How TSP/PSP Addresses CMMI Implementation Issues in Federal Acquisition

Case Study of a CMMI Level 5 Federal Contractor

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Preamble

Don’t think of business as a life without greatness
Unless the distant goals of meaning, greatness, and
destiny are addressed, we can’t make an intelligent
decision about what to do tomorrow morning –
much less set the long-term strategy of the
compant
First decision must be to commit to an ethical world,
a civilized existence, a moral order
Nothing is more practical than for people to deepen
themselves.

- Peter Koestenbaum (pkipeter@ix.netcom.com)
Advanced Information Services Inc.

Winner IEEE Software Process Achievement Award
http://www.sei.cmu.edu/managing/ieee-award/ieee.award.html
Topics

- Transforming the world of software
  - Building organization, team, and individual capability
  - Models of excellence
  - CMMI, TSP, PSP
- Federal IT projects
- CMMI implementation issues
- TSP/PSP practices
- AIS SCAMPI A global strengths
- CMM, TSP, PSP – AIS results
Building Organization Capability - Issues

- Getting management attention
- Maintaining long-term improvement focus
- Guiding the improvement work
Building Individual Capability - Issues

- The need is not for lots of process data but for engineers who gather and use that data.

- What would happen if software professionals used sound engineering practices?
  - made and followed detailed plans
  - gathered and used historical data
  - measured and managed quality
  - analyzed and improved their processes

- The need is for a Level 5 Process at the individual level.
Self Improvement
Personal Software Process Training

PSP3
Cyclic development

PSP2
Code reviews
Design reviews

PSP2.1
Design templates

PSP1
Size estimating
Test report

PSP1.1
Task planning
Schedule planning

PSP0
Current process
Time recording
Defect recording
Defect type standard

PSP0.1
Coding standard
Size measurement
Process improvement proposal (PIP)

Team Software Process
Requirements
Configuration management

scaling up PSP methods to larger projects

defect and yield management

size, resource, and schedule plans

establishing a measured performance baseline

Source: Software Engineering Institute

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Building Teamwork Capability - Issues

- Need a vehicle to help organizations capitalize on the potential benefits of disciplined teamwork
- Need a mechanism to guide teams through defining their processes and making complete, precise, and detailed plans
- Need a coach
Building Self-directed Teams
The TSP Launch Process

Day 1
1. Establish product and business goals
2. Assign roles and define team goals
3. Produce development strategy and process

Day 2
4. Build overall and near-term plans
5. Develop the quality plan
6. Build individual and consolidated plans

Day 3
7. Conduct risk assessment
8. Prepare management briefing and launch report

Day 4
9. Hold management review
Launch postmortem

A qualified TSP team coach guides the team through a defined process to develop its plan and to negotiate that plan with management.
Transforming The World Of Software Models Of Excellence

CMMI – Builds organizational capability

TSP – Builds quality products on cost and schedule

PSP – Builds individual skill and discipline

Source: Software Engineering Institute
CMM Results – Defects

The TSP in Practice, SEI Technical Report, September 2003
Federal IT Project in Software Hell

“The Federal Bureau of Investigation has officially entered what computer professionals call "software hell." After spending $170 million to create a program that would give agents ready access to information on suspected terrorists, the bureau admitted last week that it's not even close to having a working system. In fact, it may have to start from scratch.”

- NY Times, January 22, 2005
Federal IT High Risk Projects

Number of High Risk Projects with and without Performance Shortfalls (as of March 2006)

- High risk projects with no performance shortfalls
- High risk projects with performance shortfalls

Agency

Source: GAO analysis of 24 CFO agencies' March 2006 high risk reports.
Performance Shortfall

“In addition, agencies reported that about 35 percent of the high risk projects—or 79 investments—had a performance shortfall, meaning the project did not meet one or more of these four criteria:

- establishing clear baselines
- maintaining cost and schedule variances within 10 percent
- assigning a qualified project manager
- and avoiding duplication with other investments”

Source: GAO-06-647
The Headlines

- GAO: Hundreds of federal IT projects are poorly planned and underperforming
  - Nextgov.com, July 31, 2008
- $26 billion in projects on IT high-risk list
  - Federaltimes.com, October 24, 2008
- Lawmakers today expressed frustration and disbelief over the continued shortcomings of information technology projects across the federal government
  - Washington Technology, September 21, 2007
CMMI Implementation Issues

Developers execute at lower maturity levels than their organizations have achieved and advertised.

