Special Intelligence from the Women In Black

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Cora Carmody, SAIC
Joan Weszka, Lockheed Martin
Rose Whitney, Process Focus Management, Inc.

SEPG 2004
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Agenda

• Introduction  
  by Kim Caputo

• The Executive Perspective  
  by Joan Weszka

• The Manager Perspective  
  by Rose Whitney

• The Developer Perspective  
  by Kim Caputo

• The Process Group Perspective  
  by Cora Carmody
Introduction

• What’s the Secret to…
  – Achieving the SPI Mission
  – Getting past “The Wall”
  – Obtaining (and Retaining) Sponsorship
  – Being heard
Roles and Relationships

Process Group

Executive

Manager

Developer
## Key Relationships

<table>
<thead>
<tr>
<th>Setting Expectations</th>
<th>Providing Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Executive &amp; Managers</td>
<td>4 Process Group &amp; Executive</td>
</tr>
<tr>
<td>2 Executive &amp; Developers</td>
<td>5 Process Group &amp; Managers</td>
</tr>
<tr>
<td>3 Managers &amp; Developers</td>
<td>6 Process Group &amp; Developers</td>
</tr>
</tbody>
</table>
Models and Maps

• The IDEAL Model tells you what your mission is…
  …but it’s not that easy
• The NORMAL Model shows you how things get off track
• The SECRET Map shows you how to get back on track to success
The IDEAL\textsuperscript{SM} Model

\textsuperscript{SM} IDEAL is a service mark of Carnegie Mellon University.

[McFeeley 96]
### IDEAL<sup>SM</sup> Model Involvement

<table>
<thead>
<tr>
<th>Initiating</th>
<th>• <strong>Get</strong> Executive Sponsorship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diagnosing</td>
<td>• Decide What to Improve</td>
</tr>
<tr>
<td>Establishing</td>
<td>• <strong>Get</strong> Champions Involved</td>
</tr>
<tr>
<td>Acting</td>
<td>• Define/Improve Processes</td>
</tr>
<tr>
<td></td>
<td>• <strong>Get</strong> Managers to Support it</td>
</tr>
<tr>
<td></td>
<td>• <strong>Get</strong> Developers to Follow it</td>
</tr>
<tr>
<td>Learning</td>
<td>• Learn From Experience</td>
</tr>
</tbody>
</table>
The IDEALSM Model Map

I. Get Executive Sponsorship

D. Decide What to Improve

L. Learn From Experience

E. Get Champions Involved

A2. Get Managers to Support it

A3. Get Developers to Follow it

A1. Define/Improve Processes

A1. Define/Improve Processes

L. Learn From Experience

E. Get Champions Involved

D. Decide What to Improve

I. Get Executive Sponsorship
The NORMAL Model

I. Execs

D. Decide

L. Learn

A1. Processes

E. Champs

A2. Managers

A3. Develo

Process Group Frustration:
– Will they ever Learn?

We’re different …
This doesn’t Apply

to Me

R. Reorganization

NO time, no way

NO time, no way
The SECRET Map

I. Execs

L. Learn

D. Decide

E. Champs

A1. Processes

A2. Managers

A3. Developers

A. Communicate

R. Tailor

SE. Sell

NO. Communicate

RE. Rejuvenate
Decoding Chart

<table>
<thead>
<tr>
<th>Loop Re-Entry Points</th>
<th>Loop Re-Entry Points</th>
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<tbody>
<tr>
<td>NO – NO time, no way</td>
<td>• Get Managers to Support it</td>
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<tr>
<td>SE – Sell &amp; Enlighten</td>
<td>• Get Developers to Follow it</td>
</tr>
<tr>
<td>C – Communicate Expectations Often</td>
<td>• Get Executive Sponsorship</td>
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<tr>
<td>R – Reorganization</td>
<td>• Get Champions Involved</td>
</tr>
<tr>
<td>SE – Sell &amp; Enlighten</td>
<td>• Learn From Experience</td>
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<tr>
<td>MA – This doesn’t Apply to Me</td>
<td>• Learn From Experience</td>
</tr>
<tr>
<td>T – Tailor things to fit new situations</td>
<td>• Learn From Experience</td>
</tr>
<tr>
<td>L – Will they ever Learn?</td>
<td>• Learn From Experience</td>
</tr>
<tr>
<td>RE – Rejuvenate &amp; Encourage</td>
<td>• Learn From Experience</td>
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- Get Managers to Support it
- Get Developers to Follow it
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What’s the Secret to…

…getting people to listen to you?

