The Fundamental Value of Every Single CMMI Practice
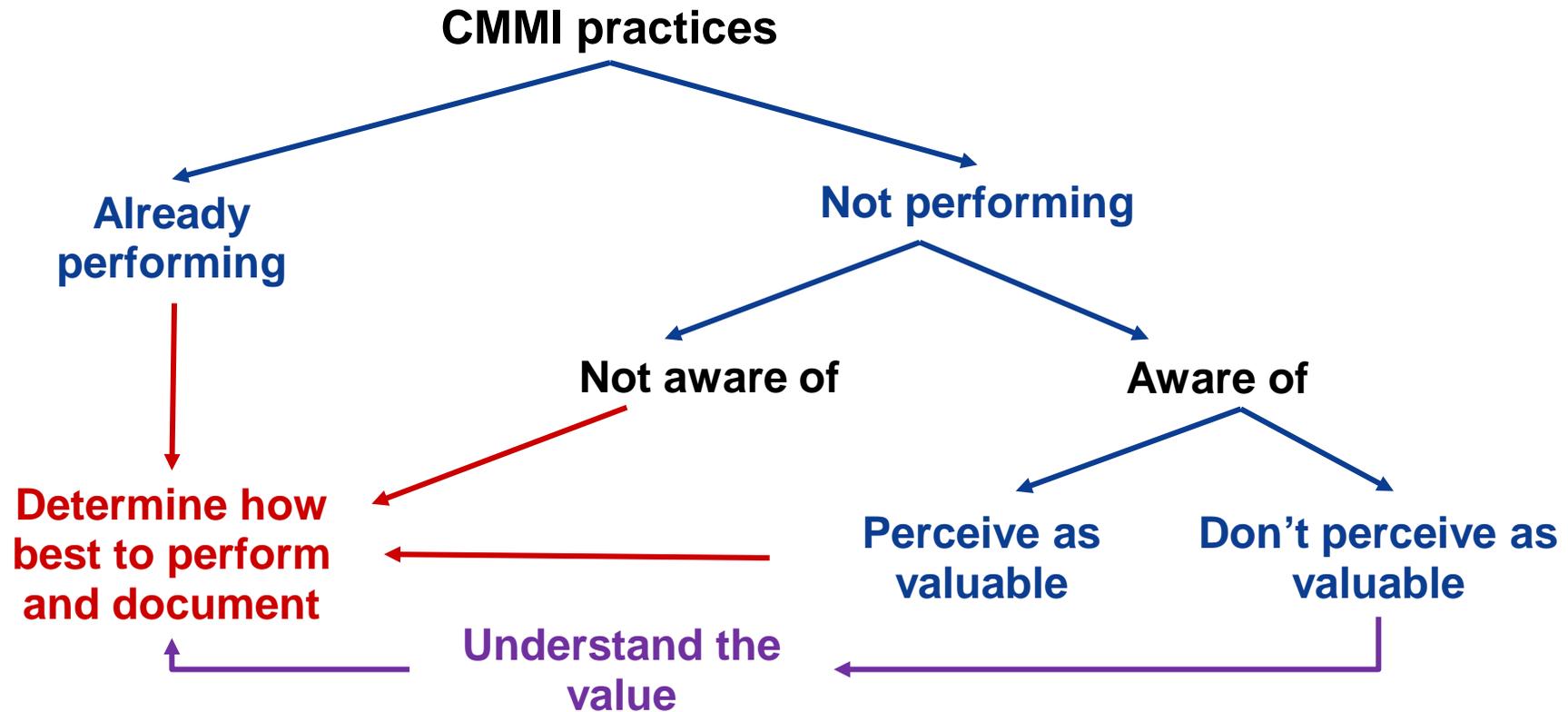
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Background

- Convincing someone to implement a CMMI practice is especially difficult when they don't believe the practice adds any value

- It is important that CMMI advocates be able to clearly explain the business value of each practice and its positive impact on project and organization performance

- This presentation will outline the potential benefits from adopting CMMI practices

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What is CMMI?

