17 November 2005

Business Improvements
Achieving CMMI® Level 5 at SAIC

Who Keeps Moving My Process?

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System and Network Solutions Group (SNSG)
Science Applications International Corporation (SAIC)

About SAIC

- **Science Applications International Corporation (SAIC)**
- **$7.2 Billion in Revenue**
- **42,000+ Employees (Offices in >150 Cities Worldwide)**
- **Largest Employee-Owned Research & Engineering Company**
- **Business Areas**
  - Criminal Justice
  - Energy – Oil & Gas & Utilities
  - Environment
  - Homeland Security
  - Healthcare
  - National Security
  - Space
  - Telecommunications
  - Logistics

SAIC and Process Improvement
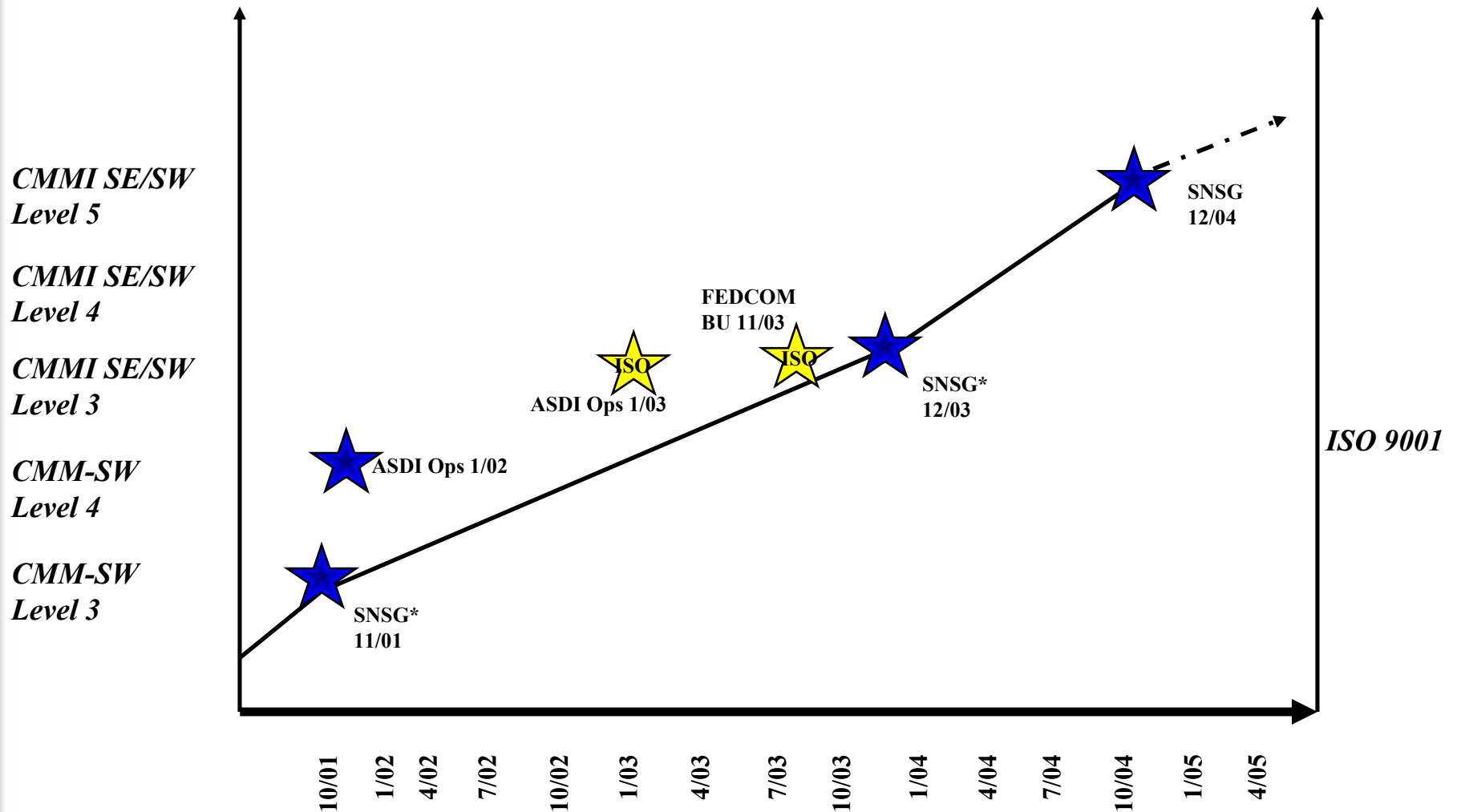
◆ **SEI CMMI® Partner Program Member**

