Experiences in Root Cause Analysis and Defect Prevention Methods

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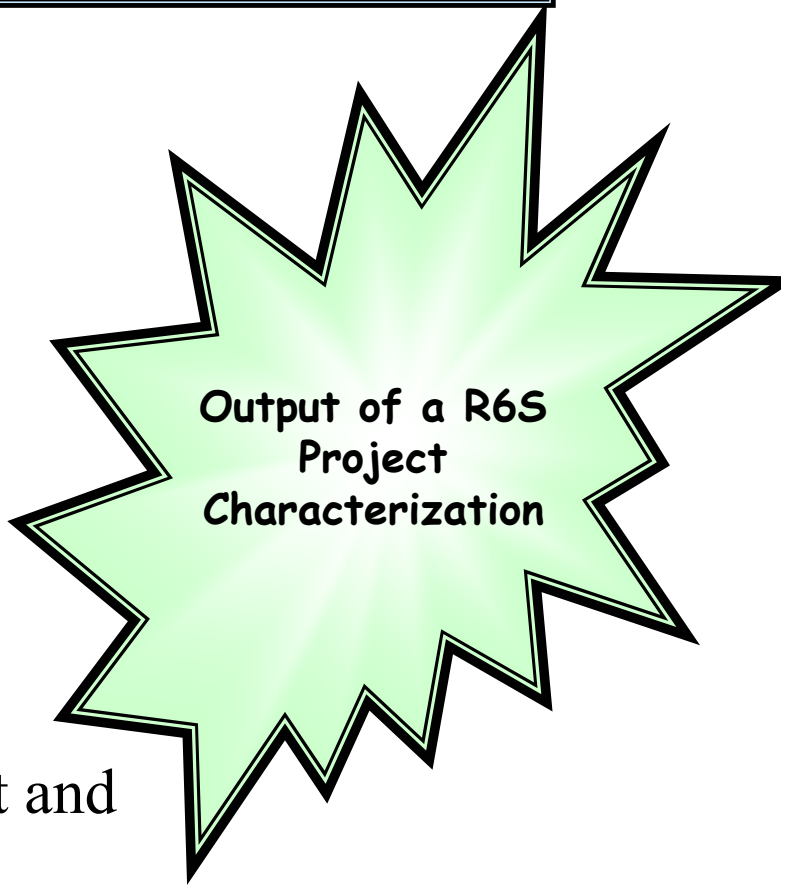
Case for Action

Deliver Quality and Reduce Costly Rework!

Six Sigma Specialist Project that focused in reducing escaping defects. Design defects that escape to Integration are 10 times more expensive than if they were caught in the Design stage.

Another thing to note is that one of the biggest problems we have found with cost and schedule is in integration.



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Set the Foundation

- Define and agree to the the following:
  - Defect
    - A flaw or imperfection that results in *incorrect software*. A defect may or may not be detected during software use.
    - A deficiency which has the potential of producing *incorrect response or undesired effect*.
  - Comment Type
    - Assignment, checking, performance, etc.
  - Comment Priority
    - 1 through 5

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When to Count a Defect

- Count a defect if:
  - The *requirements documentation* could lead to incorrect source code
    - By being incorrect
    - Or by leading to incorrect design
    - Etc.
  - The *design documentation* could lead to incorrect source code
    - By being incorrect itself
    - Or by being easy to misunderstand
  - The *source code* is incorrect

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Defect Analysis and Prevention

- *Defect Analysis* is the process of analyzing a defect to determine its root cause.

- *Defect Prevention* is the process of addressing root causes of defects to prevent their future occurrence.

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Process Focus

- *Defect Containment focus*
  - Finding defects in the stage they were introduced and as early in the lifecycle as possible
  - Eliminating escaping defects
- *Defect Prevention focus*
  - Preventing the occurrence of an individual defect or group of defects

Stage Detected	Stage Originated: Requirements	Design	Code & Test	SW Integration	Qual Test	SYS Integration	Post-Release	Totals
Requirements	3							3
Design	1	15						16
Code & Test	2	10	45					57
SW Integration	1	2	12	20				35
Qual Test	0	0	5	0	5			10
SYS Integration	2	3	2	2	0	2		11
Post-Release	0	1	2	0	0	0	5	8
Totals	9	31	66	22	5	2	5	140