- The CMMI is a model of industry best-practices for engineering products

- When an organization decides to adopt CMMI, they commit to performing these best-practices
  - Different than a customer-driven process, where you simply do what the customer asks you to do

- You are performing practices in what you understand to be the best way known in industry
  - "Best" implies predictably producing products of acceptable quality at the lowest possible cost and schedule

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Adopting the CMMI

CMMI practices

Already performing

Not performing

Not aware of

Aware of

Determine how best to perform and document

Perceive as valuable

Don't perceive as valuable

Understand the value

Key enablers
Willingness to learn unfamiliar practices
Desire to extract value not "check the box"
Ability to interpret the CMMI in your context
Understanding the value of the CMMI practices

A Typical Interchange

CMMI Change Agent

CMMI Change "Target"

"You're not doing
practice X."

"So."

"You must do that practice
to satisfy CMMI!"

"The customer didn't say
we have to do practice X."

"Practice X adds value"

"How?

"Well, it's in the CMMI,
so it must be important."

"Practice X doesn't make sense
for us – we're special."

"Well…, you have to do the
practice or you'll fail the appraisal!"

"$^&*&%!!!!!"

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Underlying Principles of CMMI

- Process discipline leads to predictable project performance
  - Say what you do; do what you say
  - Document the plans/processes
  - Communicate them to the performers and stakeholders
  - Audit to ensure we are following them

- Conscious choices lead to better processes
  - E.g., identify relevant stakeholders and their involvement; identify work products to be controlled and the control method; define validation procedures and criteria, …

- Organizational learning improves project performance
  - Capture what works, and what doesn't
  - Make rules (policies) to guide projects
  - Define expected processes, and let projects tailor them to fit
  - Capture work products and measures, and learn from them

"Interpreting the CMMI: It Depends!", R, Hefner and S. Yellayi,
2005 CMMI Technology Conference and User Group

How Do the CMMI Practices Add Value

- Each practice provides value in 4 possible ways:
  - Performance – the practice directly reduces cost and or schedule through either increased efficiency, increased effectiveness, or lowered rework
  - Quality – the practice produces higher quality products, by either preventing or uncovering defects
  - Insight – the practice helps explain current process or project behaviors, enabling action
  - Communications – the practice helps everyone understand expected behavior, or provides insight leading to better decisions

- Many practices effect more than one dimension

- Some practices provide the potential for a positive impact or reduce the risk of a negative impact

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Some CMMI Areas Offer More Potential Value than Others

- The activities which drive cost and schedule the most provide the most potential for productivity improvement

- For most large companies and large software projects, the most expensive and time consuming activities, in rank order are:
  - Defect removal
  - Producing documents
  - Meetings and communications
  - Coding
  - Project management

"The Schedules, Costs, and Value of Software Process Improvements," Caper Jones, 2007, used with permission

Why Do People Resist Change?
Perceived Loss of Personal Power

Here's the new practices you need to start implementing.

so they must not be essential industry best practices!

then I've been wrong....

and I haven't been performing them....

If these are essential industry best practices...

Barriers to Seeing the Value

"Sometimes you have to believe it to see it."

- Practitioners may not have worked in an environment where the practice was performed

- Practitioners may have worked in an environment where the practice was performed poorly or in a non-value-added manner

- The practice may run counter to a long-held belief

- Believing the practice is an improvement may require an action the practitioner is not willing to take
  - Awkwardness of doing something new
  - Admit they've been doing it wrong
  - Loss of personal power when perceived to be an expert in the current approach

Some CMMI Areas Where the Value Isn't Obvious to Many Practitioners

- PP SP 1.2 Establish Estimates of Work Product and Task Attributes
  - PMC SP 1.1 Monitor Project Planning Parameters

- Process and Product Quality Assurance

- Risk Management

- Decision Analysis & Resolution

- Supplier Agreement Management

- GP 2.6 Control Work Products
  - PMC SP 1.4 Monitor Data Management

- GP 2.7 Identify and Involve Relevant Stakeholders
  - PMC SP 1.5 Monitor Stakeholder Involvement

