National Defense Industrial Association
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Causal Analysis and Resolution: A Business Driver at All Levels

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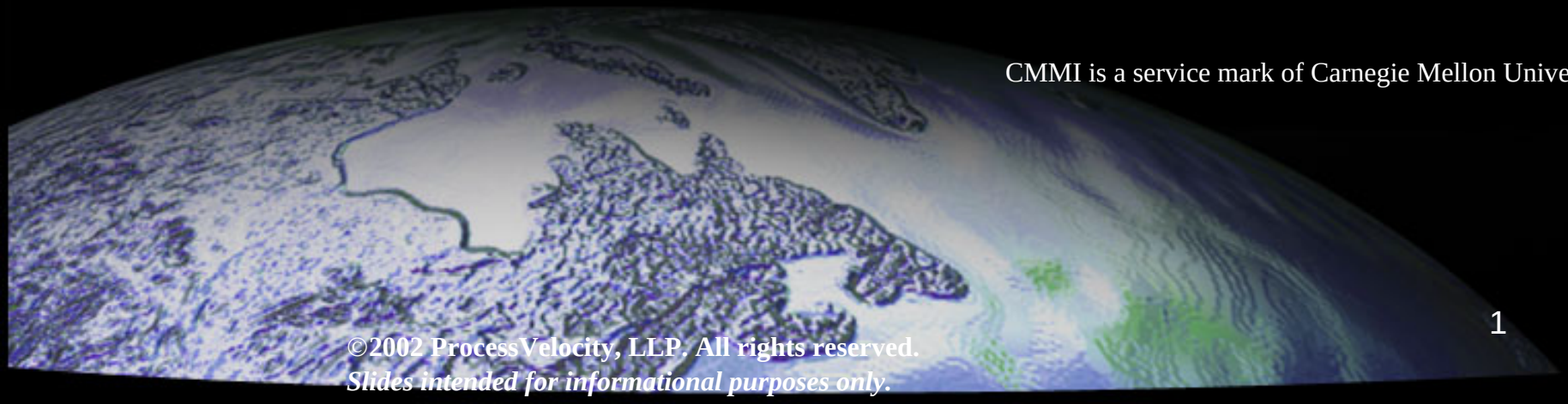

