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Customer Success Is Our Mission

# Defect Data & Configuration Management

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# Topics

- Defects and the CMMI
- Defect Collection and Reporting Process Flow
- CM Role in Defect Collection
- Issues in CM Defect Data Collection
- Summary

# Introduction

- **Raytheon Space and Airborne Systems (SAS)**
  - 13,000 + employees
  - Achieved
    - CMMI Level 5, Software Engineering, Sept. 2003, PSAS (Texas)
    - CMMI Level 3, Systems Engineering, Software Engineering, and Hardware Engineering, August 2005 (California and Texas)
      - ~ 6500 employees
      - 6 Appraisal Programs
      - Over 7800 artifacts collected
      - Appraisals Conducted
        - 2 - Class C (February, July 2005)
        - 3 - Class B (April, 2004, November 2004, May 2005)
        - 1 - SCAMPI (August 2005)

# Common Terms

- **Defect: *(n.)* Want or absence of something necessary for completeness or perfection; deficiency; *(n.)* Failing; fault; imperfection**
- **The following terms are used in a generic manner:**
  - Baseline – An approved work product at a specific revision/version and date. A baselined work product is one that is released and controlled by CM.
  - Change Request (CR) –The CR on programs could be the IR/CN, PDM Work Auth, SCR, SCN, STN, etc.
  - Configuration Control Board (CCB) – The board that reviews and dispositions CRs against baselined work products. The CCB on programs that perform this function could be called any one of a number of names – ERB, CRB, SCCB, CCB, PRB, etc.

**What is a defect and why be concerned?**

# Defects and the CMMI (1)

- **In a CMMI-compliant Organization Standard Process (OSP), defects are typically**
  - identified in product reviews and audits as described in the Verification Process Area (PA) (Level 3),
  - analyzed and used as described in the Organizational Process Performance and Quantitative Project Management PAs (Leve
  - and used to perform root cause analysis to prevent similar defe future from being introduced as described in the Causal Analy Resolution PA (Level 5).

**Identifying, using, and preventing defects**

# Defects and the CMMI (2)

- For Engineering, the purpose of identifying and categorizing defects in selected work products is to find and remove defects early in its lifecycle.
- Studies have shown that the later a defect is identified in a work product's life cycle, the more damage it causes, and the more costly it is to remove.


**What is a defect and why be concerned?**

# Defects and the CMMI (3)

5 Focus on continuous process improvement (the science of process improvement, root cause analysis, ROI, piloting). **Root cause analysis performed on defect data & other measures for prevention of future defects.**

4 Process measured and controlled quantitatively (control charts, statistical analysis, management by data). **Defect data is analyzed by both projects & the org. Corrections are made to processes.**

3 Process characterized for the **organization** and is proactive. **Peer Reviews occur & defect data reported at org & project level.**

2 Process characterized for **projects** and is often reactive. **Measures defined & collected by projects.**

1 Process unpredictable, poorly controlled & reactive. **Defects only identified and removed in later lifecycle phases.**

