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Software Engineering Institute

Pittsburgh, PA 15213-3890

High Maturity/Capability Appraisals

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Introduction

Objectives
Expectations
Ground Rules
Detailed Schedule
Background Data

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Objectives

Start to forge a more detailed and shared understanding of the interpretation of "high maturity" and "high capability" practices.

Build consensus on how to handle model interpretation for courses and appraisals.

Increase the understanding of specialized knowledge associated with accurately explaining and appraising implementations of higher levels of maturity and capability.

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What We Will Do Today

- Briefly review some standard material about model content and interpretation
- Describe areas where ambiguity exists today
- Discuss competing interpretations of key topics
- Seek opinions and experiences from Lead Appraisers and Instructors to serve as memorable examples for others
- Document needs for future work to forge a more consistent interpretation and application of CMMI

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What We Will NOT Do Today

- Provide a complete cookbook-style solution
- Resolve all actual or perceived problems in the model or appraisal method
- Seek out and penalize Lead Appraisers and Instructors who have different interpretations of the model or the method
- Provide all attendees with the necessary knowledge and competencies to be experts on these topics

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Ground Rules

- The person at the podium is not the ultimate authority on these complex topics
- We are here to work together to gain insight from listening to each other and sharing our views
- Real world examples are much more helpful than hypothetical scenarios – please try to work with facts
- Plan to work and contribute, not sit back and soak it in

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Schedule For The Day

Start	Finish	Duration	Topic
8:30	9:00	30 min	Introduction
9:00	10:00	60 min	Level 4 Practices
10:00	10:30	30 min	Break
10:30	11:30	60 min	Level 5 Practices
11:30	12:00	30 min	Prepare for Break Outs
12:00	1:00	60 min	Lunch
1:00	2:30	90 min	Subgroup Work Session
2:30	3:00	30 min	Break
3:00	3:30	30 min	Prepare Report Out
3:30	5:00	90 min	Reports and Discussion

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Challenge Questions to Ponder

- How many critical subprocesses have to be statistically managed in order to qualify for Maturity Level 4?
- In order to qualify for Maturity Level 5, do the processes changed using OID have to have previously been statistically managed? Quantitatively managed?
- What business drivers might lead an organization to want to raise OID to Capability Level 5? How about other process areas at CL4 or CL5 – what are the typical “Capability Profiles” and the business drivers that motivate them?

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Challenge Questions – 2

- In order to qualify for Maturity Level 4, is it sufficient to use control limits that are derived from organizational baselines and not project data?
- Does statistical management of critical subprocesses that operate across projects qualify for Maturity Level 4? For example, the procurement process or the DAR process.
- Is it sufficient to apply statistical management to a single attribute of a critical subprocess, in order to qualify for Maturity Level 4?

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Challenge Questions – 3

- Is it reasonable for an appraisal scoped to a single project to yield a Maturity Level rating of 4 or 5 – in an organization where multiple projects are underway?

- Should we establish different qualifications for Lead Appraisers who perform appraisals that result in Maturity/Capability Level ratings above 3?
  - What specific skill/knowledge do they need?
  - How should this be acquired or assured?

- Should different standards of data or organizational sampling be applied to appraisals focused above Maturity/Capability Level 3?

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Ground Rules for Afternoon Sessions

- The goal is active learning through participation, not passive listening. Please be prepared to work.

- Each breakout session will have a facilitator, note-taker, and reporter. We are looking for volunteers.
  - Facilitator manages the interaction
  - Note-taker records important results
  - Reporter presents the results to the larger group

- Use this morning to think about which topic you'd like to dig into more deeply – one of the challenge questions, or something you suggest during break.

Level 4 Practices

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Management by Rear-View Mirror

Most use of measurement in low maturity organizations is purely retrospective.

Overly narrow view – contextual data fades from memory quickly.

Correcting yesterday's wrong turns – it is difficult to ask "what if we do something different?"

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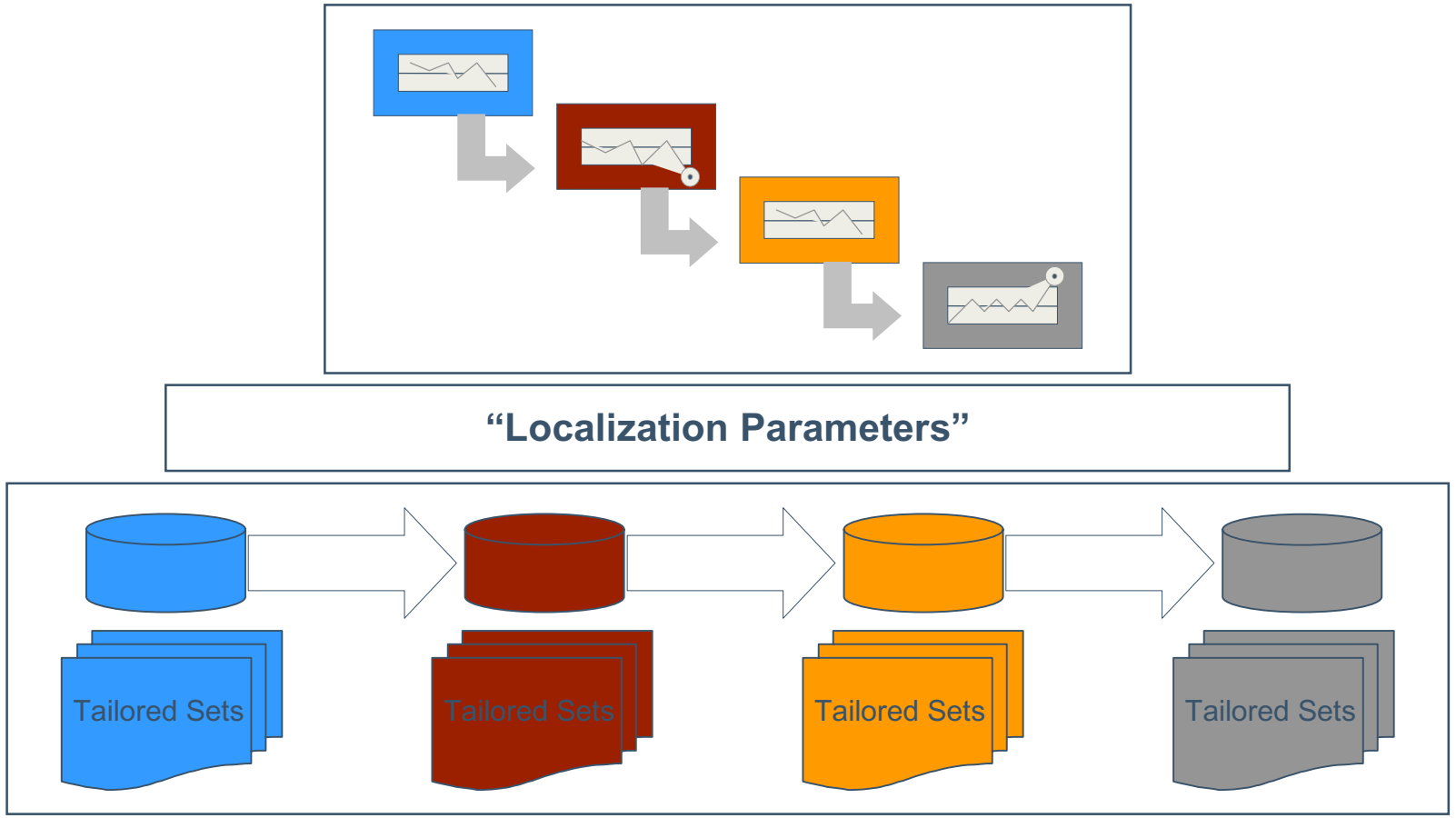
Maturity Level 4 – At A Glance



Organizational Process Performance

The purpose of Organizational Process Performance is to establish and maintain a quantitative understanding of the performance of the organization's set of standard processes in support of quality and process-performance objectives, and to provide the process performance data, baselines, and models to quantitatively manage the organization's projects.

