How to Sell Process Improvement

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DRS Technologies is a leading supplier of integrated products, services and support to military forces, intelligence agencies and prime contractors worldwide. Focused on defense technology, the company develops, manufactures and supports a broad range of mission-critical systems and sustainment solutions to support homeland security and the military’s current and future force.

DRS holds leading market positions in thermal imaging devices, combat display workstations, electronic sensor systems, power systems, rugged computer systems, air combat training systems, mission recorders, deployable flight incident recorders, environmental control systems, telecommunication systems, aircraft loaders, military trailers and shelters, and integrated logistics support services.
I have been given the goal of reaching CMMI Maturity Level X by the end of the year and nobody will cooperate with me!

or

I just reached my CMMI Maturity Level X last year and now all my programs are backsliding!

How do I get these programs to follow the processes?!?
“I didn’t bid CMMI on this job”
  – “What is the cost of CMMI?”
• “I’m behind schedule/working overtime already”
• “I’ve been doing it this way for years”
• “Everyone already knows what they are suppose to do”
• “This program is an exception/not included in the appraisal”
Process implementers do not believe they need to change.

Management concerns about cost.

Short timeline to achieve goals.

Backsliding after certification.

How is process improvement like a diet?
  - They both start out with good intentions, but eventually fall back into old habits.
4 Methods for Motivating Practitioners

- Don’t know what they are suppose to do
  - Provide help
- Don’t have time or funding to follow processes
  - Show cost benefit of process compliance
- Too wrapped up in addressing a risk or problem
  - Use process to solve their problem
- No one knows they are/aren’t following the processes
  - Friendly competition to be more compliant
Provide Help - Mentor Don’t Police

- Assign 2 QA/Process resources to each program
  - One resource to audit the program’s process compliance
  - One resource to mentor the program on process
- Assist program’s in defining their process tailoring
- Provide just in time (JIT) training on all new processes/templates
- Attend group meetings
- Explain audit findings and help to create corrective action plans
Model the Cost Benefits of Process Compliance

- Return on investment (ROI)
- Need to be able to prove to managers that it will be more costly NOT to follow processes
- Modeling process compliance savings allowing managers to see the cost savings when creating their defined process
  - Note: This is not a ML 4 model

“Large increases in cost with questionable increases in performance can be tolerated only in race horses and women.” Lord Kelvin
## SW Cost of Quality Model

### Use Defined Input:
- 44366 SLOC
- $140.00 Labor Cost

### Variable Input:
- 131.927077 % Code Reviewed
- 56.9811289 Defects Removed during Test
- 1.0066344 % Delivered Defects

### Defect Estimates:
- Total Code Defects: 228.73268
- Defects Removed by Klocwork: 28.38784
- Defects Removed by Code Review: 131.927077
- Delivered Defects: 11.4366344

### Cost Estimates:
- Cost of Klocwork: $1,845.21
- Cost of Code Reviews: $21,240.26
- Cost of Test: $155,980.14
- Cost of Fixing Defects Prior to Delivery: $179,065.61
- Cost of Fixing Delivered Defects: $156,533.21
- Total Cost of Removing Code Defects: $335,598.82

### Where Defects Detected

<table>
<thead>
<tr>
<th>Number of Defects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivered Defects</td>
</tr>
<tr>
<td>Defects Removed during Test</td>
</tr>
<tr>
<td>Defects Removed by Code Review</td>
</tr>
<tr>
<td>Defects Removed by Klocwork</td>
</tr>
</tbody>
</table>

### Cost of Defect Removal

- $700,000.00
- $600,000.00
- $500,000.00
- $400,000.00
- $300,000.00
- $200,000.00
- $100,000.00
- $0.00

- Cost of Fixing Delivered Defects
- Cost of Test
- Cost of Code Reviews
- Cost of Klocwork

- Proposed: [Graph]
- Baseline: [Graph]
What You Need to Know

- Program size in Source Lines of Code (SLOC)
  - Use code counting tool
- Total coding defects on the program
  - Need to have program collect this
- % SLOC reviewed
  - Include in minutes
- Defects found at code reviews
  - Include in minutes
- Time spent in code reviews
  - Prep & meeting time (include in minutes)
- Time spent testing
  - Mine from existing programs
- Time spent fixing defects after SW delivery
  - Mine from existing programs
Estimate Defects

- Need to be able to predict the number of defects on the program
- Estimate the number of defects removed by each event
  - What % defects do you remove by code review?
  - Do you need to remove all defects prior to delivery?
  - Test
Estimating Cost

- Estimate the time of removing those defects at different lifecycle events
  - Code review
  - Test
  - After delivery
- Allow program to enter labor cost and multiply time by labor to get cost
Solve a Problem

- Actual NRE exceeding estimated NRE
  - Design to cost
- System testing overruns due to run time errors
  - Derive SW & HW requirements from a system performance requirement
- Actual labor costs exceed estimated labor costs
  - Establish database of historical performance for use on future programs
Monthly reports:

- Report program process compliance to management in an easy to understand stoplight chart

Programs compete on process compliance

<table>
<thead>
<tr>
<th>Process Audit:</th>
<th>PP</th>
<th>PMC</th>
<th>SM</th>
<th>CM</th>
<th>Sys</th>
<th>HW</th>
<th>SW</th>
<th>PI</th>
<th>PW</th>
<th>spare</th>
<th>spare</th>
<th>Overall</th>
<th>Compliance Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process Coverage:</td>
<td>100%</td>
<td>52%</td>
<td>68%</td>
<td>32%</td>
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<td>28%</td>
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<td>100%</td>
<td>100%</td>
<td>88%</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td>96%</td>
<td>2</td>
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</tbody>
</table>

Engineering Issues: no evidence of defects being tracked to closure, BDTM incomplete
QA Audit Findings

- Perform trend analysis on findings and address issues across programs

"If you can not measure it, you can not improve it."
Lord Kelvin
Summary

• Understand that process improvement changes are disruptive to process practitioners
  – Provide mentoring to make process compliance easier to understand

• Compute ROI for process changes
  – Prove to program managers that process compliance is cost effective
  – Facilitates process tailoring

• Use processes to solve program problems
  – Process is the solution not the problem

• Measure process compliance and report it regularly at meetings with program resources and upper management
  – Process compliance included in annual goals
  – Programs compete on process compliance
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Need to be able to predict the number of defects on the program
  - Average
    - Total coding defects from a program / SLOC
  - Regression equation

Estimate the number of defects removed by each event
  - What % defects do you remove by code review?
    - Average
      - Program X reviewed 50% of their code and found 65% of their defects
      - 65%/50% = 130% (average this across programs)
      - Multiply the % code reviewed by 130% to find out what percentage of defects are removed by code review
    - Regression equation
  - Do you need to remove all defects prior to delivery?
    - Allow the user to define what percentage of defects will not be fixed prior to delivery
  - Test
    - All defects not removed from code review or delivered to the customer are removed during test
    - Time by type of test event (unit, integration, system)
Estimating Cost

- Estimate the time of removing those defects at different lifecycle events
  - Code review
    - Average program found 1 defect per hour at code review
    - Estimate cost of fixing code defect
    - Total time = code review + fixing time
  - Test
    - Time SW engineers spent in testing divided by the number of defects they removed
  - After delivery
    - Same as above, but for a post delivery cycle
- Allow program to enter labor cost and multiply time by labor to get cost