About Sustaining Process Improvement
(or . . .What have you done for me lately?)

2007 SEPG^{SM}

Austin, Texas

March 2007

Agenda

- Why is "Sustainability" important?

- What are others doing?

- CMMI requirements

- Summary

Timeframes
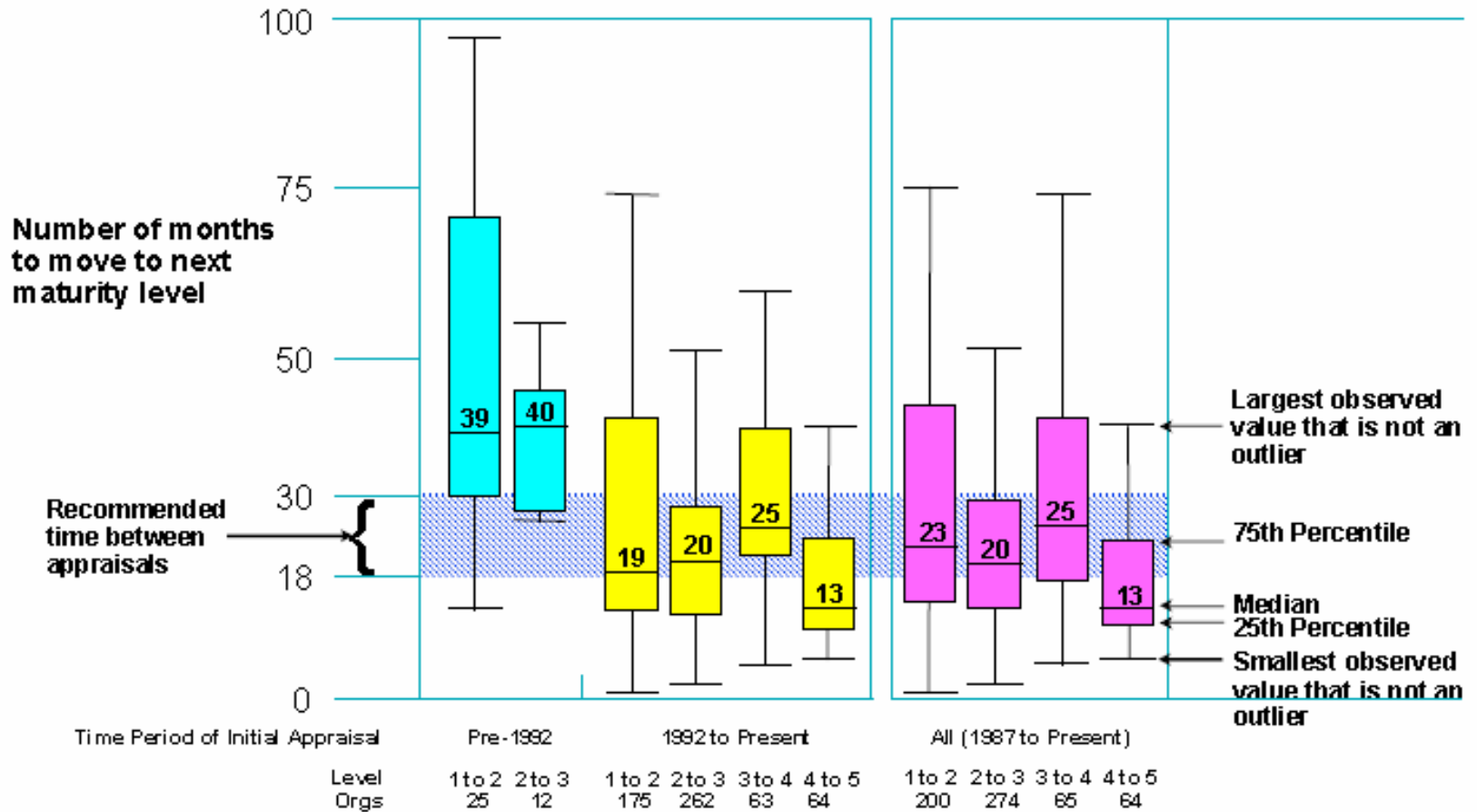

Source: "Maturity Profile"

Timeframes – why is this important?
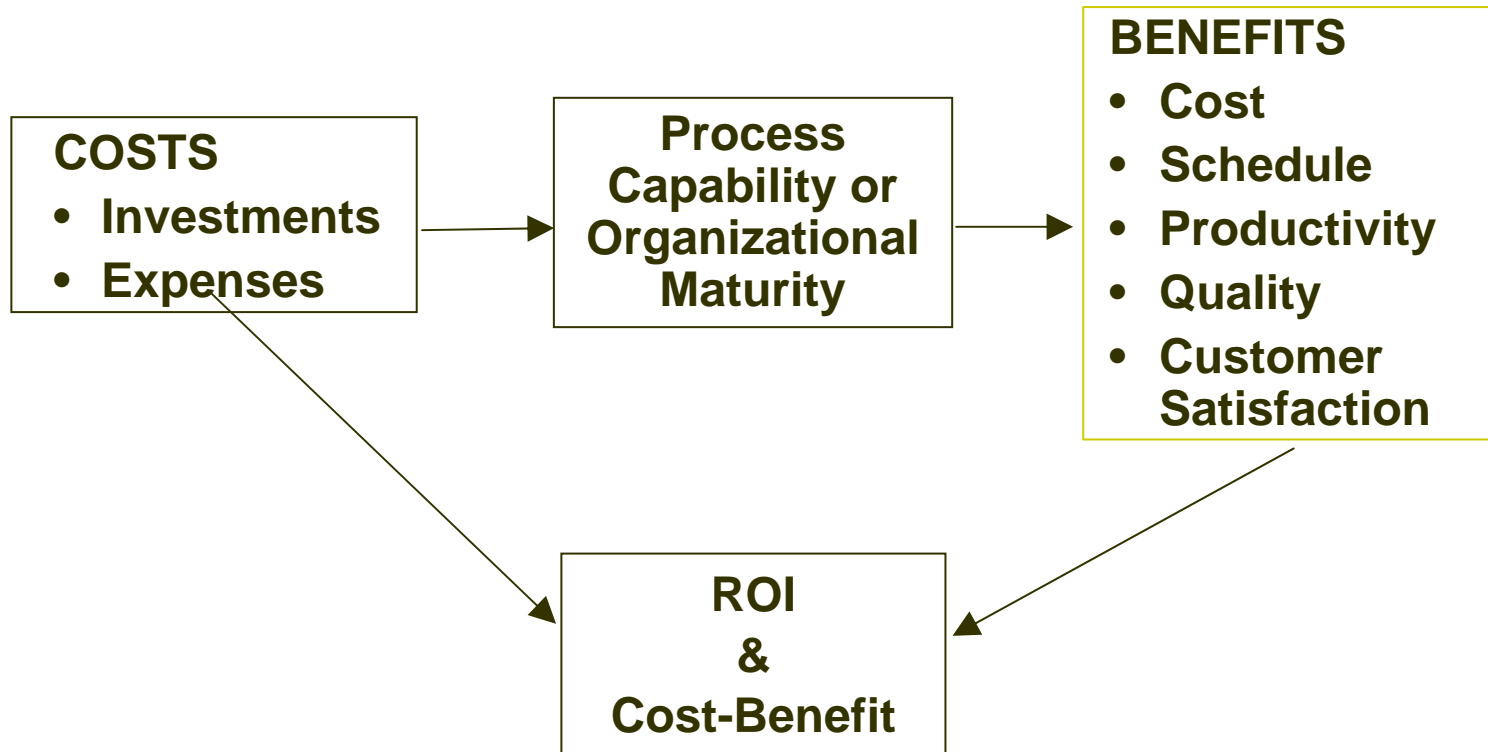
Maturity Level 1 to 2 >> 19 months

Maturity Level 2 to 3 >> 20 months

- *So, if you want to reach ML3, your process improvement program must be sustainable at least 39 months*

- *The average tenure of a CIO is 24 months*

- *Thus, we must have and prove the benefits to ensure commitment and sponsorship*

Typical Measures

- *Productivity Increases*

- *Decrease in rework*

- *Decrease in defects*

- *Higher schedule and cost accuracy*

- *Increased customer satisfaction*

- *Return on investment (amount spent on process improvement / benefits achieved)*

