FASTTrack* to CMMI®

CMMI®
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The MITRE Corporation

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* FASTTrack is coined by Al Florence for process improvement
Agenda

◆ Impediments to Process Improvement (PI)
  ◆ Real Examples of Impediments
  ◆ FAS\textit{Track} to Process Improvement
  ◆ Real Examples of FAS\textit{Track}
  ◆ Summary
  ◆ References
  ◆ ?s
  ◆ Contact Information
What are the Impediments to PI? (1 of 2)

- When improving processes in organizations the following often occurs:
  - Process Improvement (PI) is done for process sake
    - Needs to be done for business sake
  - Management wants immediate feedback
  - Management wants Level 3 in six months
  - Staff fails to “buy-in” to PI
  - PI efforts linger forever, are ignored, fail, or are cancelled
  - Recidivism sets in

- Management is not aware of effort required:
  - Fails to provide adequate funding
  - Fails to provide adequate schedule
  - Fails to provide adequate resources
  - Fails to provide adequate PI staff/skills
What are the Impediments to PI? (2 of 2)

- Management is not involved
  - Fails to provide leadership
    - Needs to be actively involved
    - Needs to “crack-the-whip”
- Organizations not ready for PI *(not addressed herein)*
  - If organizations are not ready for change PI will fail
  - All units in an organization need to want to improve
- Supplier mature in process but not acquirer *(not addressed herein)*
  - It is very difficult for a contractor to be Level 2 or Level 3 if the acquisition Agency is Level *nothing*
  - A project will perform to the lowest level of either party
    - The lower level party brings the higher level one down to its level
Where are we?

- Impediments to Process Improvement (PI)
- Real Examples of Impediments
- FASTrack to Process Improvement
- Real Examples of FASTrack
- Summary
- References
- ?s
- Contact Information
Real Examples of Impediments (1 of 4)

Example 1

◆ An organization attempting Level 3
  ➢ Management schedule is 6 months
  ➢ Organization has no documented processes
  ➢ Organization is not following many processes
  ➢ Management fails to provide enforcement or support
  ➢ Organization fails to achieve even Level 2 in six months
  ➢ I quit

Example 2

◆ At a CMM conference
  ➢ Overheard at dinner table about a company involved in PI
  ➢ Someone asked how far they had gotten
  ➢ In one year they had implemented a process for conducting meetings!
Real Examples of Impediments (2 of 4)

Example 3

◆ Large acquisition agency
  ✔ Implements Quality Assurance (QA)
  ✔ Lacks QA expertise
    ✤ Extensive training and mentoring required
  ✔ 3 MITRE staff - 80%, 3 Government staff - 300%
  ✔ Insists on extensive process documentation
    ✤ About 7 procedures for QA each about 13 pages
    ✤ Extensive guidelines and training
    ✤ Write, review, re-write, re-review... (change “happy” to “glad”)
    ✤ Preciosity sets in
Real Examples of Impediments (3 of 4)

Example 3 (comp.)

- Reorganizes several times
  - Each time new managers and staff need to agree on QA approaches
  - Each time new managers and staff need to be trained
- After about 9 months QA process in place
- Organization reorganizes several more times
  - New managers and staff need to accept QA and be retrained
- QA falls apart
- QA effort restarted again two years later from scratch
- *Exactly the same scenario is experienced in attempting to implement Configuration Management (CM)*
Real Examples of Impediments (4 of 4)

Example 4

- Project plans
  - System Engineering Management Plan
  - Software Development Plan
  - Configuration Management Plan
  - Quality Assurance Plan
  - Etc.
- Often takes months to develop
- Involve tons of people
- Cost in excess of $100K!
- I have experienced this many times on different projects at different corporations
Where are we?

- Impediments to Process Improvement (PI)
- Real Examples of Impediments
- **FASTrack** to Process Improvement
- Real Examples of FASTrack
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A solution to PI impediments may be in FASTrack

- A process that is in need of time critical improvement is quickly implemented without much of the fanfare and tedious documentation that bogs down PI efforts
- The process is quickly defined and executed immediately as a pilot
- During the pilot’s execution, the process is refined, as necessary, and the process documentation is enhanced as required
- Data and artifacts are collected on the pilot’s execution which may be used as proof that the process is, or is not, successful and for continued process improvement
- Additional FASTrack pilots are executed as necessary throughout the PI efforts
**FASTrack to Process Improvement** (2 of 5)