“If you don’t talk the way people listen, it doesn’t matter what you say”
Know Yourself and Your Audience

- What style are you?
- What style is your audience?
- What role does your audience play?

Sensor:
Results, Pragmatic, Executive Summary

iNTuitive:
Ideas, Creative, Pictures and Drawings

- Sensor: 43%
- iNTuitive: 30%
- 27%
Customize Communication to Your Audience

<table>
<thead>
<tr>
<th>Sensing Types – Prefer to see Data and Facts</th>
<th>iNtuitive Types – Prefer to see Ideas and Concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>66% of managers,</strong></td>
<td><strong>33% of managers,</strong></td>
</tr>
<tr>
<td><strong>50% engineers,</strong></td>
<td><strong>50% engineers,</strong></td>
</tr>
<tr>
<td><strong>29% change agents</strong></td>
<td><strong>71% change agents</strong></td>
</tr>
<tr>
<td>are Sensing</td>
<td>are iNtuitive</td>
</tr>
</tbody>
</table>

- West & Sullivan
iNtuitive Example: Why SPI?

Less stress.

Happy customers.

Insert miracle here

Engineers won’t have to perform magic anymore.

More time for fun, exciting work.

Fewer interruptions from management.

- West & Sullivan
Sensing Example: Why SPI?

• Nearly 1/3 of information technology projects were cancelled before completion
• Only 16% (1of 6) software projects were completed on time, on budget
• Delivered products contained on average only 61% of the originally-specified features
• Average budget overrun was 189%
• Average schedule overrun for projects that were in difficulty was 222%

“Charting the Seas of Technology: The CHAOS Study”
The Standish Group, January 1995
Bar Charts: Defects, Cycle Time, Productivity

Defects Down 500X

Productivity Up 3.8X

Cycle Time Faster by 6.7X


SEI CMM Level

2 3 4

Inspection Efficiency

1 1.68 2.00

Defect Density, per KSLOC

1 .54 .47

Build Cycle Time

NA 1 .19

Test Rate, KLOC/Days

1 4.7 20

Test Rate, reqts/week

1 1 2.7

Test Productivity, LOC/Stf Wk

1 1.66 3.07

- Motorola, Systems Solutions Group, SPIN 9/98
Graphs: Cycle Time, Productivity

Projects operating at Maturity Level 3 increased productivity by 62% ...

While cycle times improved 36%.

Reference: Scott Griffin, Boeing CIO, SEPG Conference 2000
Plots, Lines, Bars: Estimation, Defect Prevention

Improved estimation accuracy.

Product quality increased.

Defects detected earlier.

Software Estimates

Post Release Defects

Defect Management

(Based on data from 120 projects in Boeing Information Systems)

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Four Perspectives

- Executive
- Manager
- Developer
- Process Group
The Executive Perspective

- Special Concerns
- Crucial Questions
- Secret Answers
Special Concerns of the Executive

- Business & strategic objectives
- Quantitative results
  - 5X Productivity improvement
  - 70% fewer defects
  - 50% less cycle time
- Return-on-investment

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Executive Sponsorship

Executive sponsorship includes…

- funding
- resources
- visible support
- setting priorities and expectations
- motivating organizational behavior
- “walking the talk”
What’s the Secret to...

• …obtaining sponsorship? **Before** embarking on a process improvement program

• …retaining sponsorship? **After** a cycle has begun

*It’s a continuous process!*
Before… Prepare Yourself

• Obtain training on technology change management
  – Applies equally to process improvement as it does to technology adoption
• Understand the business objectives of your executive
• Have an “elevator speech” ready
  – Don’t lose an opportunity to reinforce the message

Your competence and credibility are key
Technology Change Management

- **Institutionalization**
- **Limited Adoption**
- **Trial Use**
- **Understanding**
- **Awareness**
- **Contact**

Business Objectives

• Explain how process improvement can support business performance
  – Higher productivity
  – Better quality
  – Reduced cycle time
  – More satisfied customers
  – Competitive benchmarks
    Higher Award Fees

Bottom-line: improved profitability
Software Quality
Lockheed Martin Systems Integration - Owego

Software Defects per Million Delivered Source Lines of Code

Improvements Since ‘92
80.5% Overall

% Reduction STRs / MSLOC

-80%
-60%
-40%
-20%
0%
-20%
-40%
-60%
-80%


* STR / MSLOC = Software Trouble Report/Million Source Lines of Code

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Software Productivity - All Software Including Reuse
Lockheed Martin Systems Integration - Owego

Improvements Since 1992:
9.8% Average per Year

Contributors:
• Increased Reuse (Domain Specific)
• Process Maturity and Compliance
• Process Consistency
• Increased use of High Order Language
  / 4th Generation / Object Oriented
• Use of development and test tools

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Software Productivity and Quality
Lockheed Martin Maritime Systems & Sensors – Radar Systems

Software Productivity and Quality Performance Application of Best Practices and Investment Has Resulted in Significant Improvements in Quality and Cost. As error rates declined, productivity increased by 80+%.  

