Combining Lean, Six Sigma & Agile

Why, and How?
About Me

Arlen Bankston

- Director, Lean-Agile Consulting
- Six Sigma Master Black Belt
- Certified ScrumMaster Trainer and Agile Methodology Coach
- 30+ Lean Six Sigma and Agile projects implemented over past five years
I. Introduction (What?)
II. The Case for Change (Why?)
III. Three Combined Models (How?)
IV. Discussion
1. Introduction (What?)
Let’s take a few moments to set expectations:

- How many Agile practitioners?
- How many Lean Six Sigma, BPM or operations management practitioners?
- Has anyone previously combined Lean or Six Sigma process improvement techniques with Agile?
Lean Six Sigma is one of a number of business process improvement methodologies, which shares roots with approaches such as BPM, TQM, SPC and others. (Process Focused)

Agile is an iterative and incremental approach to project delivery, encompassing methodologies such as Scrum and eXtreme Programming (XP). (Project Focused)
A 5 step approach founded on asking the right questions:

1. **Define**: What is important to the customer?
   - What is their target and acceptable limitations; anything else is considered defective

2. **Measure**: What is the frequency of defects? How many defects?
   - Capability: How is the process performing for the customers?
   - Entitlement: How good can the existing process be?
   - Gage R&R: How good is the data? Is it reliable?

3. **Analyze**: Why, when and where do the defects occur?
   - Data driven analysis to prove what the root causes are

4. **Improve**: How can we fix the process/critical defects?
   - How can root causes can be addressed?

5. **Control**: How can we ensure the process remains fixed?
   - Develop controls to ensure process improvement is sustained
**Basic Concepts of Agile**

**Key Agile principles are:**

**Focus on customer value** - Employ business-driven prioritization of features.

**Iterative & Incremental Delivery** - Create a flow of value to customers by “chunking” feature delivery into small increments.

**Intense Collaboration** - Face-to-face communication via collocation, etc; diversified roles on integrated teams.

**Self Organization** - Team members self-organize to fulfill a shared project vision.

**Continuous Improvement** - Teams reflect, learn and adapt to change; work informs the plan.
Demonstrated Successes

Agile & Lean Six Sigma have both proven their mettle in the respective domains:

- **Agile Project Execution:** Improved time-to-market, collaboration and customer satisfaction

- **Lean Six Sigma Process Improvement:** Better process controls, higher efficiency and effectiveness

However, they still tend to operate independently.
II. The Case for Change (Why?)
What’s Wrong with Independence?

Some common issues include:

At the portfolio level:
- Arbitrary and inconsistent project selection criteria
- Poor alignment of projects across value streams
- Unfocused approach to risk management

Within Agile projects:
- No quantification of project value
- Customer difficulty in providing “grounded” requirements
- Inconsistent alignment with highest-priority process needs

Within Lean Six Sigma projects:
- No incremental delivery of business value
- Limited scope of analysis and opportunity for measurement
- Insufficient linkage to execution of improvement recommendations
Why Do We Do Projects?

Why do we do projects?
   a) Increase Revenue
   b) Avoid Costs
   c) Improve Service
   d) All of the Above

To enhance businesses’ profitability by:
   - Providing “Value” to external Customers (better service, more revenue generated), \textit{and}
   - Providing “Value” to internal Customers (better service, lower cost)
What is “Value?”

Value is generated by addressing Customers’ most critical and pressing needs.

- Value, as defined by the Business Customer (Agile)
- Customer requirements (PMI)
- Voice of the Customer/Business, Critical to Quality requirements (Six Sigma)
- Value, Right Product/Time/Price (Lean)

Related, but subtly different perspectives.
How can we improve our capability to deliver Value through projects?

- **Project Execution Improvements:**
  - Delivery speed
  - Code quality
  - Business customer satisfaction

- **Business-Focused Improvements:**
  - Impact on business process performance (cycle time, SLA fulfillment, audit compliance)
  - Measurable contribution to strategic initiatives
  - Incremental operational integration & deployment
  - End user satisfaction

While these are critically important...