- *Faster time to market*

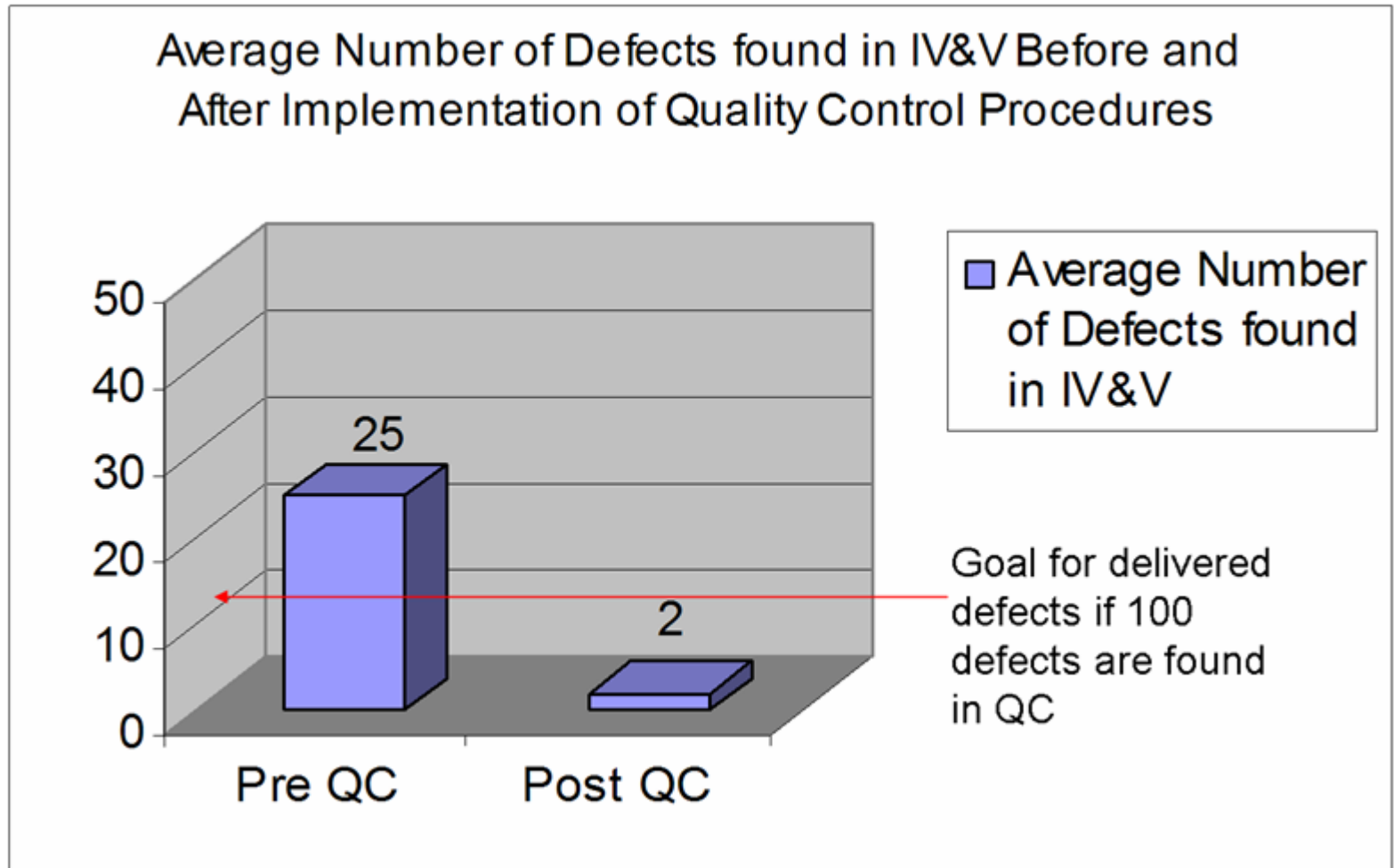- *Decrease in number of change requests*
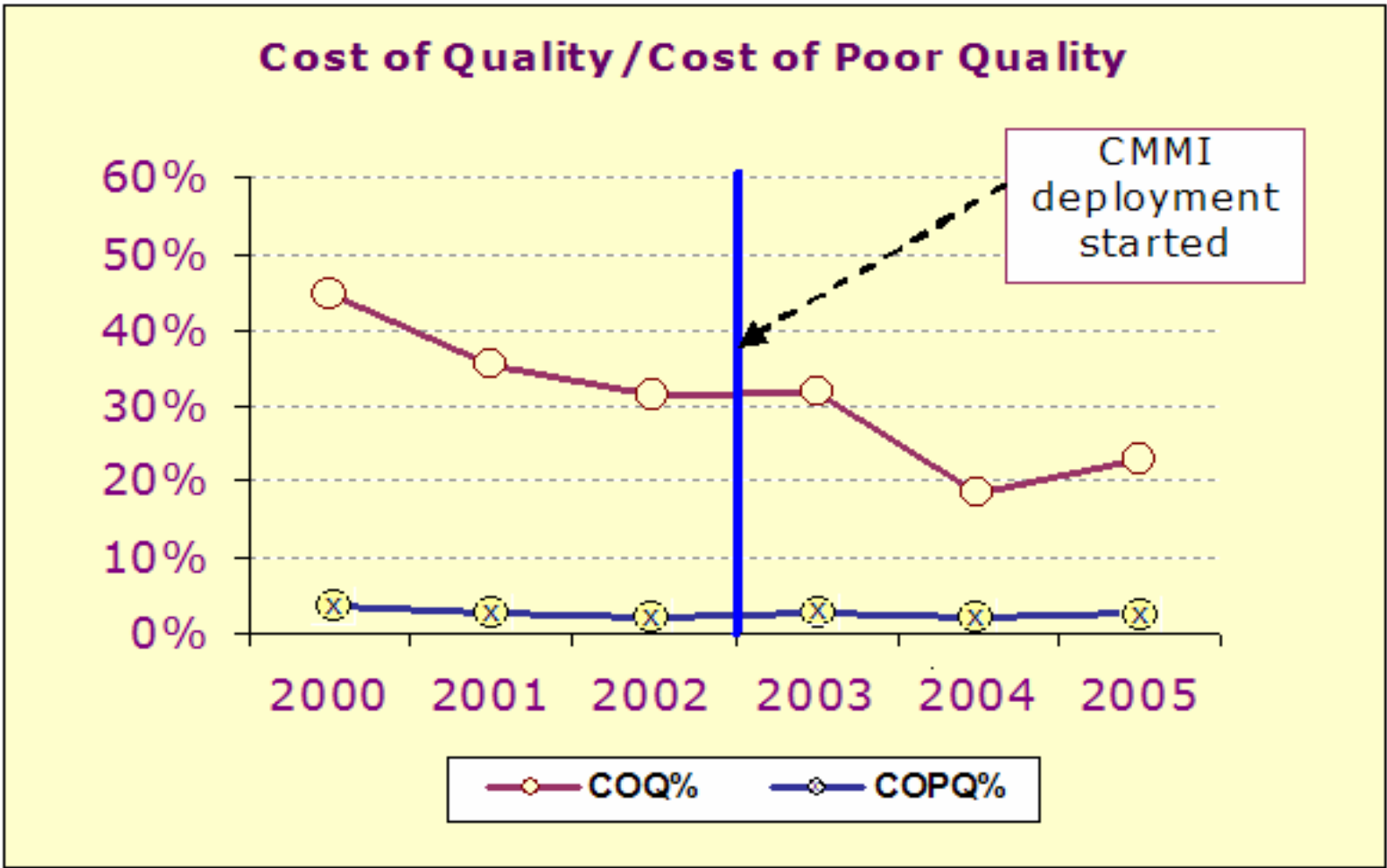
Example: Computing Return On Investment (ROI)

```
┌─────────────────┐      ┌─────────────────┐      ┌─────────────────────┐
│ COSTS           │      │ Process         │      │ BENEFITS            │
│ • Investments   │ ───► │ Capability or   │ ───► │ • Cost              │
│ • Expenses      │      │ Organizational  │      │ • Schedule          │
│                 │      │ Maturity        │      │ • Productivity      │
└─────────────────┘      └─────────────────┘      │ • Quality           │
                                                  │ • Customer          │
                                                  │   Satisfaction      │
                                                  └─────────────────────┘
                  ┌─────────────────┐
                  │ ROI             │
                  │ &               │
                  │ Cost-Benefit    │
                  └─────────────────┘
```

Source: "CMU/SEI-2006-TR-004"

Example: Computing Number of Defects

Average Number of Defects found in IV&V Before and After Implementation of Quality Control Procedures