Focus on

Defect Containment

AND

Defect Prevention

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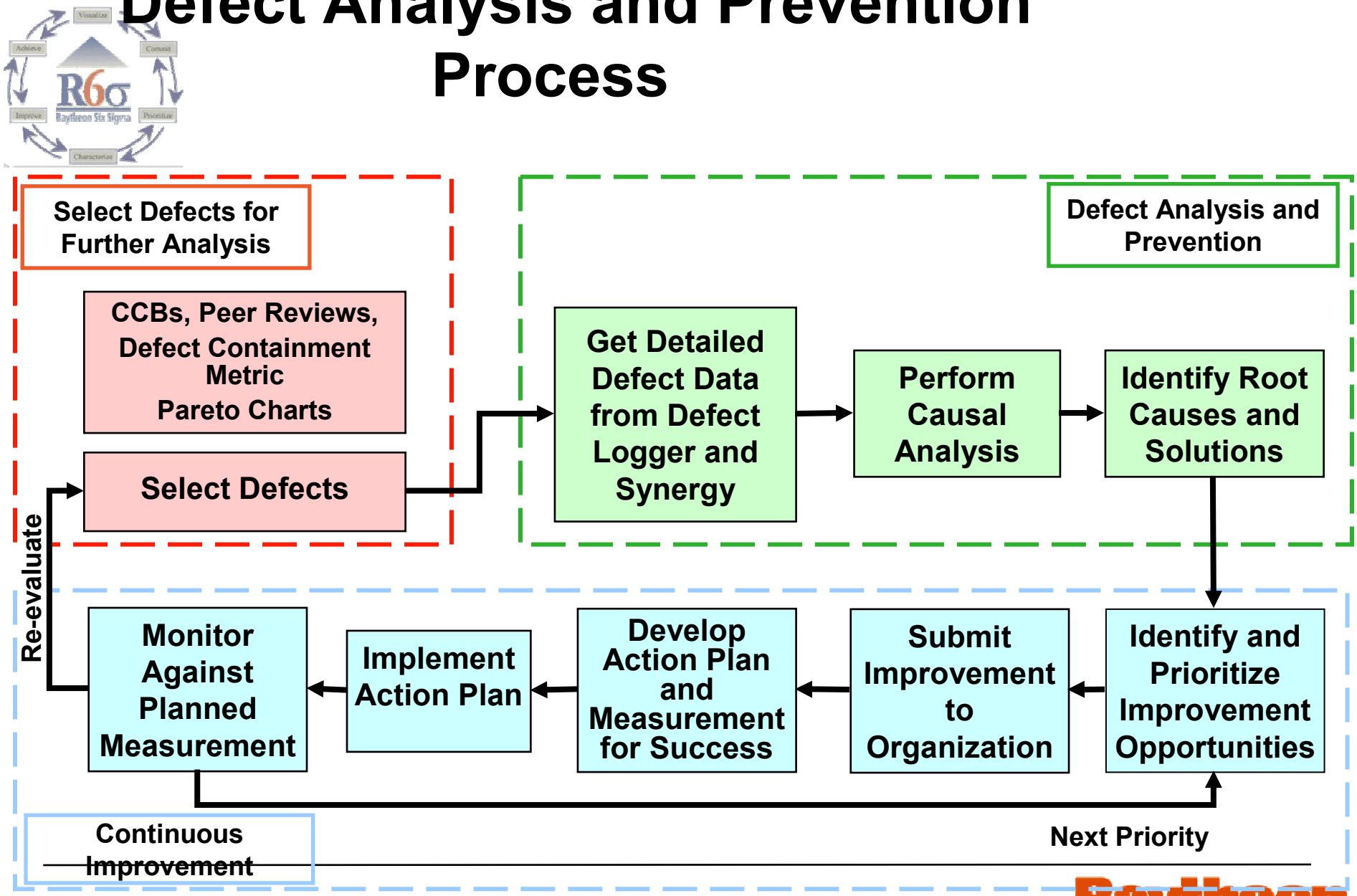
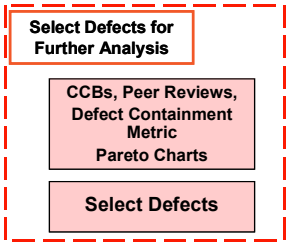
Defect Analysis and Prevention Process





Select Defects for Further Analysis

- The program metrics analysis team regularly reviews defect data to determine if defect analysis is necessary
  - Defect metric has exceeded threshold
  - Defect data shows a trend
  - Individual defect is flagged for analysis

