	AC4	AC5	AC6	AC7	AC8	AC9	AC10	AC11	AC12	AC13	AC14	AC15	ME1	ME2	VE1	VE2	VE3	VE4
RM	S	N/A	N/A	S	S	S	S	N/A	S	S	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	S	N/A	P	S	S	N/A
SPP	S	S	N/A	S	S	S	U	N/A	S	S	P	U	P	S	S	S	S	S	S	S	S	P	S	P	N/A	P	S	S	N/A
SPTO	S	S	N/A	S	S	S	P	S	S	S	U	P	U	P	S	S	S	S	P	S	S	N/A	N/A	U	N/A	P	S	U	N/A
SQA	S	N/A	N/A	S	S	S	S	N/A	S	P	P	S	S	S	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	S	N/A	S	S	S	N/A
SCM	S	N/A	N/A	S	S	S	S	S	S	S	S	S	S	S	S	S	S	U	N/A	N/A	N/A	N/A	N/A	P	N/A	S	S	U	S
OPF	S	S	S	S	S	S	S	N/A	S	S	S	P	P	S	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	S	N/A	S	N/A	N/A	N/A
OPD	S	N/A	N/A	S	S	N/A	N/A	N/A	U	S	S	S	S	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	S	N/A	S	S	S	N/A
TP	P	N/A	N/A	S	S	S	P	N/A	S	U	S	P	P	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	P	P	P	U	U	N/A
ISM	S	N/A	N/A	S	U	P	N/A	N/A	P	S	S	U	P	U	U	P	U	U	P	N/A	N/A	N/A	N/A	U	N/A	P	S	P	N/A
SPE	S	N/A	N/A	S	U	S	S	N/A	S	S	S	S	P	U	S	S	P	U	N/A	N/A	N/A	N/A	N/A	P	S	P	S	S	N/A
IC	S	N/A	N/A	S	S	S	S	S	S	S	P	P	P	P	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	U	N/A	S	S	S	N/A
PR	S	N/A	N/A	S	S	U	N/A	N/A	S	U	P	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	P	N/A	S	N/A	N/A	N/A

Ouch!

2004

KPA	CO1	CO2	CO3	AB1	AB2	AB3	AB4	AB5	AC1	AC2	AC3	AC4	AC5	AC6	AC7	AC8	AC9	AC10	AC11	AC12	AC13	AC14	AC15	ME1	ME2	VE1	VE2	VE3	VE4
RM	S	N/A	N/A	S	S	S	P	N/A	S	S	P	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	P	N/A	S	S	S	N/A
SPP	S	S	N/A	S	S	S	S	N/A	S	S	S	S	S	S	S	S	P	S	S	S	S	S	S	S	N/A	S	S	S	N/A
SPTO	S	S	N/A	S	S	S	S	S	S	S	P	S	P	S	S	S	S	S	S	S	S	N/A	N/A	S	N/A	S	S	S	N/A
SQA	S	N/A	N/A	S	S	S	S	N/A	S	S	S	S	S	S	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	S	N/A	S	S	S	N/A
SCM	S	N/A	N/A	P	S	S	P	S	S	S	S	S	U	P	S	S	S	S	N/A	N/A	N/A	N/A	N/A	S	N/A	S	S	S	S
OPF	S	S	S	S	S	S	S	N/A	S	S	S	S	S	S	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	S	N/A	S	N/A	N/A	N/A
OPD	S	N/A	N/A	S	S	N/A	N/A	N/A	P	S	S	S	S	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	S	N/A	S	S	S	N/A
TP	S	N/A	N/A	S	S	S	S	N/A	S	S	S	S	S	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	S	S	S	S	S	N/A
ISM	S	N/A	N/A	S	S	P	N/A	N/A	P	S	S	S	S	P	P	S	S	S	S	N/A	N/A	N/A	N/A	S	N/A	S	S	S	N/A
SPE	S	N/A	N/A	S	P	S	S	N/A	P	P	S	S	P	P	S	S	P	S	N/A	N/A	N/A	N/A	N/A	S	S	S	S	S	N/A
IC	S	N/A	N/A	S	S	S	S	S	S	S	S	S	S	S	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	S	N/A	S	S	S	N/A
PR	S	N/A	N/A	S	S	S	N/A	N/A	S	S	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	S	N/A	S	N/A	N/A	N/A

World's most . . .