– 5 Engineers authorized to teach the SEI Course

– 8 Engineers authorized to provide SCAMPI$^{(SM)}$ appraisal services

◆ **Long History of Internal Process Improvement**

– Organizations at CMMI® Higher Maturity Levels at more than 10 locations

– Organizations at Software CMM® Higher Maturity Levels at more than 20 locations, including the U.K.

– More than 20 organizations registered ISO 9001:2000

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SNSG Process Improvement Journey: CMMI® and ISO 9001:2000

CMMI SE/SW Level 5

CMMI SE/SW Level 4

CMMI SE/SW Level 3

CMM-SW Level 4

CMM-SW Level 3

ISO 9001

SNSG 12/04

FEDCOM BU 11/03

ISO

ASDI Ops 1/03

SNSG* 12/03

ASDI Ops 1/02

SNSG* 11/01

Time Line

10/01 1/02 4/02 7/02 10/02 1/03 4/03 7/03 10/03 1/04 4/04 7/04 10/04 1/05 4/05

*Formerly ITSS

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The "Field"

◆ **Risks**

– Balancing agility, robustness, inflexibility, discipline
– Preventing "process for process sake"
– Complacency in process
– Benefiting one versus many (balancing benefits throughout the organization)

◆ **Constraints**

– Cost
– Resources
– Career path
– Size
– Geographically dispersed (multiple locations)
– Diverse business base
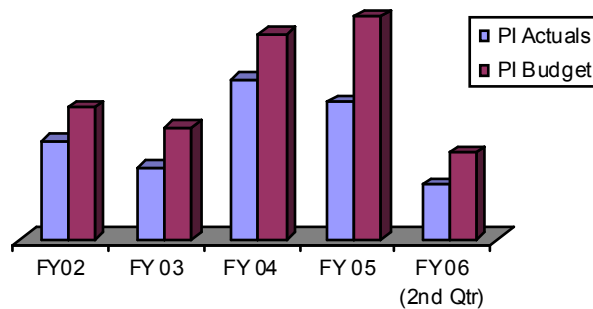– Broad customer base
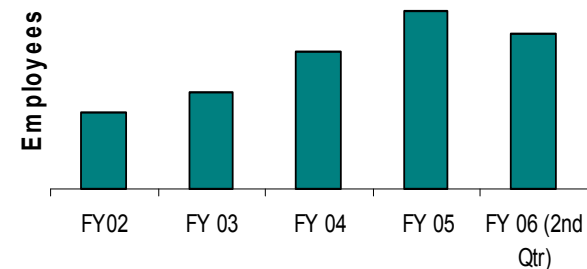– Shifts in "team" composition

The "Plows"

◆ **Mechanisms**

  – Monthly Executive Process Reviews (group president, deputy, staff)