- Pre QC: 25
- Post QC: 2

Legend: ■ Average Number of Defects found in IV&V

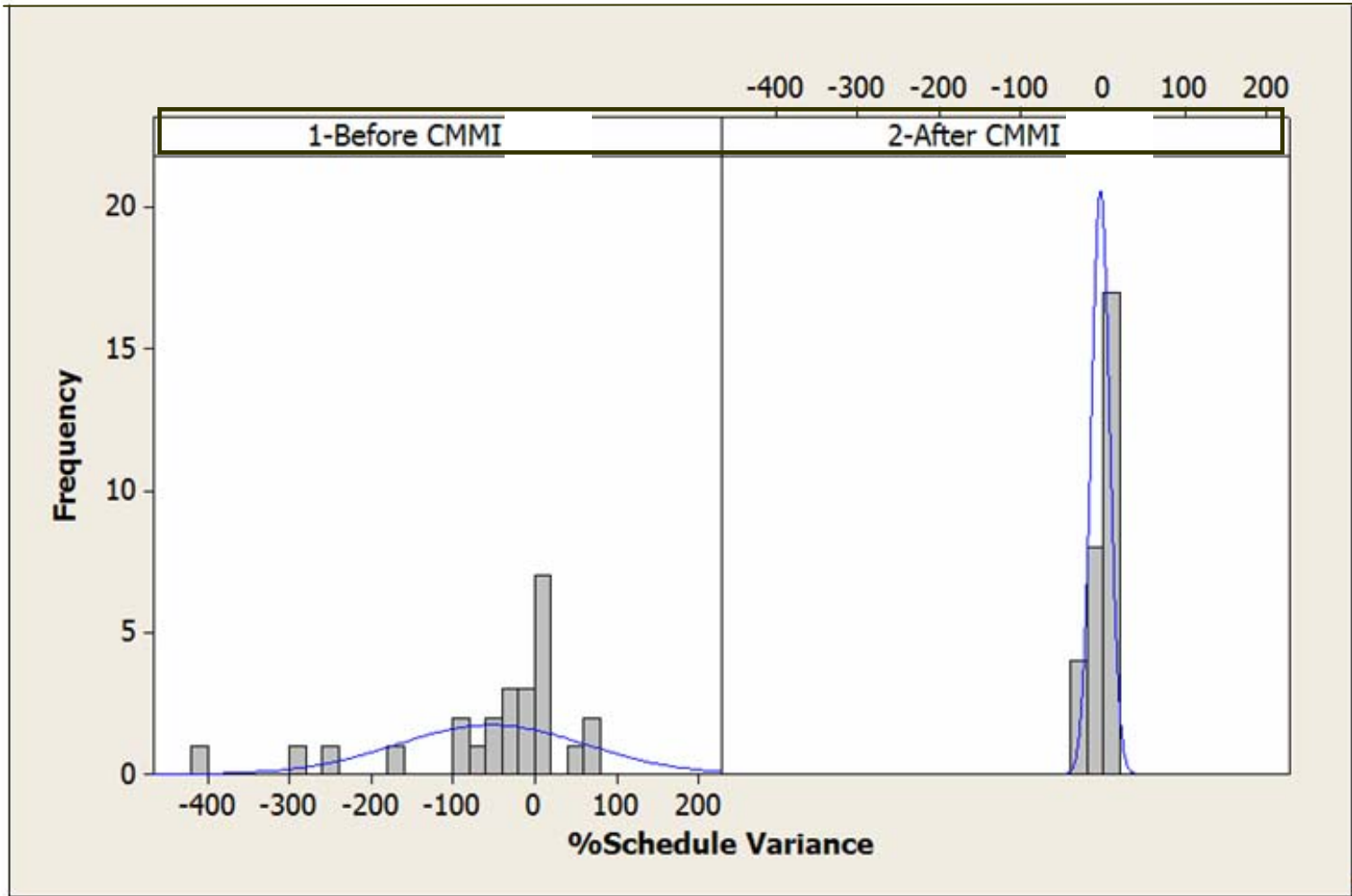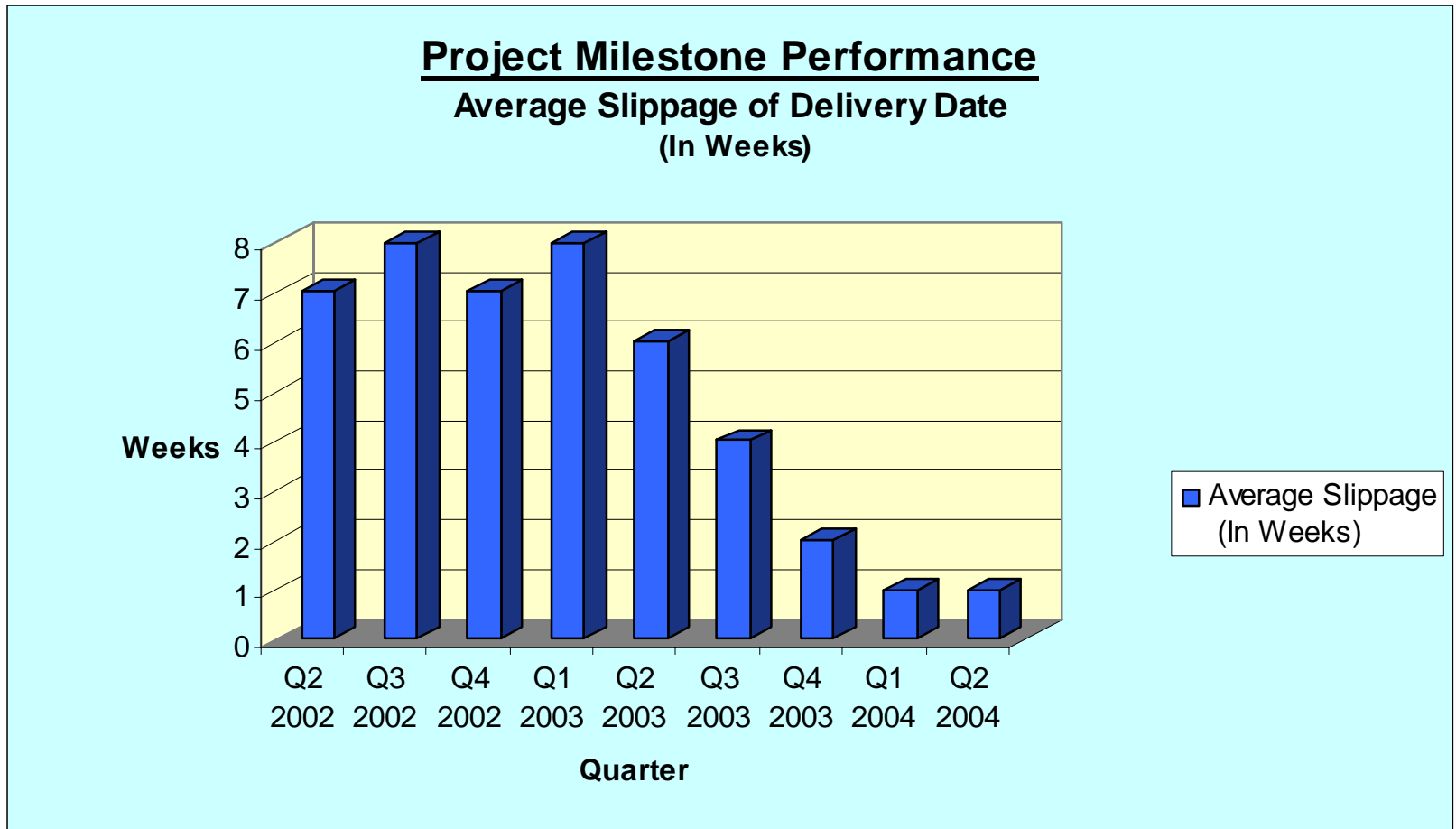Goal for delivered defects if 100 defects are found in QC

Source: "The 2001 High Maturity Workshop"

Example: Computing COQ and COPQ

Source: "The 2001 High Maturity Workshop"
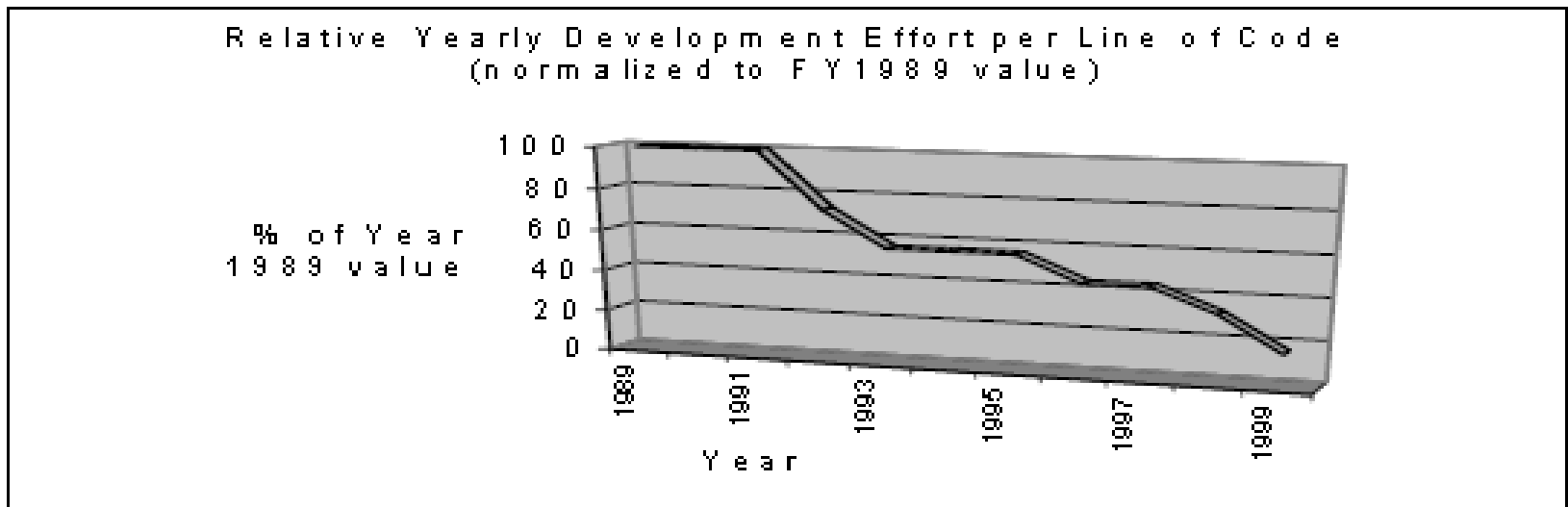
Example: Computing Schedule Variance

Source: "The 2001 High Maturity Workshop"

# *Example: Computing Project Slippage*

Project Milestone Performance
Average Slippage of Delivery Date
(In Weeks)

Source: "The 2001 High Maturity Workshop"

Example: Computing Development Effort

Relative Yearly Development Effort per Line of Code
(normalized to FY 1989 value)

