

CMMI Level 5: Return on Investment for Raytheon N TX

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Achieving CMMI Level 5

- **We did it!**
- **How Did We Do It?**
 - **Achieve Engineering Goals.**

This presentation describes the benefits of achieving CMM Level 4 in 2001, and then to achieve CMMI Level 5 in 2003.

We Did IT!

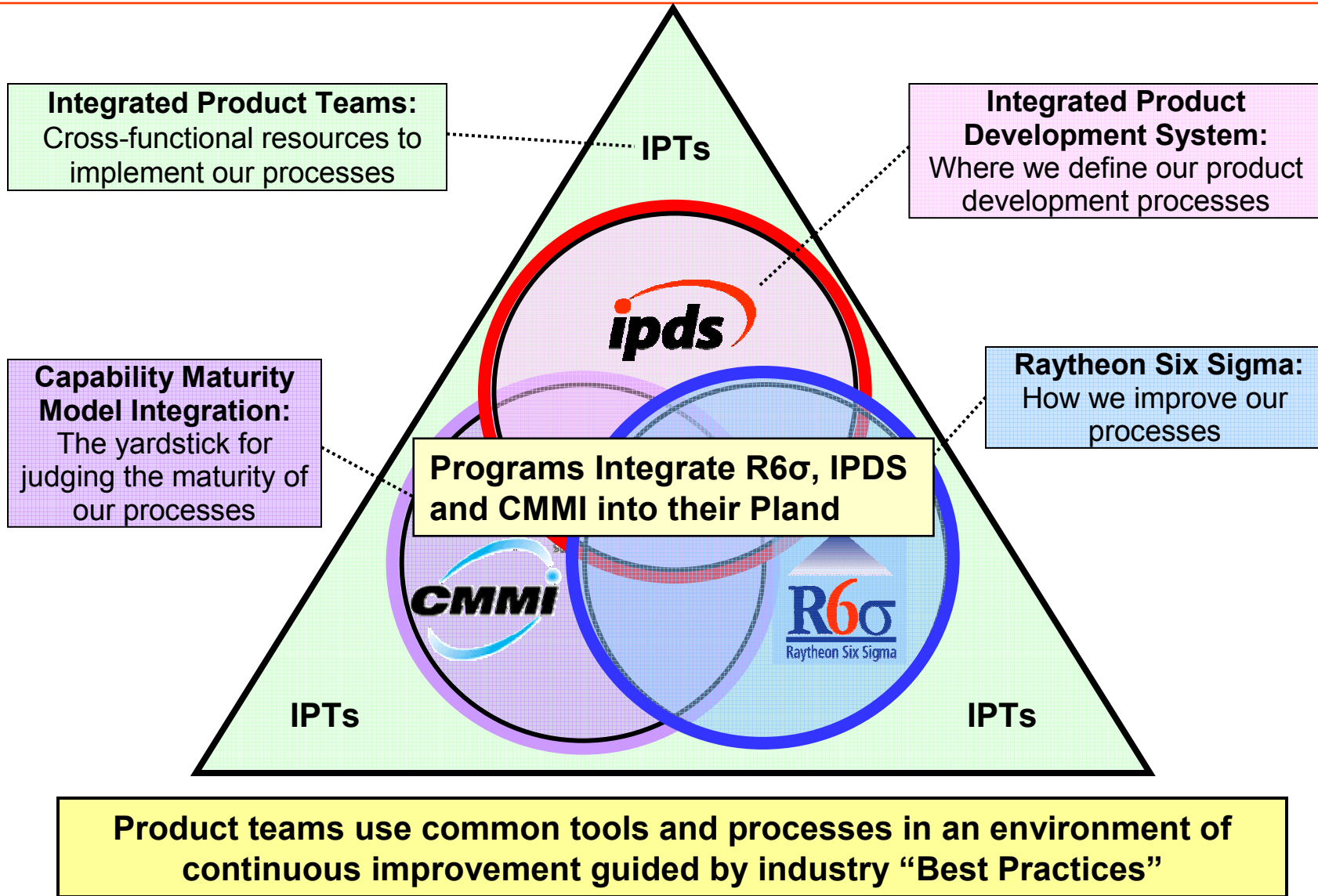


- Raytheon North Texas is the first site in Raytheon and fifth company in the world to achieve CMMI Level 5.
- Measurable results are achieved **before** achieving Level 5.
- This Presentation shows the actual ROI of going to each level, as well as our ROI projection.

How Did We Use CMMI to Achieve?