  – Monthly SNSG Process Group meetings and metrics meetings

  – Measurement program/reviews; Training program/reviews

  – Web-based tools and repositories; simple Microsoft® Office-based tools

  – Process and tool to manage innovative suggestions

  – Process action teams, Causal analysis teams

  – Change control process

  – Six Sigma®

  – Horizontal and vertical participation

Microsoft is a registered trademark of Microsoft Corporation in the United States and/or other countries. Six Sigma is a registered trademark of Motorola, Inc. in the United States and/or other countries.
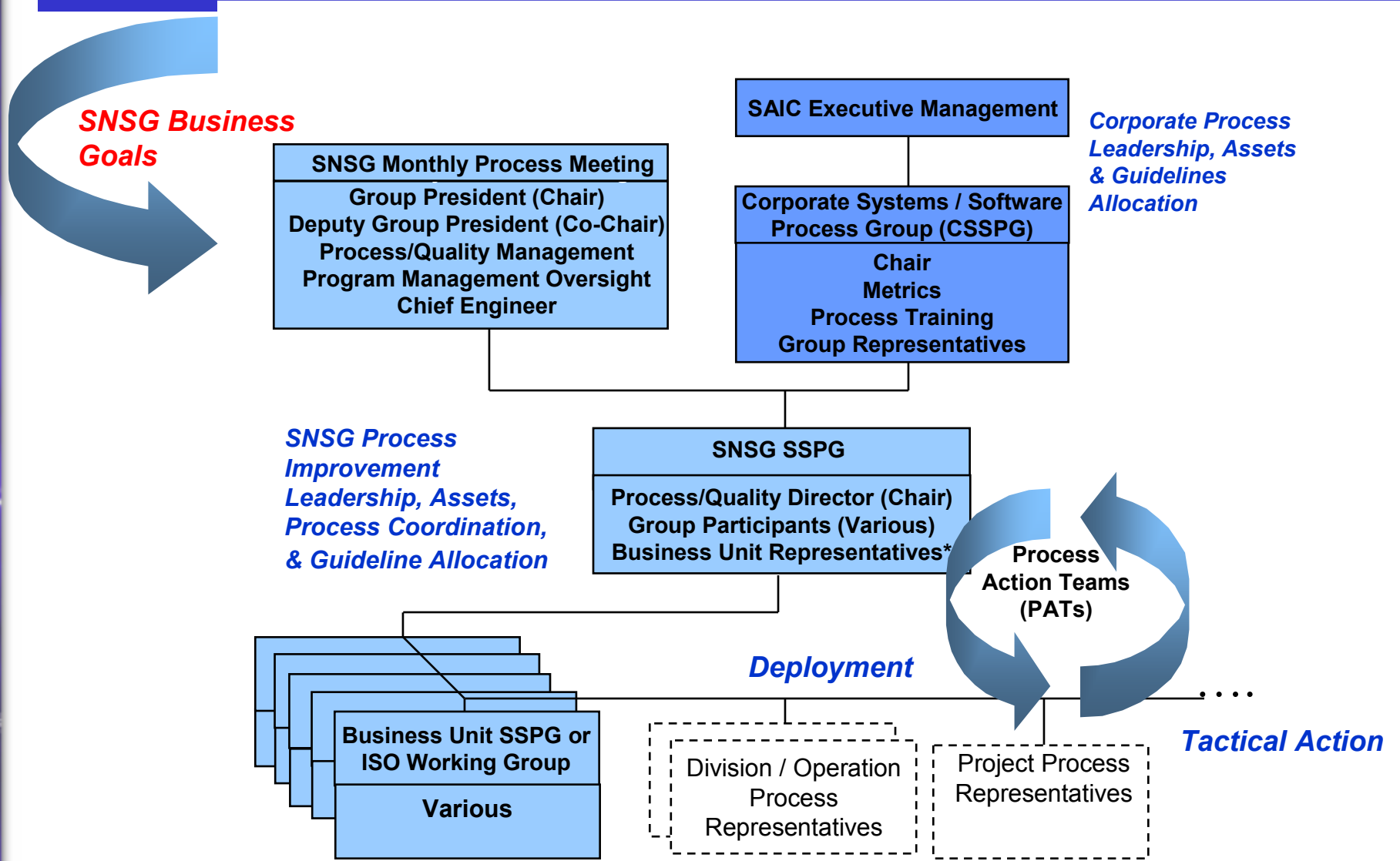
PI Expenditures

Legend: ■ PI Actuals ■ PI Budget

X-axis: FY02, FY 03, FY 04, FY 05, FY06 (2nd Qtr)

Group Size

Y-axis: Employees

X-axis: FY02, FY 03, FY 04, FY 05, FY 06 (2nd Qtr)

From Science to Solutions

"Growing the Crop"

SNSG Business Goals

SNSG Monthly Process Meeting

Group President (Chair)
Deputy Group President (Co-Chair)
Process/Quality Management
Program Management Oversight
Chief Engineer

SAIC Executive Management

Corporate Process Leadership, Assets & Guidelines Allocation

Corporate Systems / Software Process Group (CSSPG)

Chair
Metrics
Process Training
Group Representatives

SNSG Process Improvement Leadership, Assets, Process Coordination, & Guideline Allocation

SNSG SSPG

Process/Quality Director (Chair)
Group Participants (Various)
Business Unit Representatives*