2005

KPA	CO1	CO2	CO3	AB1	AB2	AB3	AB4	AB5	AC1	AC2	AC3	AC4	AC5	AC6	AC7	AC8	AC9	AC10	AC11	AC12	AC13	AC14	AC15	ME1	ME2	VE1	VE2	VE3	VE4
RM	S	N/A	N/A	S	S	S	S	N/A	S	S	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	S	N/A	S	S	S	N/A
SPP	S	S	N/A	S	S	S	S	N/A	S	S	S	S	S	S	S	S	S	S	S	S	S	P	S	S	N/A	S	S	S	N/A
SPTO	S	S	N/A	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	N/A	N/A	S	N/A	S	S	S	N/A
SQA	S	N/A	N/A	S	S	S	S	N/A	S	S	S	S	S	S	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	S	N/A	S	S	S	N/A
SCM	S	N/A	N/A	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	N/A	N/A	N/A	N/A	N/A	S	N/A	S	S	S	S
OPF	S	S	S	S	S	S	S	N/A	S	S	S	P	S	S	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	S	N/A	S	N/A	N/A	N/A
OPD	S	N/A	N/A	S	S	N/A	N/A	N/A	S	S	S	S	S	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	S	N/A	S	S	S	N/A
TP	S	N/A	N/A	S	S	S	S	N/A	P	S	S	S	S	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	S	S	S	S	S	N/A
ISM	S	N/A	N/A	S	S	S	N/A	N/A	S	S	S	S	S	S	S	S	P	S	S	N/A	N/A	N/A	N/A	S	N/A	S	S	S	N/A
SPE	S	N/A	N/A	S	S	S	S	N/A	P	S	S	S	S	S	S	S	S	S	N/A	N/A	N/A	N/A	N/A	S	S	S	S	S	N/A
IC	S	N/A	N/A	S	S	S	S	S	S	S	S	P	S	S	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	S	N/A	S	S	S	N/A
PR	S	N/A	N/A	S	S	S	N/A	N/A	S	S	S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	S	N/A	S	N/A	N/A	N/A

Good day; note OPF & SQA

More Recently – The SEPG Evolves into the Process Leadership Team and then the Process Advisory Council