Note: Appraisal method used for CMMI® was the Lockheed Martin Continuous Appraisal Method (CAM).

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SEPG 2004 Tutorial: Special Intelligence from the Women In Black
Software Productivity vs. CMM® Maturity Level
Lockheed Martin Maritime Systems & Sensors – Undersea Systems

Product Productivity Percent Improvement
Delivered Source Lines of Code per Labor Month
All Languages

Level 4,5

Level 3

Level 2

Level 1


0% 50% 100% 150% 200% 250% 300% 350% 400%
Our quality improved as our maturity increased.

* Appraisal method used was the Lockheed Martin Continuous Appraisal Method (CAM).
Software Quality
Lockheed Martin Maritime Systems & Sensors – Undersea Systems

<table>
<thead>
<tr>
<th>Sigma</th>
<th>Defects/MS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>690,000.0</td>
</tr>
<tr>
<td>2</td>
<td>308,537.0</td>
</tr>
<tr>
<td>3</td>
<td>66,807.0</td>
</tr>
<tr>
<td>4</td>
<td>6,210.0</td>
</tr>
<tr>
<td>5</td>
<td>233.0</td>
</tr>
<tr>
<td>6</td>
<td>3.4</td>
</tr>
</tbody>
</table>

MS = Million
Source Statements

Product Quality Level is in Five Sigma Range

Our quality rate is 20 times better than the average industry rates.
Predictability at CMM® Maturity Level 5
Lockheed Martin Maritime Systems & Sensors – Undersea Systems

Cost Performance Index (CPI) & Schedule Performance Index (SPI)

SCATTER PLOTS BETWEEN “1” AND “3” RATINGS ARE INDUSTRY SAMPLES. LOCKHEED MARTIN DATA HAS BEEN ADDED IN RED.

DATA FROM 8 PROGRAMS IN 2Q 2003

CPI

SPI

Reference: “A Correlational Study of the CMM® and Software Development Performance”
Lawlis, Flowe & Thordahl, CROSSTALK, September 1995

SEPG 2004 Tutorial: Special Intelligence from the Women In Black
## Process Improvement Return-on-Investment

Lockheed Martin Maritime Systems & Sensors – Undersea Systems

<table>
<thead>
<tr>
<th>Improvement</th>
<th>Metric</th>
<th>SW-CMM® Level 3</th>
<th>SW-CMM® Level 4</th>
<th>SW-CMM® Level 5</th>
<th>CMMI® Level 5*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality</td>
<td>Defects/MDSS**</td>
<td>600</td>
<td>300</td>
<td>150</td>
<td>51</td>
</tr>
<tr>
<td>Productivity</td>
<td>ESS***/Labor Month</td>
<td>220</td>
<td>280</td>
<td>340</td>
<td>379</td>
</tr>
<tr>
<td>Cost &amp; Schedule</td>
<td>+- Variance</td>
<td>15%</td>
<td>10%</td>
<td>8%</td>
<td>8%</td>
</tr>
<tr>
<td>Rework</td>
<td>expressed as a % of industry average</td>
<td>6%</td>
<td>3%</td>
<td>2%</td>
<td>2%</td>
</tr>
<tr>
<td>Reuse</td>
<td>Percent</td>
<td>68%</td>
<td>75%</td>
<td>82%</td>
<td>82%</td>
</tr>
</tbody>
</table>

Other initiatives underway during this period included
- ISO 9001 registration, followed by AS9000
- Integrated Teaming, and creation of an Integrated Process Library
- Integration of Systems Engineering and SW Engineering

* Appraisal method used was the Lockheed Martin Continuous Appraisal Method (CAM).
** MDSS = Million Delivered Source Statements
*** ESS = Equivalent Source Statements
Award Fee
Lockheed Martin Integrated Systems & Solutions

Award Fee vs CMM Level

SW CMM L2: 1993-1995
SW CMM L3: 1996-1997
SW CMM L4: 1998-1999
SW CMM L5: 2000-2001
CMMI L5: 2002

Additional Award Fee Achieved = 55% of the Potential Additional Award Fee

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“Elevator Speech”
(Mistakes vs. Proven Winners)

• Selling maturity levels instead of business results
  – “Getting to level 4 will put us one level above our competition” versus “Fewer product defects will reduce cost and improve customer satisfaction”

• Setting unrealistic expectations
  – “We can make Maturity Level 3 in three months” versus “Let’s conduct an informal benchmark appraisal and use the results to formulate our improvement plan”
The IDEALSM Model

SM IDEAL is a service mark of Carnegie Mellon University.