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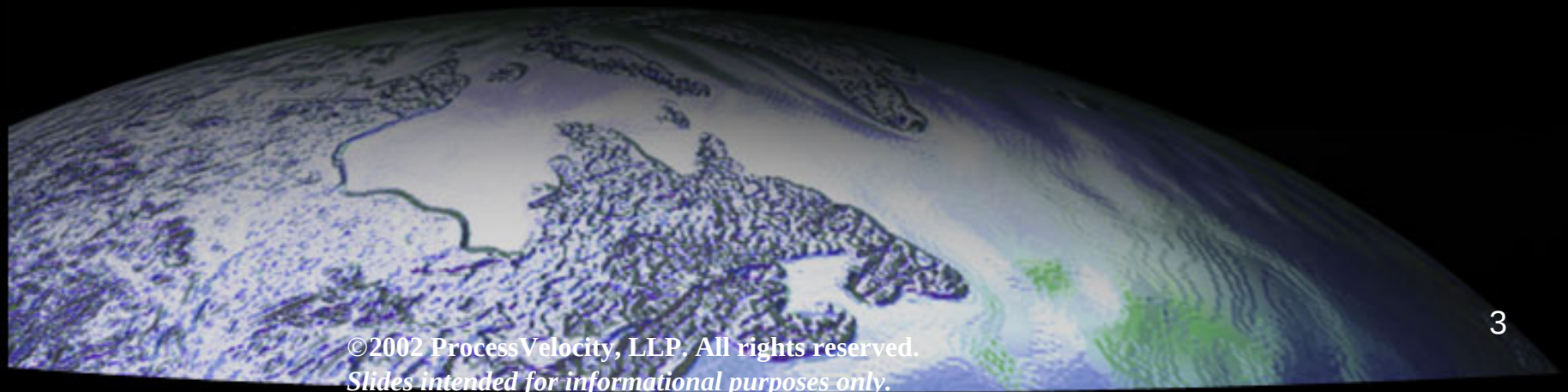
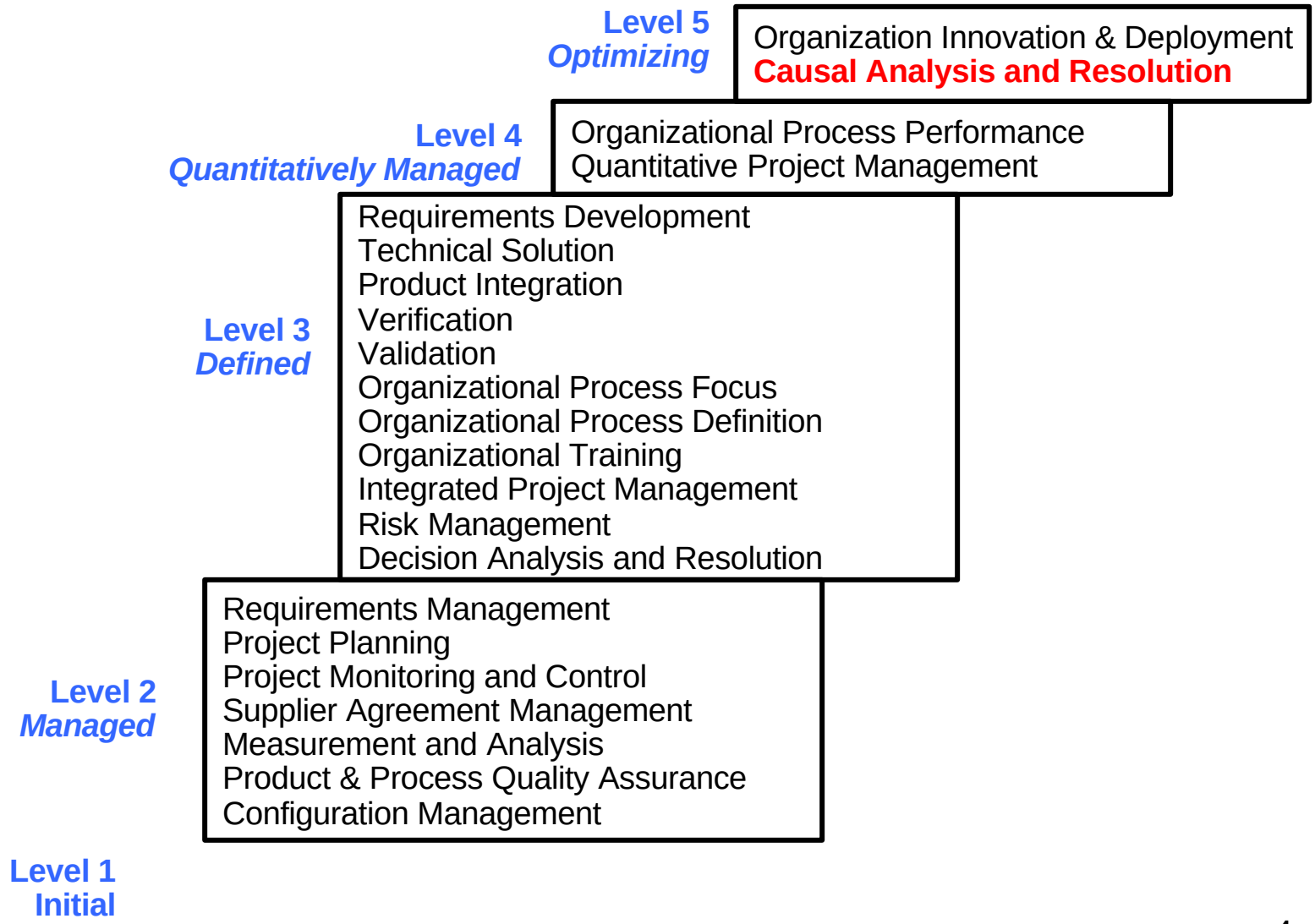
Agenda

- Overview of Causal Analysis and Resolution
- Business Necessity: Cost for Quality
- Need for Causal Analysis at All Levels
- Implementation

Overview of Causal Analysis and Resolution (CAR)



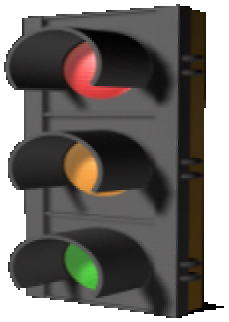
CMMI – Staged Representation



What is CAR?