- Why is Raytheon North Texas pro-active about achieving CMMI Level 5?
 - Because we want to achieve the performance excellence goals required by our business. We are focused on achieving performance excellence and recognition as the preferred supplier for new business.

Envision Improvement



How Did We Achieve Performance Goals?

How did we use CMMI to achieve our performance excellence goals?

- We picked performance goals that were important to us.
- The metrics data we collect characterizes the organizational performance in terms of our organizational goals and identifies opportunities of improvement.

SWEC SWIP Objectives

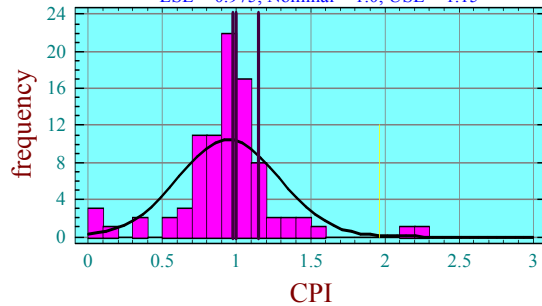
- **Meet Commitments** (to Customer)
 - Intent: Meet the cost and schedule objectives of the programs we support.
 - Quantification: CPI and SPI
- **SW Price**
 - Intent: Price software engineering products competitively
 - Quantification: \$ / DLOC
- **Deliver Quality**
 - Intent: Deliver quality software engineering products
 - Quantification: In-phase Defects and Defect Density

We have been executing statistical process control on the overall process using these measures for years.

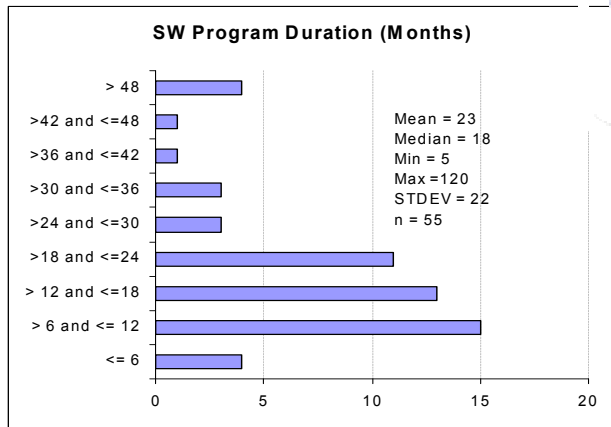
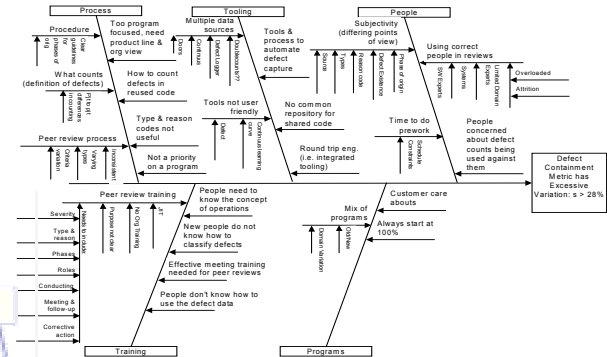
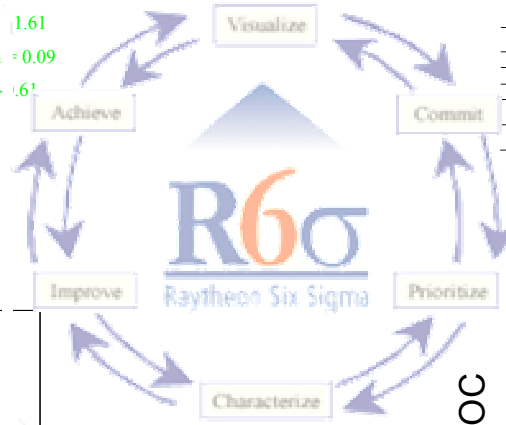
Organization Process Analysis

Process Capability for CPI

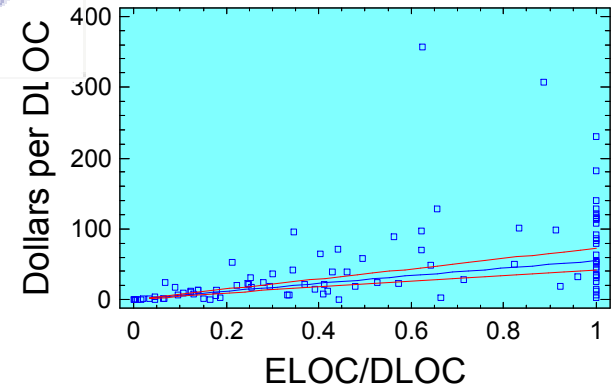
LSL = 0.975, Nominal = 1.0, USL = 1.15



Cp = 0.09
Cpk = -0.03
Cpk (upper) = 0.2
Cpk (lower) = -0.1
Cr = 1.61
Cpm = 0.09
K = .161