[McFeeley 96]
Initiating Phase - Sponsorship

• **Educate** on SPI
  – Fundamentals, including the model, life cycle and principles of managing technology change

• **Align** process improvement objectives with **business objectives**

• Obtain **long-term funding** commitment

<table>
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<tr>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
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</thead>
</table>
Diagnosing Phase - Appraisal

• *Educate* on the appraisal
  – Method, likely results (especially for initial appraisals), schedule template

• Clearly *identify sponsor actions*
  – Appraisal plan approval, including project selection
  – Active participation in appraisal (sponsor kickoff, interview, out-brief, action planning)
Establishing Phase - Plans

• Ensure plans include intermediate, *measurable milestones*
• Establish top level *“one chart” plans*
• Identify *key resource dependencies*
  – Key people are always in high demand
• Plan to *run process improvement as a project*
  – Identify WBS, cost/schedule, risks, etc.
Acting Phase – Actions and Status

- **Provide** quantitative process improvement progress status *regularly* to the sponsor
  - Monthly meetings recommended
- **Refresh/remind** regarding required sponsor actions
  - Communications
  - Briefings
  - Recognition
  - Progress assessment
Learning Phase – What’s Next?

• Communicate quantitatively what will be improved on the next cycle
  – Leverage lessons learned from our successes/failures and factor improvements into the next cycle
  – Advertise completion of a “cycle” and what happens next
The Executive Perspective - Summary

- Educate
- Communicate quantitatively
- Know and relate to business objectives
- Plan for ongoing, continued engagement
  - Status reviews
  - Continued executive involvement
The Manager Perspective

Manager

• Special Concerns
• Crucial Questions
• Secret Answers
Special Concerns of the Manager

• Fast Action

• The Balancing Act (Needs, Resources)

• Looking Competent
What’s the Secret to…

- …selling managers on committing to SPI?
- …getting people to pay attention to this?
Expanding the Scope of the SPI Job

• Recognize that you are marketing and selling SPI as a “product” and also acting as a collaborative internal consultant

• Use established methods
  – Marketing
  – Sales
  – Internal Consulting
Marketing

• Market Segmentation
  – Develop your organizational market

• Market Research
  – Research the “needs” of each market

• Marketing Channels
  – Develop appropriate communication channels and delivery methods to appeal to the market
Market Segmentation

1. Make a list of every single possible group, subgroup, informal group you can think of in your organization

2. Look for similarities between groups, such as responsibilities, actual work, client groups, demographics, etc.. Group together where it makes sense (Remember, nothing is set in concrete)

3. List groups and capture work responsibilities, concerns, and communication channels (see matrix on next slide)

4. Research SPI needs of each group
## SPI Market Segmentation Example

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<th>Primary Work Responsibilities</th>
<th>Primary SPI Concerns</th>
<th>Preferred Communication Channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior / Middle Management</td>
<td>Fiscal Health Customer Satisfaction Future Business Opportunities</td>
<td>Cost to implement Capability of internal implementation staff Actual “level” of the organization Impact on organizational morale.</td>
<td>Email Paper report/memo Weekly staff briefing</td>
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## SPI Market Segmentation Example

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<td>Project Managers</td>
<td>Deliver product</td>
<td>Cost to implement</td>
<td>Email</td>
</tr>
<tr>
<td></td>
<td>Manage development staff</td>
<td>Impact on delivery schedule</td>
<td>Face-to-face</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Impact on group morale</td>
<td>Weekly staff briefing</td>
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<td></td>
<td></td>
<td>Impact on “position” in the organization</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Capability of internal implementation staff</td>
<td></td>
</tr>
</tbody>
</table>

SEPG 2004 Tutorial: Special Intelligence from the Women In Black
Sales

• Customer Identification
  – Building person-to-person relationships

• Needs Analysis
  – Finding out the individual clients’ wants and needs and helping to fill them