Process Action Teams (PATs)

Business Unit SSPG or ISO Working Group

Various

Deployment

Division / Operation Process Representatives

Project Process Representatives

Tactical Action

. . . .
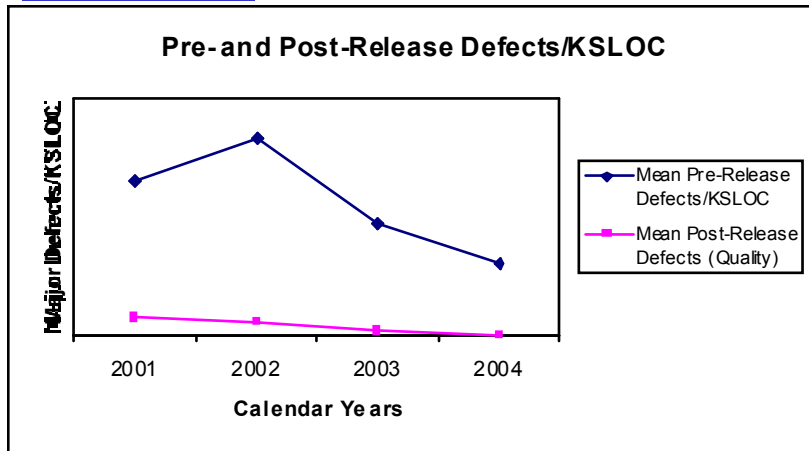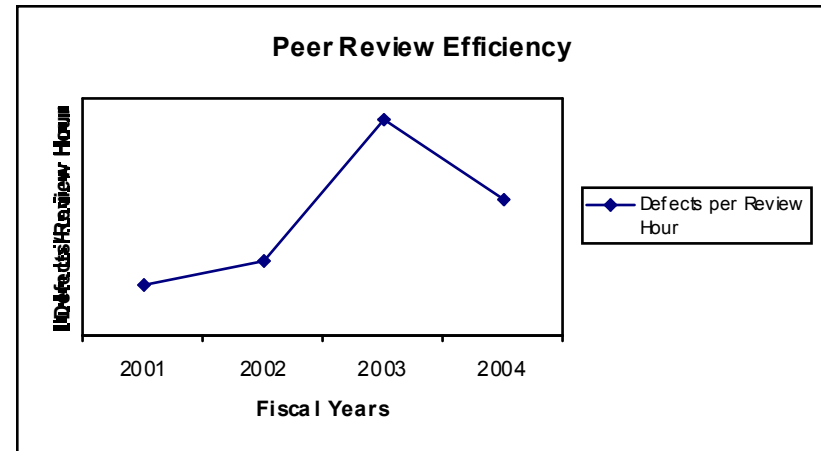
The "Harvest"

◆ **Noticeable 54% drop in pre-release defects**

◆ **Steady increase in overall customer satisfaction**

◆ **Peer reviews are approximately 84% more efficient since 2002, even though there are fewer defects to find**

- Reviews are finding defects earlier in the process (costing less) when there are less defects to be found (improved product quality)
- Reduction in training costs; increase in employee training

◆ **Improved effectiveness of Bid and Proposal process**

◆ **On-demand knowledge-sharing (lessons learned process)**

◆ **Improved project performance**

◆ **Increased business opportunities**

◆ **Reduction of 39% in process improvement costs while steadily increasing training, maturity of process assets, and skill sets**