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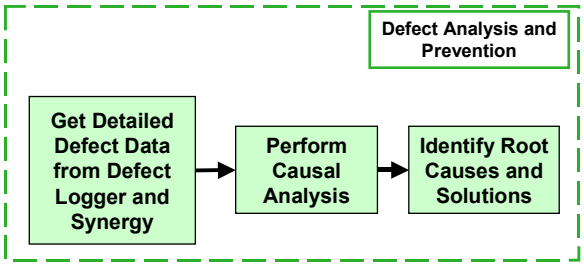
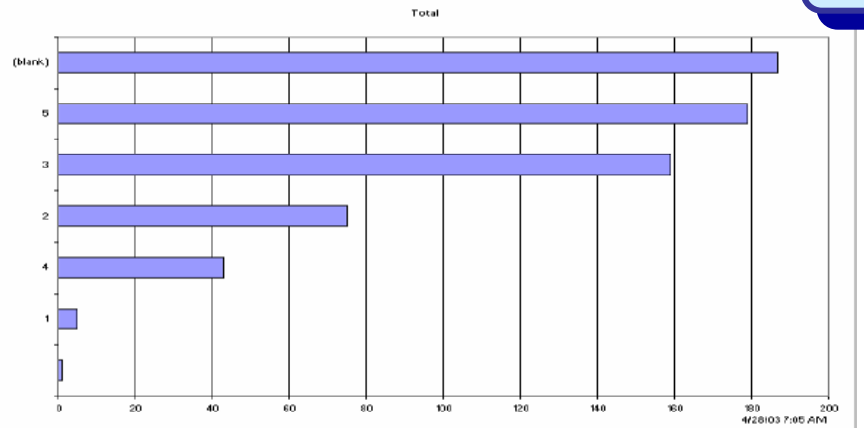


Analysis Tools

Pareto



http://homext.ray.com/sixsigma

Five Whys

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Defect Containment Matrix

Stage Originated

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Fishbone

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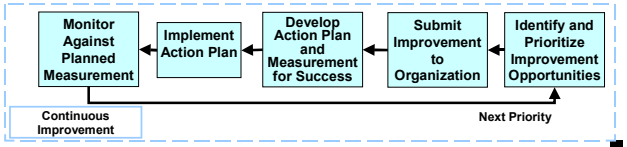

Continuous Improvement (1 of 3)

- Identify and prioritize improvement opportunities based on the potential solutions to defect root cause
- Submit improvement opportunities to the organization via the Organizational Improvement Website

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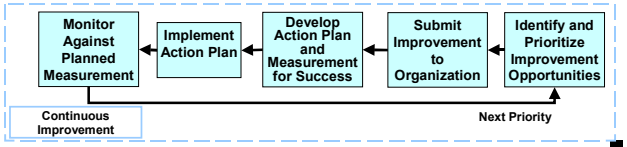

Continuous Improvement (2 of 3)

- Organizational Improvement Website
  - A *proposal* is a request to have the SWEC organization evaluate, select, and adopt a recommended improvement and to provide a funding and evaluation path for the proposal.
  - An *advisory* is an informational message to the SWEC organization advising that a program is providing a funding and evaluation path for an improved process, method, tool, technology, etc to support its own business/project goals. However, this improvement may have relevance to the organization at large and have strategic importance to the enterprise

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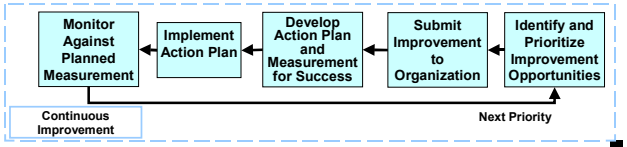

Continuous Improvement (3 of 3)

- Work as a Six Sigma Project
  - Create an action plan for the improvement
    - ➢Include how to measure success of the improvement
  - Implement the action plan
  - Monitor the progress of the action plan
    - ➢Track progress for measurement of success
  - Communicate the results to the program & organization

Six Step Process for Continuous Improvement

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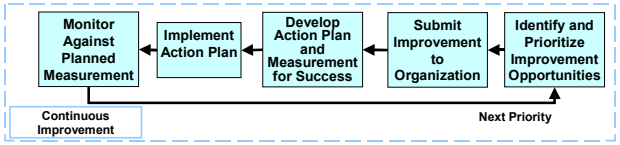

Defect Prevention

- Examples
  - New checklists
  - Modified processes
  - Updated plans
  - Scheduled training
  - Tool support

