Quality is Free: When its done early

A practitioner's approach to “getting in the game”
Abstract

- For this discussion, the key points of focus are:
  - Making quality certain
  - The value of prevention through predictability

- The investment we make, in our vocation, is a well thought out and strategic process. As quality professionals we must embrace and then teach that our value proposition is in our reputation for predictability. Therefore, quality can be sold “early”... if we know how to find it, design it, and sell it.
Objectives:

- Discuss three cases studies from Sandia National Laboratories, NM. At the end of this session, participants will be able to:

  Understand how to build a reputation of predictability, which leads to trust, which leads to “getting in the game”
Once upon a Time

Yeah, I’m on the team but no one works hard to sit on the bench.
Definitions:

- **Defect** - the lack of something necessary or desirable for completion or perfection
- **Designed in Defects** - a defect that can be avoided only through an alteration or redesign of the item.
- **Blunder** - a stupid, careless, or thoughtless mistake
- **Waste** - anything or process that does not add value to an item
- **Value** - what the customer is buying or willing to pay for
- **Predictability** (vs. Reliability) - To state, tell about, or make known in advance, especially on the basis of **special knowledge**
- **Prevention** - the action of stopping something from happening

As Quality Professionals we have to first change the way we think (or see) before we can influence others.
Burning Platforms:

- 2006: Do “what” with one requirement?

- 2007: Getting things in order

- 2007: Get us home faster

What is the common theme from each of these stories?
2006: Build “what” with one requirement

The challenge:
- One customer requirement
- Early in the project concept therefore, funding challenges
- Lots of ideas to leverage existing technologies
- No defined (documented) process existed at this stage
- Advanced concept and technology development program

How we approached it
- Lean Charter-Kaizen to focus the team and get organized
- Two 4hr sessions with Program manager, department managers, chief systems engineer, lead mechanical, and electrical engineering
- Integrated a modified Lean version of systems engineering requirements flow down

End Result:
- Program definition content the customer used to create technical requirements document (TRD). This got us all on the same vector
<table>
<thead>
<tr>
<th></th>
<th>Boost glide(1)</th>
<th>Reduced Development testing time(2)</th>
<th>System Target Range Capability(3)</th>
<th>System Fire Control Capability(4)</th>
<th>Relatively Fixed Targets(5)</th>
<th>System Accuracy(6)</th>
<th>Collateral Damage Management(7)</th>
<th>Conventional Warhead Options(8)</th>
<th>Mission Assurance System(9)</th>
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</thead>
<tbody>
<tr>
<td>a</td>
<td>Depressed trajectory booster</td>
<td>External Body Shape</td>
<td>TPS</td>
<td>Fire Control Communications</td>
<td>In-Flight Updates System</td>
<td>Unified Navigational Control</td>
<td>In-Flight Update System</td>
<td>Penetrator ( @ 900 lbs)</td>
<td>QA</td>
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<td>Max Range</td>
<td>TPS</td>
<td>Insertion Conditions</td>
<td>Mission Abort Capability</td>
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<td>KEP (&gt; 400 lbs)</td>
<td>Reporting</td>
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<td>Flight Controls</td>
<td>NG&amp;C</td>
<td>Mission Planning (real time)</td>
<td>SATCOM</td>
<td>Flight Termination</td>
<td>Impact Velocity/Angle System</td>
<td>ES&amp;H</td>
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<td>Terminal State Vector</td>
<td>Warhead Options</td>
<td>Energy Mgmt</td>
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<td>In-Flight Target Update System</td>
<td>Mission Planning (real time)</td>
<td>Future Sensor Capabilities</td>
<td>Security</td>
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<td>TPS</td>
<td>Electronics packaging</td>
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<td>NG&amp;C</td>
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<td>Communication System</td>
<td>Warhead Safety</td>
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<td>Energy Mgmt</td>
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<td>SATCOM</td>
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<td>State of Health</td>
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<td>Warhead Safety</td>
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2007: Getting things in order

The challenge:
• Customer funded effort
• Two week deliverable (plan execute)
• Customer on site to watch

How we approached it
• Lean Charter for two teams of approximately 35 people each (managers and staff)
• Detailed operations plan and clear objectives and definitions of success
• Leveraged GB resources as agents of change and social scientists “within”

End Result: Five semi trucks of equipment sent to re-application, created order to assembly/test/integration lab space, completed project to 1% of budget
### Example