\$/DLOC Regression Model



Use R6σ Tools for Metrics Analysis

Improvement Results

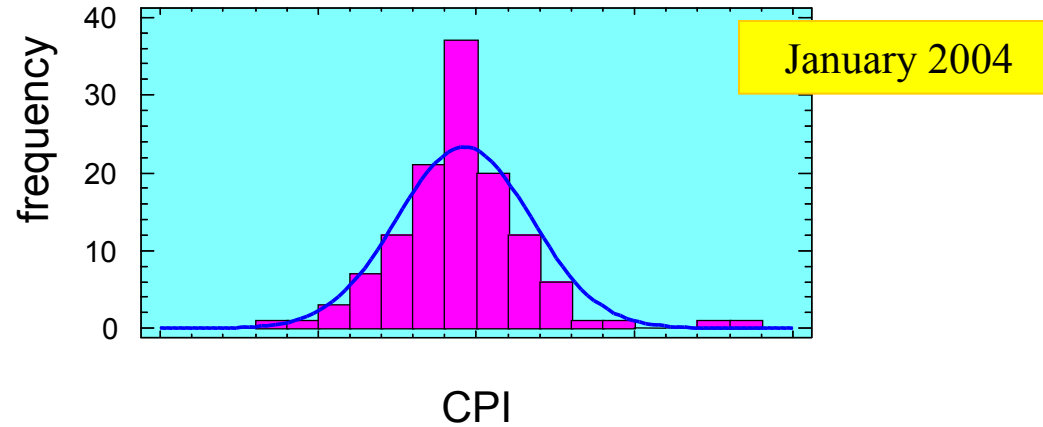
- **Demonstrated the linkage between R6 σ and CMMI Levels 4 & 5.**
- **Characterization included over 300 applications of R6 σ tools such as ANOVA, cause and effect, regression analysis, histograms, Cpk, hypothesis testing, logical process mapping, and others.**
- **Identified five projects to reduce variation in organizational performance and support the CMMI Level 5 timeline.**
- **Enabled CMMI Level 5 certification.**
 - **Improvement of Business Performance was recognized by Assessment Team as global strength in the CMMI Level 5 Assessment.**
- **Contributed ROI of 3:1 through significant cost avoidance realized by organization improvements**

Operational Results

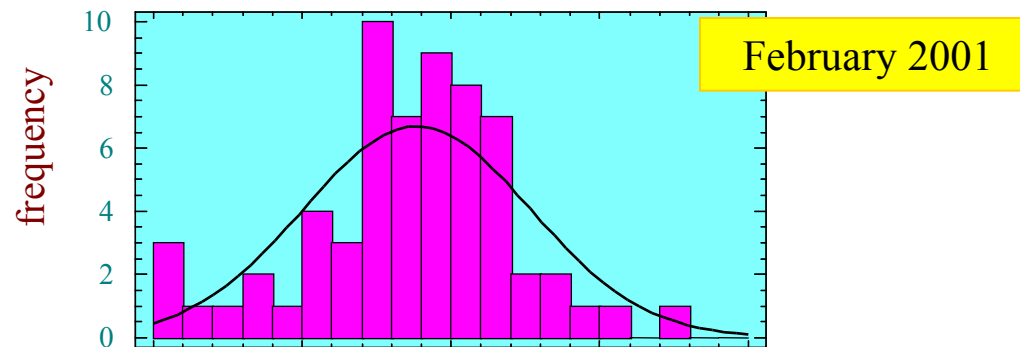
- Achieving CMMI Level 5 Certification for Raytheon image and competitive advantage is one thing, but look at the operational results.
- “Meeting Commitments” all improved concurrent with SEI CMMI Level 5 certification Across the organization, we improved:
 - CPI by 5 percentage points, and reduced variation by 34%.
 - SPI by 8 percentage points, and reduced variation by 50%
 - Defect Density by 44 percentage points, and reduced variation by 31%