• Recommendations, Benefits, Commitments
  – The engagement involves not just price, but also value
Sales Life Cycle

• Customer Identification
  – Clients, Needs
  – Decision Makers and Influencers

• Needs Analysis
  – Collect Requirements, Information & Sources
  – Preferences/ Dislikes
  – Questions to Ask

• Recommendations, Commitment
  – Problem and Solution Sets
  – Proposal with Benefits and Reason to Buy
  – Packaging and Closing the Sale
Developing the Message

- Who’s the client? (Manager)
- What is the action you want them to take when you get done selling? (Commit to SPI)
- Why would they want to do this? (Benefits)
- How do they do it? (Solution steps)
- What is the best channel? (Communication Plan)
- What language do they speak? (Big picture, bottom line first, or benefits first)
- What additional information do you need to sell? (Industry ROI, internal ROI, Competitive benchmarking data, hero information, etc.)
The Business Case for SPI

A report by DoD Data & Analysis Center for Software (DACS) found that application of SPI to an “Example organization with example projects”:

- Development costs Reduced 73%
- Rework costs Reduced 96%
- Average schedule length Reduced 37%
- Post-release defects Reduced 80%
- Weighted risk likelihood Reduced 92%
- Return on Investment 21:1

A Business Case for SPI Revised – Measuring ROI from Software Engineering and Management. DACS, September 1999

see http://www.dacs.dtic.mil/techs/roispi2/
Process Group View of Communication with Managers
But this is the Manager’s view...
### Internal Consulting Roadblocks

<table>
<thead>
<tr>
<th>Inside the Organization</th>
<th>Inside of You</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Politics &amp; the Hierarchy</td>
<td>• Anxiety &amp; Self-Doubt</td>
</tr>
<tr>
<td>• Boss-Subordinate Relationship</td>
<td>• Delivering unpopular messages</td>
</tr>
<tr>
<td>• Negotiating Confidentiality</td>
<td>• Setting Parameters &amp; saying “NO”</td>
</tr>
<tr>
<td>• Walking out is not an option</td>
<td>• Juggling Clients &amp; Workload</td>
</tr>
<tr>
<td>• Lack of Authority</td>
<td></td>
</tr>
</tbody>
</table>
Internal Consultant Roles to Play

- **Change Leader**: Offers strong facilitation & organizational influence
- **Committed Partner**: Serves the client with collaborative orientation
- **Business Driver**: Emphasizes performance management and results
- **Trusted Advisor**: Serves as a confidant for authentic communication
- **Grounded Expert**: Has specific performance improvement expertise
- **Insightful Observer**: Applies systems thinking & rigorous inquiry
Ground Rules for Contracting

1. Write down contracts. Most are broken out of neglect, not intent.
2. Contracts require specific time deadlines or durations.
3. Good contracts require good faith (and often accidental good fortune). 50/50 Responsibility
4. Social contracts are always renegotiable. If someone wants to renegotiate a contract in midstream, be grateful they are telling you & not just doing it without a word.
## Contracting Expectations

<table>
<thead>
<tr>
<th>You can …</th>
<th>You can’t…</th>
</tr>
</thead>
<tbody>
<tr>
<td>…contract for behavior, but not for the other person to change their feelings</td>
<td>…get something for nothing. There must be consideration on both sides</td>
</tr>
<tr>
<td>…say no – even to clients</td>
<td>…ask for something the other person doesn’t have, or promise something you don’t have</td>
</tr>
<tr>
<td>…negotiate for what you want</td>
<td>…contract with someone who’s not in the room</td>
</tr>
</tbody>
</table>

All wants are legitimate – it is a birthright
The Manager Perspective - Summary

- See Managers as Clients and Customers
- Understand Managers Needs
- Use Market Segmentation and Sales Cycles
- Develop Consulting Skills
- Know the Ground Rules for Contracting
Special Intelligence from the Women In Black

BREAK
The Developer Perspective

- Special Concerns
- Crucial Questions
- Secret Answers
Special Concerns of the Developer

- Improving Personal Competence
- Goal Achievement
- Schedule Pressure
What’s the Secret to…

• …getting developers to invest time in SPI?
• …getting people to adopt changes?

(Remember who they are, what they like, and what the need…)
Problems and Why

• Analysis Paralysis: Developers get caught in their own mental loop

• No time for this SPI stuff: Developers are Very Very Busy

• The Waiting Game: Developers Play Follow the Leader
Simple Situation Analysis

Use a checklist or questionnaire with areas to focus discussion...