Specific Goal for OPP

SG 1 - Establish Performance Baselines and Models

Baselines and models that characterize the expected process performance of the organization's set of standard processes are established and maintained.

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Specific Practices for OPP

SP1.1 - Select the processes or process elements in the organization's set of standard processes that are to be included in the organization's process performance analyses.

SP1.2 - Establish and maintain definitions of the measures that are to be included in the organization's process performance analyses.

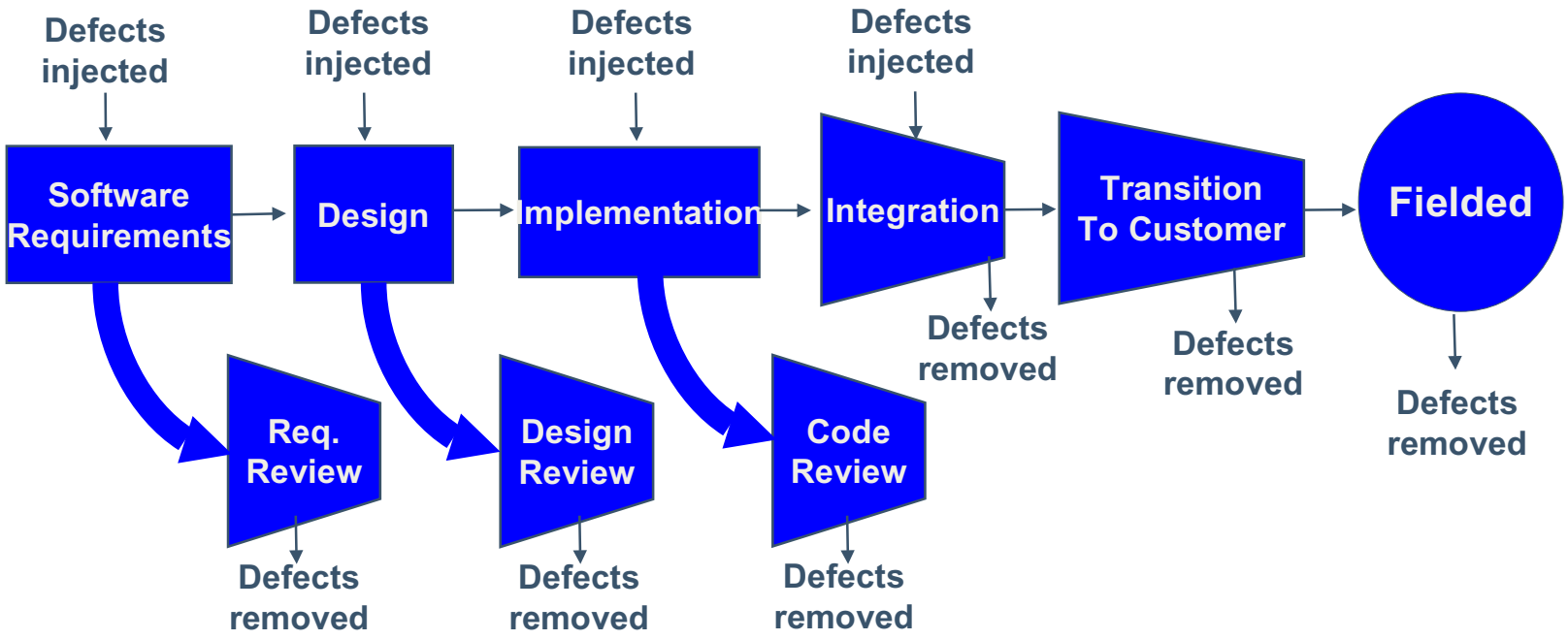
SP1.3 - Establish and maintain quantitative objectives for quality and process performance for the organization.

SP1.4 - Establish and maintain the organization's process performance baselines.

SP1.5 - Establish and maintain the process performance models for the organization's set of standard processes.

Modeling the Life Cycle

Decomposing the life cycle of a project, it can be viewed as a set of inter-connected processes – each with it's own *capacity*, *throughput*, *productivity*, *magnitude, defect introduction rate, defect removal rate*...



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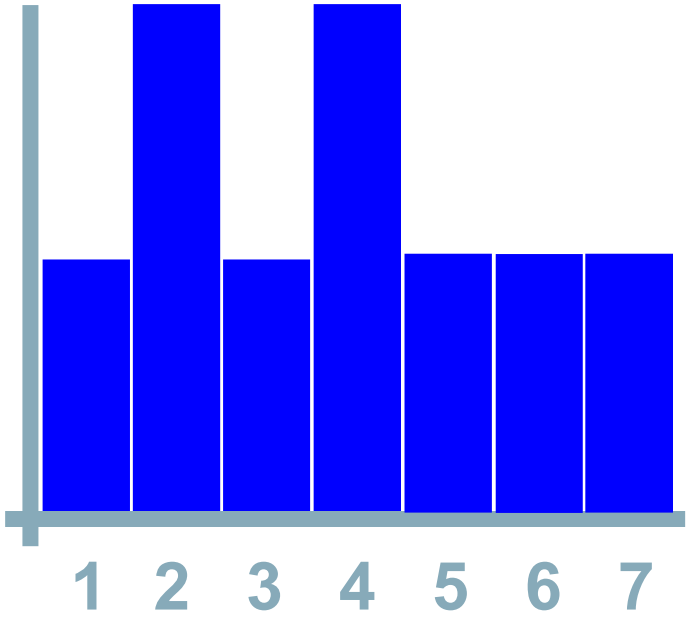
Importance of Operational Definitions

Establishing sufficient definitions of measures used, and ensuring their consistent application is one of the early challenges that organizations face when moving to level 4.

```
# include <stdio.h>
# include <stdlib.h>
// This program prints “Hollow world” to the screen.
main()
{

    printf(“Hollow world“);

}
```



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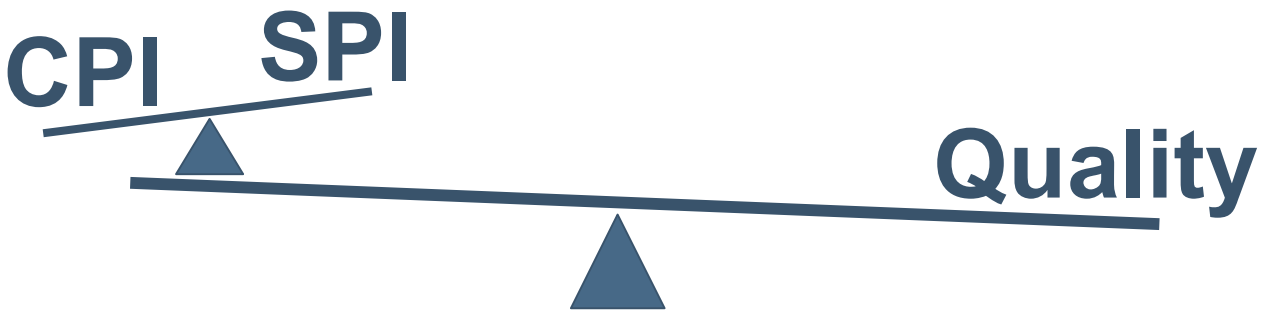
Interplay of Quantitative Objectives

Quantitative objectives for the quality and performance are not as easy to set as typical 'balanced scorecard goals.' The interrelationships among the objectives form the basis for a project management strategy.