Cost Performance Index

Process Capability for CPI

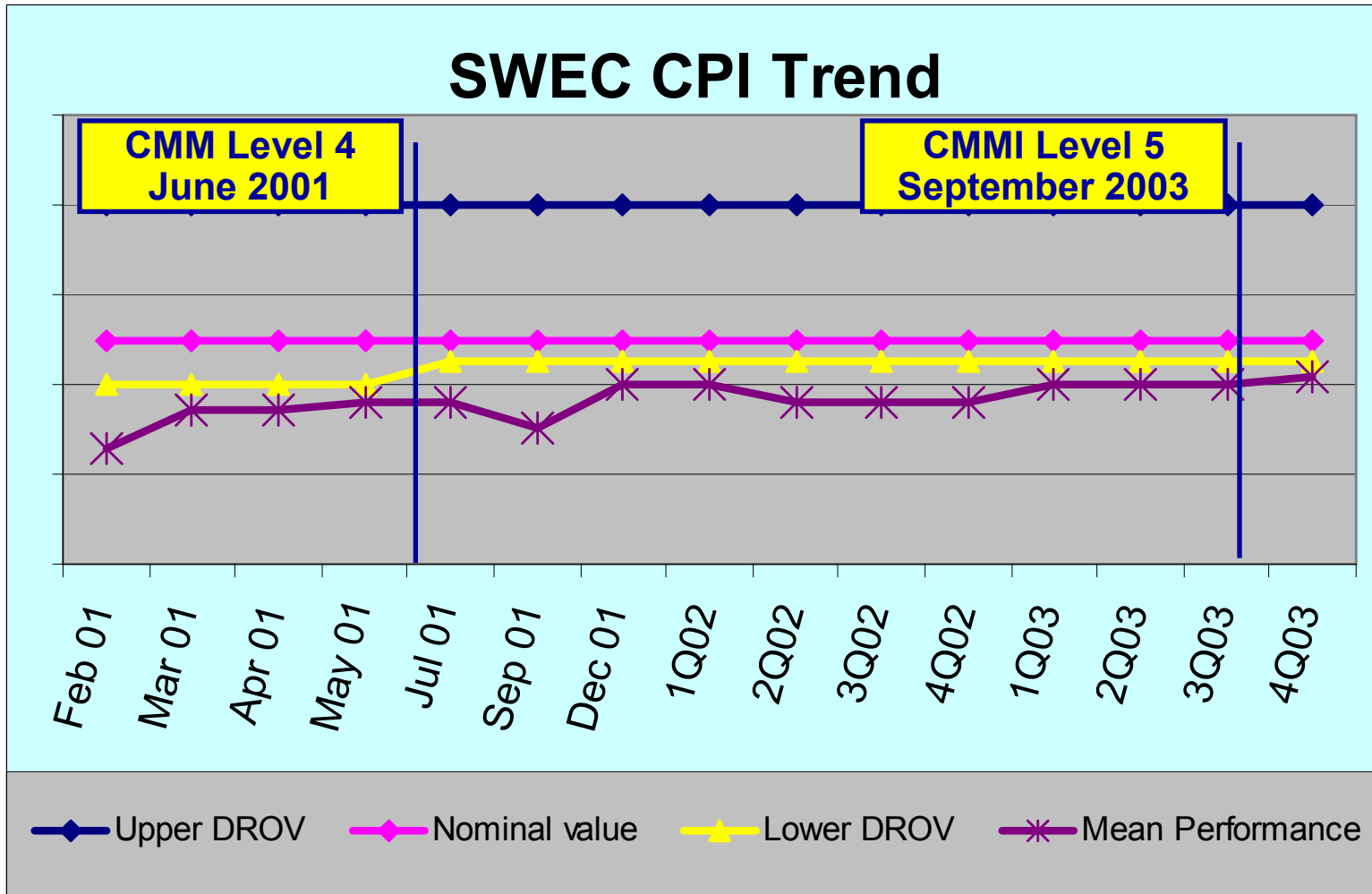


Process Capability for CPI



We no longer have CPI special cause variation on the low end!

