Can Six Sigma & CMMI Get Along? (The answer is Yes!)

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Session: sepg1439
About Intel IT Flex Services

IT Flex Services ("Flex") is Intel’s internal, full-service technology solution provider and consulting practice.

**Accessible:**
Available to all Intel business units as well as to various external initiatives.

**Valuable:**
We deliver $130M+ annually in built-to-order solutions and services through a scalable fee-for-service business model.

**Flexible:**
We extend and complement core IT and other partners' technical capacity with additional burst capacity and resources.

**Unique:**
We offer a blend of industry talent and familiarity with Intel business processes and products not available anywhere else.
Flex AQI Program

“Accelerated Quality Improvement”:

- Internal quality improvement program (i.e. SEPG) for Flex Services
- An overhead function in a break-even Pay-Per-View organization
- That means we must both improve quality and be increasingly efficient
- Use Lean / Six Sigma as a methodology for improving our program practices as well as optimizing our organizational processes
### DMAIC Overview

<table>
<thead>
<tr>
<th>What is important?</th>
<th>How are we doing?</th>
<th>What is wrong?</th>
<th>What needs to be done?</th>
<th>How do we guarantee performance?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Define</td>
<td>Measure</td>
<td>Analyze</td>
<td>Improve</td>
<td>Control</td>
</tr>
</tbody>
</table>

**Define**
- Describe the problem or opportunity, goal, process and requirements

**Measure**
- Gather data about the problem and process

**Analyze**
- Use hypothesis and data to find root causes

**Improve**
- Develop, implement and refine solutions

**Control**
- Plan for stability and measurement
DEFINE - AQI Productivity Improvement*

**Problem Statement/ Business Need:**

- AQI is required to maintain an improved rate of process engineering toward implementing CMMI ML3/ML4, but at a reduced cost.
- The Flex break-even business model puts constant pressure on spending toward process improvement
- Intel business conditions add focus in efficiency improvements

**Goals/ Objectives:**

- Demonstrate 15.0% or greater improvement in process engineering productivity toward closing CMMI ML3/ML4 gaps while maintaining existing pace of 2-4 “gaps” closed per month on average and an effort budget of no more than 2000 hours/quarter.

**Finance-Approved Business Impact:**

- Over **three years**, this translates to a Business Value of **$138-$277K**.

* Taken from Six Sigma project charter document
### DEFINE - AQI Productivity Improvement

<table>
<thead>
<tr>
<th>What improvement is targeted and what will be the impact?</th>
<th>How do you quantify success?</th>
<th>Metrics</th>
<th>Baseline/Current</th>
<th>Goal</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improvement Goal</td>
<td>Monthly Productivity</td>
<td>.0046</td>
<td>.00529 (+15%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boundary Condition Maintain (or Exceed)</td>
<td>Monthly Gap Closure rate</td>
<td>2-4</td>
<td>2-4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boundary Condition Maintain (or Decrease)</td>
<td>Quarterly Effort rate</td>
<td>2000</td>
<td>2000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Units**
- Monthly Gaps Closed/Effort Hr
- Goal Equivalents per Month
- Effort Hours per Quarter
Measure - Problem

Quarterly Process Improvement Productivity

IT Flex AQI Program

Figure 1a – Q4’06 Data Added (Q4 productivity=0.0047)
MEASURE - AQI Productivity Improvement

Key Takeaways: Planning and Review are taking more effort than expected and have non-value added steps in the process diagram – improvement opportunities!!
### MEASURE - AQI Productivity Improvement

<table>
<thead>
<tr>
<th>Suppliers</th>
<th>Inputs</th>
<th>Process</th>
<th>Outputs</th>
<th>Customers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Providers of the required resources</td>
<td>Resources required by the process</td>
<td>Top level description of activity</td>
<td>Deliverables from the process</td>
<td>Anyone who receives a deliverable from the process</td>
</tr>
<tr>
<td>Alan (PIID status)</td>
<td>gaps</td>
<td>number of gaps left to CMMI ML3</td>
<td>requirements allocated</td>
<td>Satisfies Requirements (RRR criteria met)</td>
</tr>
<tr>
<td>Flex Staff</td>
<td>resources</td>
<td>skillset and availability to support work to be done</td>
<td>quality improvement process (step 6.4 in particular)</td>
<td>Support/Improve Biz quality (useful &amp; painfree)</td>
</tr>
<tr>
<td>CMMI</td>
<td>goals &amp; practices</td>
<td>model expectations</td>
<td>QMS assets (standard processes)</td>
<td>satisfies requirements (ticket closure)</td>
</tr>
<tr>
<td>end users</td>
<td>tickets</td>
<td>priority, severity, reqts are clear, concise</td>
<td>tangible / available</td>
<td>Flex Staff</td>
</tr>
<tr>
<td>IT, Flex staff, Intel</td>
<td>other biz rets</td>
<td>relevance to our processes/org</td>
<td>tangible / available</td>
<td>Alan (PIID Changes)</td>
</tr>
</tbody>
</table>

#### Key takeaways:
Knowing our Critical for Quality indicators helps us prioritize areas of opportunity and avoid fixing one thing just to break something else equally important.
Key Takeaways:

Using **Cause and Effect Matrix** and **Pareto Chart**, we identified top four key process step/inputs to further analyze:

- Plan the work – PMs
- Plan the work – Planning participants
- WPR – PMs
- WPR – WPR Process

Project team used **FMEA (Failure Modes Effects Analysis)** to identify root causes and appropriate actions.
FMEA (Failure Modes and Effects Analysis) was completed to identify root causes with biggest impact:

- Inappropriate reviewer selection
- PM skill level
- Poor Design
- Poor controls/detection