Source: "The 2001 High Maturity Workshop"

Example: Computing Defects

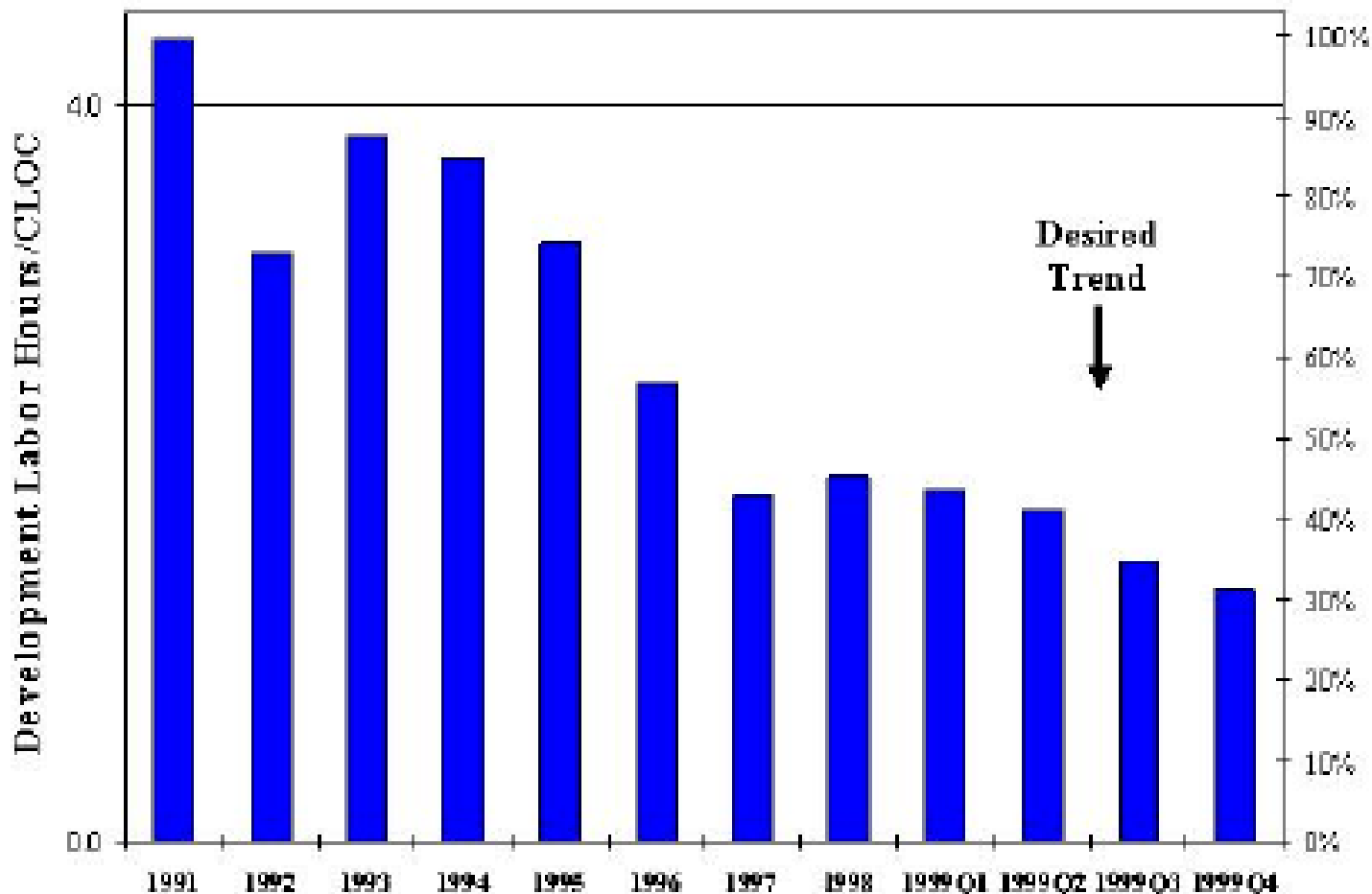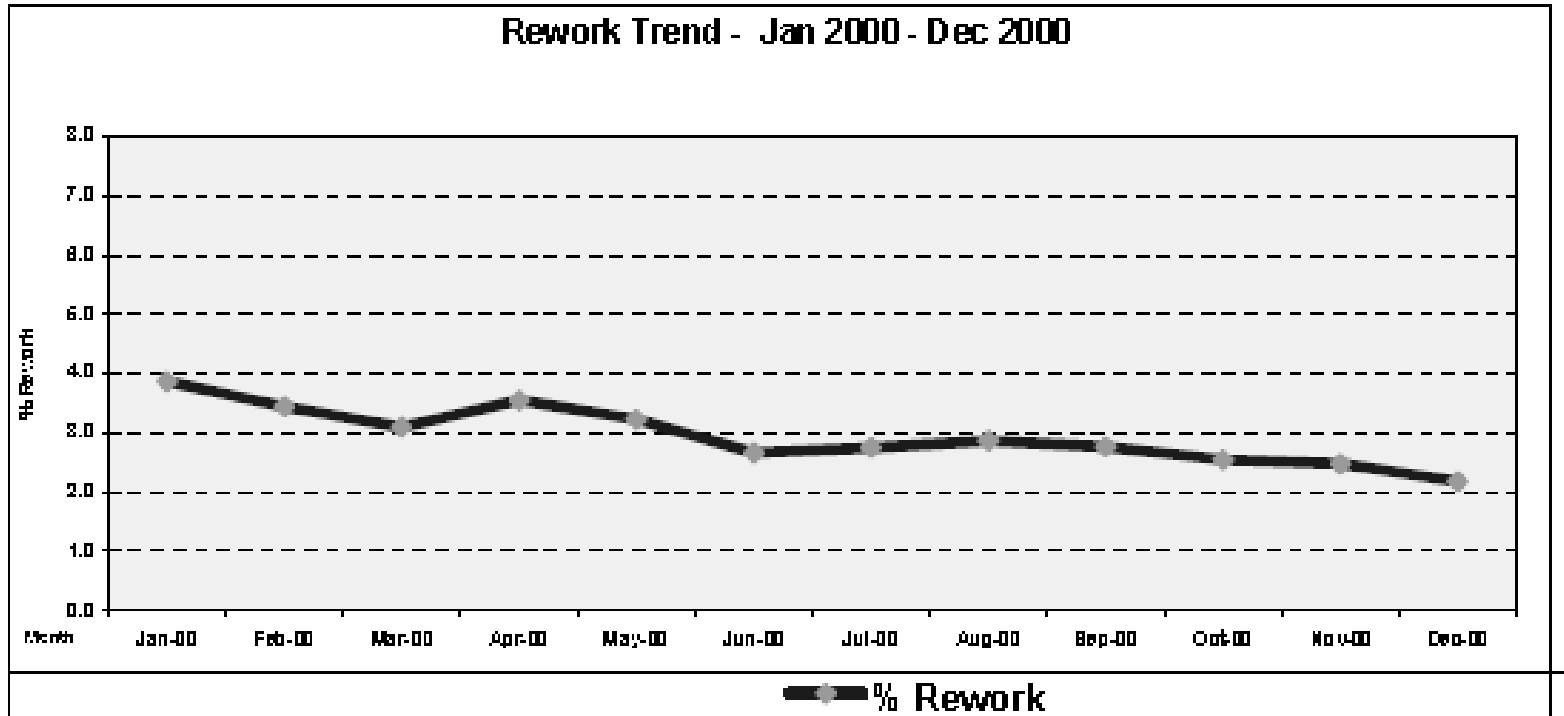Source: "The 2001 High Maturity Workshop"