- Level 4/5

Planning

- The value of planning is *communication*
  - Plans provide a structured way to investigate the best approach for satisfying given objectives
  - Practitioners know what is expected of them, so fewer mistakes are made, avoiding rework
  - Interdependences are identified and negotiated which causes fewer disconnects between groups, avoiding schedule delays and wasted resources
  - We monitor progress against plans, so that corrective actions can be taken more quickly and insightfully

- To realize the value of planning
  - The environment has to be predictable
  - Plans must be reasonable
  - Plans must be up-to-date
  - Plans must be communicated to those involved and followed
  - The process behind the plans must be communicated and followed

Planning Example

Project Planning - Specific Practice 1.2

Establish and maintain estimates of work products and task attributes.

Measures of size of complexity that contribute to determining effort and cost

- Frequently heard:
  - "It's not important to estimate or track code size, it changes anyway"
  - "We don't use attributes, we just know it's a X week effort"

- Explaining the value
  - Everyone uses attributes, perhaps subconsciously – we just want to make it conscious

Risk Management

- The value of risk management is *performance*
  - By identifying potential risks and mitigating them, you prevent schedule delays caused by a problem
  - Without risk management, effectiveness is hindered because events outside your control un-do your careful planning and execution
  - Must accept that some mitigation actions will be "wasted" because the risk is never realized

- To realize the value of risk management
  - The culture must support an open discussion of risks
  - Must be effective at identifying ALL risks, ALL perspectives
  - Risk mitigations must offer a reasonable return on investment
  - Solid plans must be written so the risks (of not meeting the plans) can be determined

Risk Management Example

Risk Management - Specific Practice 1.1

Determine risk sources and categories.

What sources of risk should we consider in identifying risk?

How should we categorize the risks once they are identified?
- Urgency
- Assignee

- Frequently heard:
  - "The sources are the same as the categories"
  - "Anybody can identify a risk at any time"
  - "Risks are categorized by impact: cost, schedule, performance"

- Explaining the value
  - Setting expectations for the types of risk to consider helps ensure that ALL risks get identified
  - How the risks will be categorized helps ensure they are managed appropriately

SEI Risk Taxonomy

A. Product Engineering

1. Requirements
   a. Stability
   b. Completeness
   c. Clarity
   d. Validity
   e. Feasibility
   f. Precedent
   g. Scale

2. Design
   a. Functionality
   b. Difficulty
   c. Interfaces
   d. Performance
   e. Testability
   f. Hardware
   g. Non-Developmental SW

3. Code and Unit Test
   a. Feasibility
   b. Testing
   c. Coding/Implementation

4. Integration and Test
   a. Environment
   b. Product
   c. System

5. Engineering Specialties
   a. Maintainability
   b. Reliability
   c. Safety
   d. Security
   e. Human Factors
   f. Specifications

B. Development Environment

1. Development Process
   a. Formaility
   b. Suitability
   c. Process Control
   d. Familiarity
   e. Product Control

2. Development System
   a. Capacity
   b. Suitability
   c. Usability
   d. Familiarity
   e. Reliability
   f. System Support
   g. Deliverability