<table>
<thead>
<tr>
<th>Today</th>
<th>Tomorrow</th>
</tr>
</thead>
<tbody>
<tr>
<td>What do you do in this area today?</td>
<td>What do you want to be doing in this area in the future?</td>
</tr>
</tbody>
</table>
## Define Results, Needs, Activities

<table>
<thead>
<tr>
<th>Results</th>
<th>Needs</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>What desired results do we want to achieve?</td>
<td>What do we need to change to affect this result?</td>
<td>What tasks do we expect to be done to effect the needed change?</td>
</tr>
<tr>
<td>How much improvement can we expect?</td>
<td>How soon do we need this result to improve?</td>
<td>Can this be done on time, to get the desired results?</td>
</tr>
</tbody>
</table>

Prioritize by Impact

Prioritize by Urgency

Prioritize by Feasibility

- Caputo
### Sample Worksheet

<table>
<thead>
<tr>
<th>Results</th>
<th>Needs</th>
<th>Activities</th>
</tr>
</thead>
</table>
| **Produce quality software**  | Need to meet all requirements                              | - Manage requirements  
- Manage changes  
- Hold peer reviews  
- Conduct testing  
- Manage configurations  
- Perform SQA |
|                               | Need to reduce defects delivered                           |                                                                           |
| **Deliver to customer on time** | Need to schedule activities and track status               | - Plan activities  
- Develop schedule  
- Track actual progress  
- React to deviations |
| **Deliver within budget**     | Need to budget our activities, track progress              | - Plan activities  
- Identify resource needs  
- Develop budget  
- Track actual costs  
- React to deviations |
Insight about Buy-in

To get buy-in for improvement activities, sell results to executives, and sell needs to managers and developers.

If you talk to executives about needs, you’ll sound like you’re complaining.

If you talk to managers and developers about results, you’ll sound like you’re out of touch with reality.
The 10-hour rule

1 hour in inspection can catch bugs,

where if the same bugs escape to test, it takes 10 hours to find and fix,

where if the same bugs escape to customers, it takes 100 hours or more to find and fix.
Bottom-line

<table>
<thead>
<tr>
<th>2 hours in inspection in one week</th>
<th>Saves at least 20 hours of rework downstream</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>That is a savings of $\frac{1}{2}$ a week of work for every inspection</td>
</tr>
</tbody>
</table>

That is a savings of ½ a week of work for every inspection.
## Defect Detection and Cost Changes as Process Maturity Increases

<table>
<thead>
<tr>
<th>Where Defects are Introduced</th>
<th>Req’ts.</th>
<th>Design</th>
<th>Code</th>
<th>Functional Test</th>
<th>System Test</th>
<th>Field Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative Cost to Fix</td>
<td>$1</td>
<td>$1</td>
<td>$1</td>
<td>$6</td>
<td>$12</td>
<td>$100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Where Defects Are Detected</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relative Cost for 100 Fixes</td>
<td>$4,000</td>
<td>$2,500</td>
<td>$1,400</td>
<td>$1,000</td>
<td>$800</td>
</tr>
</tbody>
</table>

Source: CMI/SEI-96-HB-002

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Example of How SPI Can Save Money:

Cost to Repair Design Defects

SEI found:
- Rework is 40% - 50% of project costs
- High-maturity organizations can get rework to <10% of costs

(Paulk, 1999)
Find the Leaders

• Developers follow other Developers
  – Credibility of the Process Group Lead
  – Should be someone who developed code
  – Should be someone developers will not ignore

• Critical Mass of Thoughtshare is only 18%
  – Credibility of Development Champions
  – Select Champions out of the Development Pool from opinion leaders with respected opinions
  – Give them the knowledge; let them evangelize
How to Prevent Backsliding

Meeting Agenda for Process Improvement

• Get the right people at the meeting and ask…
  – One thing the process Must Include
  – One thing the process Should NOT Include

• Ask for clarification, and edit
  – What did you mean by that?
  – Does everyone agree, or what should it be?
  – If agreed, adopt it, if no agreement, drop it

• Write the process using these points exactly
The Developer Perspective - Summary

• Keep it simple… They are busy
• Simple Techniques:
  • Today/ Tomorrow
  • Results/Needs/Activities
• Save them time
• Find the Leaders
The Process Group Perspective

- Special Concerns
- Crucial Questions
- Secret Answers
Special Concerns of the Process Group

- Improving Organizational Capability
- Energy and Motivation
- The Human Element
What’s the Secret to...