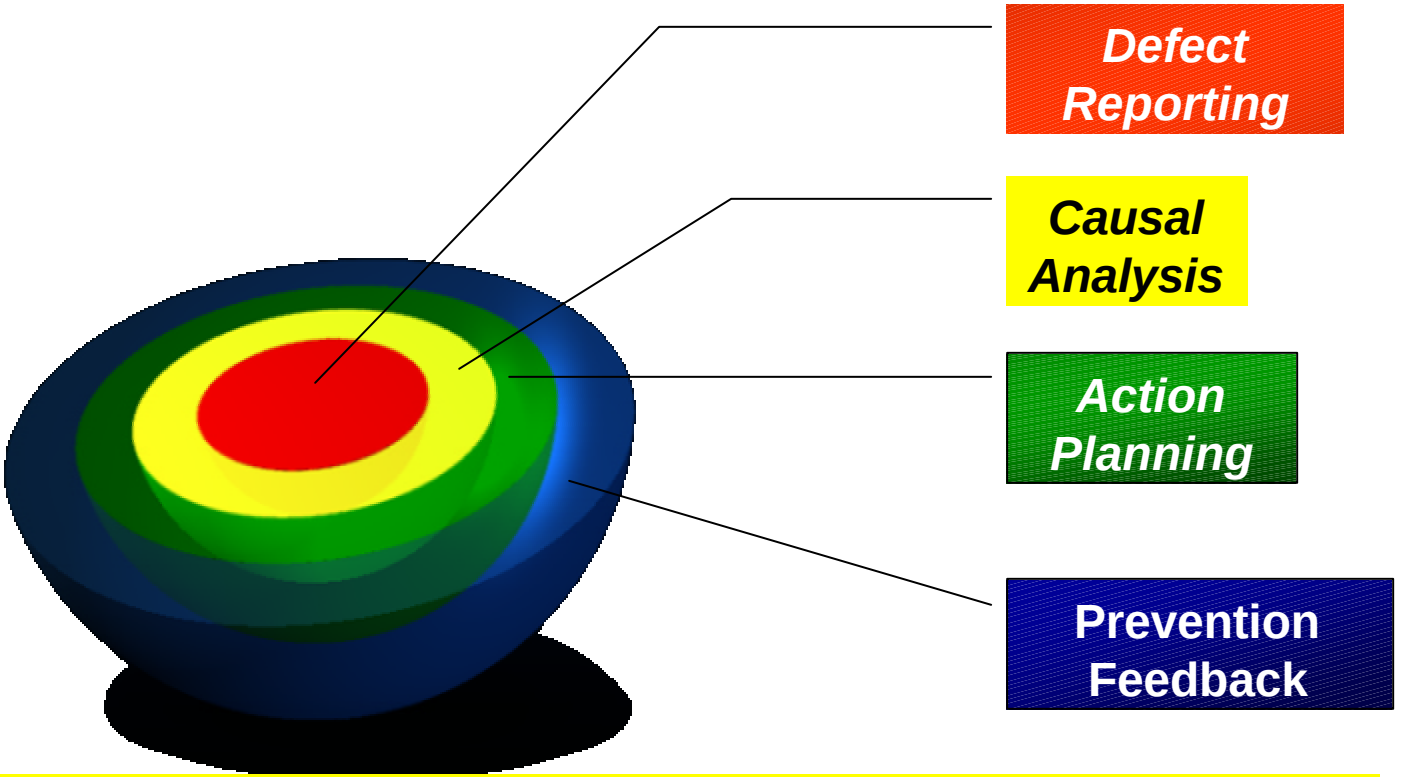
- The purpose of Causal Analysis and Resolution is to identify causes of defects and other problems and take action to prevent them from occurring in the future.
  - ✓ May also be performed on problems unrelated to defects
    - Cycle time
    - Improvement proposals
    - Dynamic systems models
    - New business directives

Past Performance



Future Successes

CAR: Key Elements



Main Questions to Answer:

- How could I have prevented this defect?
- How can the process data enable me to prevent similar defects?