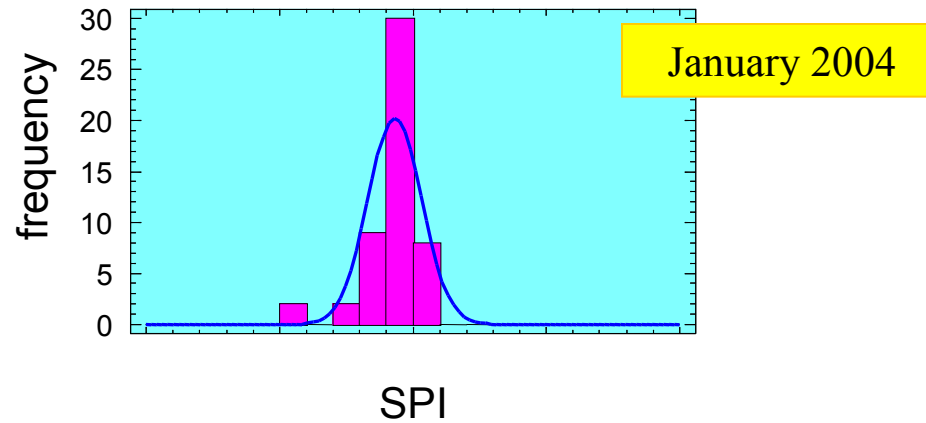
Cost Performance Index



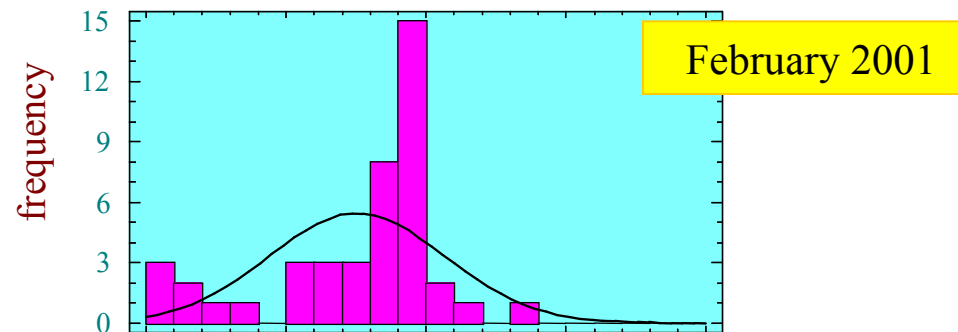
Improved CPI by 5 percentage points, and reduced variation by 34%.