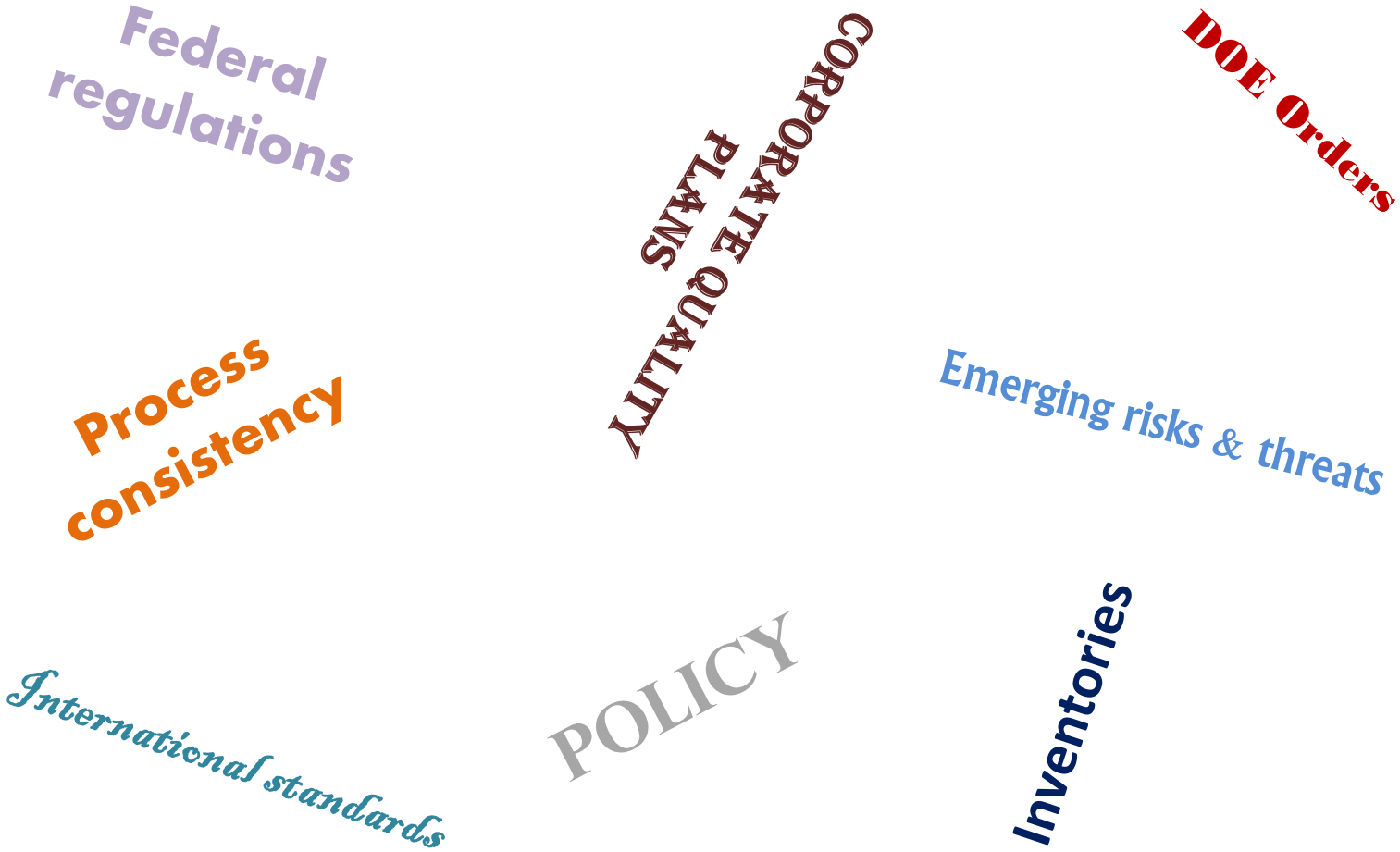
		CMMI® Categories and Process Areas				
Business Units /	Business Unit Advisors	Support M & A, CM, PPQA, DAR, ~~CAR~~	Project Mgmt. PM, PM&C, IPM, RSKM, REQM, SAM, ~~QPM~~	Process Mgmt. OPF, OPD, OT, ~~OPP / OPM~~	Engineering RD, TS, PI, VER, VAL	Services (ITIL) Strategy, Design, Services, Transition, Operations

Categories really do offer a reasoned approach for grouping Process Areas and needs.

So You're a Process Advisory Council (PAC) Member, Now What? (Training)

- Policy, Procedure, Process – what, we have a policy?
- PAC member pre-requisites – what and why
- Categories – what are we talking about here? (who, acronymania, PA documents)
- PIIDs / SCAMPIs – what are they, how are they used?
- Process Improvement Project – an abbreviated history
- PAC worldview – how it all fits together
- PAC meetings – purpose
- PAC member summary – processes, usage, championing

The Model Supports Corporate Requirements and Interests As Well



Any Resemblance to the Model is *not* Coincidental

Implement Software Quality Processes	Software Developers or Modifiers	→ Determine the risk level associated with a particular software instance using the risk-informed graded approach for software specified in SS-R89727, Specific Use Specification, Sandia Software Quality Assurance Program (SSQAP). **Note:** For each risk level, the SSQAP determines a corresponding level of formality. For example, if the risk level is high, a high level of formality helps to manage and mitigate risks. → Implement the software quality process areas (listed below) to the degree appropriate for the risk level determined by evaluating the mission using SSQAP procedure. The following process areas are elements of the implementation required under this procedure: ◦ Configuration management. ◦ Deployment. ◦ Integrated teaming. ◦ Life cycle support. ◦ Measurement and analysis. ◦ Product integration. ◦ Project monitoring and control. ◦ Project planning. ◦ Requirements development. ◦ Requirements management. ◦ Risk management. ◦ Technical solution. ◦ Validation. ◦ Verification. → The process must be documented and quality records must provide evidence that documented practices are being performed. The practice level determines each project's implementation of the process areas cited above.

- **The above content is part of a policy statement**
- **Integrated teaming will soon be removed**

The CMMI® Model Provides a Taxonomy for Development Practices

Process Areas

Configuration Management

Deployment

Integrated Teaming

Life Cycle Support

Measurement and Analysis

Product Integration

Project Monitoring and Control

Project Planning

Requirements Development

Requirements Management

Risk Management

Technical Solution

Validation and Verification

Software Quality Global Practices

CPS software quality policies, processes, and procedures (e.g., IM100.3.5) also describe six global practices that are associated with each software quality process area. Each global practice should be implemented within each process area. The descriptions provided below for the global practices and the questions in the second section of the SAI questionnaire in Appendix B are intended to provide insight for the self-assessor.