Example: Computing Software Development Productivity
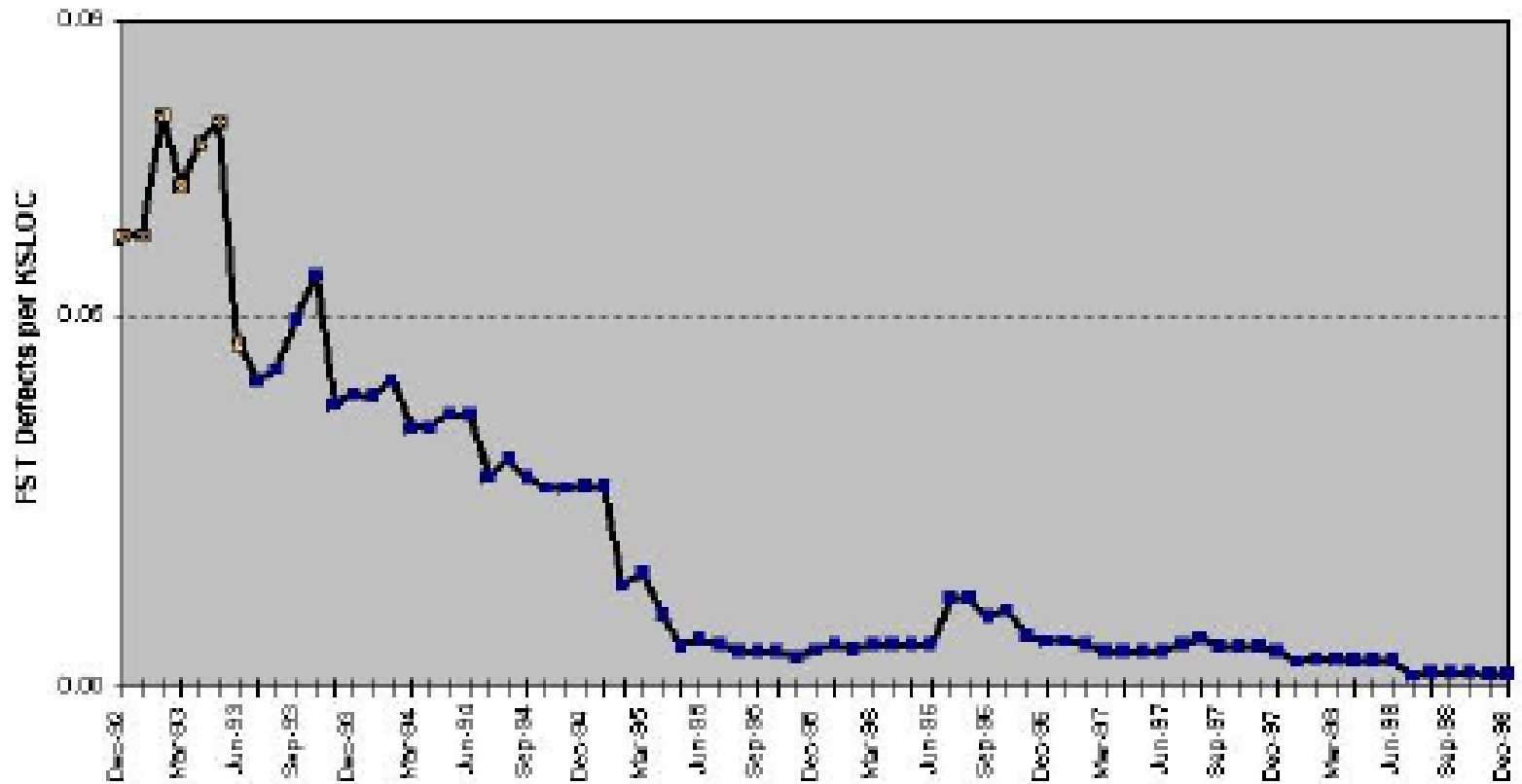
1. Prime Development Labor = "touch labor" for software design, code and software test
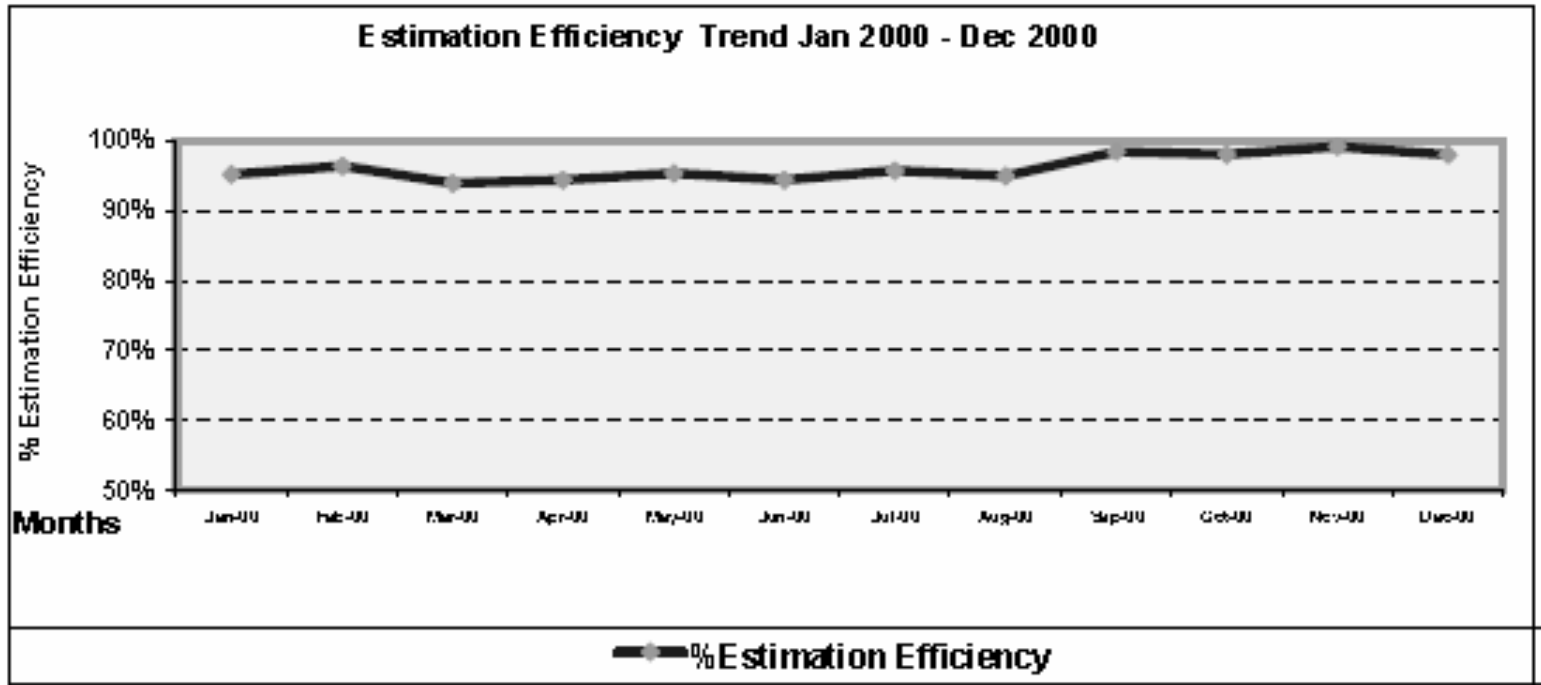2. CLOC = Changed Line of Code (new or modified)

Source: "The 2001 High Maturity Workshop"
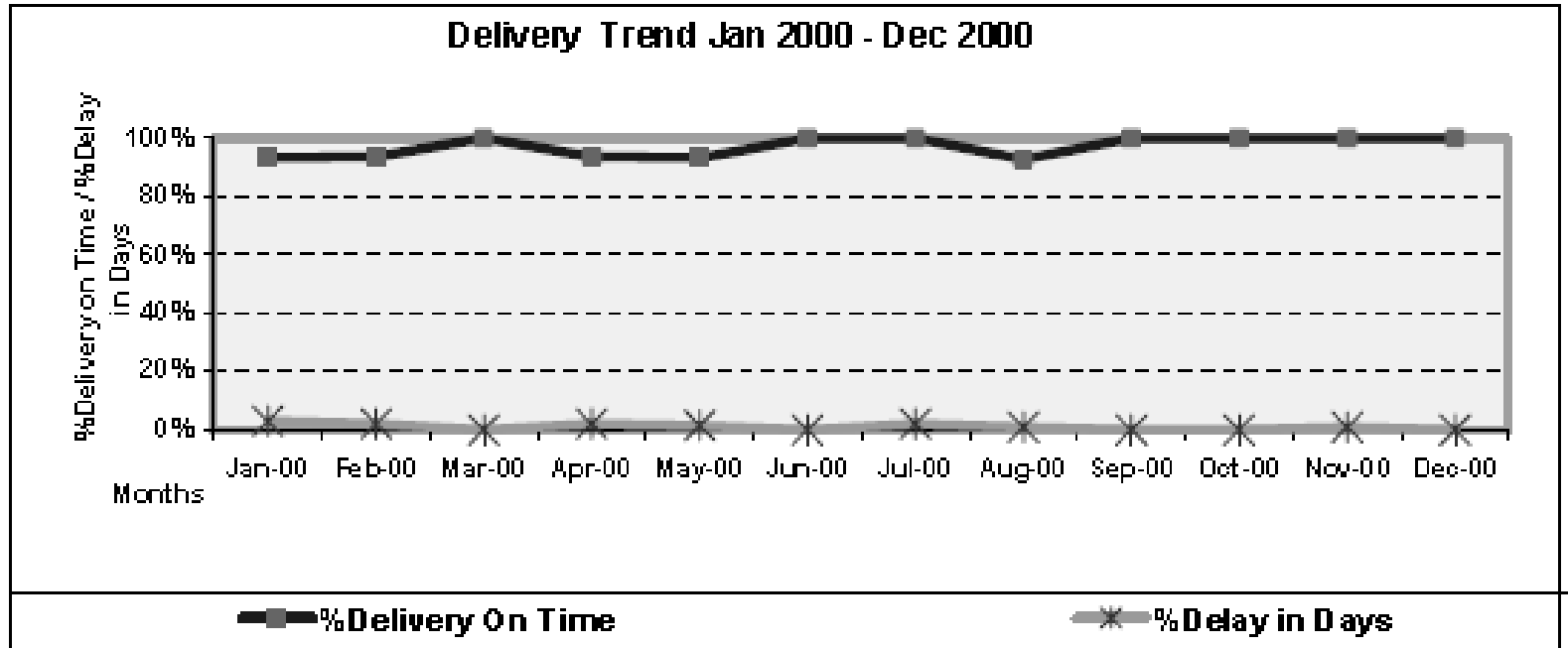
Example: Computing Rework

Source: "The 2001 High Maturity Workshop"