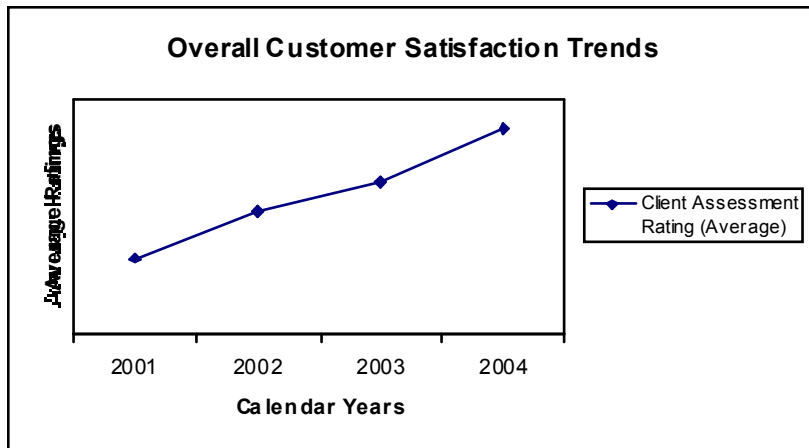◆ **Improvements accomplished while exceeding financial goals**
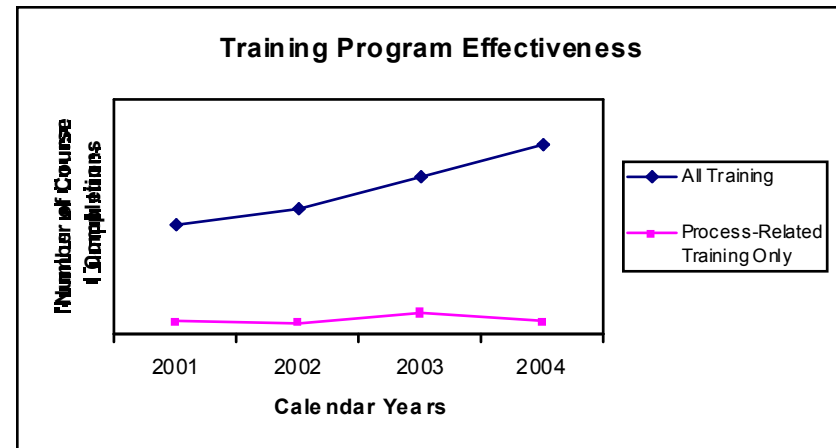
Some Trends Experienced Along the Way

Pre- and Post-Release Defects/KSLOC

Legend:
- Mean Pre-Release Defects/KSLOC
- Mean Post-Release Defects (Quality)

X-axis: Calendar Years (2001, 2002, 2003, 2004)
Y-axis: Major Defects/KSLOC

General trend of decreasing defects and increasing product quality over 4 years.

Peer Review Efficiency

Legend:
- Defects per Review Hour

X-axis: Fiscal Years (2001, 2002, 2003, 2004)
Y-axis: Defects/Review Hour

Increase in peer review efficiency despite the fact that there are fewer product defects to find.

Overall Customer Satisfaction Trends

Legend:
- Client Assessment Rating (Average)

X-axis: Calendar Years (2001, 2002, 2003, 2004)
Y-axis: Average Ratings

Customer satisfaction ratings have steadily increased.

Training Program Effectiveness

Legend:
- All Training
- Process-Related Training Only

X-axis: Calendar Years (2001, 2002, 2003, 2004)
Y-axis: Number of Course Completions

