Lessons Learned on the way to Level 3

If we knew then what we know now...

The process improvement journey of ARA’s Southeast Division (SED)

NDIA 8th Annual CMMI® Technology Conference and User Group
November 17 – 20, 2008

- Dave Groening  ARA SED QA & Process Improvement Lead
- Beth Layman  Principal, Layman & Layman
- Allen York  ARA SED Division Manager
About ARA and Southeast Division

- An engineering and science services company with distributed offices
- Diverse DoD and Federal contractor
- 1,200+ employee owners
- FY 08 Sales of ~$200 million
ARA Southeast Division

- HQ in Raleigh, NC
- Sales of approx $23M in FY08
- Mix of MS and PhD-level engineers/scientists and senior-level software system developers

Areas of Expertise
- Large-scale software system development
- High-fidelity and fast-running physics-based weapon-target interaction modeling
- Sensor exploitation & target recognition technologies
- Synthetic environment generation for semi-automated forces and visual simulators
- Conventional and nuclear (low and high altitude) weapon effects
- Rapid site/facility modeling tools
- C4ISR and decision support technologies
- Counter-IED technologies
Our Process Improvement History

FY06:
• Additional CMMI training
• Creation of Process Asset Library (PAL)
• SCAMPI Class C Document Review

FY07:
• EPG reviewed & approved processes
• Produced & began delivering process training
• Project rollout started
Process Improvement FY08

October – December
- Process training (PAL 1.0)

January - February
- Contracted with Layman & Layman
- SCAMPI Class C
- Revised FY08 Process Improvement plan
- New PI organizational structure

March - May
- PAL 1.1 process revision
  - 5 working groups (PATs)
  - More unified, detailed and prescriptive set of processes - Easier to use
- Overview sessions for all staff

June – August
- New EPG
- PI Plan update
- Project transition workshops
- Role-based training
- PAL 1.1 process audits

September
- SCAMPI B
Establish an effective Process Improvement organization

- Dedicate at least some of the resources
- Define Management’s role and keep them engaged
- Gaining buy-in across the organization is critical
- Run process improvement like a project
- Consider using a consultant
On PI = Organizational Change

Process definition is easy, process deployment and institutionalization is hard!

Lesson Learned: Don’t spend all your energy on task work

The ARA team initially underestimated their role and the powerful dynamics of change

Org. change leadership is now practiced w/great results!
MSG Role in Process Improvement

What are your main responsibilities? (Hint: There are 4 of them)

1. DRIVE PI PLANS
   - create vision and desire for change
   - approve all PI strategies, plans, roadmaps
   - ...including Measurement & Training Plan development and execution

2. COMMUNICATE regularly about PI program to your teams
   - tie business objectives of the organization to PI program
   - review plans, scope, upcoming events, expectations

3. Provide CONSEQUENCES for “not doing” it
   - ENFORCE compliance
   - tie to CDP/annual reviews

4. MONITOR & CONTROL PI Program
   - treat it like any other project
   - remove roadblocks
SED’s Communication Plan
PI Program Funding

- Our ongoing software projects could not be burdened with our PI/CMMI start-up expenses – expenses not planned for the projects
  - We did not pursue asking the government to fund our PI program through existing software projects

- Funding is a critical constraint because
  - SED is essentially a small business
  - Received little corporate support
  - Cannot use “profit” - must fund within our cost structure
    - Required an Internal Research and Development (IR&D) effort
  - IR&D funds are limited and are shared with costs to prepare proposals → trading PI for business up front
Funding Strategy

- Took out a multi-year IR&D
  - Had to be approved by CEO

- IR&D covered expenses for
  - Creating PAL, processes, templates, forms, plans
  - PIL, SCAMPIs and appraisal team, consultant

- Projects covered expenses for
  - Adopting processes – process training
  - Creating artifacts
  - Molding contractual documents to fit PI/CMMI standards
  - Process audits
How much did it cost?

- Over $1M!
- Over 3 years
- We have tracked about $950k through IR&D project
- Estimate some IR&D expenses went on overhead and some went on “personal” time
- By far, the longest and most expensive IR&D in corporate history
Lessons Learned:
- The model’s just a model
- Terminology does matter
- Avoid process silos – what’s needed is a cohesive set of processes
- Prescriptivism is better than vagaries
- Allow legacy variances (but not for preferences)
- Connect processes and training through roles
- Integrate process and measurement
- Ease the implementation burden with simple tools
Specific Process Areas

- **Project Management**
  - tying everything together with a lifecycle model

- **Measurement & Analysis**
  - the benefits of using a measurement information model

- **Organizational Training**
  - linking training with strategic planning and performance management

- **Process & Product Quality Assurance**
  - monitor process improvement progress
Project Management

tying everything together with a lifecycle model
Project Management
tying everything together with a lifecycle model
Project Management

tying everything together with a lifecycle model

Scoping & Planning
Analysis
Design
Implementation & Integration
Testing
Acceptance & Release