Stakeholder Involvement

The purpose of identifying relevant stakeholder involvement (SI) is to establish and maintain expected involvement throughout the process.

Collecting Improvement Information

The purpose of collecting improvement information (CI) is to improve planning and performance. This information may also point to improvements needed in the process itself.

Objective Evaluations

The purpose of objective evaluations (OE) is to provide credible assurance that the process is implemented as planned and follows process descriptions and procedures.

Quantitative Objectives

The purpose of identifying quantitative objectives (QO) is to, establish quantitative measurements that will enable stable subprocess performance.
Quantitative objectives should be identified as determined by the business needs of the project or organization.

Role-based Training

The purpose of role-based training (TR) is to ensure that teams have the needed skills and expertise to perform.

Problem Reporting and Corrective Action

The purpose of problem reporting and corrective action (PR) is to ensure processes for 1) assessing process and project status, 2) escalating issues, and 3) taking and tracking needed action.

The Corporate Quality Assurance Plan is Based on a Risk-Informed *Tailoring*

Table 3-2. Graded Risk Level and Associated SSQAP Recommended Practice Level

Graded Risk Level (RL) Associated SSQAP Recommended Practice Level (PL)					
Likelihood Tier Undesirable event due to software failure	**Consequence Tier** Undesirable Event				
	C4 (Catastrophic)	**C3** (Severe)	**C2** (Moderate)	**C1** (Low)	**C0** (Negligible)
L4 (Very High)	**RL = VH** **PL = P4**	**RL = VH** **PL = P4**	**RL = H** **PL = P3**	**RL = M** **PL = P2**	**RL = L** **PL = P1**
L3 (High)	**RL = VH** **PL = P4**	**RL = H** **PL = P3**	**RL = M** **PL = P2**	**RL = M** **PL = P2**	**RL = L** **PL = P1**
L2 (Moderate)	**RL = H** **PL = P3**	**RL = M** **PL = P2**	**RL = M** **PL = P2**	**RL = L** **PL = P1**	**RL = L** **PL = P1**
L1 (Low)	**RL = M** **PL = P2**	**RL = M** **PL = P2**	**RL = L** **PL = P1**	**RL = L** **PL = P1**	**RL = N** **PL = P0**
L0 (Negligible)	**RL = L** **PL = P1**	**RL = L** **PL = P1**	**RL = L** **PL = P1**	**RL = N** **PL = P0**	**RL = N** **PL = P0**

Legend:
RL values: N = negligible, L = low, M = moderate, H = high, VH = very high
PL values: P0, P1, P2, P3, and P4 are defined in the Guidance to SSQAP Practice Levels. Practice activities related to these practice levels are provided in Table 3-3.

- **"Corporate" has no documented CMMI® aspirations (ISO)**
- **PL is "Practice Level"; RL is Risk Level; more risk means more practice formality**

Process Areas Have Practices that Spread Across to "P" Levels

Table 3-3. Practice Level Tiers, Process Areas and Practice Activities

Process Area / Global Practice	Practice Activities Based upon Recommended Practice Level Tier				
	P1	P2	P3	P4	[1]Potential Work Products
Project Planning [PP]	1. Estimate the scope of the project, estimates of work product and task attributes, budget and schedule, and the project plan 2. Define project life cycle 3. Determine estimates of effort and cost 4. Plan needed acquisitions and suppliers 5. Obtain plan commitment	1. Plan for project resources, needed knowledge and skills, stakeholder involvement, and data management 2. Review plans that affect the project 3. Identify project risks 4. Reconcile work and resource levels	1. *Included in M.1, M.2, M.3, M.4, M.7*		Estimates, schedule, budget, project plan, risk plan, supplier agreements, life cycle models, tailoring results
Project Monitoring and Control [PO]		1. Monitor project planning parameters, commitments, data management, and selected supplier processes	1. Monitor stakeholder involvement and project risks 2. Conduct progress and milestone reviews 3. *Included in M.8, M.9, M.10*		Status meeting minutes, corrective actions, stakeholder commitments (approvals), supplier meeting minutes, updated supplier agreements
Risk Management [RK]	1. Determine risk sources and categories 2. Define risk parameters 3. Establish a risk management strategy 4. Identify risks 5. Evaluate, categorize, and prioritize risks 6. Develop risk				Risk management plan: risks, sources, likelihood, consequence, thresholds, mitigation, residuals; risk statusing notes, risk updates, risk management database

