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Applying Agile Techniques to Process Development: Lessons Learned

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SEIPartner

Topics



- ▶ (Agile Development) Defined
- ▶ Agile (Process Development) Defined
- ▶ Process Development Planning
- ▶ Process Architecture Design
- ▶ Process Rollout Management
- ▶ CMMI[®] Model Implementation Choices
- ▶ Real-World Example
- ▶ Lessons Learned
- ▶ Summary
- ▶ Q&A

(Agile Development) Defined



- ▶ Main Principles of Agile Development
 - Individuals and Interactions *over* processes and tools
 - Working software *over* comprehensive documentation
 - Customer collaboration *over* contract negotiation
 - Responding to change *over* following a plan
- ▶ “That is, while there is value in the items on the right, we value the items on the left more.”
- ▶ Source: www.agilemanifesto.org

Agile (Process Development) Defined₁



- ▶ Individuals and Interactions over process development techniques
 - Who are the experts in which processes and how can we empower them and work with them to quickly capture their knowledge and arrive at decent documented processes *over*
 - Using more formal and methodical ways of developing processes
- ▶ Piloting process work products over baselined policies, process documentation, and procedures
 - Get process forms, tools, templates drafted, try them out and work out the kinks *over*
 - Waiting on the complete set of process assets to be approved including approved policies, processes, procedures as well as their associated work products

Agile (Process Development) Defined₂



- ▶ “Customer” collaboration over following the formal process improvement workflow
 - Working with the end process users (e.g. project staff) to understand their process needs *over*
 - Waiting to author and implement process improvement suggestions or change requests
- ▶ Responding to change over following a plan
 - Addressing the more urgent needs of the process users *over*
 - Following “the” process development plan or spending a lot of time in re-planning the process development effort

Process Development Planning₁



- ▶ Assuming CMMI is implemented but whether implementing the staged or continuous representation, there are some good choices in planning an Agile approach
 - Incremental Process Development
 - Allows increments of your process assets to be piloted and rolled out across the organization, perhaps per process area
 - Iterative Process Development
 - Allows you to build up your process assets and to pilot and roll them out while only partially complete, perhaps to implement a process thread or to just get an initial capability in the hands of your projects
 - A combination of the two is also possible as well as other approaches

Process Development Planning₂



- ▶ Regardless of approach, be prepared to respond to changing needs and adapt quickly
 - Assuming an initial set of process needs were elicited from the end process users, they may soon realize they need something more or different sooner
 - Continue to work with the project teams to understand their changing needs or priorities
 - Change course as needed without worrying about updating the plan unless major changes might jeopardize the results
 - Small tweaks will only affect earned value and should not affect overall effort, resources, cost or schedule. It might actually reduce schedule, potentially.

Process Development Planning₃

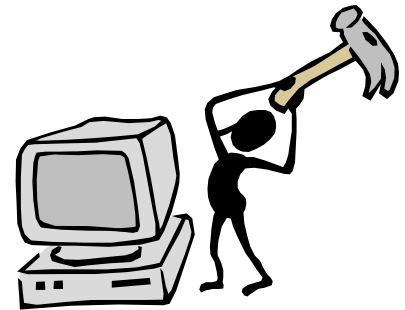
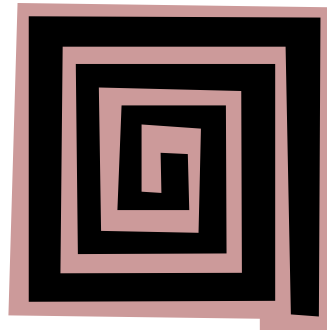
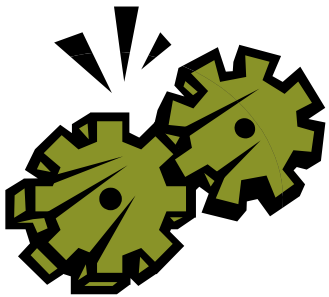


- ▶ Don't underestimate resource needs or overestimate resource availability
 - Depending on experience level and knowledge, expect to spend a minimum of 80 hours (expert level) developing the processes and assets for each PA (at CL3)
 - Take into account infrastructure
 - Process Asset Library, Measurement and Project Repositories
 - Allocate plenty of time for process tweaking
 - Expect about 10 tweaks per PA (0.5 to 8 hours/tweak)
 - If using project resources to develop processes
 - Expect availability to be low, *plan* for no more than 10% (4 hours/week), 5%-8% (2 to 3.5 hours/week) is more typical
 - Allocate time for process review/rework/approve/improve cycles

Process Architecture Design₁



- ▶ Give consideration to how everything fits and works together
 - Create an integrated solution
- ▶ Capture the know-how in the process descriptions
 - If people have to go hunting down folks for help, you got more work to do
- ▶ Use the cookie cutter approach to create easy to use project repositories (create templates for them)
- ▶ Stick with the classics (e.g., IBM's ETVX)



- ▶ Leverage Technology to reduce foot print of manually intensive processes
 - Use a DAR process to introduce automation or technology to reduce cycle time, human error and paperwork
 - Typically applied to defect tracking, action item tracking, configuration management, requirements management, document workflow, metrics collection, trending and analysis
 - Make sure to do a proof of concept before buying
 - Reassess technology improvements as part of annual process improvement planning
 - What processes take the most time, produce the most pain?