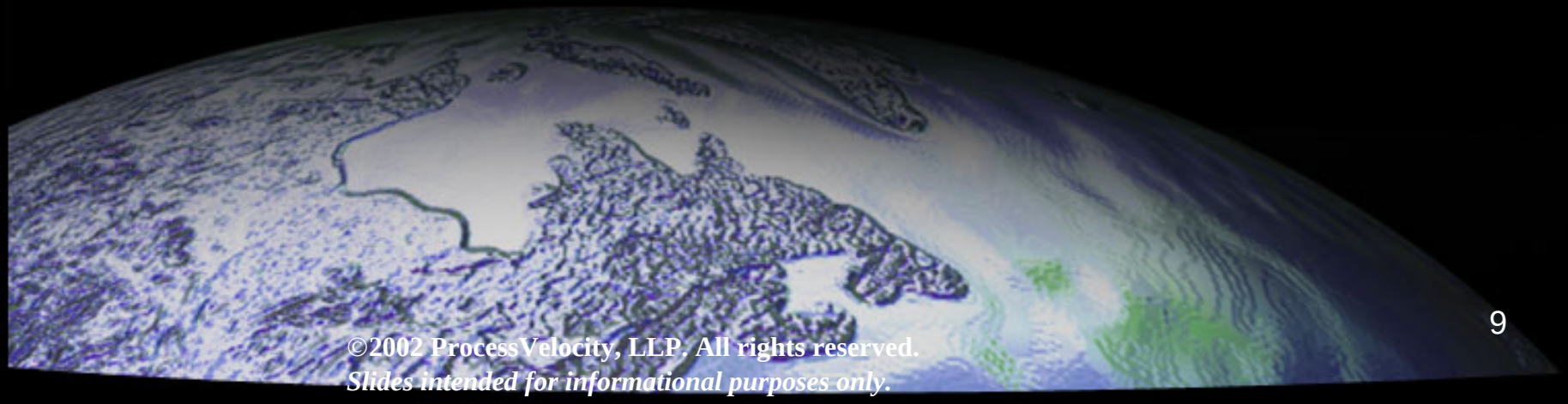
Key Considerations

- CAR Quality Management Approach
  - ✓ Defect prevention is a ***Customer Focused*** pro-active approach
  - ✓ Find points of failure and correct or avoid them
    - Positive impact on what you are building or how you are building it must be a ***Value Added Activity***
    - Reliance on detecting defects after they have been introduced is not cost effective
  - ✓ Opportunity to share lessons learned on problem areas
    - Harness project experience to determine defect similarities – common classifications
  - ✓ CAR shifts the organizational emphasis from discovery to prevention of defects

Hybrid Implementation Approach

- Parallel continuous improvement on CAR implementation, while pursuing an overall Stage Representation implementation strategy
  - ✓ Enables immediate pay off on ROI
  - ✓ Ensures early development of a data collection plan
  - ✓ Promotes awareness at an earlier level in the overall process improvement efforts
  - ✓ Prevents rework in later stages
  - ✓ Provides systems wide view of operational readiness