3. Management Process
   a. Planning
   b. Project Organization
   c. Management Experience
   d. Program Interfaces

4. Management Methods
   a. Monitoring
   b. Personnel Management
   c. Quality Assurance
   d. Configuration Mgmt

5. Work Environment
   a. Quality Attitude
   b. Cooperation
   c. Communication
   d. Morale

C. Program Constraints

1. Resources
   a. Schedule
   b. Staff
   c. Budget
   d. Facilities

2. Contract
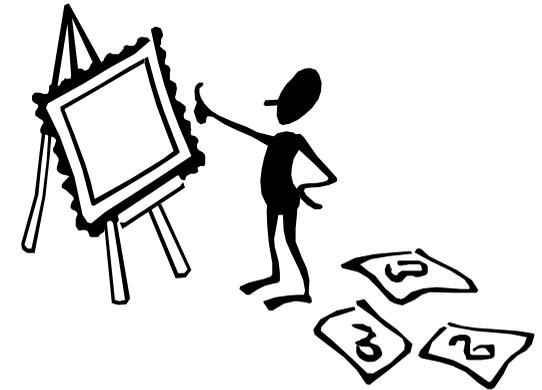   a. Type of Contract
   b. Restrictions
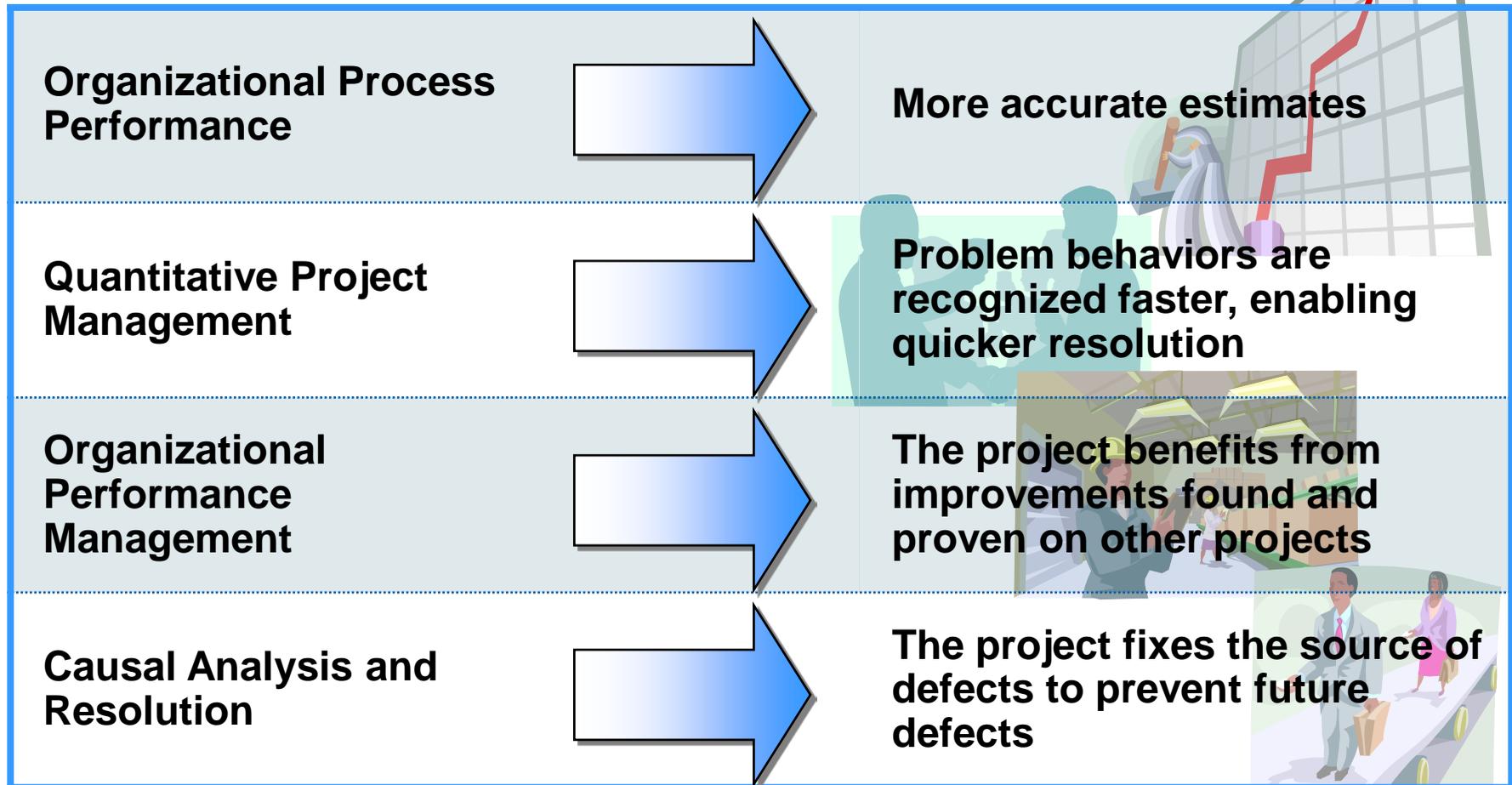   c. Dependencies

3. Program Interfaces
   a. Customer
   b. Associate Contractors
   c. Subcontractors
   d. Prime Contractor
   e. Corporate Management
   f. Vendors
   g. Politics

Taxonomy-Based Risk Identification," Marvin J. Carr, et al, Software Engineering Institute, CMU/SEI-93-TR-6, ESC-TR-93-183, June 1993.