<table>
<thead>
<tr>
<th>T.O.D</th>
<th>THR (10/18)</th>
<th>MON (10/22)</th>
<th>TUE (10/23)</th>
<th>WED (10/24)</th>
<th>THR (10/25)</th>
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<tr>
<td>7:00am</td>
<td>Leads Meeting 962/3033 (8:00am-12N)</td>
<td>Opening Meeting 962 / 1402 (STARS) &amp; 962 / 3033 (TAL) (8:00am-10:00am)</td>
<td>Report to Work Zones (7:30am)</td>
<td>Report to Work Zones (7:30am)</td>
<td>Report to Work Zones (7:30am)</td>
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<td>8:00am</td>
<td>Lunch (12:00N) Report to Work Zones (12:30pm)</td>
<td>Lunch (11:30am) Report to Work Zones (12:00N)</td>
<td>Lunch (11:30am) Report to Work Zones (12:00N)</td>
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<td>Lunch (11:30am) Report to Work Zones (12:00N)</td>
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<td>9:00am</td>
<td>Daily Status Brief 962/4069 (3:00pm-3:30pm)</td>
<td>Daily Status Brief 969/2022 (3:00pm-3:30pm) *Overall Status</td>
<td>Daily Status Brief 969/2022 (3:00pm-3:30pm)</td>
<td>Daily Status Brief 969/2022 (3:00pm-3:30pm)</td>
<td>Final Out Brief 969/2022 (3:00pm-3:30pm)</td>
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<td>4:00pm</td>
<td>By TUE (10/19)</td>
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<td>5:00pm</td>
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</table>

- **By TUE (10/19):**
  - Courtesy Self-Assessment of current state (Oct 19)
  - Current State Photos of TAL and STARS Labs (Oct 19)
  - Assessment of building grounding systems (Oct 19)

- **By MON (10/29):**
  - Final Self-Assessment of future state (Oct 27-29)
  - Floor Cleaning (Oct 26)
  - Future State Photos of TAL and STARS Labs (10/26)
2007: Get us home faster

The challenge:
- The “accident” in Kodiak, Alaska
- Long history and tribal knowledge with the current scheduling approach (approx 6 weeks)
- Low buy-in because we have tried this several times before

How we approached it:
- LSS charter with key fielding management, engineers, operations staff
- Offsite location to minimize distractions
- Strong technical management support (to challenge validity of current state thought)

End result:
- Forty foot vertical value stream (VVS) integrating each functional team
- Identified unnecessary redundancies in test and integration activities and why
- Reduced overall fielding time from six weeks to four weeks for approximately 40 staff
### Example