Overall training accomplishments increase while maintaining focus on revenue, PBT, and process improvement investments.
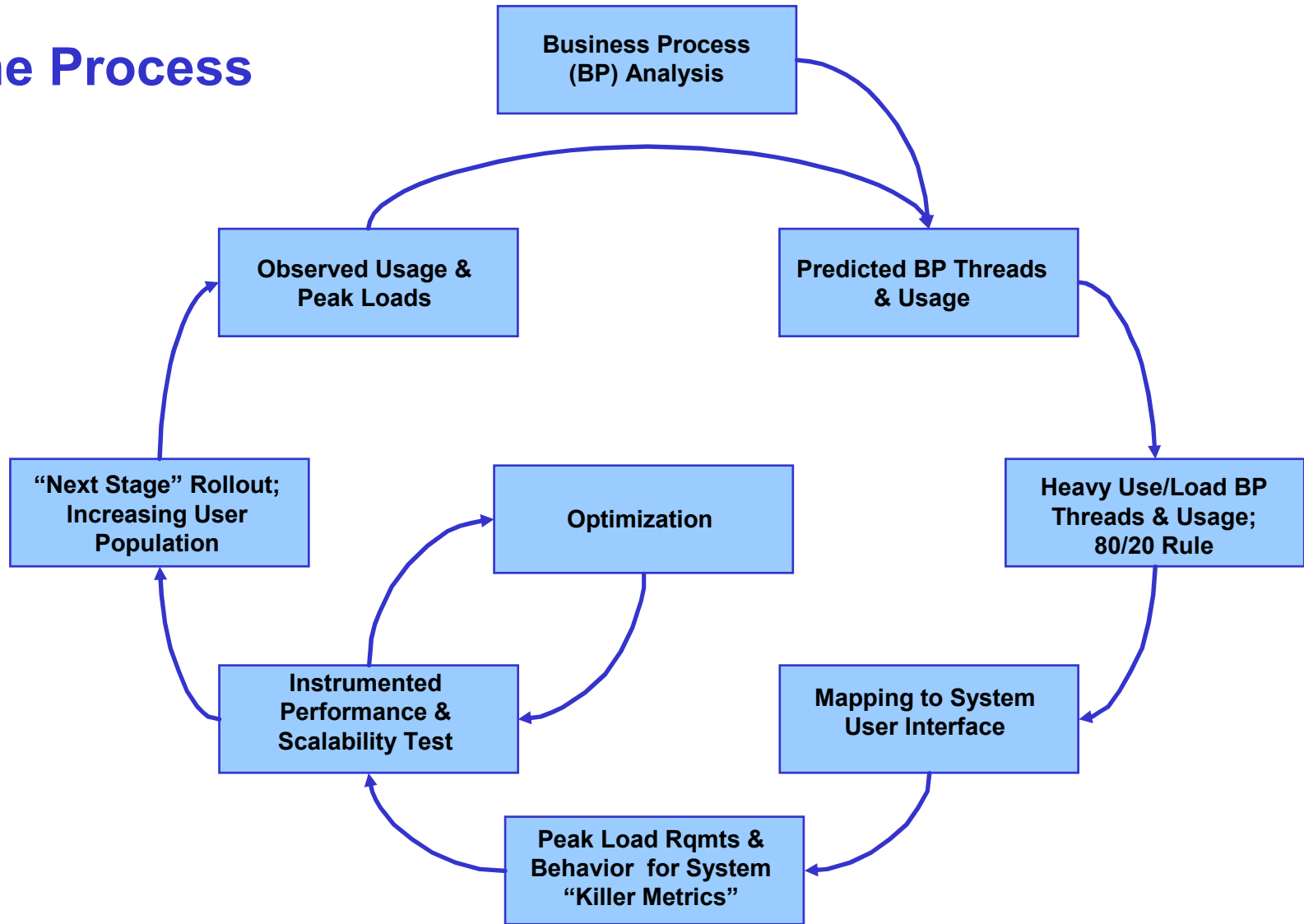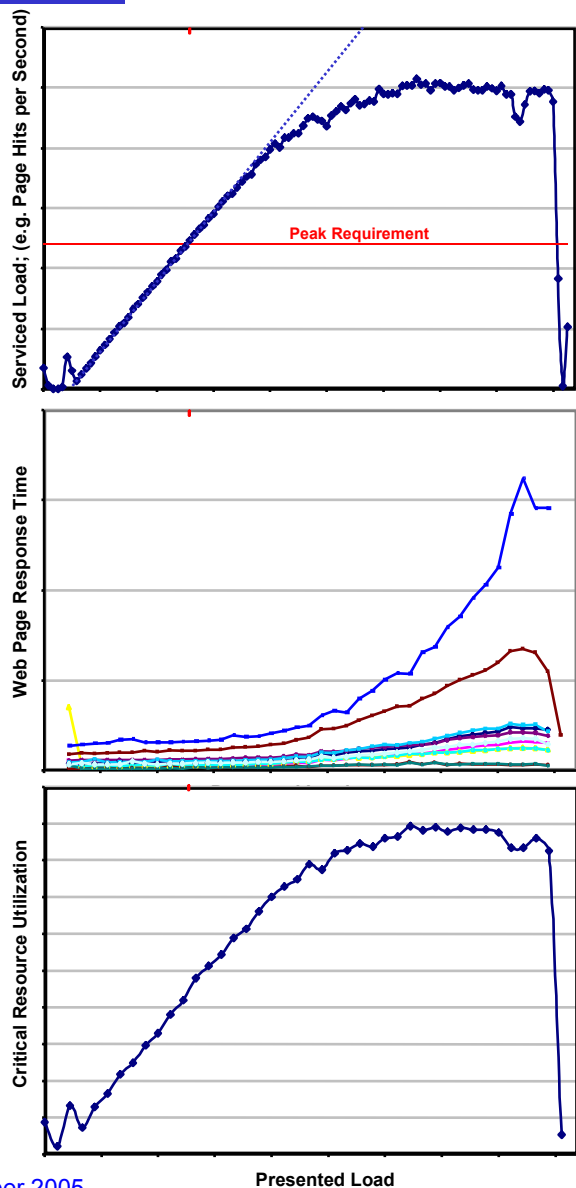
The "Harvest" – a PAT Example