Example: Computing Estimation Efficiency

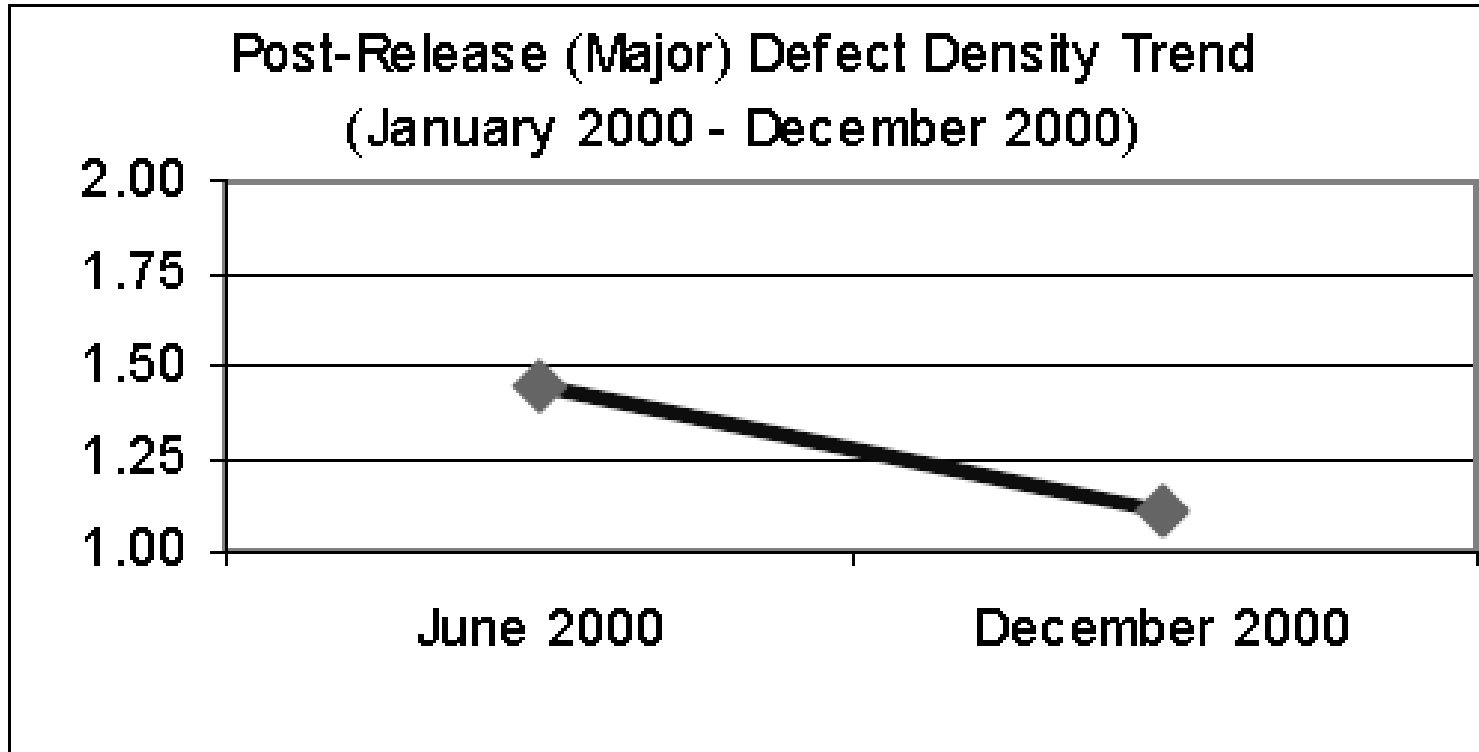Source: "The 2001 High Maturity Workshop"

Example: Computing Delivery Accuracy
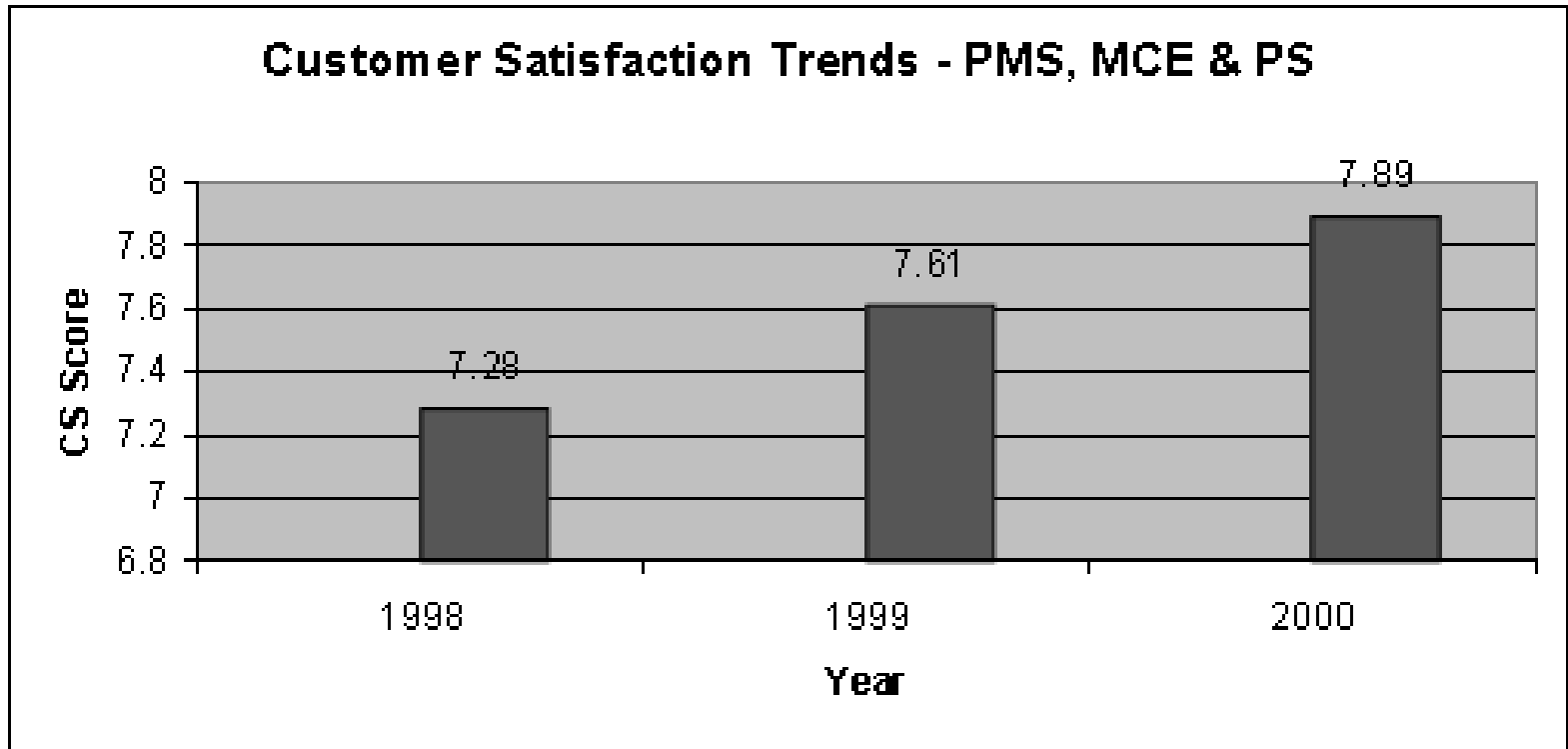

Delivery Trend Jan 2000 - Dec 2000

Source: "The 2001 High Maturity Workshop"

Example: Computing Post-Release Defects

Source: "The 2001 High Maturity Workshop"

Example: Computing Customer Satisfaction Trends

Customer Satisfaction Trends - PMS, MCE & PS

Source: "The 2001 High Maturity Workshop"

Example: Tracking Improvements

Timeframe	# Improvements Implemented	# Still in Place in 1999	Percent
1990-1993, Level 2 in 1993	45	11	24%
1993-1996, Level 4 in 1996	31	24	77%
1996-Present	22	22	100%

Source: "The 2001 High Maturity Workshop"