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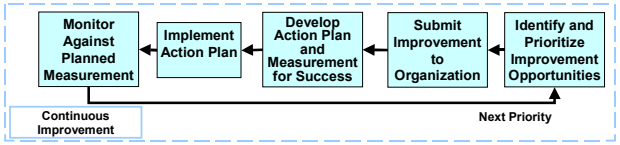

Defect Prevention

Comments

Reviewer: <All>

Comments

ID	Description	Defect			
1597	General: Are any of the new a	☐			
1546	General - Shouldn't the [GHMD	☐	Testa	Cook	Complete
1535	Add (SSS/SRS) after the Title	☐	Cosmetic	Cook	Complete
1538	The List of Tables and the List	☐	Cosmetic	Cook	Complete
1537	Remove the extra numbers in 1	☐	Cosmetic	Cook	Complete
1569	Is there a data dictionary that s	☐	Interfac	Simpson	Complete

Check to mark a defect

Check to analyze

Priority:

Reason: None

Originated In: SW Req Anal

Associated CR:

Further Analysis ☐

Location:

Resolution: Yes, littoral acquisition and azimuth tracking <31 Jul 03 verified, wmr>

Record: 1 of 63

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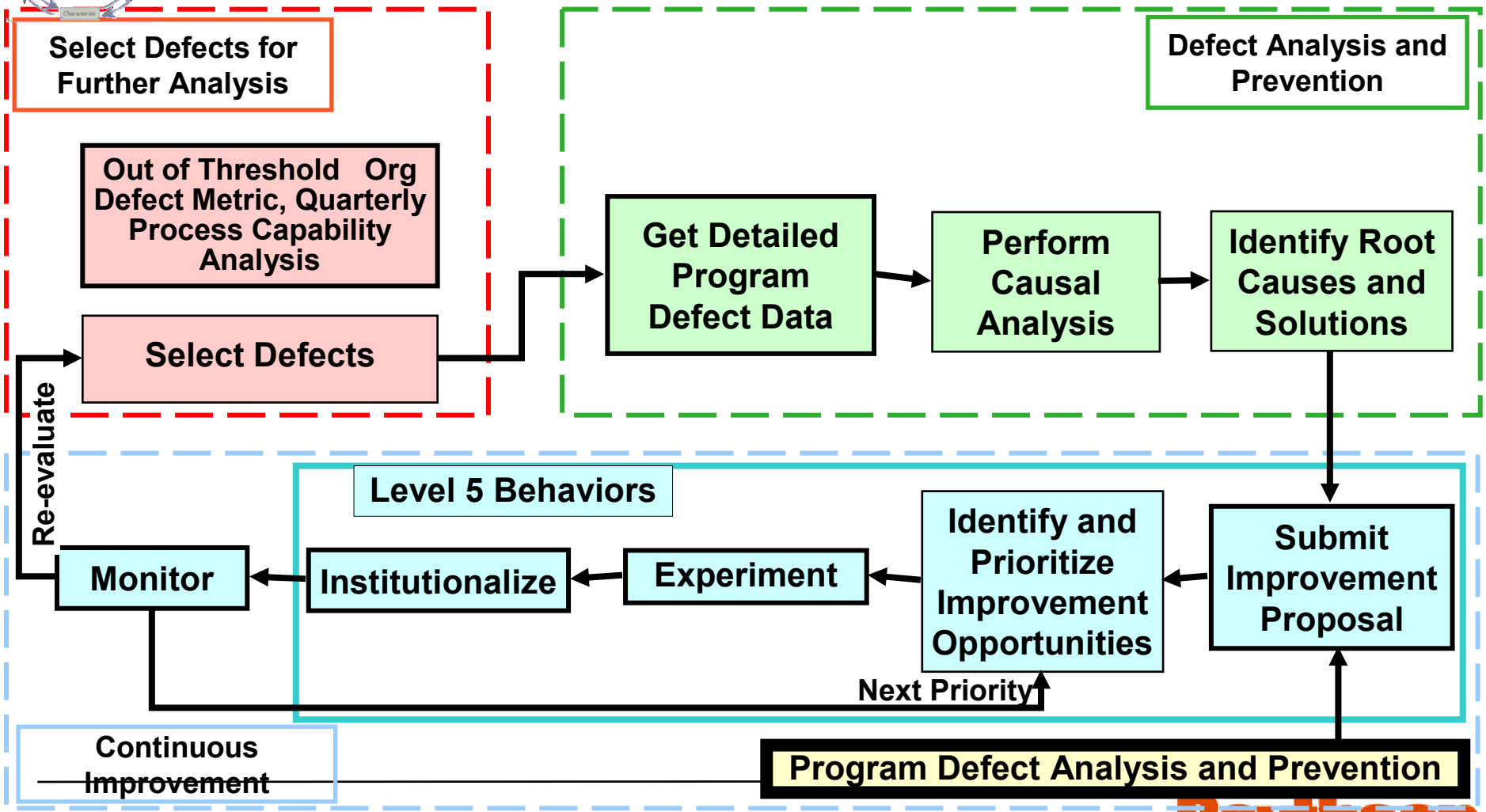
Organization Defect Analysis and Prevention Process