Assurance that new projects will incorporate CMMI processes.

High capability and maturity level ratings do not of themselves guarantee program success.


Failure to change root cause behavior that leads to programs that do not meet cost, schedule and performance expectations.

Adequate maturity at program initiation.

CMM - Necessary, Not Sufficient

- No simple model could precisely measure process maturity and complex models are not useful in guiding improvement.
- CMM consciously focused on what organization should do, not on how they should do it.
- The teamwork practices and personal disciplines required for quality software work are almost entirely issues of how, and not just what.
- Because engineers will not change the way they work without very specific guidance, the CMM does not change engineering behavior.
CMM Implementation Issues
TSP/PSP Practices - 1

- TSP teams require that individual team members must have successfully completed the two week official SEI PSP for Engineers course.
- PSP trained engineers
  - make and follow detailed plans,
  - gather and use historical data,
  - measure and manage quality,
  - analyze and improve their processes.
- With the support of a SEI-authorized TSP coach, the TSP framework enables PSP trained developers to consistently follow these practices at the personal level, and ensure that the developers execute at the maturity level of the organization.
CMM Implementation Issues
TSP/PSP Practices - 2

- TSP framework recognizes that only top management can motivate development teams to follow disciplined practices of the organization defined CMMI processes.
- In TSP, projects are initiated with the TSP launch process consisting of 9 scripted meetings led by an SEI-authorized coach.
- The coach and the team lead ensure that the team understands not only “what” management wants to accomplish in the project as well as the “how”, including the use of organization’s CMMI process.
CMM Implementation Issues
TSP/PSP Practices - 3

- Team members make detailed plans utilizing historical data
- Follow documented estimating procedure
- Teams negotiate schedule and cost commitment based on the plan
- In weekly status meeting, teams track schedule progress using earned value management
- Team members measure and manage the quality of their work products
  - Early defect removal
  - Personal review yields
  - Highest quality product into test
CMM Implementation Issues
TSP/PSP Practices - 4

- TSP teams ensure that at program initiation, sufficient time is devoted to getting consensus on development strategy and process.
- TSP teams make a detailed plan that is granular and facilitates tracking to detect one day schedule slip.
- The TSP launch process ensures a jelled team that takes ownership of the plan and the process.
CMM Implementation Issues
TSP/PSP Practices - 5

- TSP framework prescribes 8 roles within the project for team members to take, in addition to the normal development responsibility.
- The roles of Process Manager and Quality Manager within the team ensures high quality development processes to support team goals from program initiation to successful completion.
SEI CMMI Maturity Level 5

ais

The AIS Software Development Organization
(Federal and Commercial)

has successfully completed a

SCAMPI™ A
(Standard CMMI® Appraisal Method for Process Improvement)

and satisfied the goal requirements to achieve a rating of

CMMI-DEV v1.2
MATURITY LEVEL 5
December 14, 2007

as listed on the Software Engineering Institute PARS webpage

Edward P. Weller
SEI-Certified SCAMPI High Maturity Lead Appraiser 0000096-00

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SCAMPI A – Final Findings
AIS Global Strengths

- TSP coaches provide continuous mentoring for project team members
- Process focus at all levels in the organization
- Open communication
- Self-managed team structure and roles
- Individuals with:
  - Strong quality focus
  - Commitment to customer and organization
  - Sense of ownership
- Opportunity for involvement with multiple groups within the organization
- Empowered to make decisions that affect the organization
CMM/TSP/PSP Results – Schedule

>10 years history of delivering within 8% of committed schedule on average
CMM/TSP/PSP Results – Effort/Cost

AIS

Effort Deviation Individual Value Control Chart - Development Phases

>10 years history of delivering within 4% of committed effort/cost on average

Date of Project Phase Start

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CMM/TSP/PSP Results – Defects

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User Acceptance Test Defects Per KLOC - New Development Projects
(Avg=0.15, UCL=0.66)

10 years history of post-delivery defects less than 0.15 per KLOC on average

KLOC – Thousand Lines of Source Code
Transforming The World Of Software Models Of Excellence

CMMI – Builds organizational capability

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Source: Software Engineering Institute
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