Example: Tracking Defects

Software Systems Aggregate
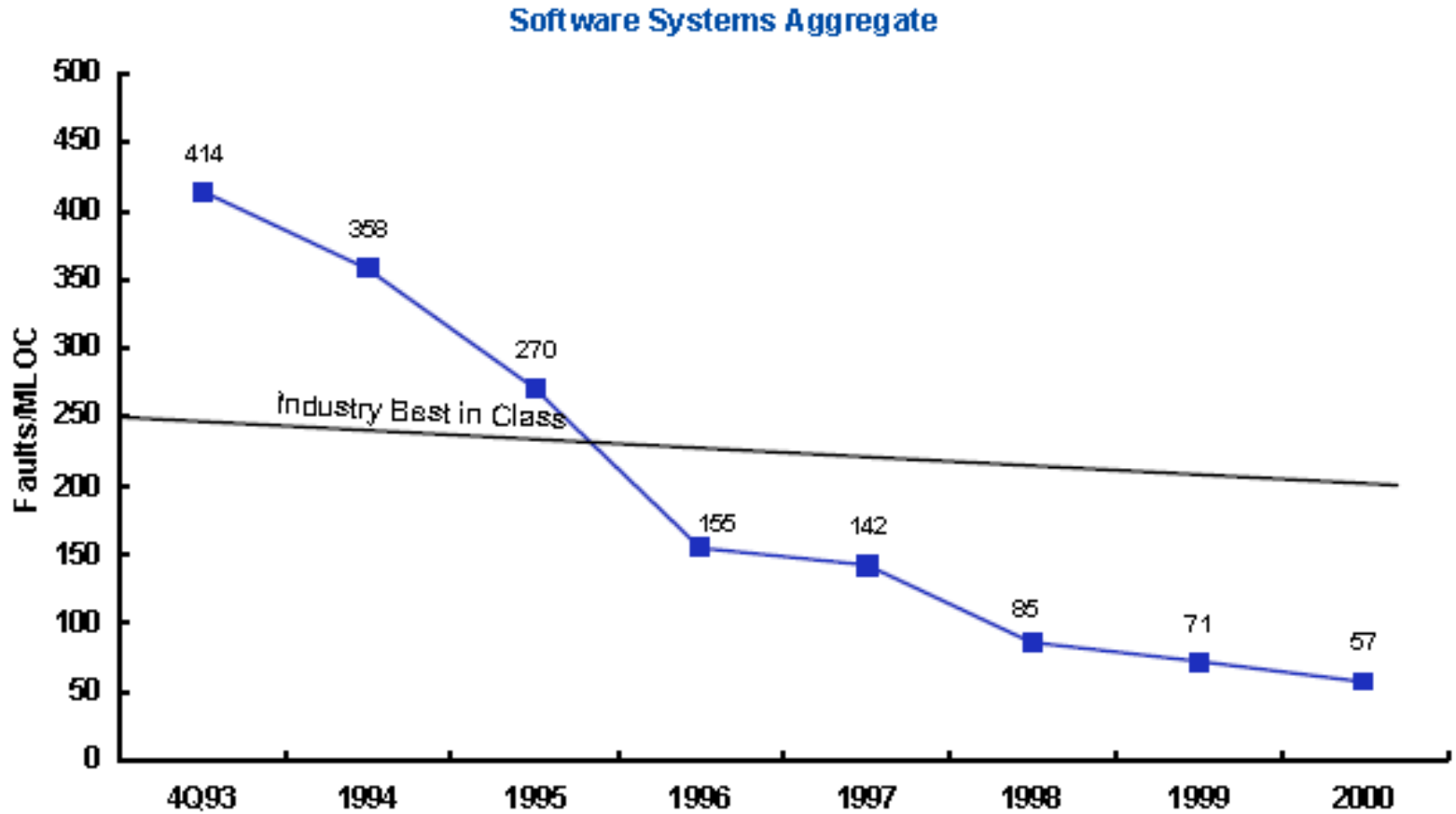
Source: "The 2001 High Maturity Workshop"

Example: Defect Removal Efficiency

Software Systems Aggregate
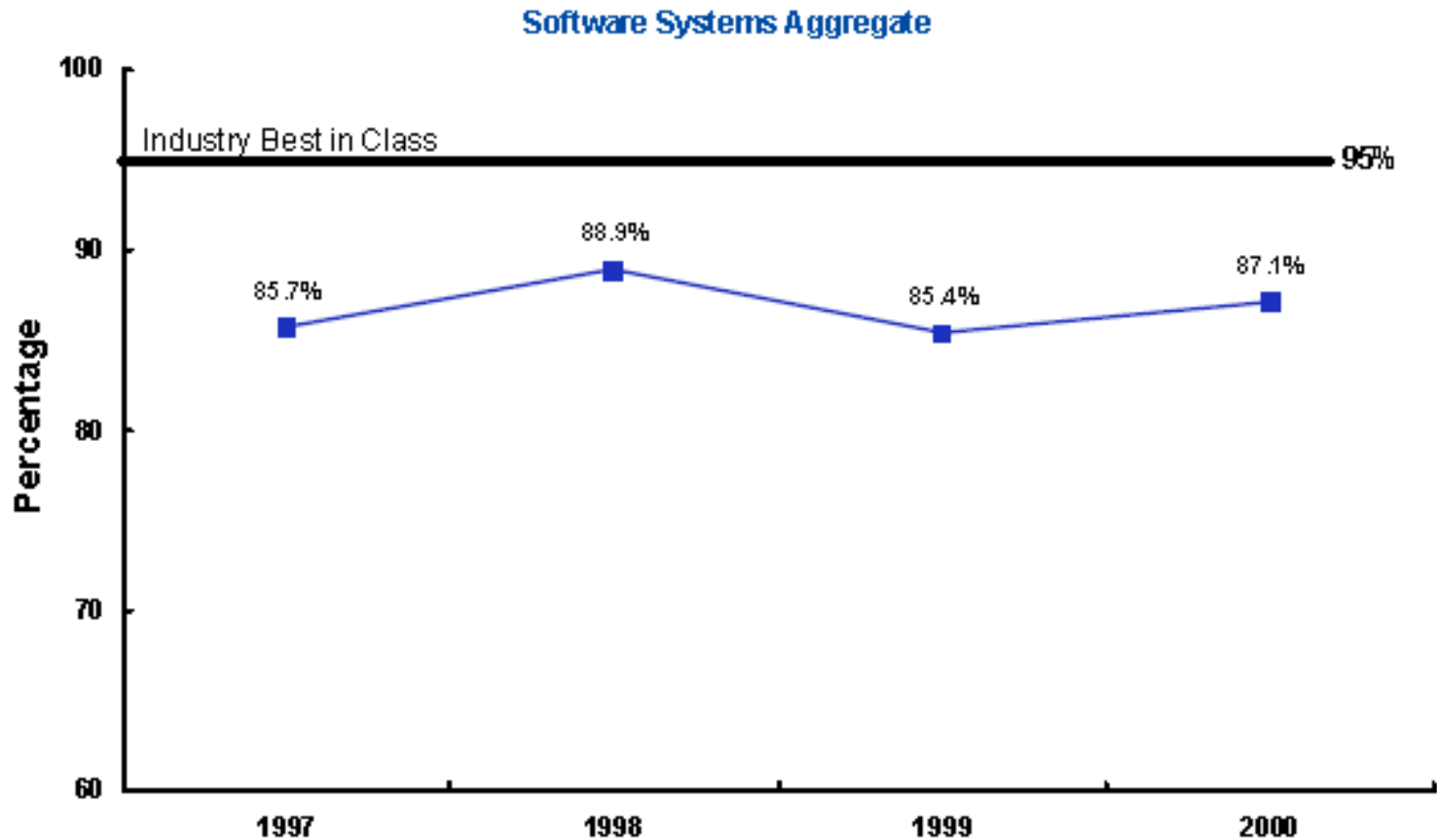
Source: "The 2001 High Maturity Workshop"

Example: Tracking Delivery Accuracy
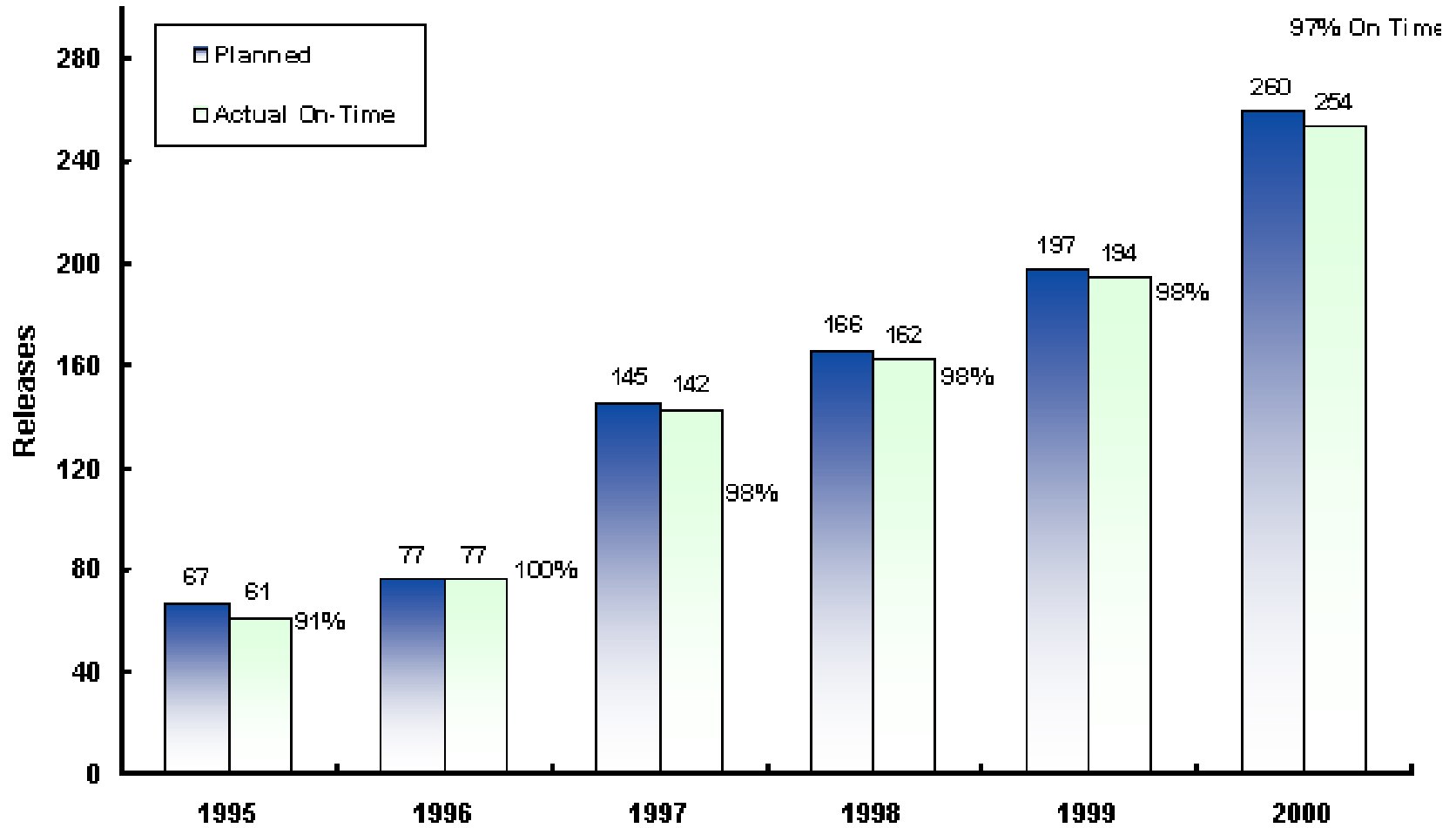
Source: "The 2001 High Maturity Workshop"