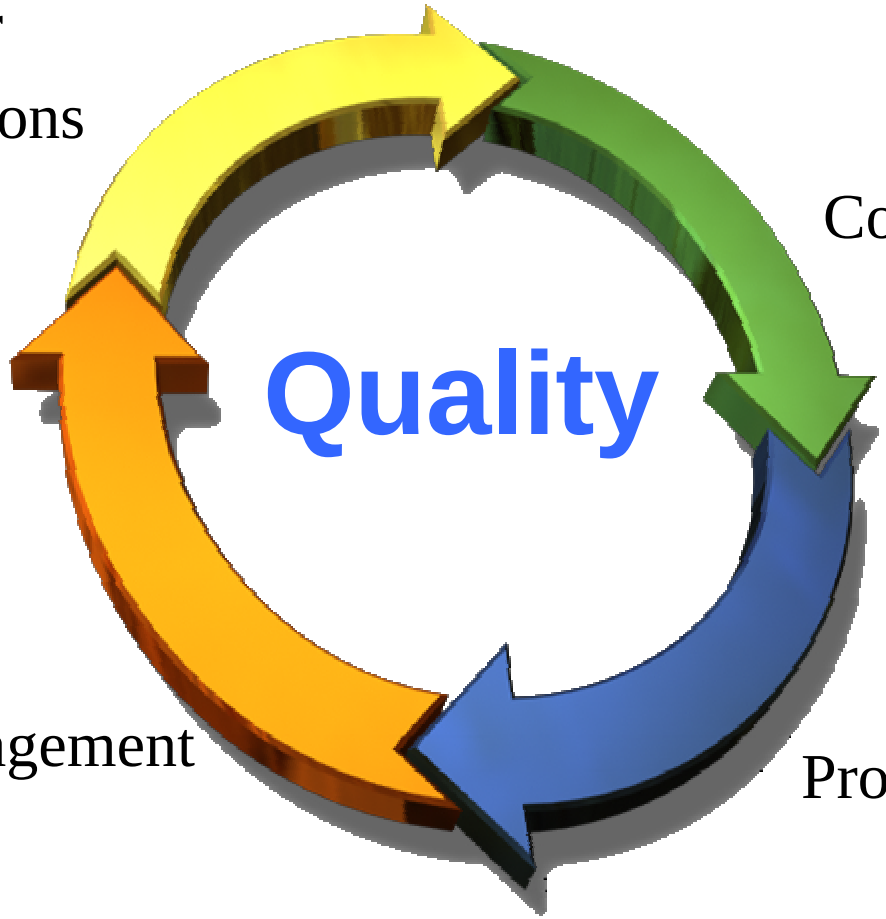
Business Necessity: Cost for Quality



Business Reality

- New “watch words” are speed, agility, collaboration, and innovation
  - ✓ Lifecycle timeframes
  - ✓ Cross functional teams
  - ✓ Rapid response
- Current business environment is characterized by rapidly changing technologies within an extremely competitive market
- Customers demand more functionality at a lower price and rapid implementation of any new capability to satisfy their changing business demands
- Focus is on performance; however, need exists for an immediate ROI that is demonstrable to the customer
- Difficult to establish a organization as an technology market leader and even more difficult to maintain it as a ***top-performing*** organization
  - ✓ One that performs better than its competitors from both technical and business perspectives

Business Drivers



Supporting Business Drivers

Analysis

What must be on track to ensure that business drivers are met?

Focus

What business drivers do you want to focus on to support the objectives?

Objectives

You can't do everything at once, so what's most important to focus on right now?

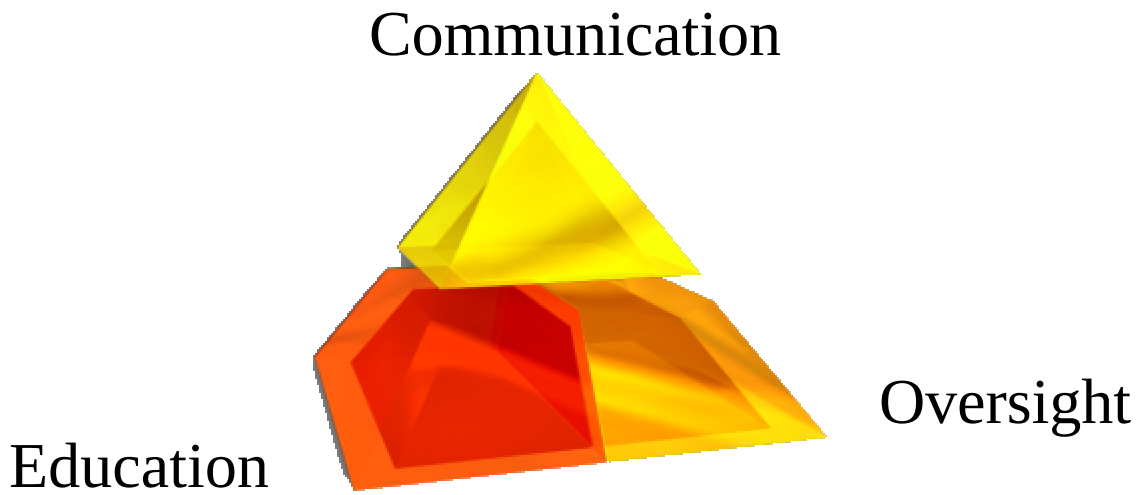
The Quality Paradigm

- **Current Mindset: "You get what you pay for!"**
- Quality Management when properly executed will help to reduce costs. The higher the quality, the lower the operating costs.
- Key component to executing a successful quality management program is to ensure a committed, proactive approach to preventing problems is achieved.
  - ✓ Bottom line: All defects can be traced to a cause, and with proper application of quality management principles, can be eliminated.

Deming quote: "Defects are **not** free. Somebody makes them and gets paid for making them."