- **FASTrack** implementation provides:
  - Early results to management
  - Buy-in from senior management and staff
  - Momentum to continue
  - Early process execution and artifact collection
  - Proof that process works
  - On-the-fly maturing of the processes
  - PI done for business sake
FAST Track to Process Improvement (3 of 5)

- Identify project/process for FAST Track
- If a process exists
  - Tailor and use
- If process does not exist quickly:
  - Develop draft
    - Process procedure
    - Procedure templates
    - Procedure guidelines
    - Procedure training
  - Select Standards
- Execute process
  - Start when draft procedure is developed
  - Continue as other drafts are done
- Collect artifacts
**FASTTrack to Process Improvement (4 of 5)**

- Mature process (on-the-fly)
- Expand
  - Procedure
  - Templates/guidelines
  - Training
- Develop/Expand Process Policy
- Select other Standards
- Store in Process Asset Library (PAL)
- 2nd, 3rd, and subsequent FASTTracks can begin anytime after the initial ones have started
**FASTrack to Process Improvement** (5 of 5)

1. Select project for FASTrack
2. Select process for FASTrack
3. Quickly develop/acquire draft process
4. Quickly execute draft process as pilot
5. Mature process on-the-fly
6. Update/complete process documentation
7. Collect process artifacts
8. Store process documentation

**FASTrack** to CMMI®
Where are we?

- Impediments to Process Improvement (PI)
- Real Examples of Impediments
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The following examples illustrate that process improvements and process installations can be done quickly, efficiently and effectively; FASTrack

Example 1

- Contractor developing the Galileo Probe to Jupiter
  - Micro processors, assembly language, firmware based
- Had never developed space firmware
- Had estimated effort at 3 developers for 6 months
  - Thought it was equivalent to a small FORTRAN program
- Had never developed real-time assembly/firmware code
- Had no software processes or standards
Example 1 (cont.)

- As the software development manager, I quickly
  - Developed (in about 3 weeks) a software process compliant with many CMMI Level 2 processes
    - Documented in a development plan
  - Re-estimated the effort
  - Acquired qualified staff

- Management was shocked that software could follow an engineering process

- Galileo spacecraft and probe were very successful for NASA
Real Examples of FASTTrack (3 of 19)

Example 1 (comp.)

“Al has generated software design, methodologies, design criteria and configuration control procedures for Galileo that will be a model for all programs. These procedures are unique in their completeness and quality for the Corporation for small software projects.” G. A Kravetz

“Many of us in the program office were originally concerned that the newness of flight software and the specific complexity of the software would compromise our estimated cost and schedule. The well organized software approach that Al has formulated and implemented has completely removed any concern. It should be noted that the software management plan generated by Al has been adapted for the entire Galileo program including the flight software for the relay receiver and the system test software.” R. J. Drean
Real Examples of FASTrack (4 of 19)

Example 2

- Management for a DoD contractor would accept new requirements from the acquisition agency (Theatre Battle Management) without conducting impact assessments and would instruct staff to implement them.
- Staff was working overtime and on weekends to keep up with this requirements creep.
- I was new to the organization as a senior systems engineer.
- I convinced management that they needed to evaluate the state of their engineering/management practices.
  - They seemed unaware that things could be done different.
- They allowed me to attempt to fix this problem.
- I quickly developed a CM process, in two days, which included a Configuration Control Board (CCB).
- I quickly trained staff and management on the process.
Example 2 (cont.)

- The next requirements request from the customer was given to me to evaluate

- I had staff:
  - System
  - Hardware
  - Software
  - Test
  - Quality Assurance
  - Configuration Management
  - Program Management
  - Contracts

- Conduct an impact assessment against their interests not limited to:
  - Function
  - Performance
  - Cost
  - Schedule
  - Interfaces
Real Examples of FASTrack (6 of 19)

Example 2 (comp.)