Project Award
Software Requirements Review
Prelim. Design Review
Critical Design Review
Test Readiness Review
Acceptance Test
Release

Project Management
Supplier Agreement Management
Configuration Management
Decision Analysis & Resolution
Measurement & Analysis
Process Audit
Requirements Development & Management
Technical Solutions
Product Integration
Verification
Validation

Process Management
Organizational Training

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SED Measurement Information Model

- Attribution & Decision Criteria
- Measurement Method
- Derived Measure
- Base Measure
- Analysis Model
- Application Guidance & Decision Criteria
- Information Need

Graphs illustrate the relationships between various measures and attributes, such as BCWP, BCWS, ACWP, and Cost Variance. Projections are based on earned value techniques.
**Project Measures**

Customer Requirements By Phase

- Added
- Dropped
- Modified
- Unmodified

Audit Scores by Process

Cumulative Assigned and Submitted (P1,P2,P3)

01 Mar 07 - 01 Jan 08

Week

Assigned Submitted

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Training linked to strategic planning & performance management

Bottom-Up Employee Assessment + CDP input

Top-Down Group Assessment

- Recruit and Retain Capable People
- Compete for Opportunities to Solve Problems
- Demonstrate and Maintain Technical Competence
- Deliver Innovative, High-Quality Solutions
- Build and Sustain Logistical Infrastructure Supporting Projects

Support Group Training Requirements

Group Training Requirements & Cost Estimates

OT Scope & Priority Cut Line

Division Annual Tactical Training Plan & Budget

- Training linked to strategic planning & performance management
- Training Database
- Training linked to strategic planning & performance management

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Process Audits throughout Project Life-Cycle
## Process Audits throughout Project Life-Cycle

<table>
<thead>
<tr>
<th>Process Area</th>
<th>Checklist</th>
<th>Meets Req'nts</th>
</tr>
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<tbody>
<tr>
<td>PM</td>
<td>Project Management Plan:</td>
<td></td>
</tr>
<tr>
<td>PM</td>
<td>PMP is under revision control</td>
<td>Yes</td>
</tr>
<tr>
<td>PM</td>
<td>PMP is peer reviewed and updated</td>
<td>Yes</td>
</tr>
<tr>
<td>PM</td>
<td>Estimation Spreadsheet created (per task)</td>
<td>Yes</td>
</tr>
<tr>
<td>PM</td>
<td>Project Schedule:</td>
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</tr>
<tr>
<td>PM</td>
<td>Work Breakdown Structure updated and reviewed</td>
<td>Yes</td>
</tr>
<tr>
<td>PM</td>
<td>Schedule is reviewed monthly and updated</td>
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</tr>
<tr>
<td>PM</td>
<td>Schedule is under revision control</td>
<td>Yes</td>
</tr>
<tr>
<td>PM</td>
<td>Project Budget:</td>
<td></td>
</tr>
<tr>
<td>PM</td>
<td>Work Breakdown Structure updated and reviewed</td>
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<tr>
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</tr>
<tr>
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<tr>
<td>PM</td>
<td>Project Risk Spreadsheet:</td>
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<tr>
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<tr>
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<tr>
<td>PM</td>
<td>Tasking Spreadsheet under revision control</td>
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<tr>
<td>PM</td>
<td>Project Reviews (IPRs) conducted:</td>
<td></td>
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<tr>
<td>SAM</td>
<td>Project Acquisition List included in PMP (if applicable)</td>
<td>Yes</td>
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<tr>
<td>SAM</td>
<td>Acquisition List reviewed at least monthly</td>
<td>Yes</td>
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<tr>
<td>SAM</td>
<td>If this is a COTS product, a PO or supplier agreement/contract must be included</td>
<td>Yes</td>
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<tr>
<td>SAM</td>
<td>If this is a consulting service, project should have an approved Agreement for Consulting Services</td>
<td>N/A</td>
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<tr>
<td>SAM</td>
<td>If this is a subcontracting product:</td>
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<tr>
<td>RD</td>
<td>Accepted Customer Requirements and Software Requirements added to RequisitePro</td>
<td>Yes</td>
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<td>Software Requirements Specification generated</td>
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<tr>
<td>RD</td>
<td>Customer commitment at milestone (meeting minutes)</td>
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<tr>
<td>RD</td>
<td>Customer commitments are under version control</td>
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Process Audits throughout Project Life-Cycle

Process Audit Score

- Scoping & Planning
- Analysis
- Design
- Implemnt & Intg
- Testing
- Release

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

PM SAM MA CM RD TS PI VER VAL DAR

Process Anomaly (PA) state transition diagram
Summary of Lessons Learned

- Establish organizational infrastructure with adequate resources
- Don’t overlook organizational change aspect (writing processes is the easy part)
- Overall process design/architecture is important
- Managing process improvement project is critical

If we had known these things at the outset, it would have taken less time and less money to achieve Maturity Level 3
Thank You – Questions?

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