"P" or "practice" Levels are Derived During Risk Determination; Tailoring is the Result

Guidance to SSQAP Practice Levels

P0 – Start with a thoughtful selection of value-adding practices from the P1 column.
P1 – Complete the remaining P1 column practices. Consider value-adding P2 column practices.
P2 – Complete the remaining P2 column practices. Consider value-adding P3 column practices.
P3 – Complete the remaining P3 column practices. Consider value-adding P4 column practices.
P4 – Complete the remaining P4 column practices.

P3 – Add these activities to each relevant Process Area:

- M.1 Establish an Organizational Policy
- M.2 Plan the Process
- M.3 Provide Resources
- M.4 Assign Responsibility
- M.5 Train People
- M.6 Manage Configurations
- M.7 Identify and Involve Relevant Stakeholders
- M.8 Monitor and Control the Process
- M.9 Objectively Evaluate Adherence
- M.10 Review Status with Higher Level Management

P4 – Add these activities to each relevant Process Area:

- H.1 Establish a Defined Process
- H.2 Collect Improvement Information

- **Process encourages the inclusion of additional "levels"**
- **M.6 has been updated to Control Work Products**

Self-assessments Against Practices Enable Teams to "Self-check"

SQUIG: Self-Assessment Instrument for Software Quality — Version 2.3

SAI Questionnaire

Software Quality Self-Assessment Instrument for Process Areas											
Self-Assessment Questions		PA has documented process? Yes No	Evidence				Progress			
		SSQAP Table 3-3 Xref	Direct		Indirect		None	Little	More	Most
			Ref #	Location	Ref #	Location				
Project Planning (PP)		☐ Yes ☐ No								
PP1	Are estimates of project planning parameters (such as scope, attributes of the work products and tasks, lifecycle, effort, cost, schedule, needed acquisitions and/or suppliers, etc.) established and maintained?	PP:P1.1-4 PP2.1								
PP2	Is a project plan established and maintained, reconciling differences between estimated and actual resources, as the project is managed?	PP:P1.1 PP2.2,4								
PP3	Are commitments to the project plan established and maintained?	PP:P1.5								
Project Monitoring & Control (PO)		☐ Yes ☐ No								
PO1	Are the actual performance and progress values of the project monitored against those planned in the project plan utilizing periodic reviews that include higher level management?	PO:P2.1 PO:P3.2 M.7,8,10 H.1								
PO2	Are corrective actions managed to closure when the project's performance or results deviate significantly from the plan?	PR:P2.2-3								
Risk Management (RK)		☐ Yes ☐ No								
RK1	Is a strategy for identifying, analyzing, and mitigating risks established and maintained?	RK:P1.3								
RK2	Are risks identified and analyzed to determine their relative importance?	RK:P1.1,2,4,5 PP:P2.3								
RK3	Are risks handled and mitigated, where appropriate, to reduce adverse impacts on achieving objectives?	RK:P1.6,7								

- "yes," most teams think too highly of themselves
- Note cross-reference to practices in blue
- Evidence columns allow teams to understand the veracity of their practice performance, and, to prep for appraisals

A Similar Structure Helped Teams to Self-assess "GPs," Safety Software, and PII Practices as Well

SQUIG: Self-Assessment Instrument for Software Quality — Version 2.3

Software Quality Self-Assessment Instrument for Global Practices										
Self-Assessment Questions		GP has documented process? Yes No	Evidence				Progress			
		SSQAP Table 3-3 Xref	Direct		Indirect					
			Ref #	Location	Ref #	Location	None	Little	More	Most
Stakeholder Involvement (SI)		☐ Yes ☐ No								
SI1	Are the levels of involvement and dependencies for identified stakeholders established, managed, and maintained throughout the life of the project?	SI:P2.1,2,3 PP:2.1 PO:P3.1 M.7								
Collecting Improvement Information (CI)		☐ Yes ☐ No								
CI1	Are process improvement opportunities identified and action plans implemented?	OE:P4.1,2,3 QO:P3.1,2 QO:P4.1 P4 H.1								
CI2	Are lessons learned and improvement data collected, analyzed, and shared across the organization?	H.2								
CI3	Are processes changed based upon suggested improvements?	M.8 H.2								
Objective Evaluations (OE)		☐ Yes ☐ No								
OE1	Are independent evaluations of identified processes and procedures conducted and reviewed?	OE:P4.1,2								
OE2	Is the implementation of identified processes and procedures independently evaluated and noncompliance issues communicated and tracked to closure?	OE:P4.1,2,3								
Quantitative Objectives (QO)		☐ Yes ☐ No								
QO1	Are quantitative objectives that address product quality, service quality, and process performance established for the processes?	QO:P3.1								