Level 4/5

- The value of Level 4/5 is *insight*
  - Level 4/5 is 10-20% cheaper than Level 3 (even though more is being done
  - Quantitative management establishes expected ranges of process performance
  - Process are stable and predictable – unusual process behaviors can be quickly identified, so effective corrective action can be taken

- To realize the value of Level 4/5
  - Processes have to be stable (performed consistently)
  - Processes under statistical control must support business objectives
  - Data has to be useful and clean
  - Analysis has to lead to actions

How Does Level 4 & 5 Benefit the Customer?

Organizational Process Performance →	**More accurate estimates**
Quantitative Project Management →	**Problem behaviors are recognized faster, enabling quicker resolution**
Organizational Performance Management →	**The project benefits from improvements found and proven on other projects**
Causal Analysis and Resolution →	**The project fixes the source of defects to prevent future defects**

Better Products and Services Produced Faster And Cheaper

"How Does High Maturity Benefit the Customer?", R. Hefner, Systems & Software Technology Conference, 2005
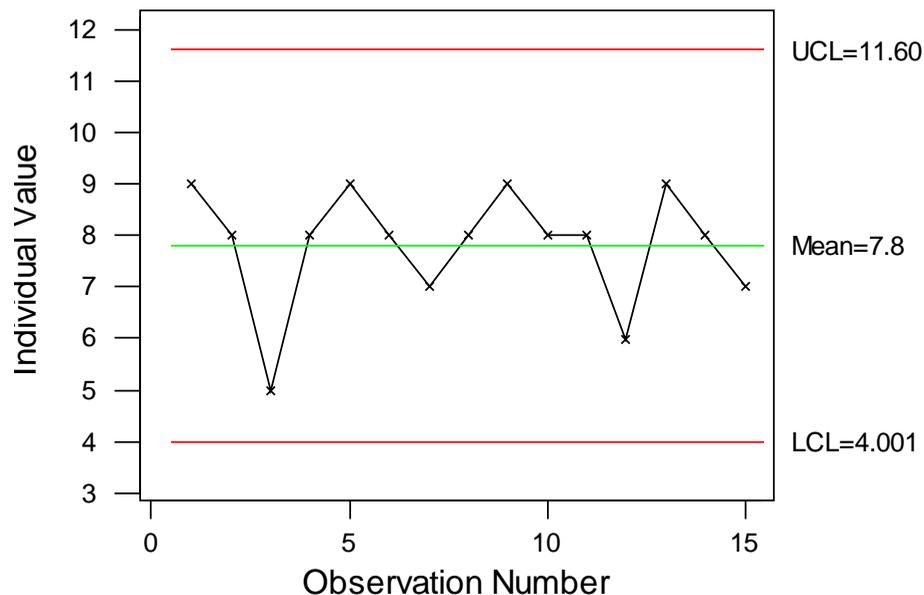
Quantitative Management Example

Suppose your project conducted several peer reviews of similar code, and analyzed the results

Mean = 7.8 defects/KSLOC

+3σ = 11.60 defects/KSLOC

-3σ = 4.001 defects/KSLOC

- What would you expect the next peer review to produce in terms of defects/ KSLOC?

- What would you think if a review resulted in 10 defects/KSLOC?

- 3 defects/KSLOC?

"A Practical Guide to Implementing Levels 4 and 5 (tutorial)," R. Hefner, 2006 CMMI Technology Conference and User Group

Summary

- Convincing someone to implement a CMMI practice is easier when you can explain how the CMMI practices add value

- Insight comes from observing practical, value-added implementations