◆ **Focus On Complex Problems That Must Be Solved Repeatedly**

– Active program to foster organizational learning

– Use a PAT as a tool to foster continuous improvement by capturing new best practices

◆ **Example: Performance & Scalability Testing & Optimization for Large-scale Web-based Systems**

– Driven by business processes, not technology $\Rightarrow$ meaningful to business people

– Rigorous instrumented test and in production representative environments, producing technical metrics that provide real insight into system behavior $\Rightarrow$ meaningful to engineers and technologists

The "Harvest" – a PAT Example

◆ **The Process**

```
                          ┌─────────────────┐
                          │ Business Process │
                          │  (BP) Analysis   │
                          └─────────────────┘
```

Observed Usage & Peak Loads		Predicted BP Threads & Usage

"Next Stage" Rollout; Increasing User Population	Optimization	Heavy Use/Load BP Threads & Usage; 80/20 Rule

Instrumented Performance & Scalability Test		Mapping to System User Interface

| | Peak Load Rqmts & Behavior for System "Killer Metrics" | |

The "Harvest" – a PAT Example

Serviced Load; (e.g. Page Hits per Second)

Peak Requirement

Web Page Response Time

Critical Resource Utilization

Presented Load

◆ **General Result: Process Assets Evolved By PATs Over Multiple Projects**
  – Continuous Improvement

◆ **Specific Result: Repeatable Process to Achieve Scalability, Performance, & Robust System Behavior**
  – Meaningful to Business Users
  – Meaningful to Engineers
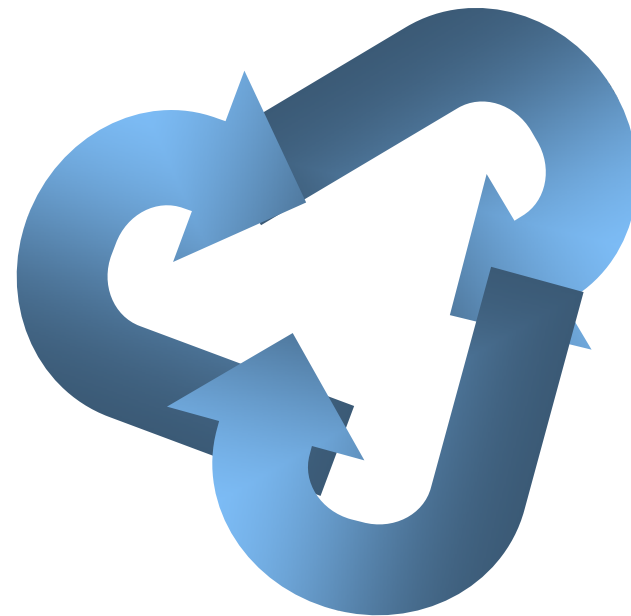 – Achieved Without Reinventing the Wheel on Each Project $\Rightarrow$ Organizational Learning

Who Keeps Moving My Process?