Schedule Performance Index

Process Capability for SPI

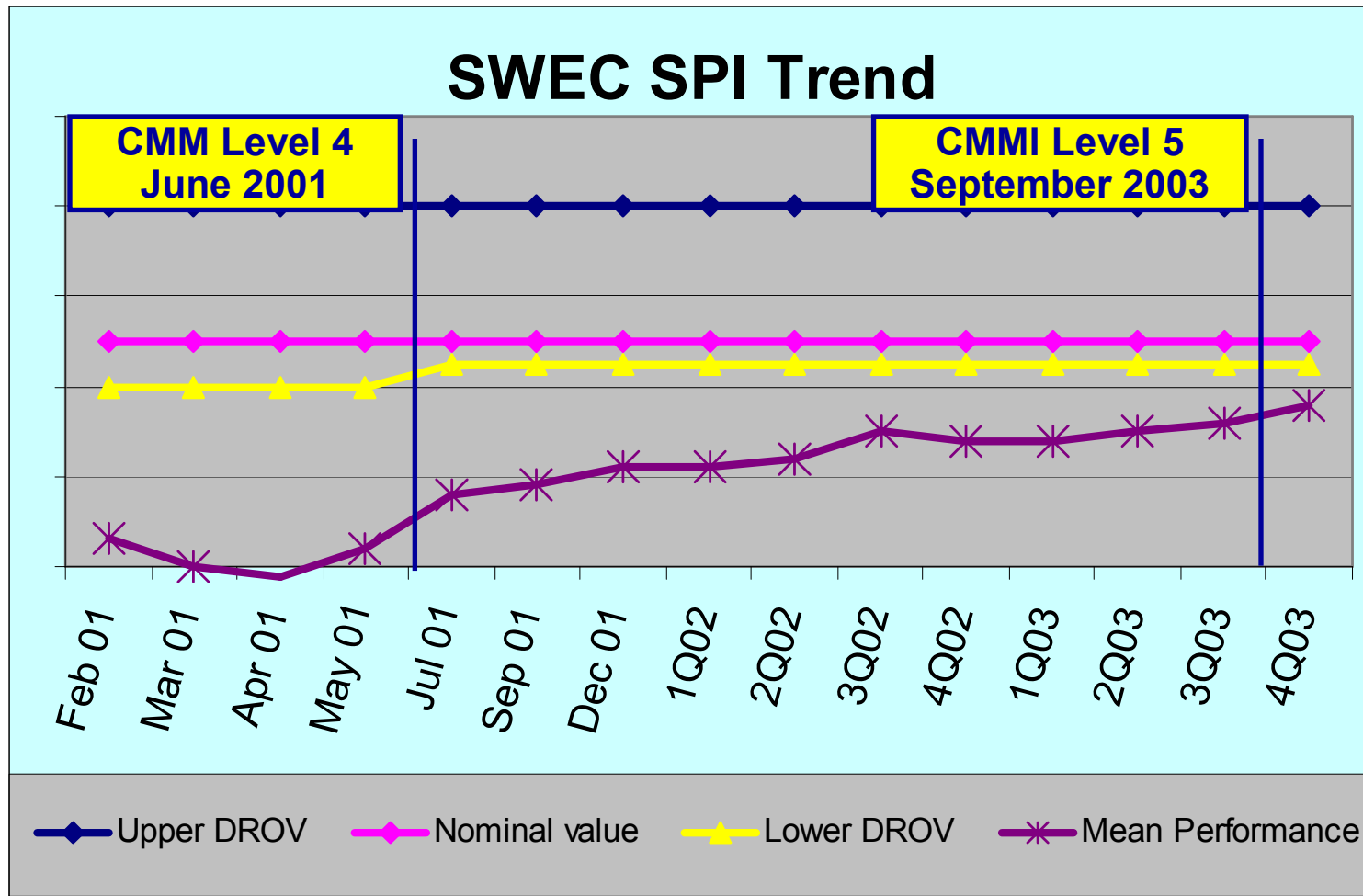


Process Capability for SPI



We are still moving in the right direction!

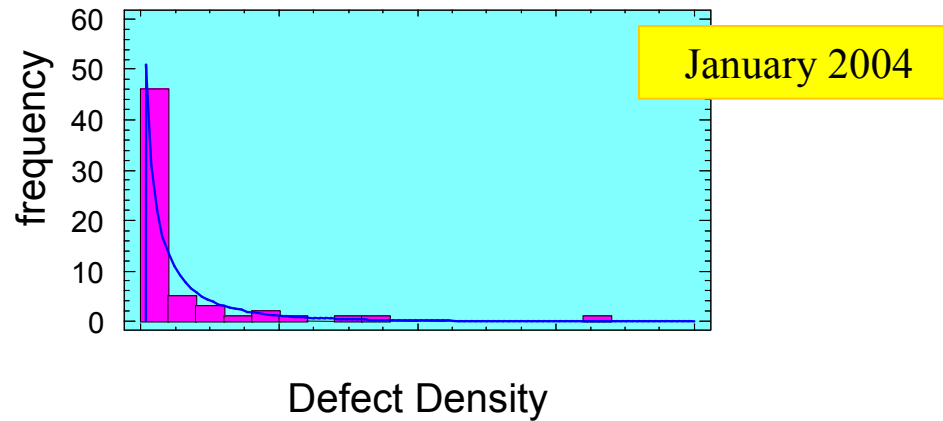
Schedule Performance Index



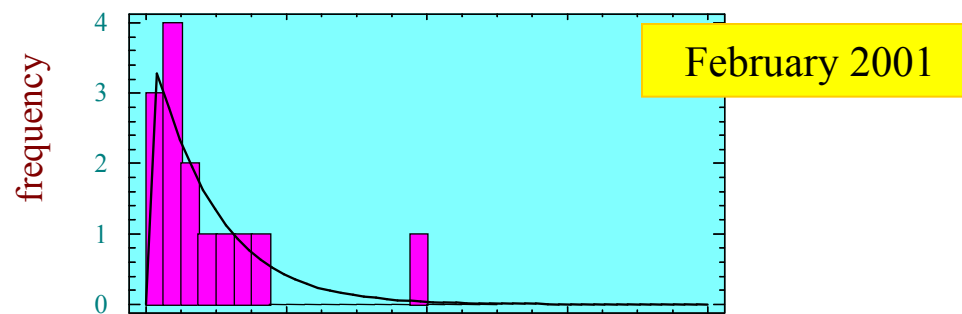
Improved SPI by 8 percentage points, and reduced variation by 50%