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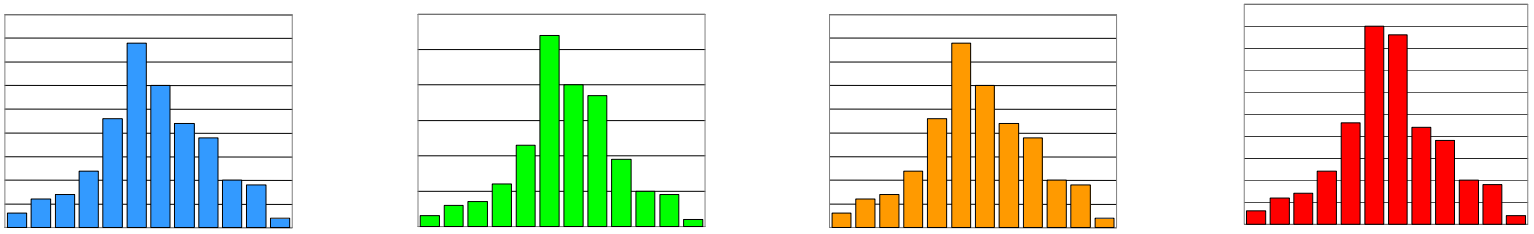
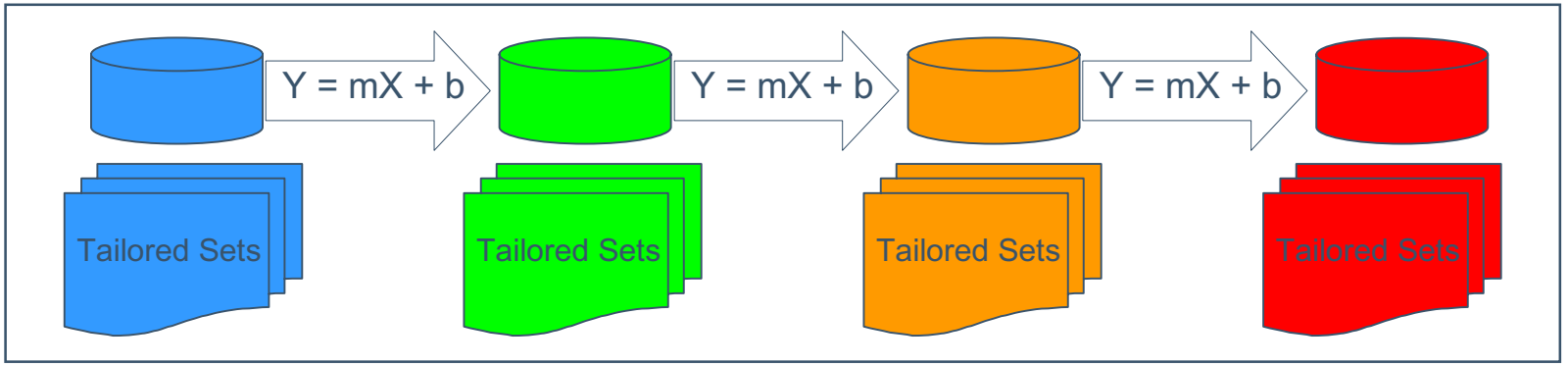
Process Performance Baselines

Process performance baselines need to be identified with the contextual factors that permit appropriate future interpretation of the data. Highly aggregated data sets with multiple common cause systems are not very usable in the context of QPM.





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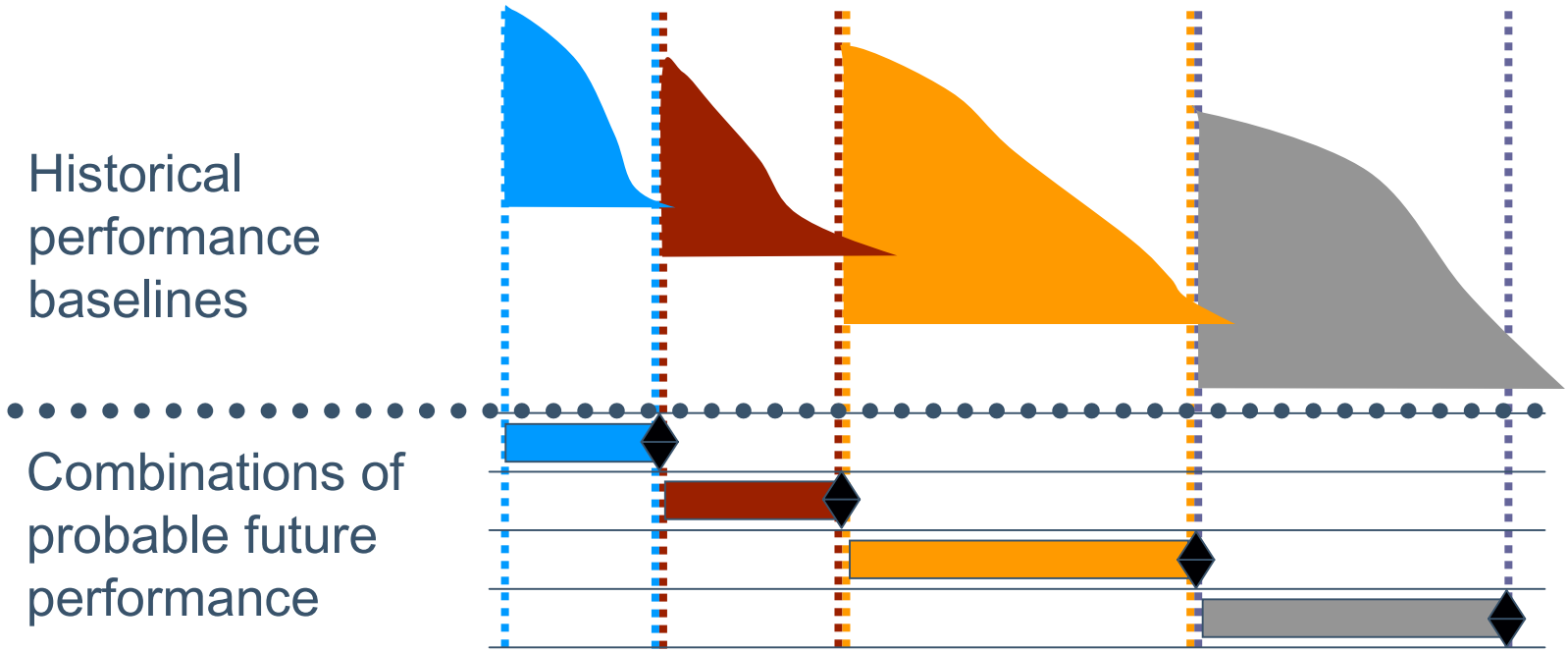
Process Performance Models

The concept of a process performance model is one of the more challenging things to master in getting to level 4. The utility of these models evolves significantly over time.



QPM

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Quantitative Project Management

The purpose of the Quantitative Project Management process area is to quantitatively manage the project's defined process to achieve the project's established quality and process-performance objectives.