These are more often neglected...
And even more important.
An explicit linkage from **Customer to Process to Execution** is necessary to ensure that the organization is tightly aligned with the real, *changing* needs of its users.
Lean and Six Sigma, by *defining the problem*, help to:
- Define and quantify Value
- Identify root causes of business problems
- Avoid suboptimization by providing full business context
- Align business management with true customer needs

*Do the right projects.*

Agile, by *crafting the solution*, helps to:
- Deliver incremental Value
- Provide framework for ongoing measurement of results
- Ensure effective implementation of improvements
- Align business management with implementation teams

*Do the right projects right.*
Agile’s Contributions

Agile execution of Lean Six Sigma process improvement recommendations can yield:

- Direct, continuously updated linkage to true needs of business & customers
- Minimized risk through iterative development and incremental delivery
- Ability to handle change beyond initial process analyses
- Focus and refinement of recommended improvements at the implementation level
- Ideal platform for innovation and new product introduction
- Support for whole-of-life product maintenance and continuing development
- Close coordination between Business and IT
Lean Six Sigma provides a number of complements to Agile project execution:

- **Grounded project vision and clear focus**
  - Product Backlog items with quantifiable Value
  - Product Backlog prioritization criteria

- **Stronger business cases**
  - Quantitative assessment of feature values
  - Clear linkage of IT efforts to business benefits

- **Means to measure success**
  - Key metrics identified for a particular process
  - Measurement and control system in place

- **Directed portfolio design**
  - Select projects based on critical process constraints
  - Align projects across functional silos
Lean Six Sigma Program
What are the best ways to improve the customer acquisition process?

- Time to complete online process
- Fewer screens
- Early notification of required information
- Update Web content
- Update UI Flow
- Integrate systems

Agile Project(s)
Reduce time to complete online process by 50%

Execution & Delivery of Value

Identify value, waste and improvement recommendations
III. The Approach (How?)
### Status Quo.

#### Six Sigma Deployment via Waterfall

<table>
<thead>
<tr>
<th>End Users</th>
<th>Value received</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business, Customer</td>
<td>Value received</td>
</tr>
<tr>
<td>Lean Six Sigma Analyst</td>
<td>Never fear, we shall Define this problem!</td>
</tr>
<tr>
<td>IT Teams</td>
<td>Solution Development: Waterfall SDLC, Design for Six Sigma (DFSS)</td>
</tr>
</tbody>
</table>

- Something is wrong! Help!
- Now, we will Measure to find out how bad it is!
- Next, let's Analyze to find the root causes.
- Here are some recommendations to Improve the situation.
- Now let's ensure the process remains under Control.

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The Waterfall Six Sigma Model works like this:

- **Lean Six Sigma projects** determine which problems projects should address, and their broad solutions.

- **Waterfall projects** are spawned in the “Improve” phase to tackle these problems, further define their solutions, and establish process control.

This has worked for years in some companies... but there is always room for improvement!
We’re going to briefly examine three possible models for combining Lean Six Sigma and Agile:

- **Model 1: Initial Approach**
  - Low-Level Combination: Agile with basic LSS tools

- **Model 2: Integrated Approach**
  - Focused Teams: Lean Six Sigma & Agile

- **Model 3: Whole of Life**
  - Death of the Project: Platform-based operational approach
### Three Models, One Set of Goals

All models share these goals:

- **Align project portfolios** with true, grounded strategic value generation
- **Accurately measure value generation** and strongly link to strategic operations
- **Improve execution speed** of process improvement initiatives
- **Tighten feedback loops** in process management and improvement efforts
- **Support incremental improvements** with a process designed around iterative delivery
Process Management Maturity Curve

1. Initial Approach
   Agile w/tools

2. Integrated Approach
   Lean Six Sigma & Agile

3. Whole of Life Approach
   Death of Projects

- Delivery Focused
- Process Improvement Focused
- Business Process Management Focused

Time

Maturity
A simple first step when:
- Projects have already been selected and scoped
- Projects affect loosely defined business processes
- Projects live within broader programs
- Quantification of project value is desired
The Initial Model works like this:

- Lean Six Sigma Analyst facilitates **rapid process definition and measurement exercises** with Agile team, Business Customer, process performers and End Users (~1 week)

- **During each Iteration**, LSS Analyst:
  - Analyzes current process performance
  - Leads detailed process design work (workflow, business rules, etc.)
  - Quantifies project value based on few key metrics
  - Facilitates feedback from end users and related process owners
  - Acts as customer proxy to team
  - Provides “voice of the process” for Product Backlog prioritization
  - Assists with operational integration of project improvements

- LSS Analyst generally works **1-2 iterations ahead of team**, gradually ramps down involvement as backlog crystallizes
Lean Six Sigma tools, Agile execution.