Process Rollout Management₁



- ▶ Process implementation is an often overlooked area
 - Processes are baselined and approved
 - Project personnel are trained (so far so good)
 - But most project plans are from their customer's or product development perspective, not the organization's new process perspective
 - Process implementation and institutionalization is at risk at this critical stage



Process Rollout Management₂



- ▶ Several strategies need to be planned for, put in place and proactively monitored and managed to guarantee success
 - Potentially re-plan projects to introduce new processes but not at the nitty-gritty level
 - Mentor and Lead by Example
 - Provide process assets that show what is expected or what might be a good example of the harder to produce work products
 - Bootstrap the more major processes, like CM
 - For example, facilitate configuration control boards
 - Walk around and mentor staff during rollout until they are comfortable with the new processes

Process Rollout Management₃



- ▶ Create a “plan” of process implementation for each project
 - Gain an understanding of when projects will be using the new processes and when evidence of their use materializes
 - When each expected work product will be created
 - Develop a tool to record this data to arrive at a forecast for each project’s full compliance (FC) or process implementation schedule
- ▶ Train the project to track their progress toward meeting these expectations and revise as needed
 - Try to avoid overly optimistic commitments

Process Rollout Management₄



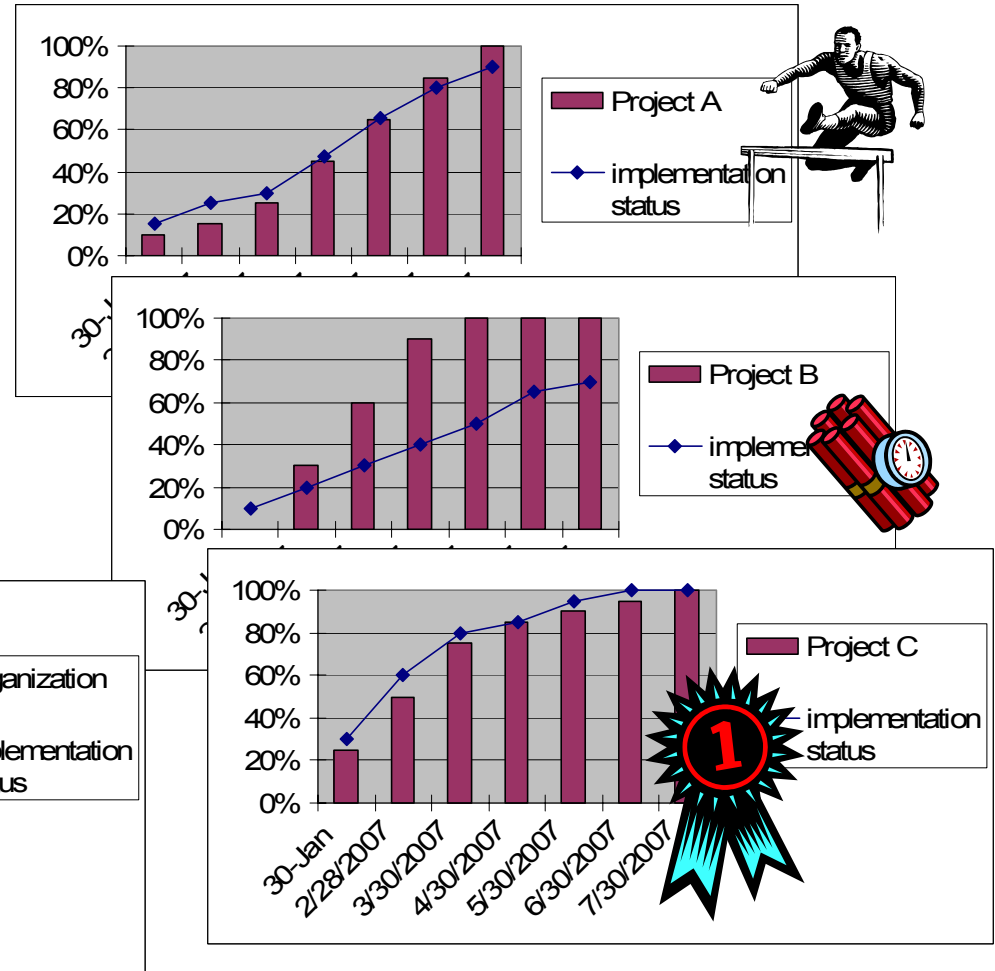
- ▶ Aggregate and proactively monitor and manage all the project rollout forecasts at the organizational level (sounds like OPF, huh?)
 - Take corrective action when it seems any project is falling significantly behind their forecast
 - Take corrective action when the organization is falling significantly behind its forecast
- ▶ Organizational process compliance forecasting helps determine appraisal readiness and can predict the SCAMPI appraisal milestone date

Process Rollout Management₅

Case I: 3 Projects, Same Start Date



- ▶ What does an example forecast look like?
 - Bars represent forecasted compliance
 - Lines represent actual compliance achieved
 - Projects A&B are behind schedule in implementing processes
 - Project C has reached full compliance on schedule!

