Changing Behavior:
The key to adoption of complex process technology

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My goals for this presentation

1) Present new or different approaches to technology transition
2) Challenge your current thinking (changing change agents is hard)
3) Describe what I see is working in the field (and my thoughts on why)
4) Focus on the potential benefits to you and your organization inherent in these approaches to change
5) Describe my reactions and internalization of the approaches
Topics

- Current SEI Change Management Approach
- What's Needed
- A New Approach
- Bandura Social Learning
- Bayesian Belief Networks
Comprehensive System Change Model (IDEAL)

A Process Improvement Infrastructure
Core Teams are typically formed and given responsibilities and roles for managing, facilitating, and implementing a change effort from start to finish.

Typical Organization Structure

The Process Change Method

1. Organize and Prepare
2. Conduct Organizational Scan
3. Establish Technical Working Groups
4. Understand Project’s Current State
5. Redesign the Process
6. Develop Solution
7. Conduct Pilot(s) and Evaluate
8. Facilitate Organizational Learning
My experience with using IDEAL:

• Takes too long (SEI time to move up)
• Costs too much
• Engineers don’t embrace it
• Hard to sell Management Value Proposition
The assimilation gap is the gap between the objective and the deployment.

1) Implementation gap

2) Performance gap

Interested In?

A streamlined transition approach that provides:

- Compelling Management Value Proposition
  - Predictable Costs
  - Creeping Commitment
  - Quick results with measurable ROI
- Concentrated and Focused process investments
- Accelerated Learning Environment
  - New Processes, New Experiences, New Data, New Beliefs, New Behaviors
- Rapid Predictable Organizational Adoption
- Continually Measurable Results
Major Differences in Approach to Transition

• Concentrated Process
  ➢ Comprehensive Packaged Operational System of Integrated Processes
  ➢ Proven Performance
  ➢ Integrated Operational Measurement System (Individual level)

• Focused Implementation Strategy
  ➢ Unit oriented (Project/Team)
  ➢ JIT Concentrated 3 level Training
  ➢ Accelerated Learning Laboratory
  ➢ Effective Project/Team Launch Process
  ➢ Coaching and continued support
Comprehensive HP Development Process

The process elements are adapted to the organization’s process.
Effective Project/Team Launch Process

TSP Process Structure

The TSP process elements can be organized into whatever process structure makes the most business and technical sense.

- The phases can be implemented iteratively in small cycles, in a spiral with increasing cycle content, or sequentially as in a waterfall.
- TSP projects can start on any phase or any cycle.
- Each cycle starts with a launch or re-launch and ends with a post-mortem.

The TSP Launch Process

1. Establish Product and Business Goals
2. Assign Roles and Define Team Goals
3. Produce Development Strategy
4. Build Togglers and Next-Phase Plans
5. Develop the Quality Plan
6. Build Bottom-up Consolidated Plans
7. Conduct Risk Assessment
8. Prepare Management Briefing and Launch Report
9. Hold Management Review

The TSP launch process produces necessary planning artifacts, e.g., goals, roles, estimates, task plan, milestones, quality plan, risk mitigation plan, etc.

The most important outcome is a committed team.
Operational Plans Implemented Processes

Measurement Framework

<table>
<thead>
<tr>
<th>Schedule</th>
<th>Effort</th>
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<tbody>
<tr>
<td>[Image]</td>
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<tr>
<th>Size</th>
<th>Quality</th>
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<td>[Image]</td>
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</table>

The TSP Launch Process

1. Establish Product and Business Goals
2. Assign Roles and Define Roles and Responsibilities
3. Develop the Quality Plan
4. Define the Target and Task Plans
5. Prepare the Project and Launch Support
6. Launch the Project
7. Conduct Risk Assessment
8. Implement Risk Management Plan
9. Tail Management Review

The TSP Development Process

Requirements Specification
High-Level Design
Implementation
System Test

The TSP process elements are adapted to the organization's process.

Quality Tracking

The TSP launch process continues with the necessary planning activities: e.g., goals, roles, estimates, task plan, milestones, quality plan, risk mitigation plan, etc. The most important outcome is a committed team.

Resource Tracking

Cumulative plan and actual resource hours shows resource burn rate and potential source of risk.

Earned Value Tracking

Cumulative budget and earned revenue shows the actual progress of the project.

TSP Weekly Status Report

| [Table] |

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Focused Implementation: Building Organizational Capability Project-by-Project, Team-by-Team

EPG identifies gaps and potential improvements, and executes improvement strategies.

Baseline

Corporate

Divisions, Departments, or Groups (4)

Projects (20)

Training  Launch

- Project data, improvement proposals, gaps

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Does it work for Organizations?

TSP Implements CMMI -2

An organization using TSP has directly addressed or implemented most specific practices (SP):
- 85% of SPs at ML2
- 78% of SPs at ML3
- 54% of SPs at ML4
- 26% of SPs at ML5
- 60% of ML2 and ML3 SPs
- 75% of SPs through ML5

Most generic practices are also addressed.