• …dealing with the human element?

• …getting people to listen to you?
Dealing with the Human Element

- Care and Feeding
- Peer Pressure
- Time Pressure
- Spirit
Care and Feeding

- Literally, “feeding” …
The Social Side…

- Rejuvenate people
- Interact as people

- Learn where everybody is coming from…
- Life history can color their ability to accept change
  - It could be something that happened 20 minutes ago or 20 years ago, you just don’t know
Meeting Reminders

Do:
• Be respectful of people’s time
• Have an agenda and stick to it
• Watch body language
• Work the crowd
• Watch out for the strong silent type…

Don’t
• Be process fanatics
• Stick to the letter of the law
• Let the tools use you; you use the tools
• Forget to smile or laugh …
Put your whole body into it!

• Your presence makes a difference.

• When Executives show up, people are appreciative. It shows you care!
  – Some executives think: “They’ll think I’m interfering”

– Importance of your presence applies equally to SPI teams and project teams
Peer Pressure

- Executive Status Reviews
  - A few presentations
  - Walk around view of Wall Charts
  - Face time for teams

“You’d think after 5 years of SPI, Jim’s radar would be a little bigger”
Process Reuse: a Learning Tool

• Rethink your goal
  – “How close to the finish line can I start?”

• Borrow with honor
  – shamelessly steal and edit process artifacts

• Find it Fast
  – It has to be easier to find than to reinvent
Time Pressure

• Visual Charts 🥰
  – If they don’t get it in 10 seconds, they won’t bother trying
  – If it’s too detailed, use highlighting or color to draw attention to the point

---

SEPG 2004 Tutorial: Special Intelligence from the Women In Black
<table>
<thead>
<tr>
<th>Architecture</th>
<th>Technology</th>
<th>Technology Type</th>
<th>primetime zone</th>
<th>impact on business</th>
<th>cost to implement</th>
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</thead>
<tbody>
<tr>
<td>XML</td>
<td>text analysis</td>
<td>Data/Knowledge</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>data, analysis, decision support</td>
<td>Data/Knowledge</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>content based retrieval</td>
<td>Data/Knowledge</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Brilliant content</td>
<td>Data/Knowledge</td>
<td>2</td>
<td>3</td>
<td>3</td>
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<tr>
<td></td>
<td>Audio Mining</td>
<td>Data/Knowledge</td>
<td>4</td>
<td>3</td>
<td>3</td>
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<tr>
<td></td>
<td>Intelligent Agents</td>
<td>Data/Knowledge</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>speech recognition</td>
<td>Input</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>natural language processing</td>
<td>Input</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>display technologies</td>
<td>Output</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>digital ink</td>
<td>Output</td>
<td>3</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>handwriting recognition</td>
<td>Input</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>speech synthesis</td>
<td>Output</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>wearables (embedded miniature computers)</td>
<td>Device</td>
<td>4</td>
<td>3</td>
<td>3</td>
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<tr>
<td></td>
<td>Automatic Platform Adjustment</td>
<td>Transport/Connectivity</td>
<td>2</td>
<td>1</td>
<td>3</td>
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<tr>
<td></td>
<td>Enterprise Portals</td>
<td>Data/Knowledge</td>
<td>1</td>
<td>1</td>
<td>2</td>
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<tr>
<td></td>
<td>Voice Portals</td>
<td>Data/Knowledge</td>
<td>2</td>
<td>2</td>
<td>2</td>
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<tr>
<td></td>
<td>Quantum Computing</td>
<td>Device</td>
<td>4</td>
<td>3</td>
<td>4</td>
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<tr>
<td></td>
<td>Web tops</td>
<td>Data/Knowledge</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Linux</td>
<td>Device</td>
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<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>B2B Electronic Commerce</td>
<td>Application</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>CRMs</td>
<td>Application</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>ASPs</td>
<td>Application</td>
<td>1</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Workflow engines</td>
<td>Application</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Wireless Web (WAP/WML)</td>
<td>Transport/Connectivity</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>DSL/Cable modems</td>
<td>Transport/Connectivity</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Enterprise Directory/w LDAP</td>
<td>Access</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Digital Authorization</td>
<td>Access</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Biometrics</td>
<td>Access</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Smartcards</td>
<td>Access</td>
<td>2</td>
<td>2</td>
<td>2</td>
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<tr>
<td></td>
<td>Voice over IP</td>
<td>Transport/Connectivity</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Bluetooth</td>
<td>Transport/Connectivity</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
Props and Backdrops