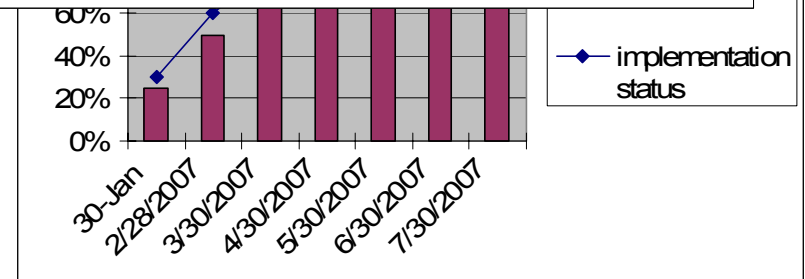
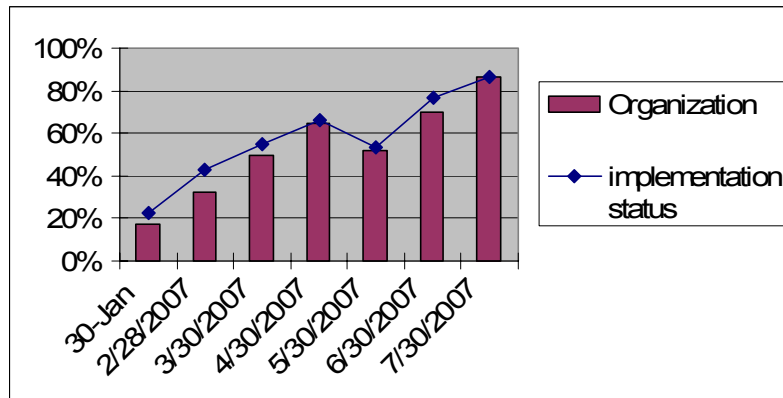
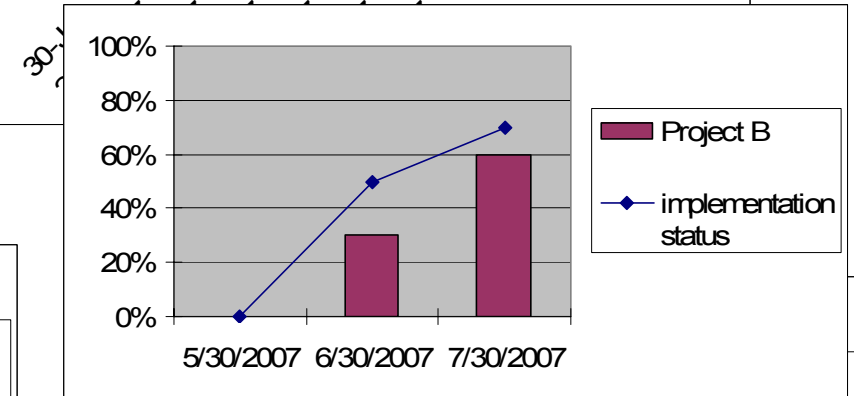
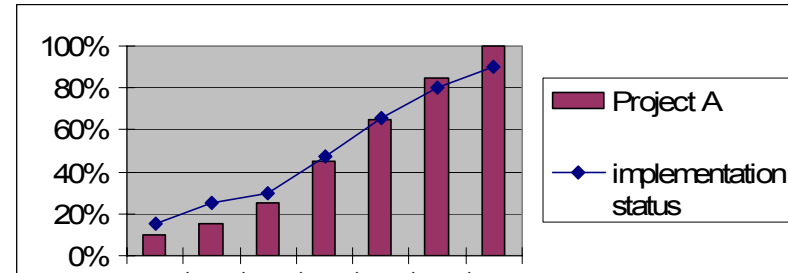


Process Rollout Management₆

Case II: 1 Project, Later Start Date



- ▶ Notice in this case that the organizational forecast takes a dip as the new project starts up
- ▶ It may take a couple of months or more to achieve full compliance
- ▶ Note, compliance can regress for other reasons like process abandonment



Process Rollout Management₇

Sampling of other Cases



- ▶ More complex cases are possible
 - Projects using different lifecycle processes
 - Development
 - IT
 - Maintenance
 - Services
 - Projects tailoring out processes
 - Projects using customer processes
- ▶ Need to take into account how these cases affect forecasting at the project and organizational level



Process Rollout Management₈



- ▶ Reaching full compliance (FC) does not necessarily mean a project or organization has fully institutionalized its processes
 - For this, one might
 - Track how consistent the new processes are being applied after reaching full compliance
 - Is the expected frequency of work product outputs consistent?
 - Track the commitment of the organization's staff to the new processes
 - Is there wide or expected levels of staff participation?
 - Both of these measures can be forecasted and tracked in a similar manner as the work products
- ▶ Once the organization has reached FC and has achieved institutionalization, the result is a higher degree of confidence towards a successful appraisal outcome

Process Rollout Management₉



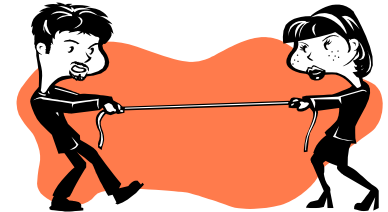
- ▶ Achieving institutionalization is a challenging problem in organizational change
 - Depending on the existing company culture and personalities involved, it can be quite a challenge to implement change in a smooth fashion
 - The goal is to foster a self-reinforcing process and achieving high taken-for-grantedness
 - Process rollout forecasting and tracking helps
 - But carefully managing the expectations of staff and all stakeholders from the very beginning is the real key
 - Lessons can be learned from Psych-101
 - See:
http://changingminds.org/disciplines/change_management/-change_management.htm

CMMI Implementation Choices₁



▶ Which Representation to Use?