- The impact assessment showed that the request could not be implemented
- I told the CCB that we had to reject it
  - Can we do that?
  - Watch me!
- CCB recommended rejection
- Management accepted the recommendation
  - This was the first time they had ever rejected a customer request
- This started the organization down the path to process Improvement
  - Within a few years they had achieved CMM® Level 3
Example 3

- Contractor developing a very large criminal database application
- Going into a System Design Review
- As the newly assigned Development Manager I reviewed the System Requirements Specification
  - Requirements very poorly written: ambiguous, inconsistent, not uniquely identified, untestable, unimplementable, etc. *(so what else is new?)*
- Convinced management and the customer to delay the review by one month to fix specification
- Quickly documented a methodology for the proper specification of requirements
  - Had been using this method since 1978
- Trained the system, software, and test engineers on the methodology
- We rewrote the specification and passed the review without any action items assigned to us
Example 4

- Same contractor developing a very large criminal database application
- Configuration Control Board (CCB) meeting once a week for 2 to 3 hours
  - CCB items ranged from requirements to design defects and everything in between *(even the kitchen sink)*
  - Membership included all managers and all technical leads
    - About 12 members
    - Program Manager (PM) Chair
I convinced the PM to allow me to redesign the CCB and Configuration Management Process

- CCB items ranged from baselined requirements to other important contractual, critical issues such as:
  - Statement-of-Work
  - Master Schedule
  - Costs, based on thresholds
- CCB met monthly or as necessary
- CCB membership
  - PM (Chair)
  - Deputy PM
  - Development Manager
  - Systems Engineering Manager
  - Test Engineering Manager
  - CM and QA Managers
  - Contracts (as necessary)

The project continued this approached and achieved, with the organization, CMM Level 3 less that 2 years after contract award without a Level 2 assessment.

2 Unfortunately, we failed at to achieve Level 4 for many of the reasons listed earlier.
Real Examples of FASTrack (10 of 19)

Example 4 (comp.)

- Formed a Technical Review Board (TRB)
  - Winnow out items from CCB
  - Promote appropriate items to CCB
  - Conduct impact assessments on baseline changes
  - Make recommendations to CCB
- TRB met weekly
- TRB membership
  - Deputy PM (chair)
  - Development Manager
  - System Engineering Manager
  - Test Manager
  - CM and QA Managers
  - Technical Leads (as required)

Project continued to improve processes and acquired CMM® Level 3 compliance by Critical Design Review. Its parent organization was the first to achieve Level 3 in the corporation.
Real Examples of FASTrack (11 of 19)

Example 5

◆ A DoD organization that acquires and also develops products is implementing both the CMMI® for development and the CMMI® Acquisition Module for acquisition

◆ Using a FASTrack approach

◆ Formed

➢ Steering Committee (Senior Executive Management)
  ▶ Approve, release, and enforce process policy
  ▶ Approve process procedures
  ▶ Oversee and approve Process Group’s efforts

➢ Process Group (3 MITRE staff 60% FTE, 5 DoD staff 25% FTE)
  ▶ Provide status and recommendations to Steering Committee
  ▶ Develop/acquire processes
  ▶ Develop/acquire and present process training
  ▶ Select projects for FASTrack
  ▶ Select processes for FASTrack
  ▶ Follow FASTrack approach
Real Examples of FASTTrack (12 of 19)

Example 5 (cont.)

◆ Process Group
  - Developed Process Policy
  - Selected pilot project
  - Selected processes to pilots
  - Developed Schedule
    - Level 2 Appraisal,
    - Level 2 and Level 3 processes
    - Acquisition processes
  - Developing draft processes
  - Developing draft guidelines
  - Developing training on processes
  - Providing training

◆ Steering Committee
  - Signed Process Policy
  - Reviewed and approved FASTTrack approach
Real Examples of FASTrack (13 of 19)

Example 5 (cont.)

💖 Pilot Project
  ➢ Taking training
  ➢ Applying FASTrack on processes
  ➢ Maturing processes

💖 Organization had no documented procedures

💖 Pilot project followed undocumented methods and had some process artifacts
  ➢ CCB Minutes
  ➢ CM Plan
  ➢ Baseline Requirements
  ➢ Etc.
Example 5 (cont.)

🔹 Leveraged *CMMI® to develop draft procedures and training
  ➢ Two or more processes developed and implemented per month
    (note: 9 months to implement QA shown on Examples of Impediments, example 3, with many more resources)
    ✷ Developed draft procedure and guidelines
    ✷ One to two procedure per process area (3 to 4 pages vs. several procedures with up to 13 pages shown on Examples of Impediments, example 3)
    ✷ Developed and delivered process training (can be used as guidelines)

🔹 Piloting procedures on project
  ➢ Provide mentoring
  ➢ Mature process
  ➢ Collect artifacts

*Credit given to SEI
APPENDIX A QUALITY ASSURANCE TASKS - TAILORING TABLE

A QA plan has been developed that is generic and should cover QA needs for most projects.