<table>
<thead>
<tr>
<th>Mission Activities</th>
<th>Option 1 – One Shift</th>
<th>Option 2 – Split Shift</th>
<th>DAYS</th>
<th>Booster</th>
<th>Payload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plane Lands In Kodiak</td>
<td></td>
<td></td>
<td>11</td>
<td>ABCDEFGHI</td>
<td>JJKK</td>
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<tr>
<td>Kodiak Setup</td>
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<td>11</td>
<td>BCDDEFG</td>
<td>IJ</td>
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<td>Upload Motors (IPF)</td>
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<td>DEF</td>
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<td>Motor Leak Checks (IPF)</td>
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<td>GSE Test (SCAT)</td>
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<tr>
<td>Setup Heat Wagon and Ducting to SCat</td>
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<tr>
<td>SS Motor Assy (IPF)</td>
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<td>MAT Test (SCAT)</td>
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<td>FS/SS Inspect (IPF)</td>
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<tr>
<td>Move T-Erector to SCAT</td>
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<tr>
<td>FSST Setup Motion Stand In SCAT</td>
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<td>Orbus Motor Inspect</td>
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<td>FSST Dry-Run for Record (w/o PDM)</td>
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<td>Pad Closed</td>
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<td>Move T-Erector to IPF</td>
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<td>Inter-stage MDF</td>
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<td>Ordnance Day</td>
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<td>GSE Setup</td>
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<td>Payload GSE Checkout in LEB</td>
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<td>Change Payload Batteries</td>
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<td>Payload State-of-Health Chks in SCAT</td>
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<td>Payload GSE Setup in SCAT</td>
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<td>Payload State-of-Health Chks in SCAT</td>
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<tr>
<td>Instrumented CM Checkout</td>
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<td>RV V-Band Inspection</td>
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<tr>
<td>Unpack Payl’d (RV,PDM,CM) at SCAT</td>
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<td>CD H ABCDEFG IJKK</td>
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<tr>
<td>No.</td>
<td>What (Task needed)</td>
<td>When (due by)</td>
<td>Where (location) HSV, ABQ, KLC</td>
<td>Why (the benefit)</td>
<td>Who (TBD)</td>
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<tr>
<td>1</td>
<td>1. Heat Wagon Process Improvement. Determine all ducting designs and requirements during FV 10 fielding. Have diagrams with dimensions and build as much of the Heat Wagon in ABQ.</td>
<td>FV 10 (prior to lift off)</td>
<td>ABQ, KLC</td>
<td>less setup in KLC and faster fielding</td>
<td>Mechanicals and Bill Noel</td>
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<tr>
<td>4</td>
<td>4. Update Procedures for Thermal Blanket and Rigging (5 Hrs).</td>
<td>FV 11</td>
<td>KLC</td>
<td>Fielding efficiency</td>
<td>Mechanical crew</td>
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<tr>
<td>9</td>
<td>9. Investigate Impact to TM, GLC, and Video Processes (of Future State).</td>
<td>FV 11</td>
<td>ABQ</td>
<td>Need to review and integrate into new FS</td>
<td>Booster Team</td>
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<tr>
<td>10</td>
<td>10. Investigate Alternative EPS Key Load.</td>
<td>FV 11</td>
<td>ABQ</td>
<td>faster TX key loads</td>
<td>TM</td>
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<td>11</td>
<td>11. SNL Flight Ready Certification = Process Developed (1 Day).</td>
<td>FV 11</td>
<td>ABQ</td>
<td>TBD</td>
<td>TBD</td>
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<tr>
<td>12</td>
<td>12. Review/Improve Anomaly Investigation and Closure Process (1 Day).</td>
<td>FV 10</td>
<td>ABQ</td>
<td>Accurate, Timely, complete, capture and categorization of anomalies</td>
<td>COO</td>
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<tr>
<td>38</td>
<td>15. Communicate the Future State Strategy to Involved Community.</td>
<td>FV10</td>
<td>ABQ</td>
<td>Community buy in and support</td>
<td>Sub team</td>
</tr>
<tr>
<td>57</td>
<td>8. Generate Huntsville List of New Activities (Huntsville Investigate: GLC work and Weighing Motors. (1 Hr.) (Huntsville: Look into 2 Sets of Equipment (Test) (1 DAY)). See 108-116</td>
<td>FV 11</td>
<td>ABQ / HSV</td>
<td>New future state generated new activities for HSV</td>
<td>LME</td>
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<tr>
<td>69</td>
<td>21. One Plane Assumption (Action Item for Eric).</td>
<td>FV 11</td>
<td>ABQ</td>
<td>Changed to a required delivery date that will support future state schedule</td>
<td>Sub team</td>
</tr>
<tr>
<td>84</td>
<td>Need cross-training redundancy for every key position. PLO, LSE, PC/ACC, COO, ORD</td>
<td>FV 10</td>
<td>ABQ</td>
<td>eliminate single point failures with a new future state</td>
<td>Management</td>
</tr>
<tr>
<td>85</td>
<td>Modify umbilical test. Test takes a long time. Need a shorter test</td>
<td>FV 10</td>
<td>ABQ</td>
<td>Need a shorter test for the new future state</td>
<td>Mechanic</td>
</tr>
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</table>
Key Takeaways

- Recognition of a opportunity for “Quality” to step in.
- Discipline in the planning and engagement effort
- Clear and reasonable expectations of success that touch the heart, as well as the brain, of the recipient(s).

So, what did it look like?
How We Influence

Your customers are communicating their problems **all the time**. Be on the lookout for new opportunities to help.

Knowing what tool to use and when to use it is **critical**. Continue to “develop your prevention toolbox” so you are ready to respond when the time comes (manage your training and development).

Designers and PRT leads do not speak quality jargon. Talk to the value or what end result will be and not the process or tool you will use. Use that later.

What matters to you may **not matter to your customer**. Find common ground and address the benefits of your proposal cost and schedule. Remember, time is of the essence and the window of opportunity is always short.

**Become a trusted resource in the mind of your customer**
Pathway to Predictability (design it)

Event / Project Description: (Project/Task = 9164503.91)
Design process and outline requirements that result in efficient and practical design of SQA, SLM, and SMC processes.