Categorization of Defect Causes

- Narrows range of defect investigations
- Majority of defects are traced to:



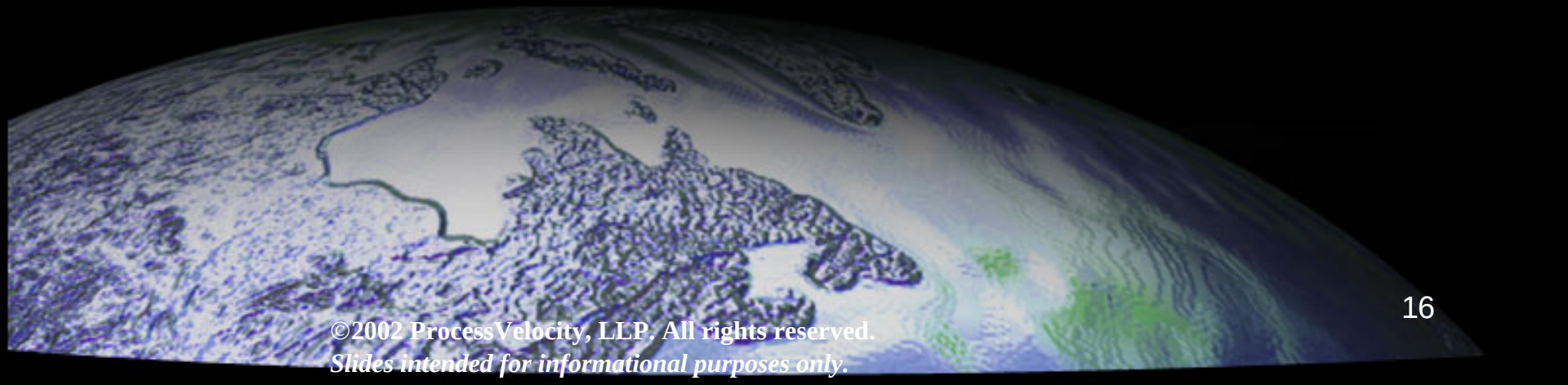
Based upon analysis of 1336 defects from the baseline project (TETRA Release 1) and two other projects. “Defect Prevention Techniques for High Quality and Reduced Cycle Time”

When will it change?

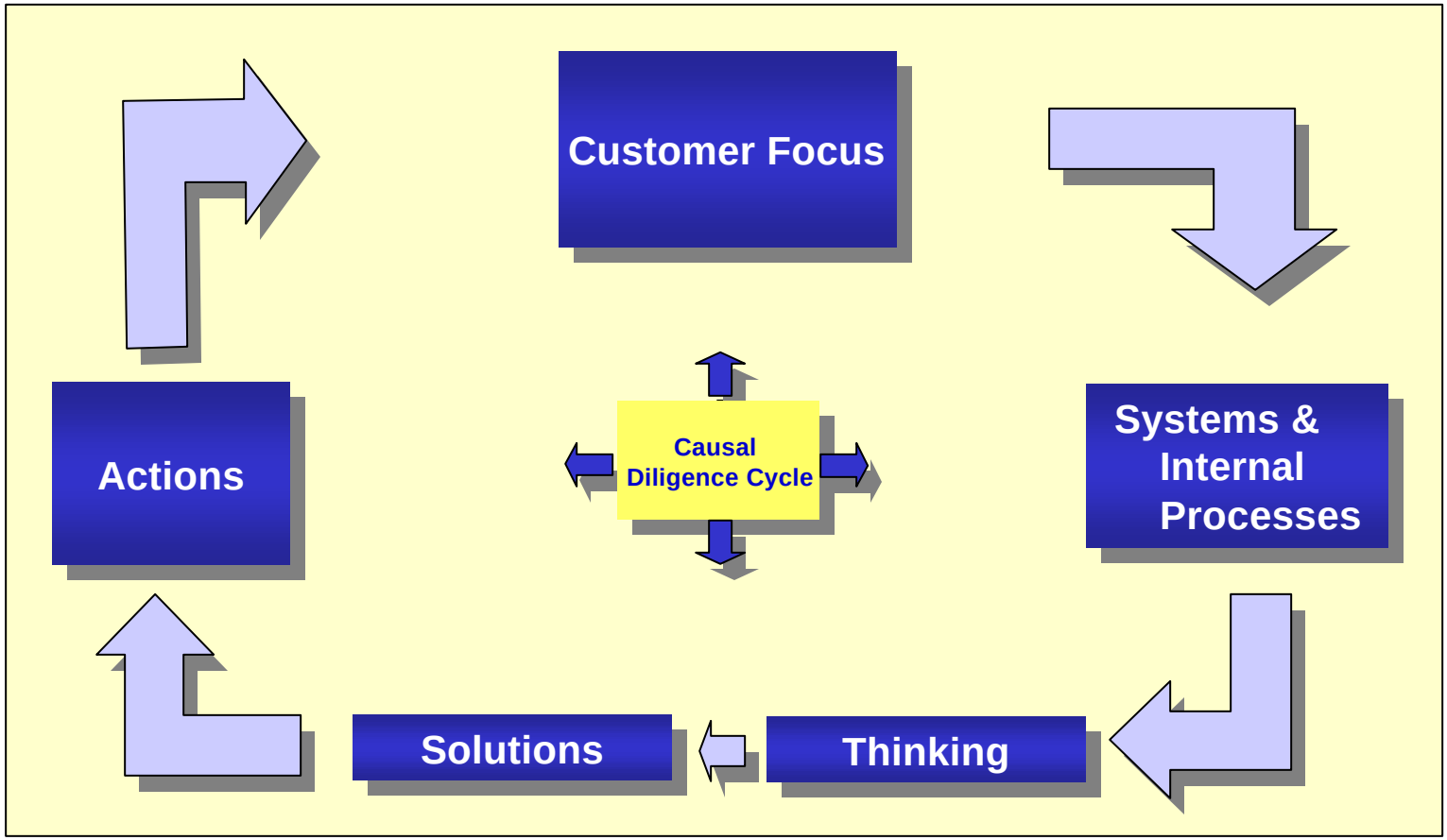
- According to the U.S. Defense Dept. and the Software Engineering Institute, there are typically 5 to 15 flaws in every 1,000 lines of code
- Tracking down each bug eats up about 75 minutes, according to a five-year Pentagon study
  - ✓ Fixing them takes two to nine hours each
- On the outside, that's 150 hours, or roughly $30,000, to cleanse every 1,000 lines