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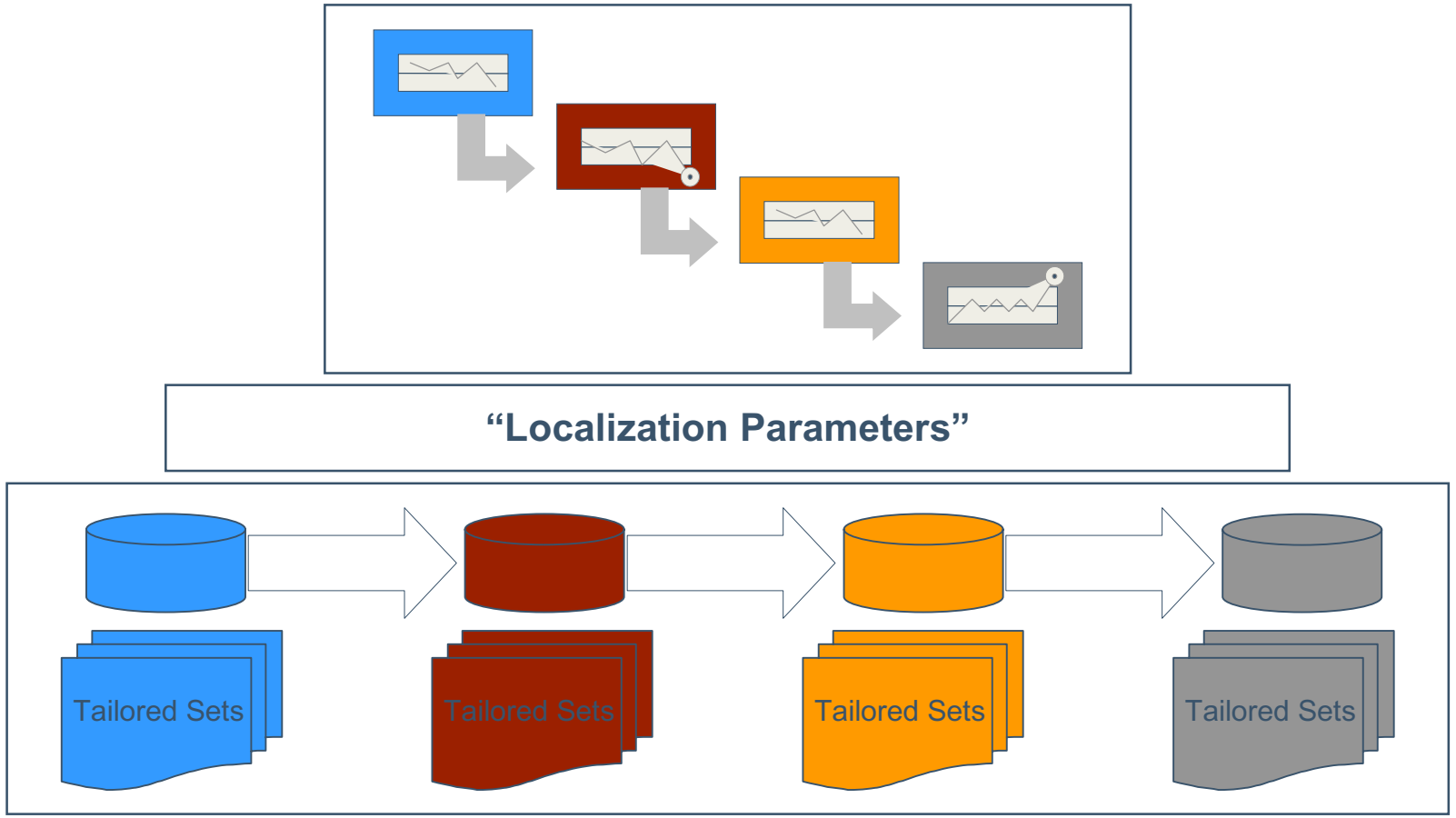
Using Knowledge of History



Specific Goals for QPM

SG 1 - Quantitatively Manage the Project

The project is quantitatively managed using quality and process-performance objectives.

SG 2 - Statistically Manage Subprocess Performance

The performance of selected subprocesses within the project's defined process is statistically managed.

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Specific Practices for Goal 1

SP1.1 - Establish and maintain the project's quality and process-performance objectives.

SP1.2 - Select the subprocesses that compose the project's defined process based on historical stability and capability data.

SP1.3 - Select the subprocesses of the project's defined process that will be statistically managed.

SP1.4 - Monitor the project to determine whether the project's objectives for quality and process performance will be satisfied, and identify corrective action as appropriate.

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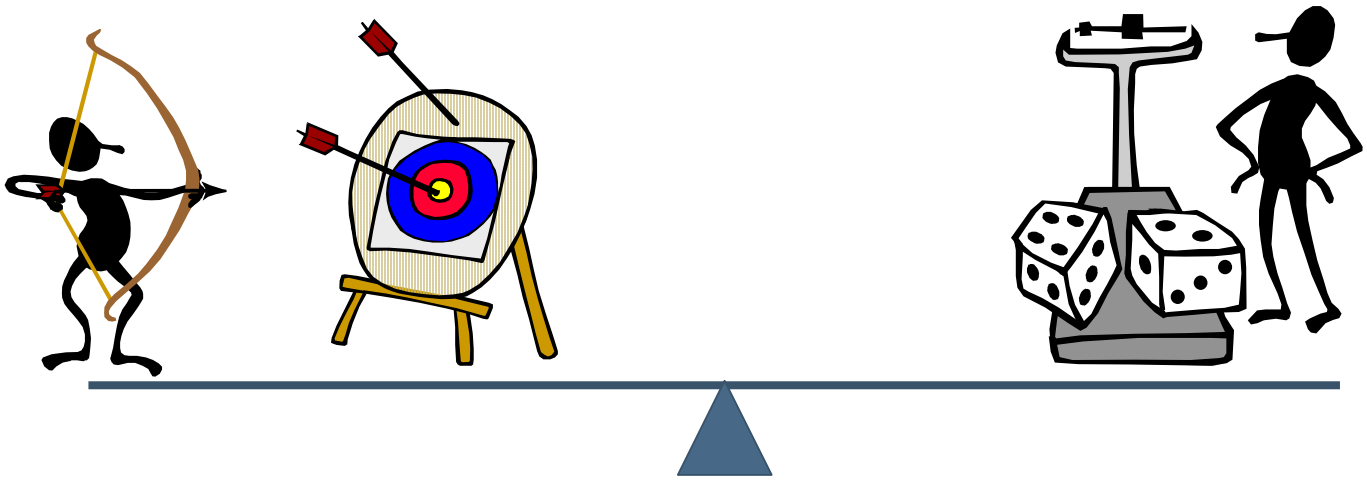
Quality and Process Performance Objectives

Using knowledge of the business context for the project, and the past performance of processes, objectives for the project are set. These objectives are not limited to the 'end-game' but provide interim performance targets, and are subject to revision with new knowledge.