Event / Project Date: Major Milestones:
- December 2007: Starting Design and Release
- January 2008: First Management Assistance Report
- June 30, 2008: Final report issue and implementation.

Six Sigma Principles:
- Define: Identify and define the problem.
- Measure: Define the current process.
- Analyze: Identify root causes.
- Improve: Implement solutions.
- Control: Create a plan to sustain improvements.

Customer Demand & Constraints:
- Customer Demand: At the Div and SQA levels, efficient and effective management assistance process are in place that meet the requirements of the SQA, SLM, and SMC processes.
- Quarterly requirements are critical, scheduled, and readily available.
- Constraints: (1) Subject to requirements in SQA, SLM, and SMC processes.

Process Information:
- SQA, SLM, and SMC Processes:
- Operational & Strategic Plans:
- Mission Assurance Processes:
- Division Facilities:
- Operations:
- Contingency Plan:
- Business Continuity:
- SQA Requirements:
- Relationship:
- Business Process:
- Customer Value:

Value Stream Mapping:
- Value Stream Mapping:
- Identify value stream.
- Identify waste.
- Define process.
- Establish new process.

Lean Principles:
- Standard Operating Procedures
- Process Control
- Waste Identification
- Brainstorming
- Lean Applications

Center QMS Effort (LSS three phased Project)

<table>
<thead>
<tr>
<th>Plan</th>
<th>Do</th>
<th>Check</th>
<th>Act</th>
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</thead>
<tbody>
<tr>
<td>Define Process</td>
<td>Perform Activity</td>
<td>Confirm Process</td>
<td>Improve Process</td>
</tr>
<tr>
<td>Document</td>
<td>Verify</td>
<td>Confirm</td>
<td>Repeat Process</td>
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</table>

Common Approach:
- Value Stream Analysis
- Time-Value Mapping
- Cycle Time & Efficiency

Operating Excellence:
- Value Stream
- As-Is Process
- Value Stream Analysis
- Time Value Mapping
- Cycle Time & Efficiency

Lean Principles:
- Standard Operating Procedures
- Process Metrics
- Lean Processes
- Brainstorming
- Lean Applications
- Visual Controls

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- Brainstorming
- Lean Applications
- Visual Controls
Pathway to Predictability (sell it)

The main story: (1-2 sentences) of what the project (or effort was about)

The plan: (1-2 sentences) of how we approached the engineering effort

The “Oh no” moment: (1-2 sentences) describing something happened (or that was not expected)

The response: (1-2 sentences) on what we did in response to the ‘Oh no moment”

The consequence: (1-2 sentences) on the price we paid because of our response (or decision)

The lesson learned: (1-2 sentences in the colored banner) from our “reflection” of where we went wrong or how we could have avoided this issue with better assurance engineering. I’m calling assurance engineering the things we sometimes ignore (or place little emphasis on) that eventually requires us to perform heroics, and suffer pain, in order to meet the mission objective.
Back to the future

My mantra: If you put me in the game... you won’t regret it

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**Aggies’ Owens honored**

New Mexico State cornerback Dennis Owens, San Jose State wide receiver Kevin Bowman, and Nevada-Las Vegas tailback Kirk Jones have been selected as Pacific Coast Athletic Association football players of the week.

Bowman and Jones were honored as co-offensive players of the week for their performances in Saturday games, and Owens was tabbed as the defensive player of the week.

Owens, a 5-10, 165-pound freshman from Tempe, Ariz., was credited with five tackles and broke up a pass during New Mexico State’s 27-16 win over UTEP. Owens’ biggest play of the game occurred with 57 seconds remaining when, with the score 20-16, he intercepted a pass at the NMSU goal line and raced 100 yards for a touchdown to clinch his team’s first win of the year.

Bowman, a 6-foot-2, 195-pound senior from Sacramento, Calif., tied a regular-season single game school record for receptions with 12 catches in San Jose State’s 38-21 victory over Utah State. He had 146 yards in reception yardage and caught one touchdown pass.

Jones, a 5-10½, 201-pound sophomore from Long Beach, Calif., rushed for 133 yards on 16 carries in Nevada-Las Vegas’ 41-23 triumph over Long Beach State.

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... but the throw is intercepted by freshman Dennis Owens (45), who returned it on a sideline run 100 yards for the clinching touchdown.
Objectives:

Understanding how to build a reputation of predictability,

which leads to trust

which leads to “getting in you game”
Questions?