**Lean Six Sigma & Agile: Integrated**

- **User needs (VOC) are not static!**
- **Allows for gradual integration and detailed feedback**

**End Users**
- Provide high-level needs

**Business Customer**
- Something is wrong! Help!
- Value received
- "Commander’s Intent"
- Detailed input from user and process perspective

**Lean Six Sigma Analyst**
- High-level Define: CTQs
- Value stream
- Critical constraints
- Measure & Analyze process performance data
- Gather user feedback
- Help to prioritize Backlog
- Build Controls into process
- Report Value delivered

**Agile Team**
- Iteration 0: Architecture Spike
- Iteration 1: Develop Measurement System
- Iteration 2:...

1. Defines what value means for this project
2. Places project in context with related business activities

"Value received" from user and process perspective.

"Commander’s Intent" for success.

Gives business visibility into true project value to their processes.

1. Defines what value means for this project
2. Places project in context with related business activities
A good choice when:
- Significant change is needed to business processes
- A program (multiple projects) is to be launched
- New processes need to be defined
- Complex problems preclude an obvious solution
Model 2: Integrated Basics

The Integrated Model works like this:

- **Lean Six Sigma projects** provide initial definition and analysis of process areas
  - Tackle large, complex process issues
  - Provide grounded business cases and clear focus
  - Provide metrics to define success

- **Agile projects** are spawned in the “Improve” phase
  - Utilize output from LSS projects to form Product Backlog
  - Members from LSS team are involved in execution
  - Adjustments are made as necessary to initial LSS analyses based on exploratory and production data influx
**Model 2: Integrated Details**

**A simple step forward.**

### Lean Six Sigma & Agile: Serial

**End Users**
- Provide high-level needs

**Business Customer**
- Something is wrong! Help!

**Lean Six Sigma Analyst**
- Never fear, we shall Define this problem!
- Now, we will Measure to find out how bad it is!
- Next, let’s Analyze to find the root causes.
- Here are some recommendations to Improve the situation.

**Agile Team**
- Build initial measurement systems (1-2 resources)

**Fulfill Product Owner Role**

**Fulfill Customer Proxy Role**
- Continue detailed measurement, analysis and improvement design...

**Iteration 1**
Process Management Maturity Curve

1. Initial Approach
   Agile w/tools

2. Integrated Approach
   Lean Six Sigma & Agile

3. Whole of Life Approach
   Death of Projects

Good when:
- Mission-critical or long life systems are involved
- Multidisciplinary teams exist around core processes
- Customer needs evolve rapidly
- Competitive pressures are intense

Time
Maturity
The Whole of Life Model works like this:

- **Platform-based teams** execute top-priority tasks in regular cadence
  - Fixed cost
  - Deep domain understanding

- Ongoing measurement and analysis **drives business**
  - LSS skill set is held by business management
  - Extensive customer experience feedback mechanisms

- Balance between **maintenance** and **new development**

- Ideal for **mission-critical** applications or non-IT **business management**
Who needs projects anyway?

Lean Six Sigma & Agile: Operational (Whole of Life)

- **End Users**
  - Use Product v3.0
  - Provide Feedback
  - Use Product v3.0
  - Use Product v3.1

- **Business Customer(s)**
  - Provide Feedback
  - Provide Prioritized Business Needs

- **LSS Operations Manager**
  - Analyze current performance
  - Provide process recommendations
  - Gather User Feedback: Updated VOC/CTQs
  - Measure Value delivered
  - Update Process Control mechanisms

- **Platform-Based Agile Team**
  - Iteration: Enhancements Maintenance
  - Deploy Updated Products/Services

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Let’s take a quick look at some of the specific tools and techniques that we might utilize in a combined model...
Improve the process for new customers to sign up for financial management services.

**OK, so what’s important?**

- **User needs** (intuitive, quick, friendly, attractive)
- **Business needs** (data capture, user retention, up/cross-sell)
- **Process needs** (upstream/downstream workflow integration, data integration, business rule implementation)

**So, we need to:**

- Document the existing new account setup processes and supporting systems.
- Identify and prioritize enhancements to the processes and underlying technical solution based on business and end user needs.
- Define and implement ongoing metrics that will tell us how the process is performing.
Our Business Context

Suppliers (S)

Inputs (I)
- Personal Information
- Fund Selection Information
- Client Interaction Preferences
- Financial Information
- Enter via specific channel
- Enter personal info
- Select funds
- Enter financial info
- Select preferences
- Account funding
- Detect fraud
- Mail account info

Process (P)

Outputs (O)
- Funded Account Setup Confirmation
- Prospect Information (Personal, Financial, Fund, Preferences)
- Mail account info
- Money
- Marketing Channel Attribution

Customers (C)
- Prospect
- Fund Managers
- Fraud Control
- Customer Service
- Mail Room
- Marketing

Prospect
Mail Room
Our Critical Constraints & Obvious Opportunities

CASE STUDY

This area presents an obvious opportunity for improving both internal efficiency and customer satisfaction. Also, benchmarks show that it dramatically lags competitive standards.