http://www.businessweek.com/1999/99_49/b3658015.htm

Need for CAR at All Levels



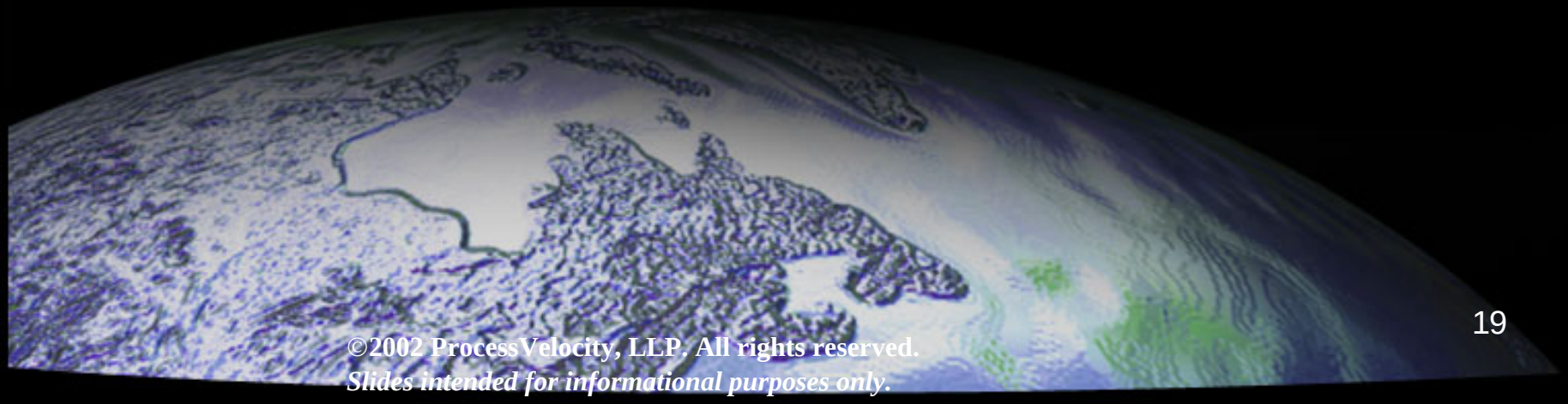
CAR Alignment with Business Needs



Probing Questions

- What are the business goals you'd like to hit this year?
- How are you communicating business goals and objectives throughout the company?
- How are you tracking progress in meeting those goals?
- What must I do to keep a true customer focus throughout my workday?
- What must be done to harmonize all systems and processes?
- What must I do to achieve detailed thinking on a continuous basis?
- How can I create rapid solutions for prevention, while thinking at a slower rate?
- What must I do to understand the consequences of any actions continuously throughout my workday?