Specific guidance for the Progress columns doesn't seem to help teams be realistic about their progress

We "map" to Every Known Requirement

Table 2-1. Mapping of Software Process/Practice Requirements

Requirement	IM100.3.5	DOE O 414.1D Attachment 4	NQA-1-2008 Subpart 2.7	QC-1 Rev 10
Configuration Management [CM]	Configuration Management	**X**	Section 102, 203, 500	Section 3.3, 3.7, 3.8
Deployment [DE]	Deployment		Section 404, 405, 406, 407, 500, 600	Section 3.8, 3.11, 3.16
Integrated Teaming [IT]	Integrated Teaming			S2
Life Cycle Support [LS]	Life Cycle Support		Section 101, 405, 406, 407	Section 3.8, 3.10, 3.11, 3.16
Measurement & Analysis [MA]	Measurement & Analysis			Section 2, 3.3, 3.4
Product Integration [PI]	Product Integration		Section 403	Section 3.8, 3.10, 3.11
Project Monitoring and Control [PO]	Project Monitoring and Control		Section 400	Section 2, 3.16
Project Planning [PP]	Project Planning	**X**	Section 102, 201, 400	Section 2, 3.16
Requirements Development [RD]	Requirements Development	**X**	Section 201, 401	Section 2, 3.16
Requirements Management [RM]	Requirements Management	**X**	Section 201, 401, 500	Section 2, 3.16
Risk Management [RK]	Risk Management	**X**	Section 201, 401	Section 2, 3.16
Technical Solution [TS]	Technical Solution	**X**	Section 101, 201, 401, 402, 403, 500, 600	Section 3.3, 3.4, 3.5, 3.8, 3.16
Validation [VA]	Validation	**X**	Section 201, 202, 204, 300, 302, 402.1, 404	Section 2, 3.9, 3.16
Verification[VE]	Verification	**X**	Section 102, 201, 202, 204, 300, 302, 402.1, 404	Section 2, 3.3, 3.4, 3.5, 3.9, 3.16
Training[TR]	Training	**X**		Section 3.2
Stakeholder Involvement [SI]	Stakeholder Involvement		Section 403	Section 2, 3.16
Objective Evaluation [OE]	Objective Evaluation			Section 2, 3.15
Collection of Improvement Information [CI]	Collection of Improvement Information			Section 2, 3.1
Problem Reporting and Corrective Actions [PR]	Problem Reporting and Corrective Actions	**X**	Section 201, 204, 402, 404, 406	Section 3.1, 3.12, 3.13
Quantitative Objectives [QO]	Quantitative Objectives			Section 2, 3.4
Supplier Management [SM]	Implied (Each Sandia organization that develops, *subcontracts* for development, *acquires*, modifies, maintains, or *uses* applicable software)	**X**	Section 100, 101, 201, 300, 301, 302, 500, 600	Section 3.6, 3.16
Quality Planning [QP]	Included in Project Planning	**X**		Section 2, 3.1, 3.8,

And today . . . The Model Impacts:

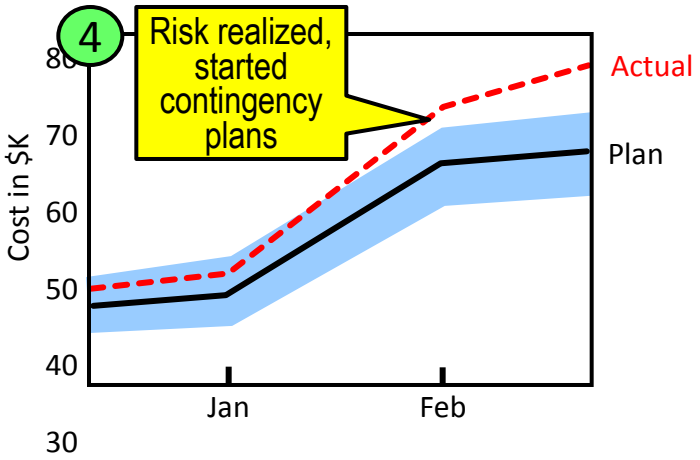
- Policy and governance
- Sponsors and regulation interpretation
- "Parent" company confidence
- Transitions from Peer Reviews to VER, estimated defect prediction
- Certified appraisers and instructors within the organization and the corporation
- Pilot projects are purposeful, not "as reckless"
- Processes beyond the CMMI-DEV model (OCTAVE and RMM)
- New Mexico SPIN
- Everything's a DAR now . . . even if not a DAR

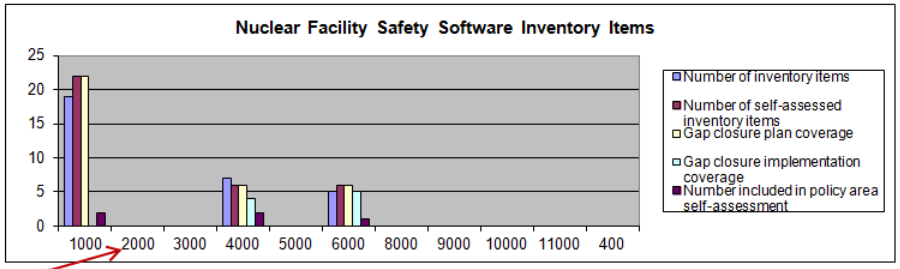
Other Newly Institutionalized Lexicon Elements

- (Documented) Process
- Relevant stakeholder
- Monitor and control
- Corrective action
- DAR
- OSSP

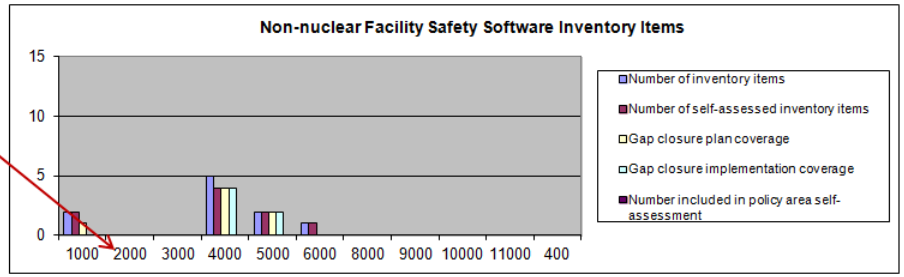
Understanding what constitutes *process* ***"a well-documented process contains inputs, outputs, roles and responsibilities, sequences and dependencies, reviews and approvals, and entry and exit criteria, as examples. A process should have many of, but not necessarily all of, these attributes. It may be textual or graphical but should not be merely imaginary or virtual."***

A New Slide in the DEV Course Illustrates What is and is not Analysis – and Is Put to Use





A reiteration from an earlier "issue" is represented with the absence of data in some unlikely Divisions.