◆ **Reorganizations**

◆ **Mergers and Acquisitions**

◆ **Competing resources**

◆ **"Immediate needs" versus "time to pilot and deploy"**

Continuous Adaptation to Change
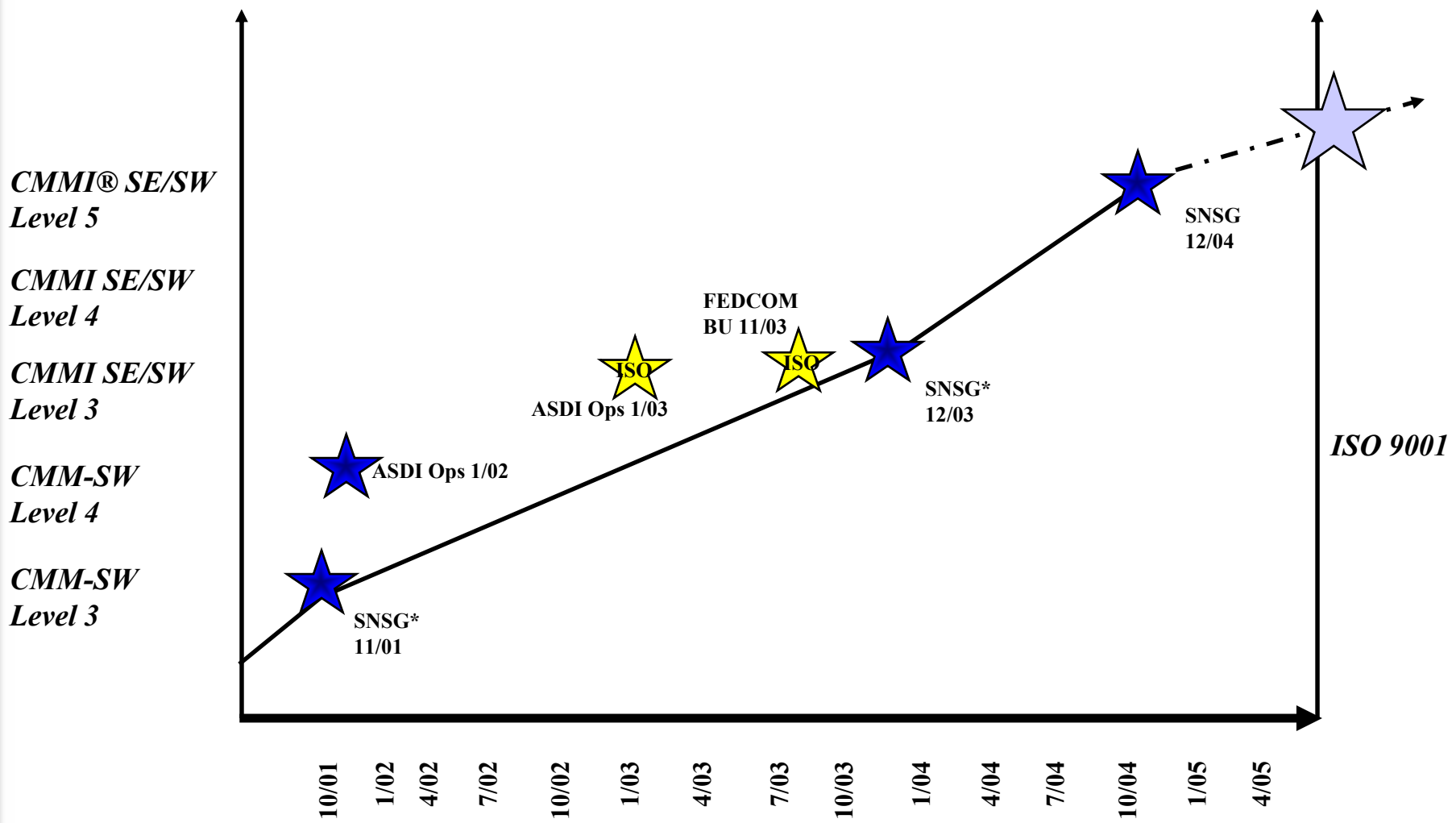
Working with Change

◆ **In Place:**

– Transitioning process
– Improving process improvement
– Streamlining processes
– Integrating processes
– Web-enabled learning management system
– Empowerment with accountability (and quality reviews/audits)
– "On-demand" process training
– Proposal readiness review process
– Process performance modeling tool
– Web-enabled lessons learned database and process
– Scalable process for large systems development environment

◆ **In Work:**

– Document management collaborative review tool
– Project review improvements/streamlining

SNSG Process Improvement: Looking Ahead

CMMI® SE/SW Level 5

CMMI SE/SW Level 4

CMMI SE/SW Level 3

CMM-SW Level 4

CMM-SW Level 3

ASDI Ops 1/02

SNSG* 11/01

ISO ASDI Ops 1/03

FEDCOM BU 11/03

ISO

SNSG* 12/03

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SCIENCE APPLICATIONS INTERNATIONAL CORPORATION