Implementation



Growing the CAR Measurement Process

- Iterative analysis process
- Focus on value-added performance metrics
  - ✓ Performance must be measured from the onset of any initiative
  - ✓ Should be an integral part of the company operations
  - ✓ Breakeven point of quality efforts must be considered, i.e., cost benefit analysis at any level of implementation

** Most performance initiatives are hampered by the unavailability of objective quality data

CAR Measurement at All Levels

5 **Continuing improvement is based on business objectives, market demands and cost-benefit analysis.**

4 **Defect causal analysis is based on the principles of statistical process control.**

Actual measurements are compared to expected values of mean and variance.

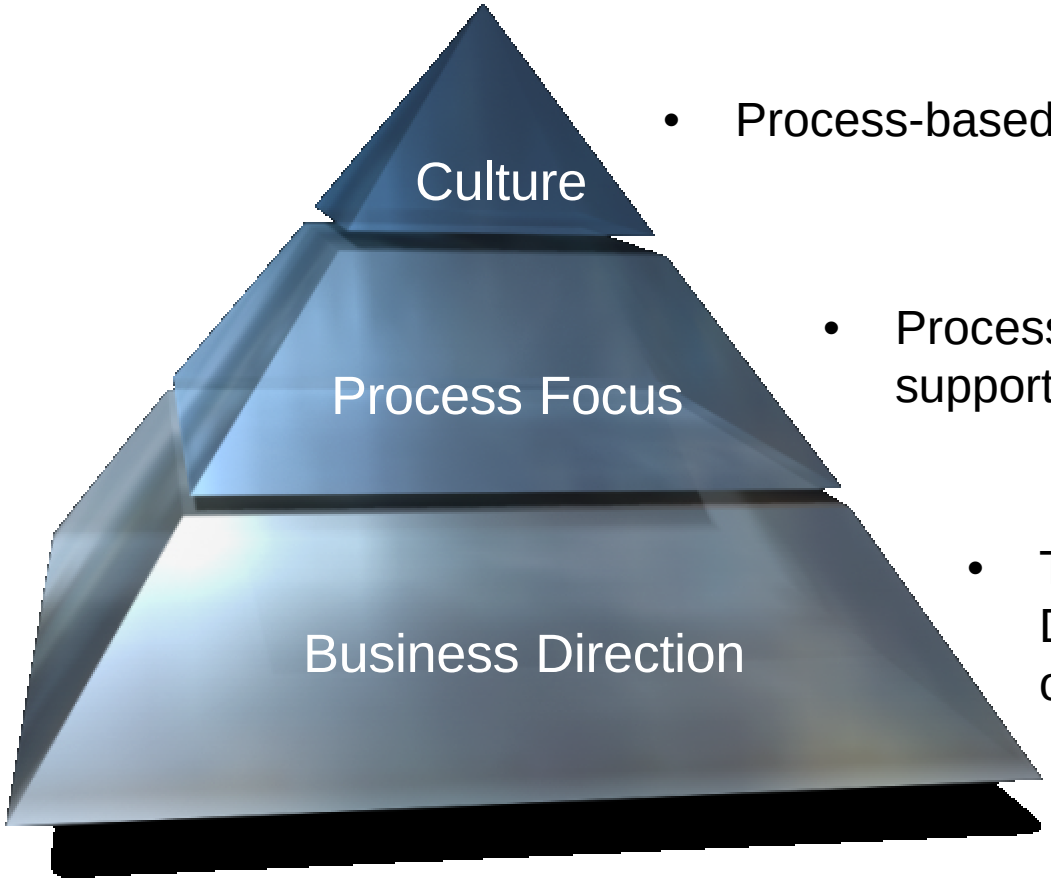
3 **There are consistent definitions from one project to the next.**

Defect data are collected across the organization. Causal analyses are conducted in a consistent manner.

2 **Projects collect defect data. Different projects may use different definitions. Infrastructure enforced via PPQA**
CAR filter applied to Measurement and Analysis Process Area

1 **Projects collect defect data, as available. Establishment of metrics traceability to business drivers. Establishment of CAR principles. Establishment of data collection and analysis mechanism. Training conducted on defect prevention and root cause analysis**

Barriers to CAR Implementation



- Process-based culture is immature
- Process Focus is limited; no supporting infrastructure
- Translation of “Business Drivers” to measurable objectives

Bibliography

- http://www.businessweek.com/1999/99_49/b3658015.htm

- “Defect Prevention Techniques for High Quality and Reduced Cycle Time” EuroSPI98, Abraham Peled, Leeba Salzman, Abraham Danon, Paul Rogoway, Motorola Communications Israel Ltd. Tel Aviv, Israel

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