Defect Density

Process Capability for Defect Density

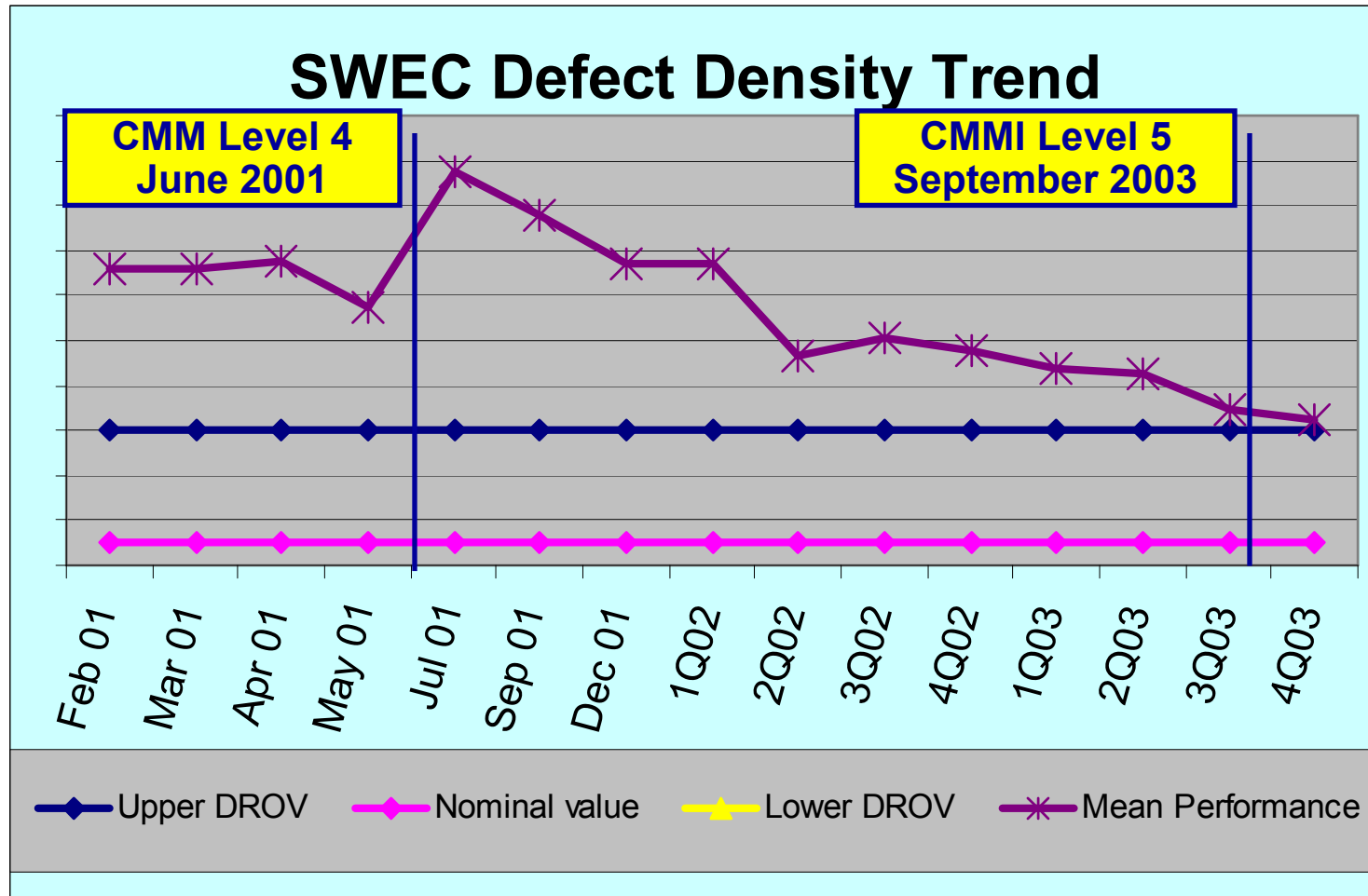


Process Capability for Defect Density



Continuing improvement in mean and variation.