Reliable Products

An analysis of 20 projects in 13 organizations showed TSP teams averaged 0.06 defects per thousand lines of new or modified code.

Approximately 1/3 of these projects were defect-free.

These results are substantially better than those achieved in high maturity organizations.

Source: CMU/SEI-2018-TR-014

Organizations Using TSP

Productivity Improvement

From data on over 40 TSP teams, Intuit has found that:
- post code-complete effort is 8% instead of 32% of the project
- for TSP projects, standard test times are cut from 4 months to 1 month or less.

Non-TSP

TSP

Organizations using TSP report productivity gains of 30% to 80%, resulting in lower costs or more functionality in delivered software.
## Individual Transition:

<table>
<thead>
<tr>
<th>Contact</th>
<th>Awareness</th>
<th>Understanding</th>
<th>Trial Use</th>
<th>Adoption</th>
</tr>
</thead>
</table>
| • Conversation  
  • Website  
  • Article | • Conferences  
  • Books  
  • Articles  
  • Training | • JIT Training Focused on the projects and units implementing the processes (two weeks)  
  • Three levels of training  
    • Executive  
    • Team Leader  
    • Practitioner  
  • Advanced Learning Laboratory | • Packaged proven whole product Launch Process  
  • Supported by a “COACH”  
  • Instrumented  
  • Implements the Processed learned in the Learning Laboratory on the actual project  
  • Coach reinforces discipline throughout the project | • Project Based Rollout Strategy  
  • Organizational Commitment  
  • Organizational Support (EPG) |
Advanced Learning Laboratory

Training ++  Behavioral modification
Process Simulation  Challenge current beliefs
Individual Instrumentation  Change Behavior
Immersion Therapy  Change Behavior generates new results
Self Discovery
Process Simulation

Executing the Processes

Product-Process-Planning Data

Results from executing the Process

Process Simulation

Program 1
Program 2
Program 3
Program 4

**Measurement Framework**
- Schedule
- Effort
- Size
- Quality

**The TSP Development Process**

**Productivity**
- Size
- Effort

**Defect Fix Time by Type**
- Defect Fix Time by Type

**Total Cost of Quality**
- Total Cost of Quality

**Time Estimating Error**
- Time Estimating Error

**Total Defects**
- Total Defects

**Failure Cost of Quality**
- Failure Cost of Quality

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Changing Behavior
Belief Systems and Behavior

Belief drives behavior

Belief → Behavior

How to change a belief?

Show results inconsistent with the belief
My Beliefs-My Data-- My Journey

Think  Change  Improve
Consciousness Model and Bandura Social Learning
Bayesian Belief networks

Bayesian Inference Model: Allow the use of prior knowledge.

Let $P(h|\xi)$ be a degree of belief in $h$ given current state of information $\xi$.

New evidence $\tilde{e}$ is presented.

Update using Bayes’s Theorem:

$$
P(h|\tilde{e},\xi) = \frac{P(h|\xi)P(\tilde{e}|h,\xi)}{P(\tilde{e}|\xi)}$$
The Technology Acceptance Model is an information systems theory that models how users come to accept and use a technology.

Simplified Acceptance Model based on Beliefs
Repeated for Contact, Awareness, Understanding, Trial use and Institutionalization

Benefit

Work

Continue

## Concept of a BBN Model

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<tbody>
<tr>
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<td>Work</td>
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<tr>
<td>Continue</td>
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Using BBN Model to Predict Future

For a particular client at a given point in the adoption curve, knowledge of any of the past or present scores can be used to predict the future scores!
Using BBN Model to Explain Past

For a particular client at a given point in the adoption curve, knowledge of a recent score can be used to explain what the historical, unknown scores most likely were.
# Transition Survey

## Awareness:

Activity: Executive Seminar/ Team lead training

<table>
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<th>PSP will benefit me/my organization:</th>
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</thead>
<tbody>
<tr>
<td>No</td>
</tr>
<tr>
<td>0%</td>
</tr>
<tr>
<td>25%</td>
</tr>
<tr>
<td>50%</td>
</tr>
<tr>
<td>75%</td>
</tr>
<tr>
<td>100%</td>
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</table>

(For Partners) What percentage of clients continue on to understanding

| 0%                                        |
| 25%                                       |
| 50%                                       |
| 75%                                       |
| 100%                                      |

## Comments:
Changing Benefit Profile

This distribution of the Benefit score is noticeably moving up across the adoption phases.
Changing Work Profile

This distribution of the Work score is noticeably moving up across the adoption phases.
Changing Continue Profile

This distribution of the Continue score is noticeably moving up across the adoption phases.
Overall Trend of Average Responses
Some Initial Linear Models

Contact-Continue-Score = 4.3 + 0.85 * Contact-Work-Score

(Adj-Rsquare = 48%)

Understand-Benefit-Score = 41.1 + 0.49 * Awareness-Benefit-Score

(Adj-Rsquare = 36%)

Although we prefer adjusted Rsquare values in the 80%+ range, these single factor prediction models show promise.

Remember, Adj-Rsquare is the amount of behavior of the outcome explained by the modeling factor.
Questions?