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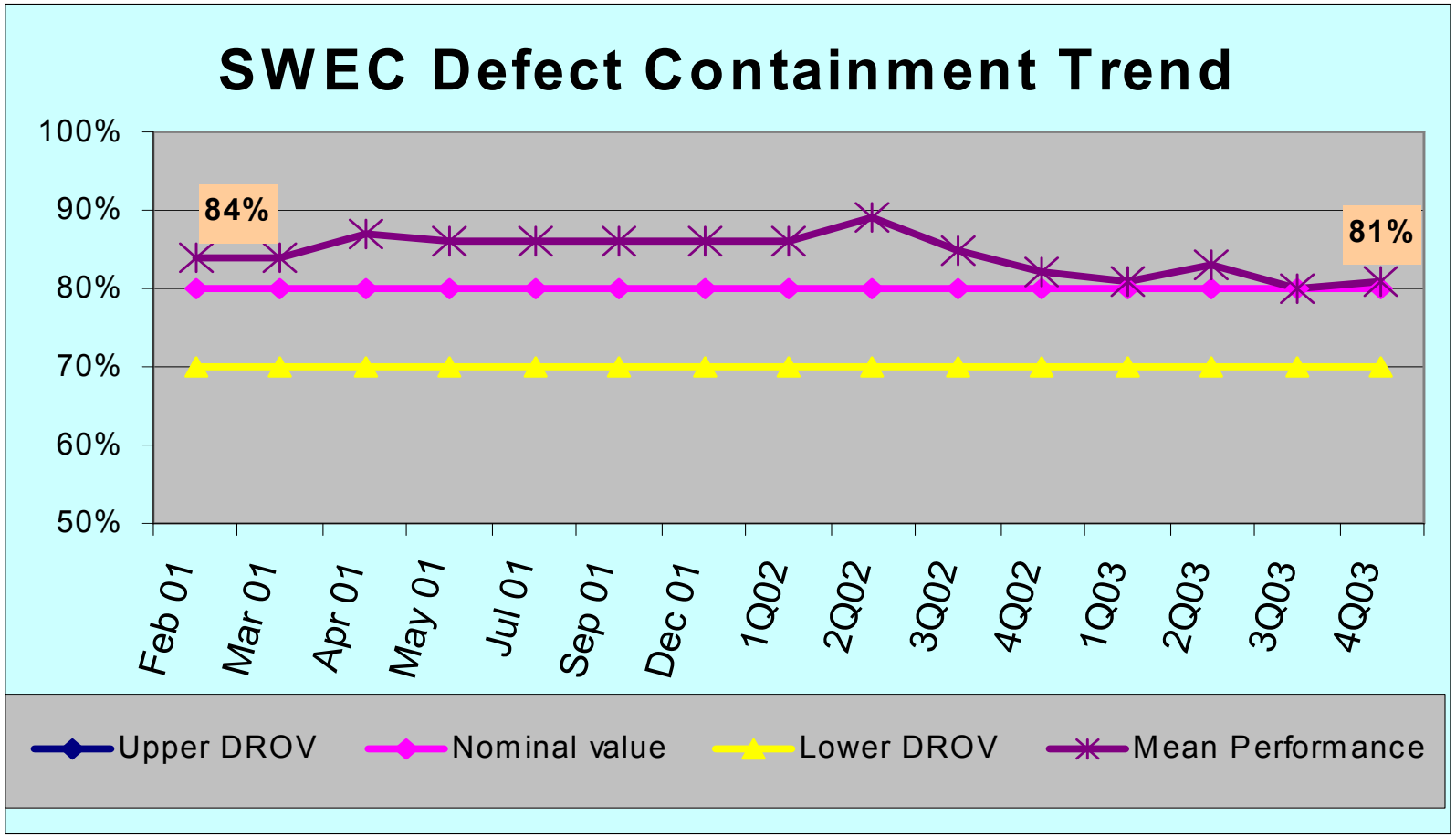
Results