This area contains the most customer interaction, and huge variation. Also, benchmarks show that it dramatically lags competitive standards.

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Our Critical Measures

Current survey data tells us that these are the most important quality factors to our Internal & External Customers.

These are some metrics that we could use to gauge how well we’re doing. Which ones tell the story best?

Metric Importance

### External (Customer) Quality

<table>
<thead>
<tr>
<th>Metric</th>
<th>Expected</th>
<th>Exciting</th>
<th>Strong</th>
<th>Medium</th>
<th>Weak</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web site is easy to use</td>
<td>9 3 9 1 3 3 9 9 9 3 1 9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer representative is readily available via phone</td>
<td>1 1 1 1 1 1 1 3 1 3 9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer representative is readily available via chat</td>
<td>1 1 1 1 1 1 1 3 1 3 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Representatives treat me well</td>
<td>1 1 1 1 1 1 1 1 1 1 1 9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Account options are easy to understand</td>
<td>9 9 1 3 9 9 9 3 3 1 9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investment options are easy to understand</td>
<td>9 9 1 3 9 9 9 3 3 1 9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extended information is easy to find</td>
<td>9 9 1 3 9 9 9 3 3 1 9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The process is fast and efficient</td>
<td>9 1 3 1 1 1 3 9 9 9 1 9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I know up front what information is required</td>
<td>9 9 3 3 9 9 9 3 3 1 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I know up front how much time it should take</td>
<td>9 9 1 3 9 9 9 3 3 1 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Page response time is good</td>
<td>9 1 3 1 1 1 3 9 9 9 1 9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The process is built around my personal goals</td>
<td>9 1 3 1 1 1 3 9 9 9 1 9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site is accessible to disabled users</td>
<td>3 1 3 1 1 1 3 3 3 1 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>My data is secure</td>
<td>3 1 3 1 1 1 3 3 3 1 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Web site is visually appealing</td>
<td>1 1 1 1 1 1 3 1 1 1 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regulatory requirements are met</td>
<td>1 1 1 9 9 9 3 1 1 3 1 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fraudulent accounts are controlled</td>
<td>1 3 1 3 9 3 1 1 9 1 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The system is easy to modify and expand</td>
<td>1 1 1 1 1 1 1 1 1 1 1 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>System is reliably available</td>
<td>3 1 1 1 1 1 1 9 9 9 1 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Internal Quality

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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Metric Importance:

| Metric Importance | 85 65 37 41 77 71 75 89 61 59 23 105 | | | |
|-------------------|------------------------------------------|---|---|---|---|---|---|---|---|---|---|---|

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We could choose to measure many things, but these few are the most telling.
## Project Y

<table>
<thead>
<tr>
<th>Metric/Measure</th>
<th>Operational Definition</th>
<th>Performance Target</th>
<th>Tolerance Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to complete online process</td>
<td>Elapsed Time <em>from</em> Login Landing <em>to</em> Receipt of Final Confirmation</td>
<td>10 minutes</td>
<td>&lt; 20 minutes</td>
</tr>
<tr>
<td></td>
<td>“Elapsed Time” = Absolute difference between Login Landing &amp; Receipt of Final Confirmation times (<em>Minutes:Seconds</em>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Login Landing” = Point in time when prospect reaches login.jsp page (<em>Minutes:Seconds</em>)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Receipt of Final Confirmation” = Point in time when confirmation.jsp page is fully loaded (<em>Minutes:Seconds</em>)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Other LSS & Agile Joint Activities

Backlog Prioritization (QFD)
- What Backlog items will contribute most to our defined Value (priorities)?

Value Measurement (Process Capability, Analysis)
- How are we doing against our goals so far?
- What are the key factors that are contributing to our success/failure?

Control Strategy (FMEA, Control Plans)
- What are some of the major risks in our project’s host processes that we should consider?
- What is the relative priority of these risks?

Scenario Planning (QFD, Simulation, Prototyping)
- When we have multiple ways to address a problem, which is best?