Optimizing

Quantitatively Managed

Defined

Managed

Initial

Increasing Capability

**The emphasis on defect data increases with maturity.**

# Defect Data Collection & Reporting Process Flow

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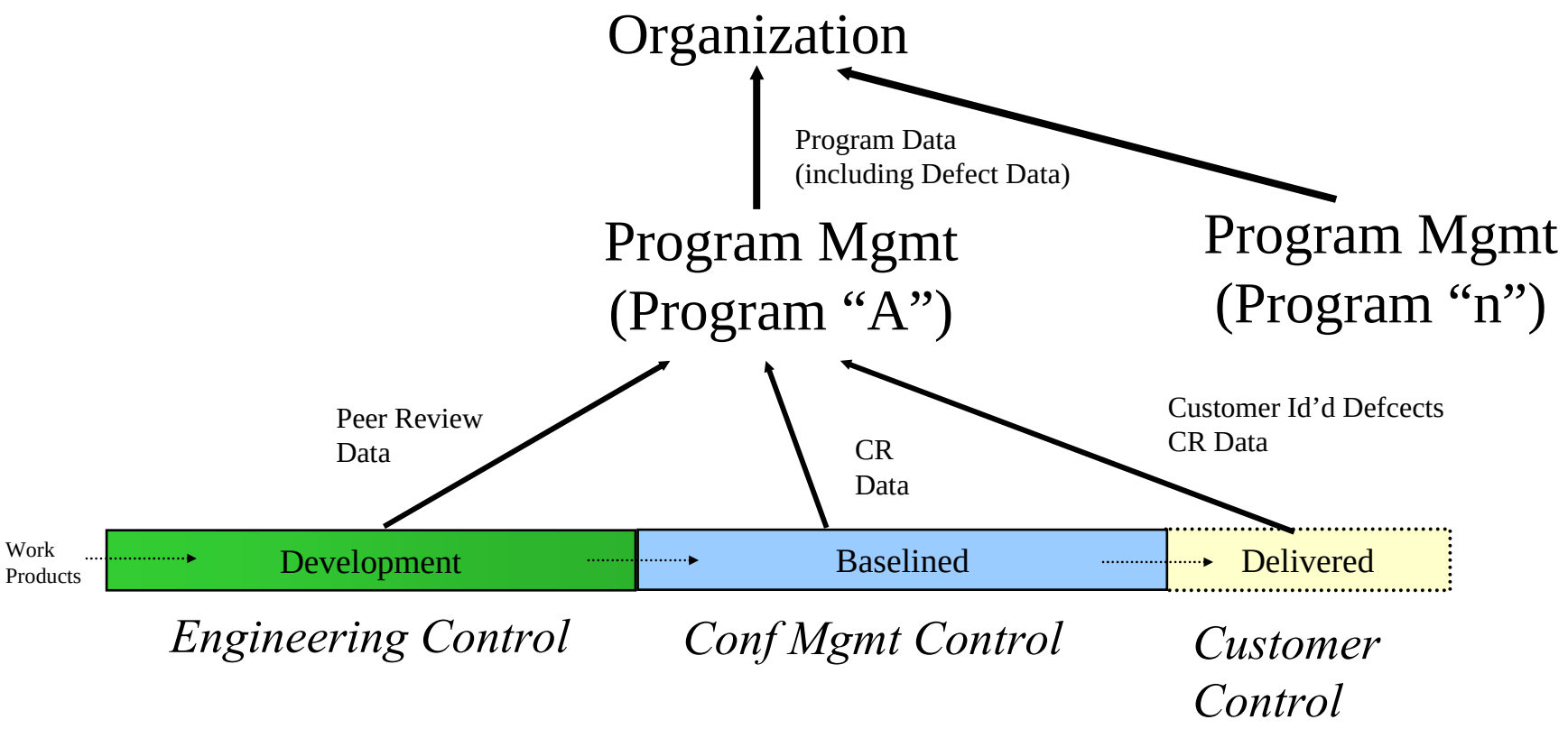


**Defect Data is collected from Peer Reviews & CM**

# Engineering Control

- **During development, a work product is typically under Engineering Control.**
- **When ready, the work product is Peer Reviewed, defects identified, and categorized including:**
  - Type of defect found
  - Phase where defect was injected
  - Phase where defect was found
- **The defect data is collected and reported to Program Management.**
- **This process is part of the CMMI Verification Process Area (PA).**


**Peer Reviews provide defect data for work products under Engineering Control.**

# CM Control (1)

- **Once the work product has been Peer Reviewed and ready to be controlled, it is given to CM for baseline (release).**
- **Once released, the Change Management process begins.**
  - To change a released work product, the appropriate Change Requests (CRs) are initiated and evaluated by a Configuration Control Board (CCB).
  - The CCB analyzes (or facilitates the analysis of) the change and, if determined to be a valid change, the defect is identified and categorized on the CR.