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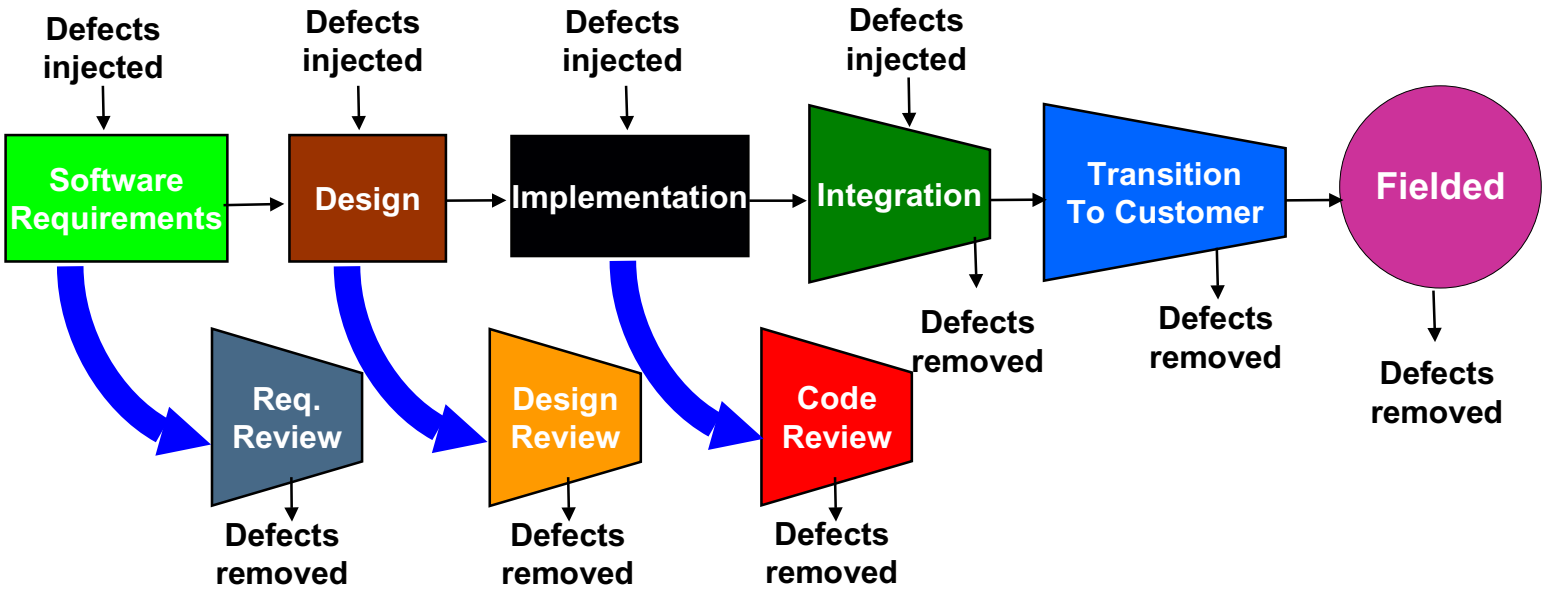
SP1.2 - Select the subprocesses that compose the project's defined process based on historical stability and capability data.

SP1.3 - Select the subprocesses of the project's defined process that will be statistically managed.

SP1.4 - Monitor the project to determine whether the project's objectives for quality and process performance will be satisfied, and identify corrective action as appropriate.

Select Based on Stability & Capability

Knowledge about the performance of tailored sets of processes helps to pro-actively construct the project defined process in a way that increases the probability of meeting the objectives.



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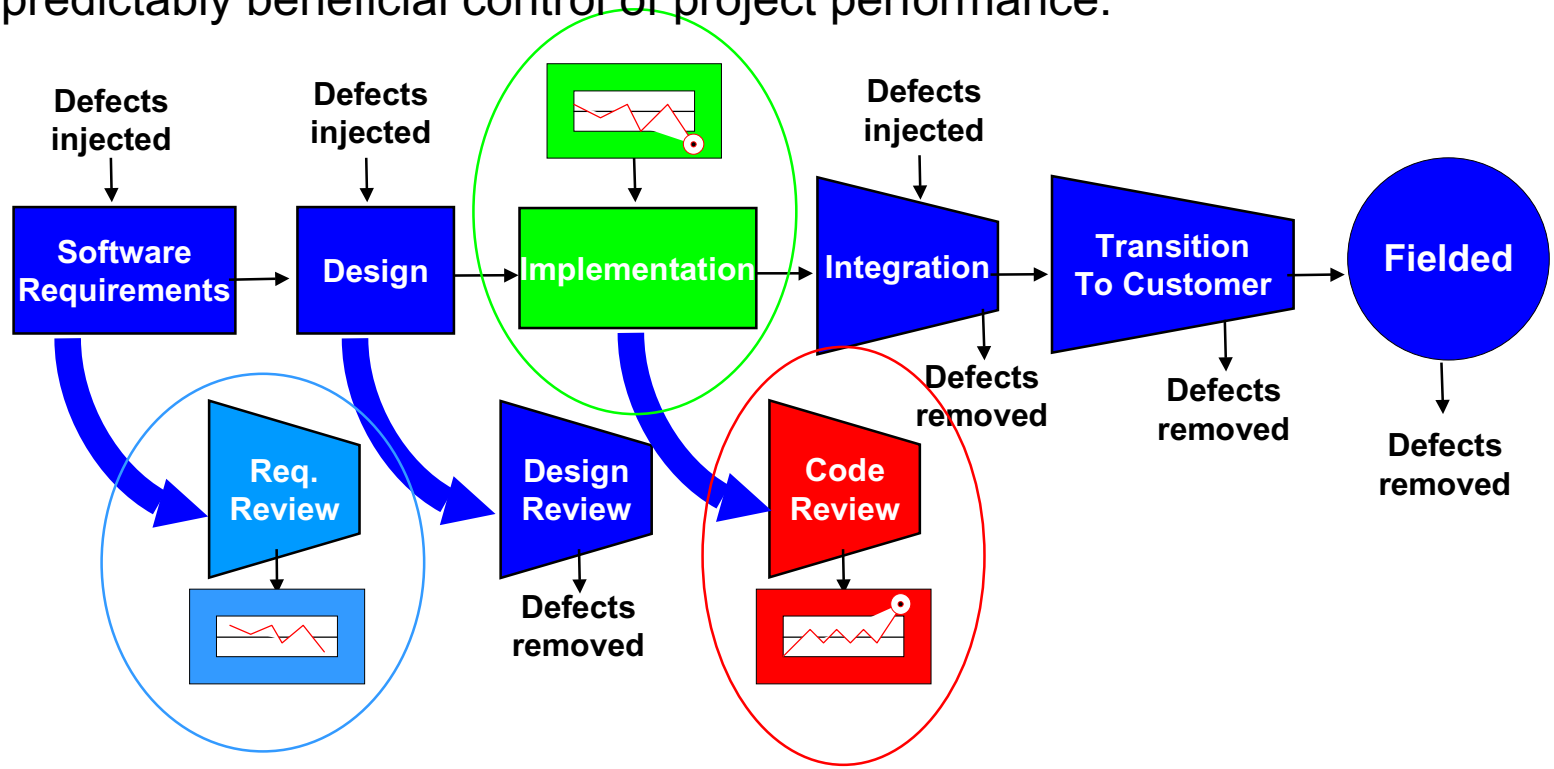
Select for Statistical Management

High-leverage elements of the constructed process are identified to provide strategic management options in order to support timely and predictably beneficial control of project performance.