Actions/Owners were identified for each:

<table>
<thead>
<tr>
<th>Action</th>
<th>Owner</th>
</tr>
</thead>
<tbody>
<tr>
<td>A - Establish Criteria for selecting right reviewers for Standard WPR methodology w/in AQI program;</td>
<td>Lisa</td>
</tr>
<tr>
<td>B - Improve controls</td>
<td>Alan</td>
</tr>
<tr>
<td>C - Establish Criteria for selecting right PMs;</td>
<td>Keith</td>
</tr>
<tr>
<td>D - Improve controls</td>
<td>Alan</td>
</tr>
<tr>
<td>E - Implement Design Phase and Design Reviews into AQI lifecycle;</td>
<td>Keith</td>
</tr>
<tr>
<td>F - Improve Controls</td>
<td>Alan</td>
</tr>
</tbody>
</table>
ANALYZE - AQI Productivity Improvement

Actions validated by re-calculating RPN for post-fix scenario

Key Takeaways:

Actions taken will improve highest RPN items in FMEA, but also address lower ones through ‘collateral benefit’ effect.

Flex Alternative Selection Process wasn’t used in this case, but gives a good framework for evaluating alternative actions during this step if needed.
IMPROVE - AQI Productivity Improvement

Implement changes during “Sally” release Early Adopter Period and test with AQI program.

- Quality Improvement Process
  - WPR criteria added
  - AQI PM criteria added
  - AQI lifecycle added, includes design reviews
  - PPQA processes placed emphasis on AQI

- Aligned PQAG resources to mentor and review AQI projects
  - Adds control over AQI activities same as with full projects

Pending successful pilot, implement to production with “Sally” release at end of Q2.
IMPROVE– New Work Product Review form

- Define
- Measure
- Analyze
- Improve
- Control

Clarified review scope

Automation

Work Product Review and Approval Template

Review Information

- SR#
- Inspection Leader
- Type of Review
- Content To Be Reviewed
- Work Product Size
- Date of Request
- Date of Approval

Document Information

- Title
- Link to WP
- Log Entry... (Optional)
- All Defects View
- Defect Summary

Reviewers / Approvers

- Scope of Review
- Time Spent
- Approved

Technical Review Leader Log

- Re-Work effort
- TOTAL # of Defects Found by Severity
  - Show Stopper
  - Medium
  - Low
- TOTAL Defects
- TOTAL TIME SPENT (Hours)

AR / Issue / Resolution

- Due Date
- Assigned To
- Status

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IMPROVE - AQI Productivity Improvement

Key Take away:
There is relative decrease in the V&V effort, yet a relative increase in rework effort. This indicates that the V&V activity is still finding defects and driving rework, just more efficiently.
IMPROVE - AQI Productivity Improvement

"As Is" process map

"To Be" process map
Key Take away-The control charts show a drop in weekly V&V effort, but the rework effort remains at roughly the same level. Another confirmation that we haven’t thrown out quality.
## CONTROL - AQI Productivity Improvement

<table>
<thead>
<tr>
<th>Action</th>
<th>Who</th>
<th>When</th>
<th>How</th>
<th>Why</th>
<th>Corrective Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revise AQI’s WPR &amp; data mgt plan &amp; execute to it</td>
<td>AQI PM - Keith</td>
<td>Bi-Weekly</td>
<td>Update PrP, use PTOC, report to Lisa, review at AQI Coordination Meeting</td>
<td>Ensure that the program executes the improvements and captures data</td>
<td>Educate AQI team leads, assign ARs to correct and provide missing data</td>
</tr>
<tr>
<td>Monitor WPR &amp; Rework effort data</td>
<td>AQI PM - Lisa</td>
<td>Monthly</td>
<td>AQI Coordination Meeting Review*</td>
<td>Observe &amp; ID effort OOC &amp; act on signals</td>
<td>Take action to get process back in control**</td>
</tr>
<tr>
<td>Monitor PM Compliance to AQI PDP re: WPR &amp; data mgt.</td>
<td>PQAG - Rick</td>
<td>Quarterly</td>
<td>Audit</td>
<td>Observe &amp; ID process compliance &amp; act on non-conformance issues</td>
<td>Log &amp; Fix Non-conformances</td>
</tr>
<tr>
<td>Monitor the Control Plan</td>
<td>Compliance manager – Alan</td>
<td>Quarterly</td>
<td>Institutionalization audit via the checklist for OPF</td>
<td>Ensure accountability for the control plan</td>
<td>Ensure status of critical variables is visible</td>
</tr>
</tbody>
</table>

* Monthly review of V&V and Rework Effort in hours per week as plotted on a control chart using JMP. Data source is Tracking Tool for AQI Program

** See past special causes.
Summary of the outcome

- Weekly V&V effort dropped from ~50 hrs/week to ~3 hrs/week without compromising output or quality.
- Using a conservative figure of only 25hrs per week for calculations...
  - 25x52x$67=$87,100 per year which calculates out to $261,300 in three years.
  - The original Finance-Approved Business Impact over three years was $138-$277K.
Quotes & Role Models

George Box - “All models are wrong; some models are useful”

W. Edwards Deming: “In God we trust, all others bring data”

Peter Drucker - “If you can't measure it, you can't manage it.”

Swiss Army Survival Guide - “If the map doesn't agree with the terrain, in all cases believe the terrain.”

Gandhi – “You should be the change that you want to see in the world.”

Wayne Gretsky – “Skate to where the puck is going to be”

Albert Einstein – “Things should be made as simple as possible, but not any simpler.”

Watts S. Humphrey - "Insane persons believe they can continue doing the same thing over and over and get a different result."
Any Questions?
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