- Staged or Continuous?



▶ My take on it and the choices:

- Develop, appraise and market processes using the staged representation
- Develop, appraise, and market processes using the continuous representation
- Develop using the continuous representation and appraise and market using the staged representation

CMMI Implementation Choices₂



- ▶ Can all 3 be done in an Agile way?
 - Short answer: Yes
 - Long answer: staged representation is a bit more restrictive than the other 2 approaches
- ▶ Why do I prefer using the continuous representation?
 - Because I like the power of performing the activities associated with OPD, OPF, DAR right away (assuming the goal is ML2) and perhaps other higher level process areas even if only at a capability Level 1!
 - Most companies do, too. They implement OPD and OPF even for an ML2 rating, they just don't realize they are using the continuous representation!



CMMI Implementation Choices₃

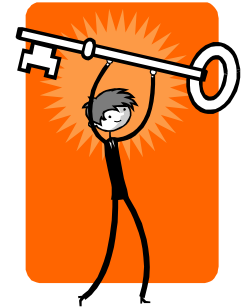


- ▶ Typically organizations achieve a continuous representation target profile without realizing it
 - Most implement OPD, OT, OPF to help develop their ML2 processes, train their people and rollout their processes
 - Some even formalize these processes and actually achieve higher CL ratings for these support “activities”
- ▶ Some organizations have people that champion their own particular causes and start implementing other processes “outside” the main improvement effort
 - For example, the test manager might implement VER and VAL processes right away (hint, I was one!)

CMMI Implementation Choices₄



► Once you realize the power of the paradigm shift to the continuous representation



- You can leverage it to make your process development Agile from the very beginning
- You can plan for it
- You can give your organization a jumpstart on reaching higher levels of maturity while providing the support it needs to achieve its current goal

Real-World Example₁



► Company ABC

- Name changed to develop this presentation in an Agile manner!
- Size and Business: 75 employees, IT services and consulting
- Goal: Achieve ML2 rating
- Initial Planned Approach: Incremental Process development and rollout
 - REQM, PP, PMC, CM, PPQA, SAM, and MA in that order
 - All processes developed by yours truly
 - Staged ML2 appraisal in 13 months
 - Fixed Price Contract



Real-World Example₂



- ▶ Initial estimate was nearly 1300 hours to develop CL3 (we don't do CL2) processes and process assets across the 7 ML2 process areas
- ▶ Assumptions included client creating the PAL (process asset library), measurement repository and training material
- ▶ Unfortunately, budget was cut to 1000 hours and client was not informed of assumptions
 - Resulting in significant scope creep with a 20+% decrease in the budget!



Real-World Example₃



- ▶ Would it be possible to implement a process development effort using cost-effective strategies from the software world to reduce effort and risk?
 - Use systems engineering to create a more streamlined set of processes and process assets?
 - Reduce effort by reuse?
 - Reduce downstream issues and risks by prototyping to detect issues earlier?

Real-World Example₄



- ▶ Borrowing software development techniques to reduce effort/risk (continued)
 - Take advantage of agile techniques like iterative development, leveraging collaborative teaming, etc.?
 - Reduce training requirements by creating a turnkey solution that provides some built-in help?
 - Build QA into the process to increase quality of delivered product?
- ▶ But is there a limit to just how much scope creep can be absorbed using agile techniques?
 - What will be sacrificed as budget limit is reached?

Real-World Example₅



► Agile Adaptations:

- Approach altered to use continuous representation (surprise, surprise) and more Agile approach changing major process development sequence to:

- OPD_{CL1} , OPF_{CL1} , DAR_{CL3} , $REQM_{CL3}$, PP_{CL3} , PMC_{CL3} , CM_{CL3} , $PPQA_{CL3}$, MA_{CL3}
- Notice the further increase in scope
 - SAM was dropped (deemed not applicable) but 3 out-of-scope processes were added, providing us this strategic opportunity:
 - » We are teaching folks how to fish!