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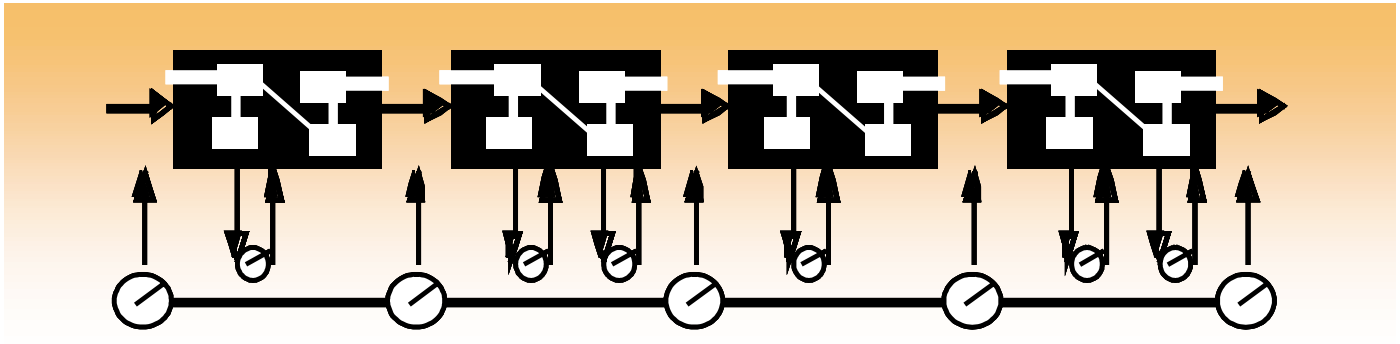
SP1.4 - Monitor the project to determine whether the project's objectives for quality and process performance will be satisfied, and identify corrective action as appropriate.

Monitor Performance

The vital few elements of the constructed process that contribute to predictable performance are monitored. This is done in the context of a quantitative (not statistical) framework for managing the project as a whole.



QPM Goal 2

Specific Goals for QPM

SG 1 - Quantitatively Manage the Project

The project is quantitatively managed using quality and process-performance objectives.

SG 2 - Statistically Manage Subprocess Performance

The performance of selected subprocesses within the project's defined process is statistically managed.

Specific Practices for Goal 2

SP2.1 - Select the measures and analytic techniques to be used in statistically managing the selected subprocesses.

SP2.2 - Establish and maintain an understanding of the variation of the selected subprocesses using the selected measures and analytic techniques.

SP2.3 - Monitor the performance of the selected subprocesses to determine their capability to satisfy their quality and process-performance objectives, and identify corrective action as necessary.

SP2.4 - Record statistical and quality management data in the organization's measurement repository.

Selecting Measures & Techniques

More than one measure is typically needed to characterize the performance of any process we care about. Multiple analytic techniques are typically used to understand performance.

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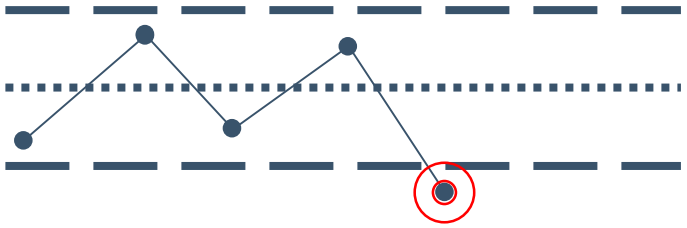
Maintain Understanding of Variation

Knowledge of variation may start with historical performance baselines, but becomes more precise with experience. Control limits from the past may serve as initial specification limits.



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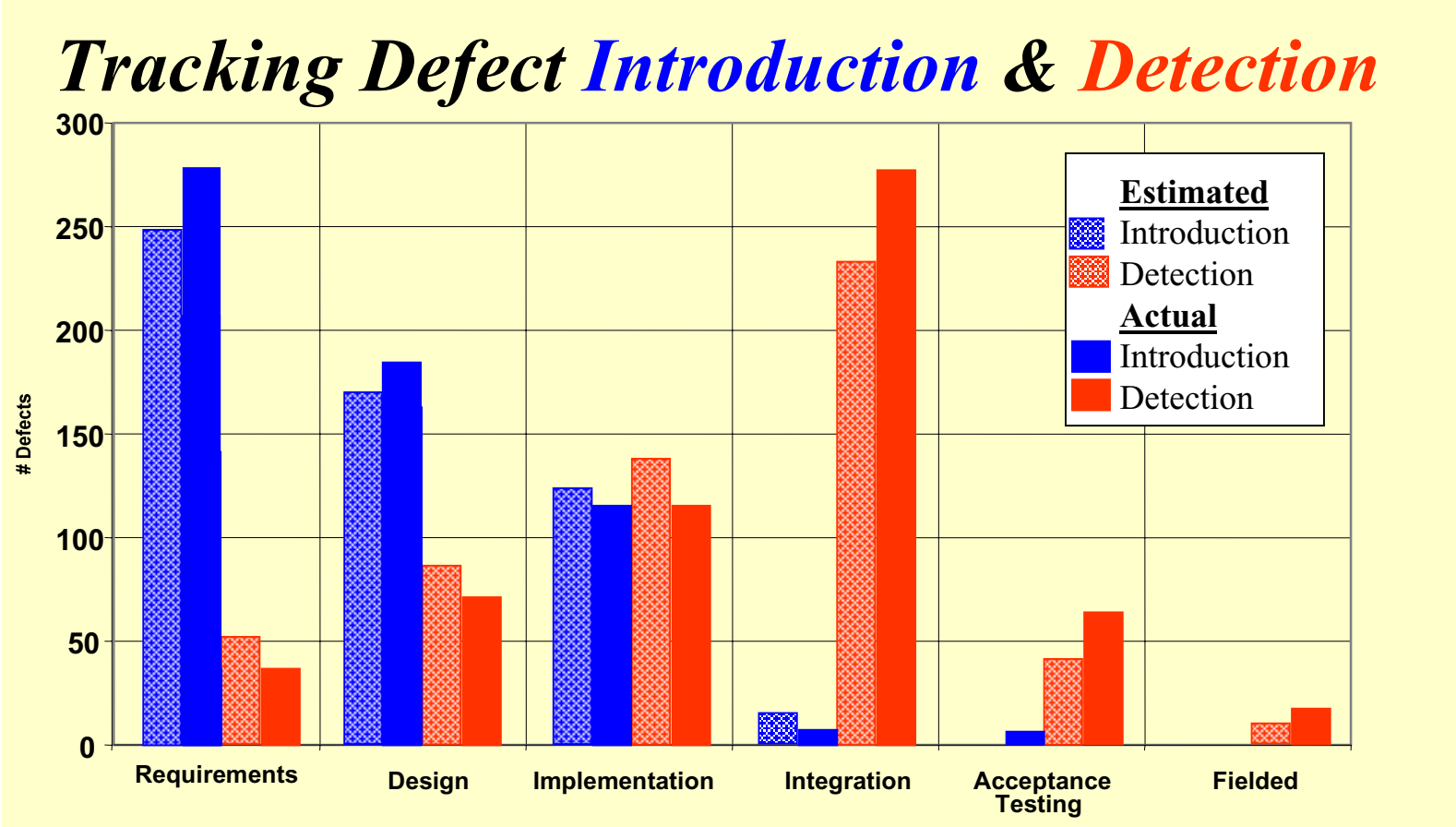
Monitor Capability To Meet Objectives