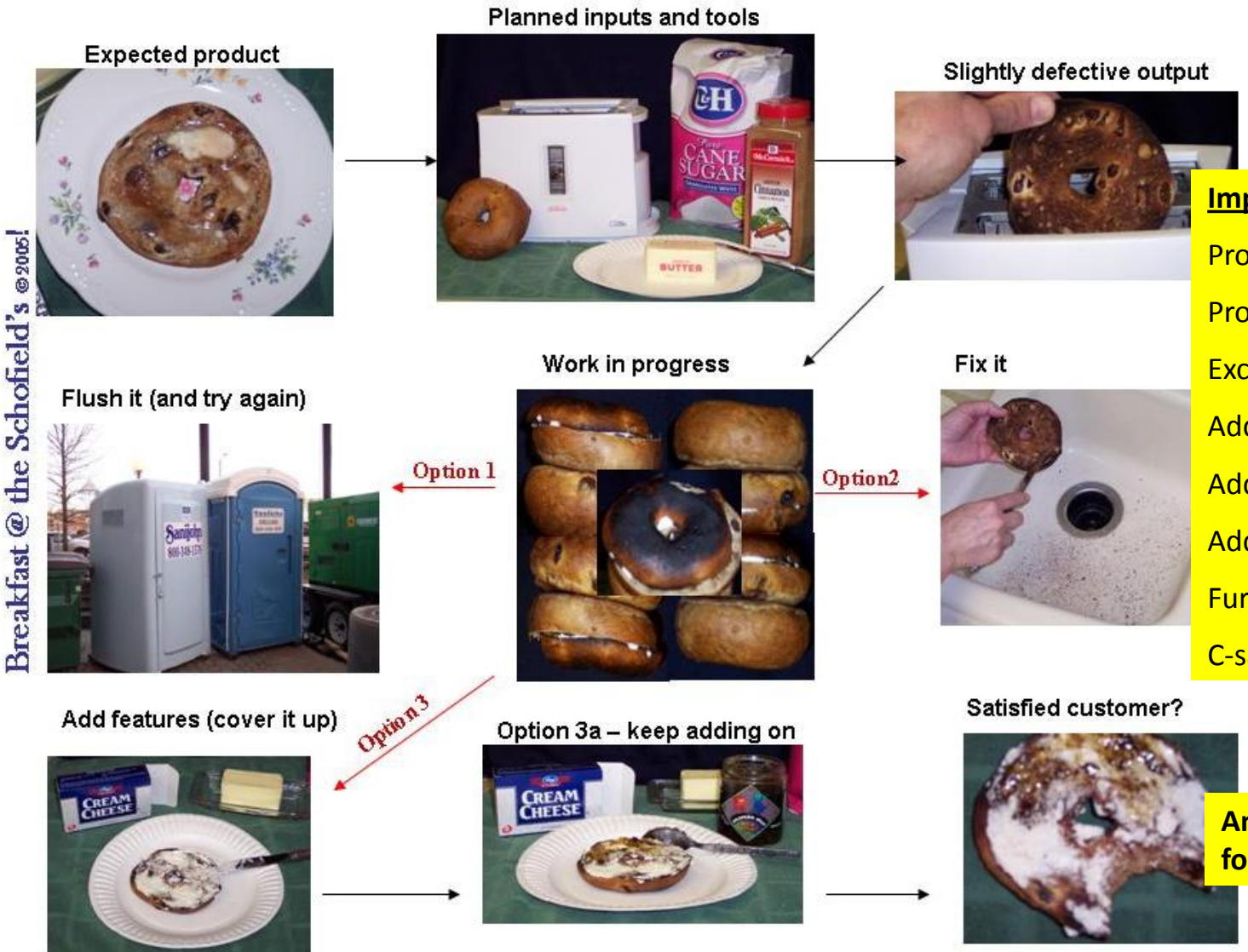


Steps to Minimize the Results of Process Investment – A Bonus

1. Reduce the budget; avoid replacing resources when vacancies occur. Redirect remaining resources to "important work" (be sure that the re-directed resources know that their process work is therefore *not* that important).
2. Bury the process and quality work deeply in the organizational structure, like a department versus at a Center level.
3. Tell the process team (as an exception to the rest of the department) "we don't know where you would fit in a re-org" despite many team-generated profferings for sponsorship and visibility.
4. Remove accountability in the leadership meetings and transfer ownership to senior managers who have other priorities. Create relationships that are not engendered by senior management.
5. Confuse policy (and ownership) with process and "assert" direction upon process.
6. Assign younger and less experienced staff in key positions where they can be more easily ignored and unlikely to "speak up."
7. Rotate senior management every two years—why sustain momentum that isn't working?
8. Remove visibility of PPQA / CM results from management meetings, making process results less visible and easier to skirt.
9. Create special "teams" with duplicative roles to further diffuse the process team role and (perhaps unintentionally) morale.
10. Create and adopt unsustainable SCAMPI intentions and not so plan or budget.
11. Shift the process team objectives often: complete methodology, develop a tailoring wizard, deploy tools, move to new tools, provide tool training, stop licensing tools.
12. Allow teams to do what is right in their own eyes; limit public support for the team assigned to build and deploy the OSSP.

Reference: Deming's 1st Principle of Management Obligation: *Constancy of Purpose*

Process Orientation for Breakfast



Implications for:

Process variation

Product variation

Excess WIP

Added steps

Added materials

Added labor

Further variation

C-sat

Any parallels for software?

The "Paths" and Journeys are not the same for all Groups

Pathways to Process Improvement?

I hope you enjoyed this one! **Thank you!**