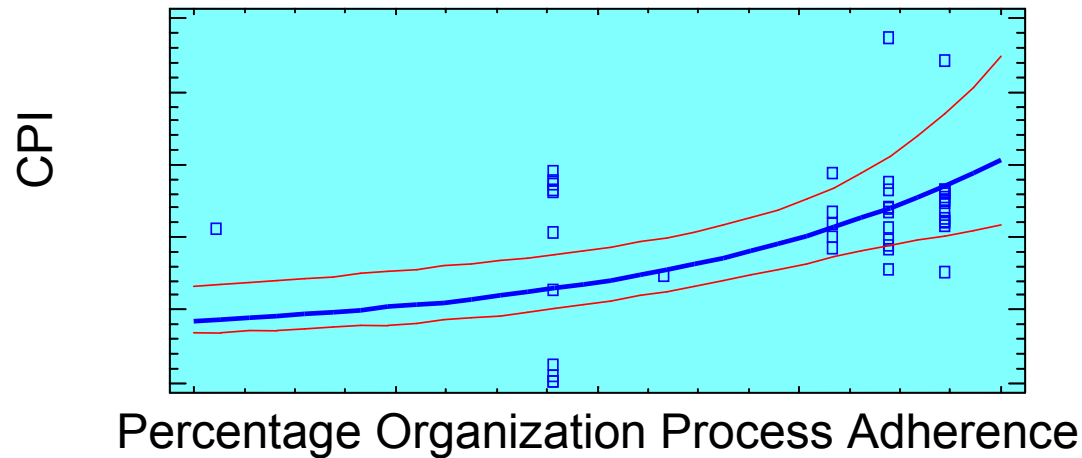
Defect Density



Improved Defect Density by 44 percentage points, and reduced variation by 31%

Characterize – CPI Analysis

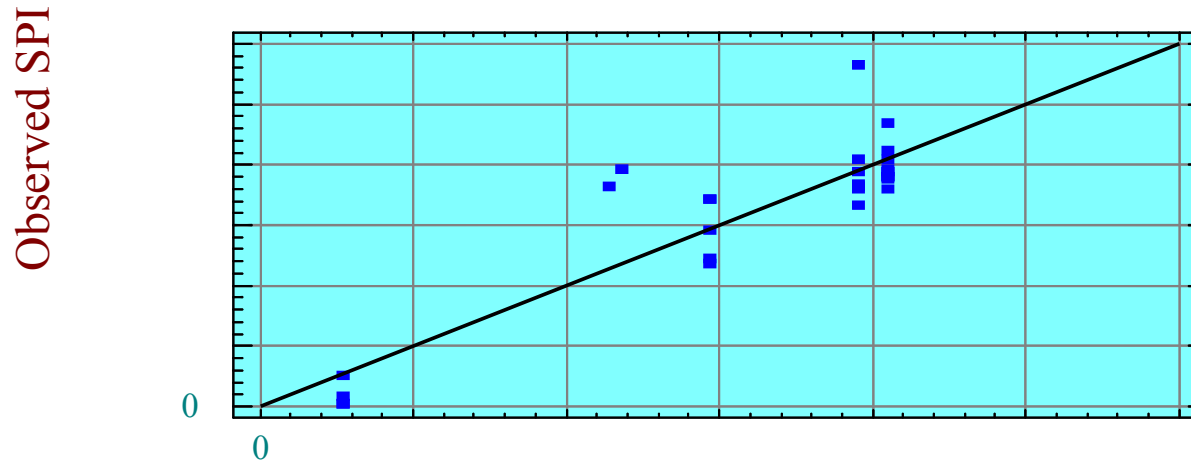
Plot of Regression Model



- ✓ **Regression Analysis included a sample of various process characteristics.**
- ✓ **Projects that follow the standard process tend to have a better and more predictable CPI performance.**
- ✓ **Process adherence is not a guarantee of CPI success. It improves the probability of CPI success.**

Characterize – SPI Analysis

Predicted SPI based on Process Adherence vs. Observed SPI



Multiple Regression Analysis Prediction of SPI

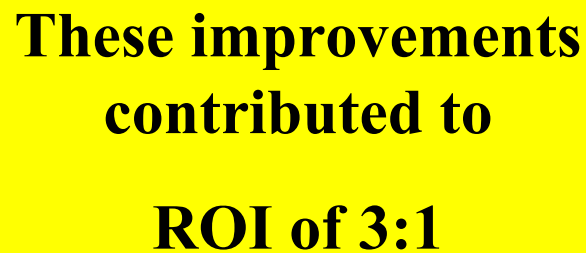
- ✓ **Multiple Regression Analysis included Level 2, Level 3, and Level 4 process characteristics.**
- ✓ **Projects that follow the standard process tend to have a better and more predictable SPI performance.**
- ✓ **Process adherence is not a guarantee of SPI success. It improves the probability of SPI success.**
- ✓ **Organizational process adherence is the only identified factor affecting SPI.**

Results

- Our improvements were recognized as organizational strengths in the appraisal.

“This accomplishment leads the way for Raytheon to distinguish ourselves from the competition and achieve customer satisfaction through superior program execution. There is no higher illustration of customer focus than this level of excellence.”

Colin Schottlaender, Raytheon NCS President



**These improvements
contributed to
ROI of 3:1**