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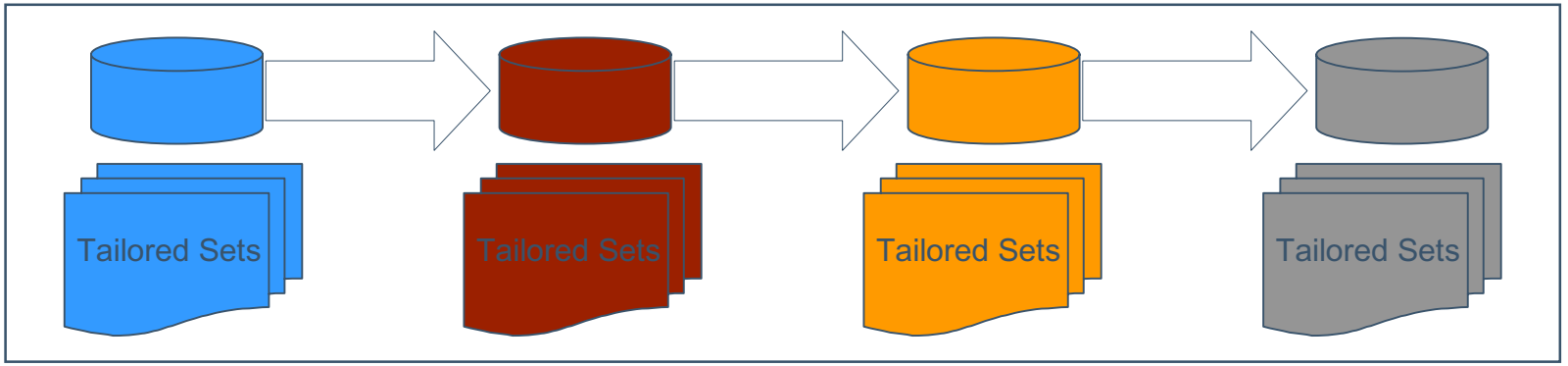
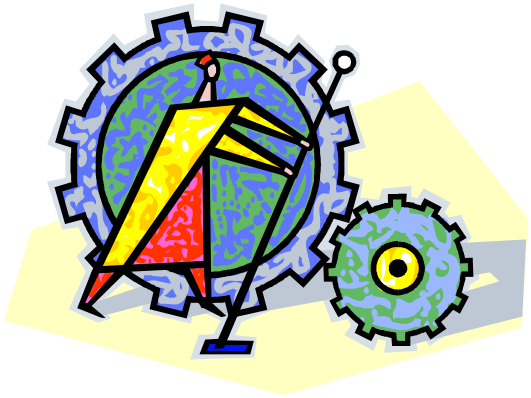
Record Management Data

Capturing data, along with an adequate understanding of the context from which they arise, is also process to be managed carefully.



Level 5 Practices

Maturity Level 5 at a Glance



A profound understanding of the performance of time-tested processes and technology supports strategic analysis and improvement within the context of a quantitative framework.

Purposeful changes are planned and deployed using techniques that manage risk and support demonstrable improvement.

Organizational Innovation and Deployment

The purpose of Organizational Innovation and Deployment is to select and deploy incremental and innovative improvements that measurably improve the organization's processes and technologies. The improvements support the organization's quality and process-performance objectives as derived from the organization's business objectives.

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Specific Goals for OID

SG 1 - Select Improvements

Process and technology improvements that contribute to meeting quality and process-performance objectives are selected

SG 2 - Deploy Improvements

Measurable improvements to the organization's processes and technologies are continually and systematically deployed

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Specific Practices for Goal 1

SP1.1 - Collect and analyze process- and technology-improvement proposals

SP1.2 - Identify and analyze innovative improvements that could increase the organization's quality and process performance

SP1.3 - Pilot process and technology improvements to select which ones to implement

SP1.4 - Select process- and technology-improvement proposals for deployment across the organization

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Collect and analyze process- and technology-improvement proposals

Some of the improvement proposals focus on evolving the capability of the processes or technology, while other proposals tend to be more revolutionary. We'd expect these to be handled differently.

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Identify and analyze innovative improvements that could increase the organization's quality and process performance.

Improvements are purposefully sought, not just passively received.

Practices for documenting and evaluating proposals may be similar to those described in the previous SP, but the activity described here is initiated differently.

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Pilot process and technology improvements to select which ones to implement

Piloting process & technology innovations is more than a "feasibility study."

Expectations for performance are established and measured to project benefits.

Pilot studies are investments.

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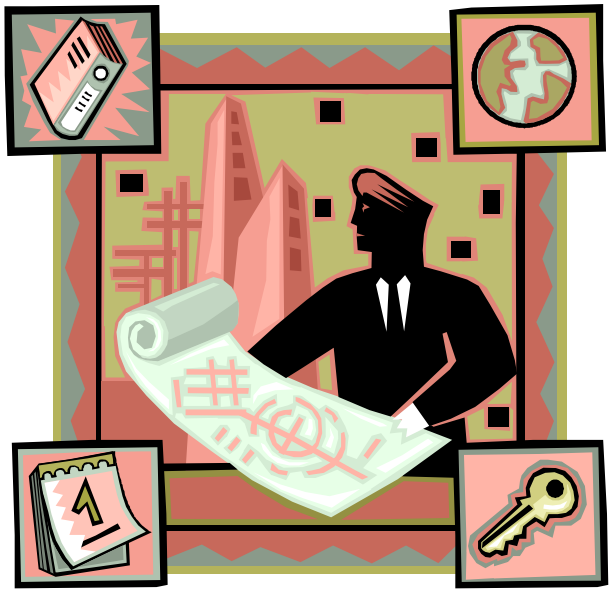
Select process- and technology-improvement proposals for deployment across the organization

Improvements identified in this context are ones that warrant prioritization, ROI analysis, and consideration of benefits on a more broad scale than a single project's timeline or performance.



OID Goal 2

Specific Goals for OID

SG 1 - Select Improvements

Process and technology improvements that contribute to meeting quality and process-performance objectives are selected

SG 2 - Deploy Improvements

Measurable improvements to the organization's processes and technologies are continually and systematically deployed

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Specific Practices for Goal 2

SP2.1 - Establish and maintain the plans for deploying the selected process and technology improvements

SP2.2 - Manage the deployment of the selected process and technology improvements

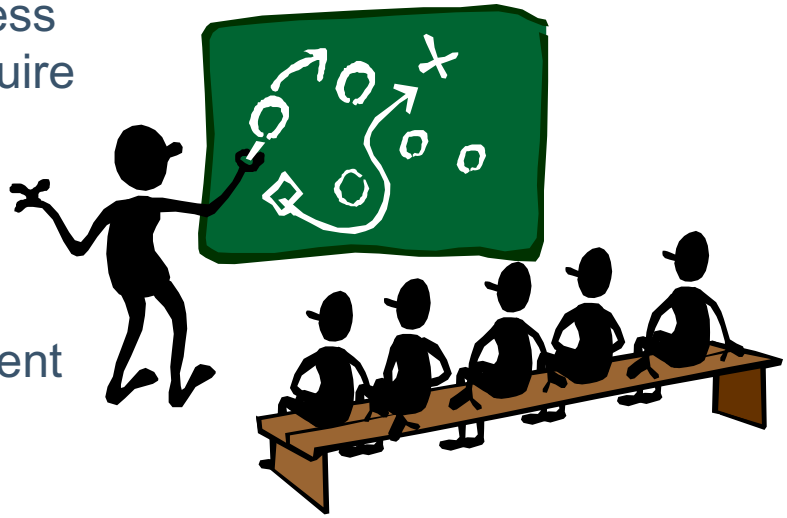
SP2.3 - Measure the effects of the deployed process and technology improvements

Establish and maintain the plans for deploying the selected process and technology improvements.

This practice does overlap with Generic Practice 2.2, but there are unique attributes of some process or technology changes that require a different type of planning.