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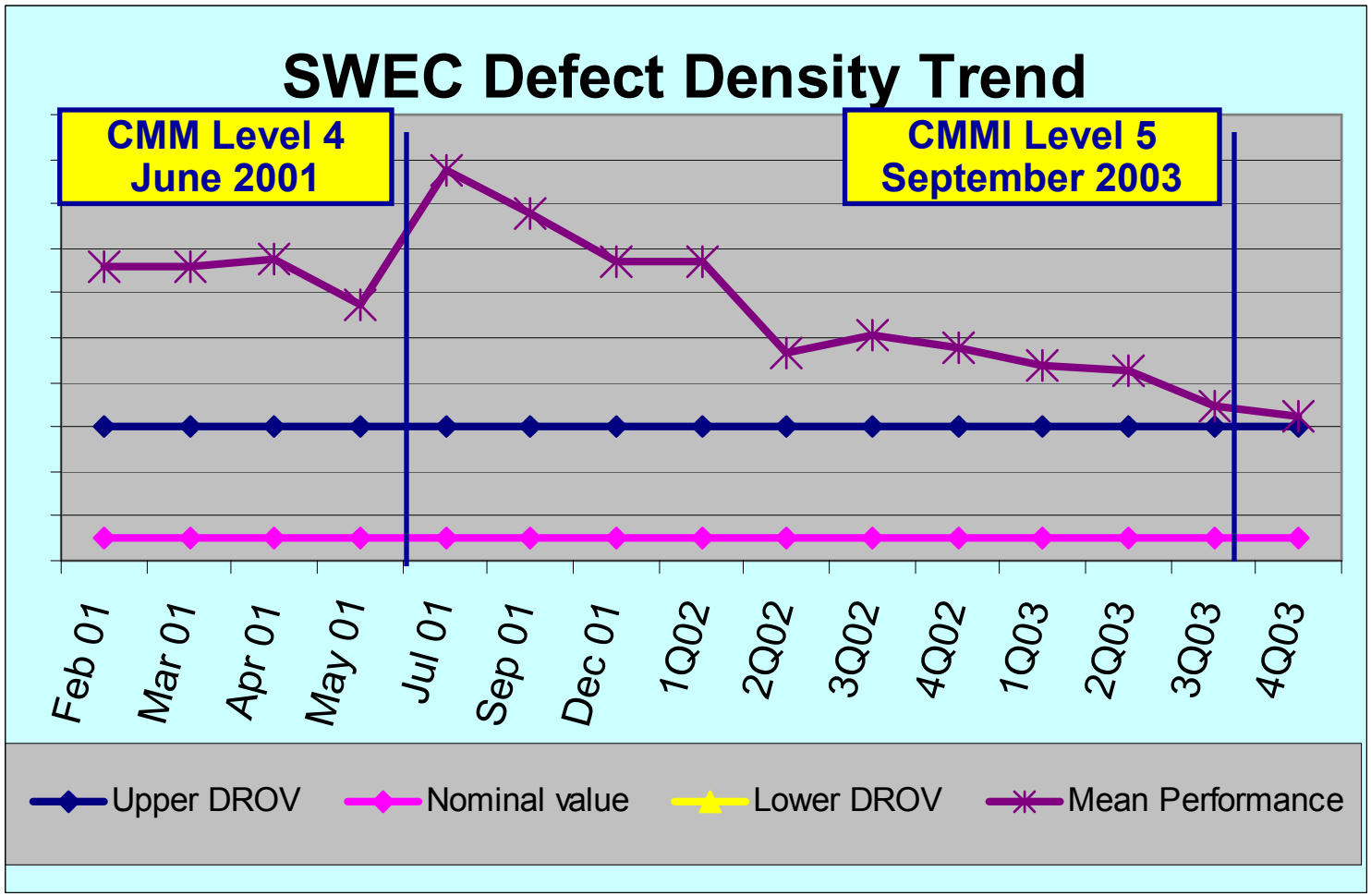
Defect Density



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

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Summary

- Out of phase defects cause expensive rework
- Use common definitions and counting approach
- Focus on defect detection and prevention
- Analyze metrics at least monthly using R6σ tools
- Prioritize and implement defect prevention activities
- Promote lessons learned to the organization

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