**CRs provide defect data for work products under CM Control.**

# CM Control (2)

- CM collects and provides the change and defect data to Program Management.
- This process is part of the CMMI CM Process Area (PA).

**CRs provide defect data for work products under CM Control.**

# Customer Control

- **Once work products are delivered, defects found are communicated back to the organization by the customer. This communication takes the form agreed upon by the customer and the program.**
  - A CR is written documenting the defect found by the customer.
  - Since the work product has been released prior to customer delivery, the CR follows the same Change Management process described under CM Control.
- **CM collects and provides the customer change and defect data to Program Management.**
- **This process is part of the CMMI CM Process Area (PA).**

**CRs provide defect data found by the customer on delivered work products.**

# CMDM Role in Defect Data Collection

- **During program startup, CM defines:**
  - the work products to be placed under CM Control and when that control is triggered.
  - the Change Management process to be used on the program (including the type of CRs to use, the data collected on them (fields), and the CR lifecycle).
- **Once a work product is given to CM for release (baseline), CM ensures that the Change Management process is followed for any changes.**
- **When taking a CR (against a released work product) through its lifecycle, CM ensures that all fields on the CR are completed, including the defect data fields.**
- **CM coordinates the capture and analysis of defects found by the customer after delivery.**

**CM ensures that defect data is captured on all CRs during the Change Management process.**

# Issues in CM Defect Data Collection (1)

- **If defect data is not collected on CRs (the change mechanism):**
  - The only data provided to the organization will be from Peer Reviews.
  - Since the goal is to find defects as early as possible, any defects found in released work products that escaped their phase (e.g., requirements defects found in Test) will not be identified.

**Defect data not captured on CRs is a lost opportunity.**

# Issues in CMDM Data Collection (2)

- **Issues that impact the effective identification and use of defect data include:**
  - **Programs that release their work products late in their lifecycle:**
    - May not be providing accurate defect data information to the organization.
    - May not be documenting all changes that occur in Integration and Test on CRs; therefore, the CM defect data will not be accurate.
  - **Method for documenting changes on CRs - Care must be taken on the use of CRs for documenting changes and defect data.**
    - One CR for each type of defect identified: Easier for collecting and reporting defect data. Harder for overall change management since more than one work product could be affected.
    - One CR for each work product: Easier for change management, harder for identifying and categorizing all associated defects. The CR would need to collect all instances of defects and their categories.


**To get an accurate view, the appropriate CR process must be used.**

# Impact of Defect Data Issues

- The organization will not get the opportunity to analyze and correct any systemic problems. Analysis performed at the organizational level will be incomplete and conclusions reached may not be valid.
- The organization will get a false picture of how effective the program is in early capture of defects.
- Levels 4 and 5 could be impacted if the organization isn't provided with all defect data. Very few defects will be identified during Test and Integration phases could raise a red flag during a CMMI appraisal.

**Ineffective CM defect data collection methods impacts the organization.**

# EPGs Role in Defining the Defect Data Process

- **The organization's EPG establishes the annual process improvement objectives based on the organization's goals. If those goals include achieving a CMMI Level 3, a proactive EPG will:**
  - evaluate the process needs for Levels 3 and 4.
  - identify gaps in current processes.
  - establish supporting measurements and analysis processes through Level 3 that will easily pave the way to Level 4.
  - ensure that all sources of measurement data have a defined standard process for identifying, categorizing, and reporting (including defect data). This would include the CM Change Management process and the collection of defect data on CRs.


**The EPG must ensure that mechanisms are in place to collect and report defect data from CRs.**

# Summary

- **Defect data is identified in two activities:**
  - During a Peer Review of a work product
  - During the Change Management process of a released work product.
- **CM collects, maintains, and reports the defect data in CRs.**
- **Without the CM defect data, organizations will not have all the measurement data needed for:**
  - Evaluating the programs and organizations status in early capture of defects
  - Analyzing and eliminating systemic product quality issues
  - Achieving CMMI Levels 4 and 5