Real-World Example₆



► Agile Adaptations (continued)

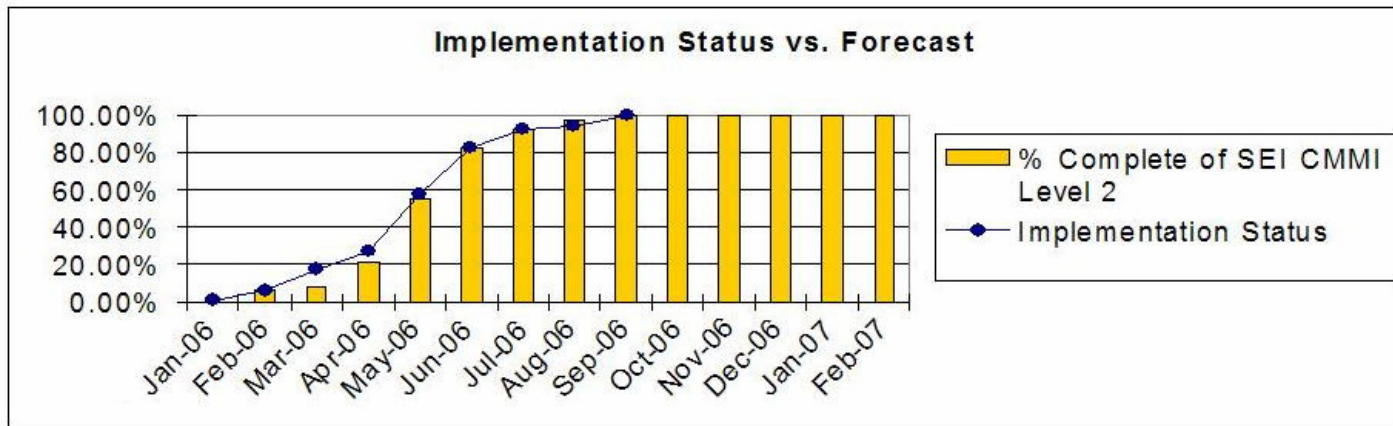
- Embedded iterative approach within increments
 - But did not plan iterations, adapted to project's needs
- Produced several process assets out of sequence (and iteratively) to tackle immediate project issues
 - Action item tracking, PMR slides, change management, meeting agendas/minutes, project status meeting process, requirements specification template, schedule template, metrics to track project progress
- Integrated process and infrastructure
 - Metrics, project repository design, QA audits and process descriptions were designed in an integrated fashion

Real-World Example₇



► Result

- Organization achieved ML2 Rating in 9 months with 6 global strengths, and strengths in many process areas, with only 2 weaknesses
- Notice organization passed appraisal at FC point
 - Lead Appraiser felt processes were highly stable and fully institutionalized by this point
 - I left the organization at 6 month mark (June 30th) with all processes completely rolled out and organization at 83% process (and CMMI) compliance



Real-World Example₈



► How good were our Agile/mitigation strategies?

■ Savings

- REQM: 44%, PP: 11%, PMC: 24%, MA: 13%, SAM: 100%
- Schedule: 30%, Appraisal: 40% (3 days actual vs. 5 days planned)
- Process group setup: 90%

■ Over-runs

- PPQA: 36% (not right-sized to organization, but high quality)
- CM: 10% (under estimated)
- Planning: 93% (plan had to be revamped due to scope creep)
- Rollout: 371% (effect of significant scope creep!)
 - Unplanned training, infrastructure development, meetings, etc.

■ Items sacrificed

- Appraisal readiness
- Residual mentoring and tweaks on CM and PPQA

■ Original plan would have yielded a 4% budget cushion

Real-World Example₉



▶ How effective was our approach?

- PPQA was overweight for the organization
 - Effort involved overran by 36%
 - Resulting process was inefficient and went beyond the point of diminishing returns for QA
- Training and mentoring absorbed more time than envisioned
- Although our approach was very successful, perhaps we were a bit too Agile
 - Training and QA could have benefited from more formal design techniques

Lessons Learned₁



- ▶ Run the PI effort as a piloting project
 - Use the PI effort as an early testing ground to develop key planning and management artifacts
 - Project plan, schedule, action item tracking, project review (PMR forerunner), project status report, metrics collection and reporting, earned value management, risk management, change control
 - The PI effort should be run as well if not better than the projects as it can potentially provide good examples of work products for projects to follow



Lessons Learned₂



- ▶ Pilot some key processes in a process group to jumpstart processes in other process areas (PA)
 - For example, an software engineering process group (SEPG)
 - The SEPG becomes the PI effort project staff
 - Some SEPG processes can be adapted to other PA's, like process change control to software change control (CM)
- ▶ When process experience is lacking use an external consultant to bootstrap the SEPG
 - Consultants can show the group what kinds of action items are needed to get process improvement activities going
 - Consultants can chair the meeting until the designated chair is ready
 - Consultants can develop initial PI plan and mentor the team through an initial set of suggested improvements