Supporting Materials

"Performance Results of CMMI-Based Process Improvement"

- *SEI: Technical Report CMU/SEI-2006-TR-004*

- *http://www.sei.cmu.edu/publications/documents/06.reports/06tr004.html*

Supporting Materials

SEI: Classes Available

- *Implementing Goal-Driven Measurement*

- *Managing Software Projects with Metrics*

- *Measuring for Performance-Driven Improvement*

http://www.sei.cmu.edu/products/ courses/

CMMI Requirements – ML2

Measurement and Analysis (ML2)

- *Is aligned with information needs and objectives*

- *Specific measures, analysis, storage, reporting and communications are defined*

This is the beginning of the Measurements program which will evolve over time as higher Maturity Levels are achieved

CMMI Requirements – ML3

OPF; SP 1.1 Establish Org'l Process Needs

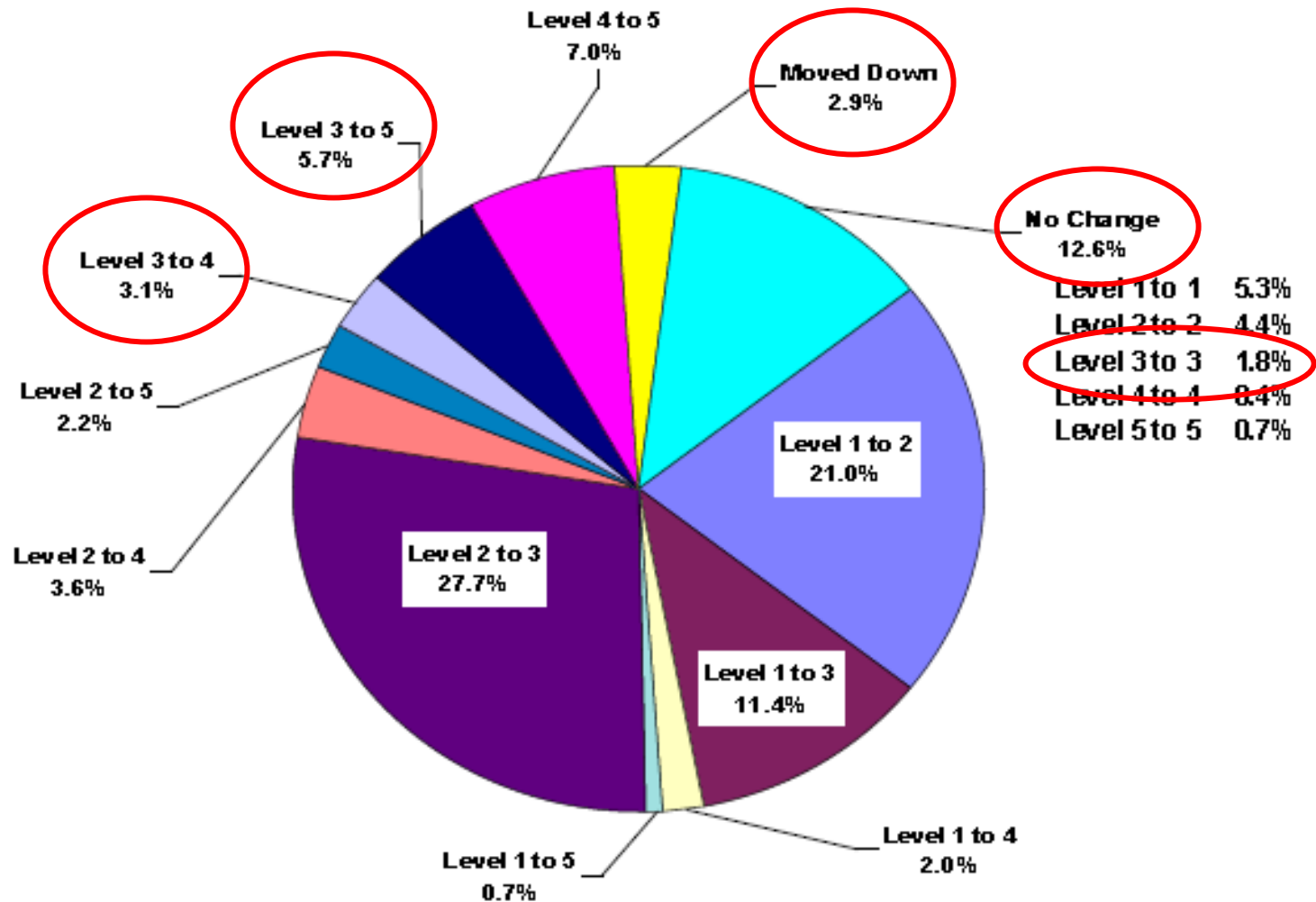**SP 1.3/3.4 Improve Org'l Processes**

GP 3.2; Collect improvement information

- *Maturity Level 3 "expects" measurable process improvement!!!*

- *Builds upon what MA began at ML2*

- *Improvements are aligned with organizational needs*

ML3 – the "Sustainable" Maturity Level

Reappraisals Change in Maturity Level

- Level 4 to 5 — 7.0%
- Level 3 to 5 — 5.7%
- Level 3 to 4 — 3.1%
- Level 2 to 5 — 2.2%
- Level 2 to 4 — 3.6%
- Level 2 to 3 — 27.7%
- Level 1 to 5 — 0.7%
- Level 1 to 4 — 2.0%
- Level 1 to 3 — 11.4%
- Level 1 to 2 — 21.0%
- Moved Down — 2.9%
- No Change — 12.6%
  - Level 1 to 1 — 5.3%
  - Level 2 to 2 — 4.4%
  - Level 3 to 3 — 1.8%
  - Level 4 to 4 — 0.4%
  - Level 5 to 5 — 0.7%

Based on **685** reappraised organizations using their first and latest appraisal

ML3 – the "Sustainable" Maturity Level

Why is this?

- We just discussed ML2 MA and ML3 OPF and GP 3.2

- Measures are linked to business objectives

- Processes are evaluated and improved

- Mistakes are not repeated
  - Lessons Learned are captured and applied
  - Measures are communicated
  - Measures are consistent

Compliance vs. Continuous Improvement

Appraisals ensure "reasonableness", not "committed" continuous improvement

- *SCAMPI training:*

    Don't judge "goodness" of product, only existence and reasonableness

- *Thus, <u>the internal process improvement team</u> MUST ensure that continuous improvement is really happening*

Communications

- **Measurement and Analysis expects that the communications mechanisms are defined**

- **Communications:**
  - **Is usually adequate to Management**
  - **Is not always adequate to everyone else**
  - **We are asking people to do a lot of work to gather and input measurements**
  - **Thus, we MUST show them how the measures are being used!!!**

Measurement Skill Sets

Most critical shortage across organizations!!!

- *If you have someone that can:*
    - o *Determine the real objectives*
    - o *Determine the measures for these*
    - o *Define and implement the program (gathering, analyzing, storing, communicating, etc.)*
- *GREAT!!!*
- *If not, get some help to get the program established*
- *Companies provide resources for lots of roles but often neglect MEASUREMENTS!!!*

Re-Appraisals

Why Re-Appraise?

- *New guidelines have a 3 year expiration on appraisal results*

When you re-appraise:

1. *You are expected to continue to follow all the processes*

2. *You are expected to "improve"*
   - *OPF SP 1.3. 3.4 and GP 3.2*
   - *Objective evidence that proves this*

Re-Appraisals

In other words,

"Sustain" the process improvement program long enough to ensure the processes are *"institutionalized"* enough to be *sustainable* on their own.

Process Improvement Must Compete

Process improvement resources are competing with other projects that are showing a ROI

- **Thus, you must be able to show "measurable" benefits of process improvement**

- **Anecdotal evidence will only carry you so far**

Industry Reported Benefits

Performance Category	Median Improvement
Cost	34%
Schedule	50%
Productivity	61%
Quality	48%
Customer Satisfaction	14%
Return on Investment	4:1

- *Industry statistics will only buy you a start*

Source: SEI-2006-TR-004

Summary

- **Why is "Sustainability" important?**

- **What are others doing?**

- **CMMI requirements**

QUESTIONS?

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