It has a tailoring mechanism built into an appendix where the detailed QA activities are described.

Projects use the appendix to appropriately tailor the plan to the project’s specific needs and to the scope of the application.

Projects can accomplish this tailoring with minimum resources and costs.
Real Examples of FASTrack (16 of 19)

Example 5 (cont.)

QA Plan Tailoring (2 of 4)

Appendix A

Describes the activities to be executed to effectively administer the QA program. It provides a tailoring schema used to tailor this plan to be used on specific programs and projects.

Allows for quickly adapting plans to projects

All too often project plans: (Project Management Plan, System Engineer Plan, Software Development Plan, Configuration Management Plan, Quality Assurance Plan, etc.) take months and tons of people to develop, and can cost in excess of $100K.
### Appendix to QA Plan

#### QUALITY ASSURANCE TASKS TAILORING TABLE

QA tasks are shown in the table along with task numbers. Responsible organizations are shown along with QA process areas. References to procedures are included for those tasks that require them. The table allows programs and projects to tailor the QA process to the scope of a specific application by indicating “Y” for “used” and “N” for “not used”. Additional QA tasks can be added at the end of each section, if needed, for a specific application. The main body of this plan should not be tailored since all QA tasks are included in this appendix.

TAILORED FOR PROJECT/PROGRAM: ____________________________
Program/Project Manager: _________________________________
Date: ______________

OTC Process Group: ________________________________
Date: ______________

OTC Enterprise-Level Quality Assurance: __________________
Date: ______________

OTC Process Steering Committee: _________________________
Date: ______________
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<tr>
<th>3.4 QA Manager</th>
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<tr>
<td>a. Primarily responsible for overseeing QA task assigned to programs/projects and to QA personnel</td>
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<td>b. Works closely with the Process Group and serves on the group while developing QA process artifacts and QA orientation and training</td>
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<td>c. Provides QA orientation and training</td>
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<tr>
<td>d. Works with Program/Project Management in tailoring and applying QA.</td>
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<tr>
<td>e. Attempts to resolve QA non-compliance with program/project management</td>
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<tr>
<td>f. Escalates QA non-compliance to Steering Committee</td>
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<th>3.5 QA Personnel</th>
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<td>a. Support the development/acquisition of QA processes and best practices</td>
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<tr>
<td>b. Support the development and tailoring QA plans</td>
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<tr>
<td>c. Conduct product reviews on external products delivered by contractors and suppliers</td>
<td>QA Product Review Procedure</td>
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<td>d. Conduct product reviews at the enterprise level and on programs/projects</td>
<td>QA Product Review Procedure</td>
</tr>
<tr>
<td>e. Conduct process audits at the enterprise level and on programs/projects</td>
<td>QA Process Audit Procedure</td>
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# Real Examples of FASTrack (19 of 19)

Example 5 (comp.)  
**Level 2 Appraisal in February 07 Scheduled**

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<th>CMMI®-AM</th>
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<td><strong>Support</strong></td>
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**FASTrack on Schedule**

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Where are we?

- Impediments to Process Improvement (PI)
- Real Examples of Impediments
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Summary (1 of 2)

◆ CMMI implementation can be:
  - Costly
  - Time consuming
  - Prone to failure

◆ Many reason for this
  - Management support
  - Schedule constraints
  - Funding
  - Immediate expectations
  - Excessive process documentation
  - Failure to get buy-in
  - Etc.
Summary (2 of 2)

- FASTrack provides
  - Early results to management
  - Buy-in from senior management and staff
  - Momentum to continue
  - Early process execution and artifact collection
  - Proof that process works
  - On-the-fly maturing of the processes
References

1. Florence, Al. *Proper Specification of Software Requirements*;
   b. NDIA System Engineering Conference, October 2005
   c. SEPG Conference, March 2006
      i. Won best paper award at MITRE, 2003
      ii. Used by David A. Cook, Ph.D. as required reading by his graduate students in Systems Engineering
   e. Quality Assurance Institute Journal, October 2003

2. Florence, Al; *Success at Level 3, Failure at Level 4, Lessons Learned*;
   1. Software Technology Conference (STC), Salt Lake City. 2001
   4. Quality Assurance Institute Journal, April, 2002

3. *Capability Maturity Model® Integration (CMMI), Version 1.1.*
   Software Engineering Institute. March 200
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