Lessons Learned₃

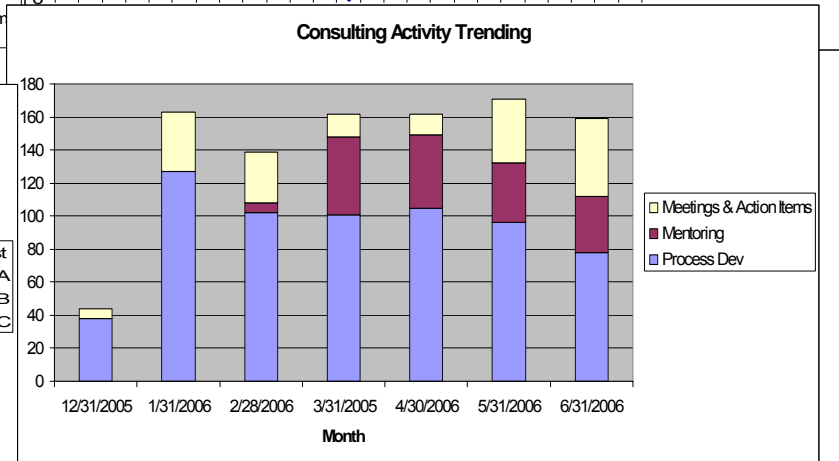
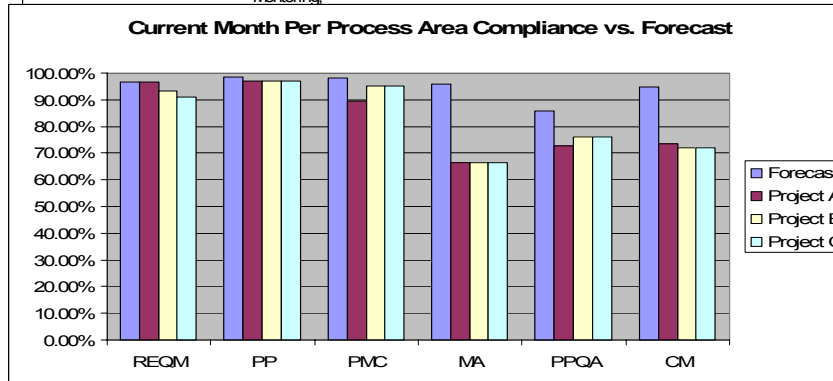
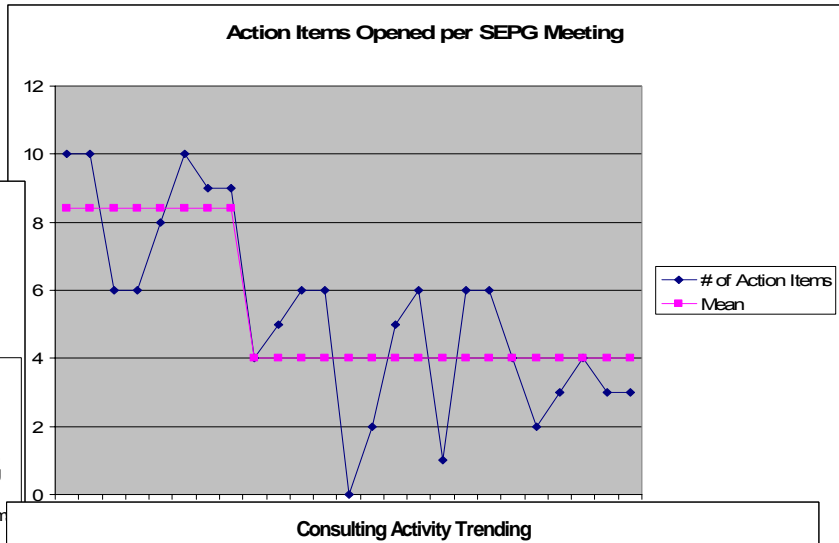
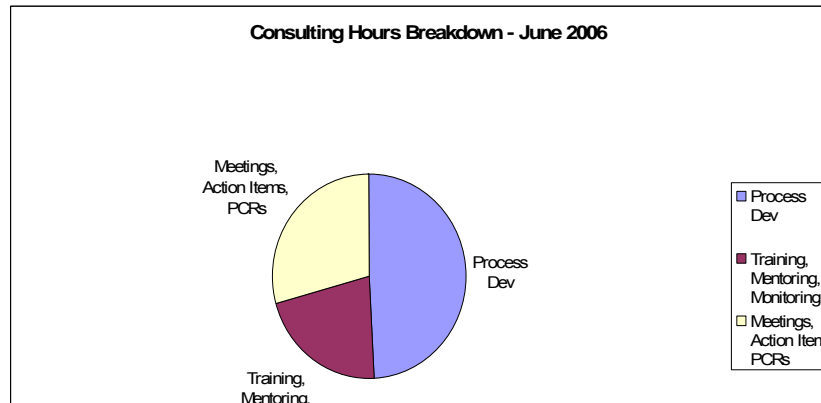


- ▶ Use the ample resources of the Internet to speed process development
 - Learn to use the right set of buzz words to find useful examples of policies, processes, templates, tools and even educational material
- ▶ Use the IEEE Software Development Library instead of reinventing the wheel when it comes to documentation standards
 - It saves time and is an excellent return on investment
 - See http://shop.ieee.org/ieeestore/Product.aspx?product_no=SE113

Lessons Learned₄



- ▶ Track metrics to understand the efforts involved and to help predict future process improvement outcomes



Lessons Learned₅



- ▶ Appraisal readiness is in the eye of the beholder
 - Just how much institutionalization is enough to be appraisal-ready can vary from Lead Appraiser to Lead Appraiser
 - Criteria should be metrics-based rather than subjective
 - Better to be “over-prepared” to cover the wide range of interpretation
 - Agile approaches to process development may lead to earlier appraisals as many processes are up and running quickly
 - However, expect weaknesses in those processes rolled out nearer the appraisal if an appraisal is scheduled too aggressively
 - I prefer seeing all the processes used for at least 4 to 6 months if not more
 - It takes a while for processes to become stable and reach full institutionalization (where you can walk away and they continue ad infinitum and there is evidence of continuous PI)