Current Process 1.0  Process Scenario 1 1.3  Process Scenario 2 1.5
## Roles & Responsibilities

<table>
<thead>
<tr>
<th>Role</th>
<th>Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Product Owner</strong></td>
<td>Accountable for success or failure of project</td>
</tr>
<tr>
<td></td>
<td>Prioritizes the Product Backlog</td>
</tr>
<tr>
<td></td>
<td>Empowered to make decisions for all customers and users</td>
</tr>
<tr>
<td></td>
<td>Presents and explains Product Backlog to team</td>
</tr>
<tr>
<td><strong>LSS Analyst</strong></td>
<td>Quantifies project value based on few key metrics</td>
</tr>
<tr>
<td></td>
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<td>Facilitates feedback from end users and related process owners</td>
</tr>
<tr>
<td></td>
<td>Acts as customer proxy to team</td>
</tr>
<tr>
<td></td>
<td>Assists with operational integration of project improvements</td>
</tr>
<tr>
<td><strong>Scrum Team</strong></td>
<td>Estimates work level of effort</td>
</tr>
<tr>
<td></td>
<td>Executes top-priority items on Product Backlog</td>
</tr>
<tr>
<td></td>
<td>Accountable for meeting sprint/iteration commitments</td>
</tr>
<tr>
<td><strong>ScrumMaster</strong></td>
<td>Responsible for the process</td>
</tr>
<tr>
<td></td>
<td>Responsible for maximizing team productivity</td>
</tr>
<tr>
<td></td>
<td>Sets up and conducts meetings</td>
</tr>
<tr>
<td></td>
<td>Representative to management and team</td>
</tr>
</tbody>
</table>
### General Implementation Guidelines

<table>
<thead>
<tr>
<th>Gaps</th>
<th>Combined Lean Six Sigma &amp; Agile Solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>At the portfolio level:</strong></td>
<td></td>
</tr>
</tbody>
</table>
| Arbitrary and inconsistent project selection criteria | - Map core processes touched by existing and upcoming projects  
- Select new projects based on critical process constraints |
| Poor coordination between related projects | - LSS Black Belts coordinate process interactions across projects, especially in different departments within the same value stream |
| Unfocused approach to risk management | - Build risk mitigation factors directly into project portfolio selection criteria  
- Use Lean Six Sigma tools to discover and control root causes within Agile projects |
## General Implementation Guidelines

### Combining Lean Six Sigma & Agile Solutions

<table>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Within Agile projects:</strong></td>
<td></td>
</tr>
</tbody>
</table>
| No quantification of project value    | ▪ Base project value on extrapolation of key process metrics  
                                         ▪ LSS Black Belt tracks project value generation |
| Customer difficulty in providing clear requirements | ▪ LSS Black Belt acts as customer proxy, assists with translating high-level goals to effective user stories |
| Inconsistent alignment with highest-priority process needs | ▪ LSS aligns actions with top-priority customer (hence process) needs  
                                                          ▪ Agile supports test-and-learn approach through early operational exposure |
## General Implementation Guidelines

<table>
<thead>
<tr>
<th>Gaps</th>
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</tr>
</thead>
<tbody>
<tr>
<td><strong>Within Lean Six Sigma projects:</strong></td>
<td></td>
</tr>
<tr>
<td>No incremental delivery of business value</td>
<td>- Use iterative delivery to quickly address “low hanging fruit,” quantify value with LSS</td>
</tr>
</tbody>
</table>
| Limited scope of analysis and opportunity for measurement | - Do coarse definition, measurement & analysis to get top priorities up front, then more granular and focused analysis during each iteration  
- Analysis takes place in parallel to delivery (LSS Black Belt is looking 1-2 iterations ahead of delivery team) |
| Insufficient linkage to execution of improvement recommendations | - LSS Black Belt ensures that high-level process recommendations are translated into effective implementations  
- Improvement effectiveness is tested both before (prototyping, spikes) and after (usability testing, process analysis) implementation |
Some specific steps that you can try now are noted below.

- **Business Context:**
  - Use high-level mapping tools (SIPOC, Value Stream Map) to “see the whole picture”
  - Use lower-level maps as appropriate to illustrate system interactions with business processes

- **Quantified Value:**
  - Integrate high-level Define and Measure techniques into up-front Agile Discovery Session (~1 week)
    - Determine key process metrics, where they don’t exist, then drill down to aligned project metrics
    - Build measurement systems at start of project, refine over time

- **Process & Customer Perspective:**
  - Team with existing process experts to supply Process Coaches to Agile projects
  - Use Process Coaches as customer proxies, and to facilitate end user feedback
IV. Discussion
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