- Little Books or Reference Cards
  - Purple Book Guide to SPI
  - ISO 9000 Reference Card
- CMM Posters
- Wall Charts
Iconize Your Spirit

• Give your team a name and graphic with meaning they can relate to

As Predictable as the Rising Sun…

Phoenix Rising from the ashes…
Unsurpassed Excellence
As our process matured, so did the Phoenix logo…
Use SPI ROI Data To Your Advantage

- **Software Engineering Institute 1994 study**: Average of 5:1 ROI for 13 organizations engaged in SPI
- **Navy FMSO**: saved over $2 million using Formal Inspections
- **Air Logistics Center**: 7.5:1 ROI, 10X productivity increase
- **Raytheon**: Achieved a 7.7:1 ROI with 2:1 productivity gains, defect rate reduced by 4.2X, reduced testing effort by 1/2. Received $9.6M bonus for early delivery
- **PRC**: Reduced documentation defects by 78%, code defects by 70%, defects found in operation by 60%, increased ability to meet monthly cost goals by 40%
- **Boeing**: Reduced cycle time up to 50%, increased productivity 240%, and realized a cost-to-benefit ratio of 1:7
- **Ogden Air Logistics Center**: Spent ~$5M to reach Level 5; received over $100M in new work (19-to-1 ROI)
Intangible Benefits of SPI

At Ogden Air Logistics Center - CrossTalk, May 1999
- **Positive** influence on working environment
- **Beneficial** structure provided to the development process
- **Fewer** surprises and last-minute glitches, “fire drills” **reduced**
- **Better** quality software; overtime & unhappy customers **reduced**

At Boeing Space Transportation Systems - IEEE Software, Oct 1999
- **Employee** satisfaction **up from 74% to 96%**
- Employees **motivated to eliminate defects, improve quality**

At SSC San Diego Costs and Benefits of SPI, Karen D. Prenger
- **Better** management control over project, team communication
- **Better** overall performance of the software
- **Improved** morale of team, **less** overtime, absenteeism
- **Increased** competitive advantage and repeat business

At multiple sites - DACS: Business Case for SPI Revised
- **Improved** customer satisfaction
- **Improved** professional staff
Benefits of SPI at SSC San Diego

Testimonials from Level 3 Project Managers about SPI:

- We have been awarded new work based on our SPI efforts
- We have fewer surprises, last minute glitches, and fire drills
- We have fewer risks this year because we learned from our Risk Management Plan from last year
- We are now consistently producing builds with zero defects
- We produced more complex builds in less time
- Implementing Peer Reviews and other process improvements significantly reduced the problems found and the testing efforts (e.g., reduced trouble reports by 71%, time to conduct tests by 33%, time to fix all trouble reports by 70%)
- We have better communication across the team, and people know what they are supposed to be doing
- The project people have told me they would not work on another project without a defined processes
- I feel I am a much better project manager
The Process Group Perspective

Summary

- People are Human
  - Care and Feeding
  - Use Visual Techniques
- Know Yourself and Your Audience
  - Talk the Way They Listen
  - Use Data to Your Advantage
**The SECRET Decoding Chart**

<table>
<thead>
<tr>
<th>NO – NO time, no way</th>
<th>Loop Re-Entry Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE – Sell &amp; Enlighten</td>
<td>• Get Managers to Support it</td>
</tr>
<tr>
<td>C – Communicate</td>
<td>• Get Developers to Follow it</td>
</tr>
<tr>
<td></td>
<td>Expectations Often</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>R – Reorganization</th>
<th>Loop Re-Entry Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>SE – Sell &amp; Enlighten</td>
<td>• Get Executive Sponsorship</td>
</tr>
</tbody>
</table>

| MA – This doesn’t Apply to Me | Loop Re-Entry Points |
| T – Tailor things to fit new situations | • Get Champions Involved |
|                                   | • Learn From Experience |

| L – Will they ever Learn? | Loop Re-Entry Points |
| RE – Rejuvenate & Encourage | • Learn From Experience |
One More Secret: SPI Leadership

“As for the best leaders, the people do not notice their existence. The next best, the people honor and praise. The next, the people fear, and the next, the people hate. When the best leader’s work is done, the people say, “We did it ourselves.””

Lao-Tsu, 6th Century BC
Special Intelligence from the Women In Black

QUESTIONS
References

Special Thanks

- To Beth Gramoy, US NAVY RETIRED, Member of the “Original Broadway Cast” for her enthusiastic support and contribution to this presentation.
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