Lessons Learned₆

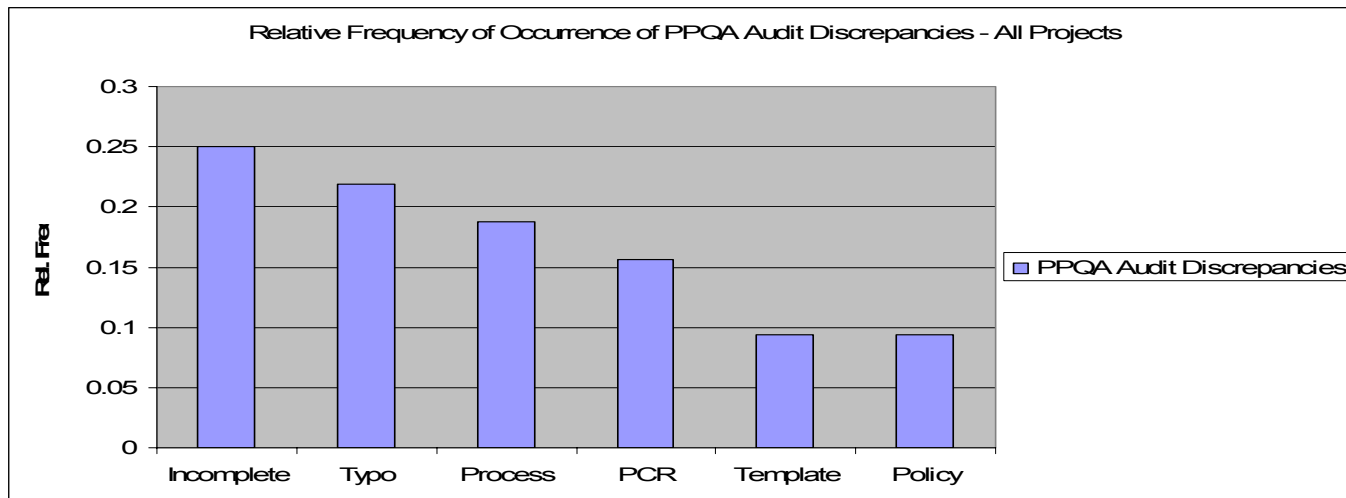


- ▶ Outsourcing PPQA audits is a common approach to accelerating the path to an appraisal
 - However, make sure you have independence in the organization to manage and track any deficiencies uncovered to closure
 - Company ABC did not have a full-time QA manager at the time, so a project lead was assigned the role
 - As a result some conflict of interest was introduced and created a weakness in the tracking of issues associated with their project
 - This was reflected in the appraisal results as an issue was uncovered
 - This approach only makes sense if the processes have had a chance to stabilize
 - Otherwise, you're just being a bean counter to check off a box to pass an appraisal and discounting the real value that PPQA brings to the organization
 - Doing audits too early will just create a bunch of unnecessary work, you'll generate a ton of issues due to unstable processes

Lessons Learned₇

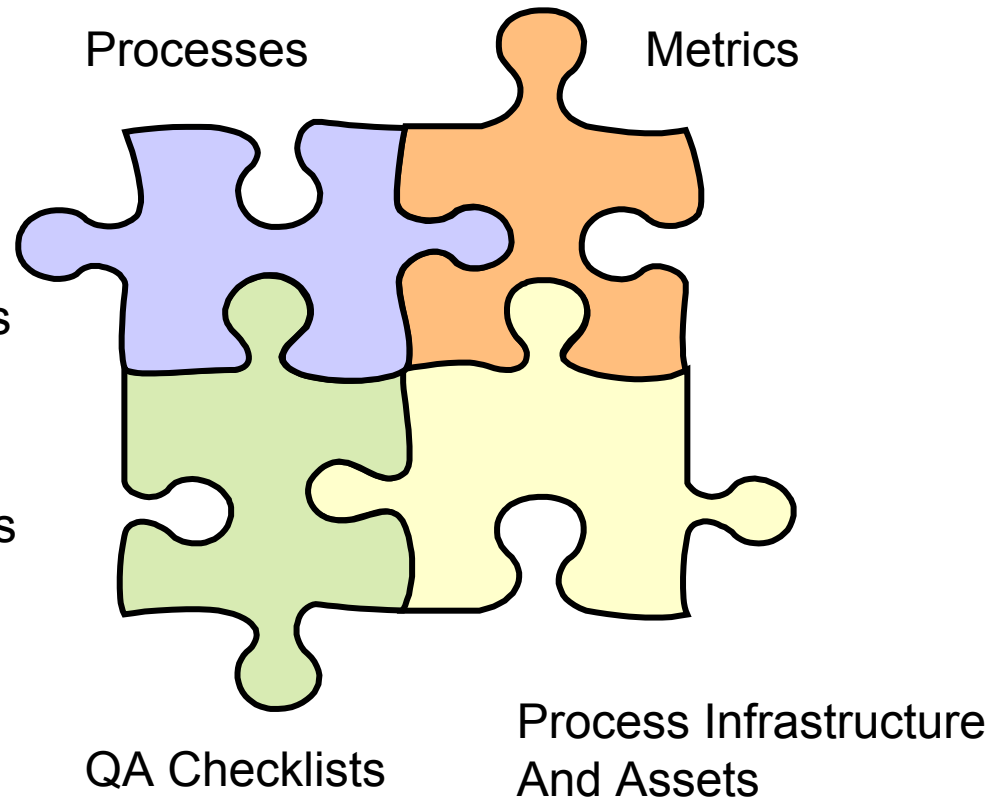


- ▶ A review of the PPQA audit results showed evidence that full process stability had not yet been achieved
 - Work product issues accounted for 35% of audit findings
 - Process/Policy issues accounted for about 30%
 - Process Tweaks introduced to account for 15% of issues
 - However, audit process was detailed enough to see these trends
 - Audit processes are usually a weakness for most organizations



Lessons Learned₈

- ▶ Create an integrated process solution
 - Process descriptions identify metrics to be collected
 - Measurement Repository points to source processes
 - Processes identify QA verification
 - QA checklists relate process threads to process assets and infrastructure for evidence
 - Process infrastructure reflects process architecture
- ▶ Smooths roll out and use



Lessons Learned₉



- ▶ Implement some CMMI-Friendly and hence Appraisal-Friendly processes
 - Show traceability within some of the process assets to the CMMI process areas
 - Acts as a built-in mentor, reinforces CMMI training
 - Effective if processes map very clearly to CMMI
 - Reduces logistics (and stress levels) to prepare for an appraisal
 - Simplifies appraisal process
 - Reduces appraisal time
- ▶ Some examples
 - Meeting agenda/minutes, PMR slides, project repository, measurement repository, plan, schedule
 - Preparing project summary presentations with CMMI traceability is also very appraisal-friendly as it helps the appraisal team more easily verify and give credit for oral affirmation data

Lessons Learned₁₀



- ▶ Create defined processes and assets
 - Moving process implementation to CL3 and working out kinks allows the organization to use more stable processes
 - Reduces the effort of the major improvement push associated with going to ML3
 - Allows those new to process time to build experience needed to identify improvements and practice continuous improvement
 - Provides a common approach on all projects and simplifies moving from one project to another
 - We implemented a hybrid between ETVX (entry criteria, tasks, verification, exit criteria) and ETXM (m=metrics) to produce ETVXM process architecture
 - Hint: If trying to be appraised at CL3, remember to update process asset library with examples of well-implemented work products and other PI data

Lessons Learned₁₁



- ▶ Spending more effort using more formal process design practices could have benefited QA and created training material
 - Employ other software development techniques
 - Context diagrams
 - Event sequence diagrams
 - Reuse design outputs as training and overview material (plan on leveraging those documents, think ROI)
 - Create tools to right-size process to environment
 - Metrics-based tailoring toolset
 - Incorporate Agile aspects into resulting products!

Summary



- ▶ Creating a more streamlined approach for process improvement is not only possible but can even lead to surprising results
 - Apply Agile principles
 - Be prepared to adapt to customer needs as you learn what they really need
 - “Beg, Steal and Borrow” to leverage widely available resources and reduce overall effort while also potentially increasing quality
 - Pro-actively manage process rollout to understand where you are and how far you still need to go to reach your process improvement goal
 - Learn where to place your priorities

Questions and Answers



Acronyms₁



- ▶ CL2/3 – Capability Level 2/3
- ▶ CM – Configuration Management
- ▶ CMMI – Capability Maturity Model Integration
- ▶ DAR – Decision Analysis and Resolution
- ▶ ETVXM – Entry Criteria, Tasks, Verification, Exit Criteria, Metrics
- ▶ FC – Full Compliance (with processes)
- ▶ FI – Full Institutionalization
- ▶ IEEE – Institute of Electrical and Electronics Engineers
- ▶ IT – Information Technology
- ▶ MA – Measurement and Analysis
- ▶ ML2 – Maturity Level 2
- ▶ OPD - Organizational Process Definition
- ▶ OPF – Organizational Process Focus
- ▶ OT – Organizational Training

Acronyms₂



- ▶ PA – Process Area
- ▶ PAL – Process Asset Library
- ▶ PI – Process Improvement
- ▶ PMR – Program Management Review
- ▶ PP – Project Planning
- ▶ PMC – Project Monitoring and Control
- ▶ QA – Quality Assurance
- ▶ REQM – Requirements Management
- ▶ ROI – Return on Investment
- ▶ SAM – Supplier Agreement Management
- ▶ SCAMPI – Standard CMMI Appraisal Method for Process Improvement
- ▶ SEPG – Software Engineering Process Group
- ▶ SEI – Software Engineering Institute
- ▶ VAL – Validation
- ▶ VER - Verification

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Presentation Sources



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- ▶ Changing Minds, “The Psychology of Change”, <http://changingminds.org/index.htm>, 2002
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