Things to consider:

- Customization of technology
- Changes needed for deployment
- Addressing barriers
- Unique stakeholders



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SP2.1 - Establish and maintain the plans for deploying the selected process and technology improvements

SP2.2 - Manage the deployment of the selected process and technology improvements

SP2.3 - Measure the effects of the deployed process and technology improvements

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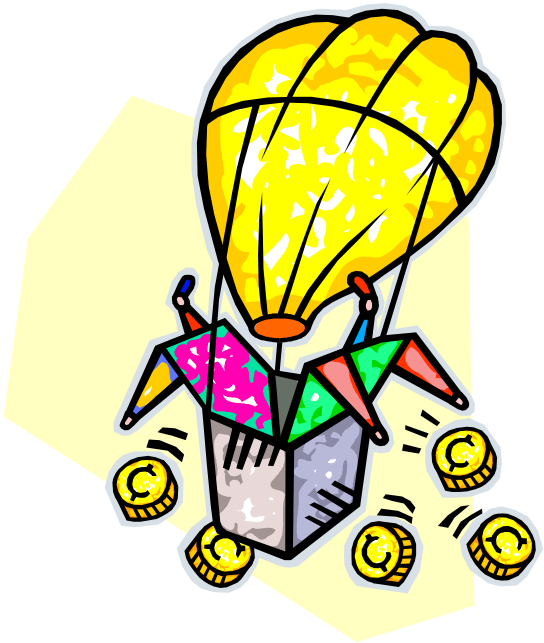
Manage the deployment of the selected process and technology improvements.

The context of a defined and quantitatively managed process provides an effective basis for understanding the impact of a change. This involves getting insight prior to the time when a “return on investment” can be computed.



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Specific Practices for Goal 2

SP2.1 - Establish and maintain the plans for deploying the selected process and technology improvements

SP2.2 - Manage the deployment of the selected process and technology improvements

SP2.3 - Measure the effects of the deployed process and technology improvements

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Measure the effects of the deployed process and technology improvements.

Simply determining that the deployment was not a disaster is not sufficient.

There are a set of objectives and plans that provide the framework for measuring effects against estimates.

CAR

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Causal Analysis and Resolution

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.

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Specific Goals for CAR

SG 1 - Determine Causes of Defects

Root causes of defects and other problems are systematically determined

SG 2 - Address Causes of Defects

Root causes of defects and other problems are systematically addressed to prevent their future occurrence

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Specific Practices for Goal 1

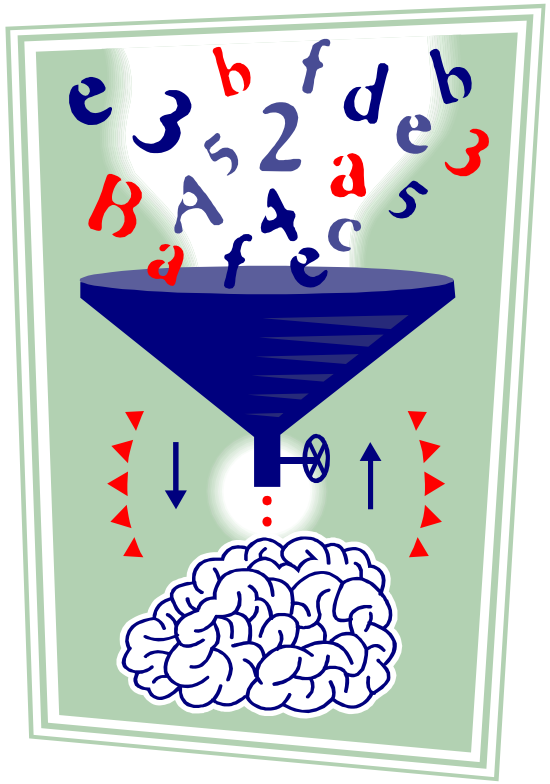
SP1.1 - Select the defects and other problems for analysis

SP1.2 - Perform causal analysis of selected defects and other problems and propose actions to address them

Select the defects and other problems for analysis

Performing CAR on every defect or problem is potentially very wasteful.

The potential return on addressing types of defects and problems drives the choice. This looks a lot like DAR in practice.



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Specific Practices for Goal 1

SP1.1 - Select the defects and other problems for analysis

SP1.2 - Perform causal analysis of selected defects and other problems and propose actions to address them

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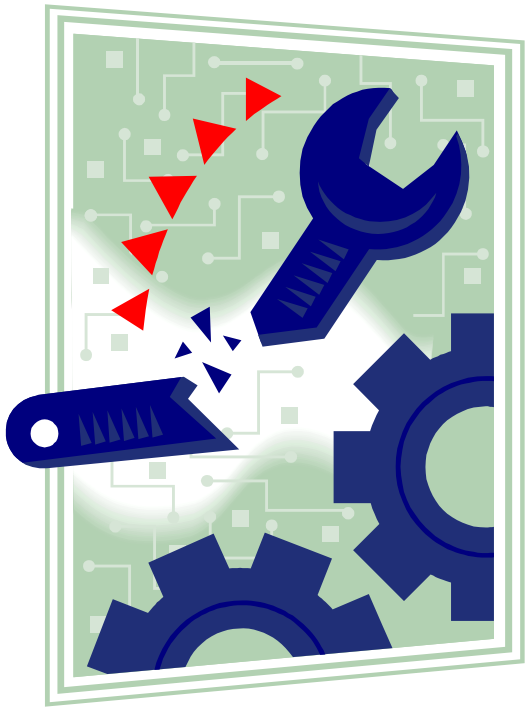
Perform causal analysis of selected defects and other problems and propose actions to address them

Causal analysis implies gaining insight about the system of events that led to the identified defects or problems.

This leads to addressing the potential for future defects and problems of the same type, not just addressing a single issue at one point in time.



CAR Goal 2

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Specific Practices for Goal 2

SP2.1 - Implement the selected action proposals that were developed in causal analysis

SP2.2 - Evaluate the effect of changes on process performance

SP2.3 - Record causal analysis and resolution data for use across the project and organization

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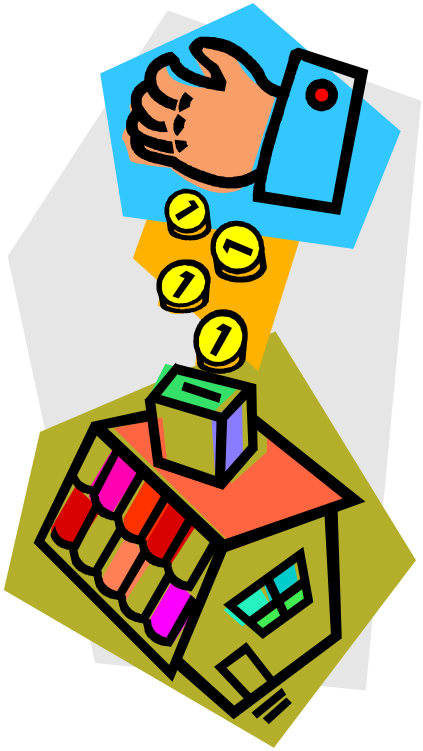
Implement the selected action proposals that were developed in causal analysis

This practice overlaps with the OID practices in terms of how it can be realized.

There is a more routine aspect to this practice, however, that may be evident at a local level:
- identifying related defects
- searching for similar causes

The process of prioritizing actions draws on a DAR-like mentality.



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Specific Practices for Goal 2

SP2.1 - Implement the selected action proposals that were developed in causal analysis

SP2.2 - Evaluate the effect of changes on process performance

SP2.3 - Record causal analysis and resolution data for use across the project and organization

Evaluate the effect of changes on process performance

The intent is to view the impact for on-going performance of the related process or technology, not a one-time “ROI.”

Need to answer questions like “is a 5% performance change an improvement, or just part of the normal fluctuation?”

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Specific Practices for Goal 2

SP2.1 - Implement the selected action proposals that were developed in causal analysis

SP2.2 - Evaluate the effect of changes on process performance

SP2.3 - Record causal analysis and resolution data for use across the project and organization

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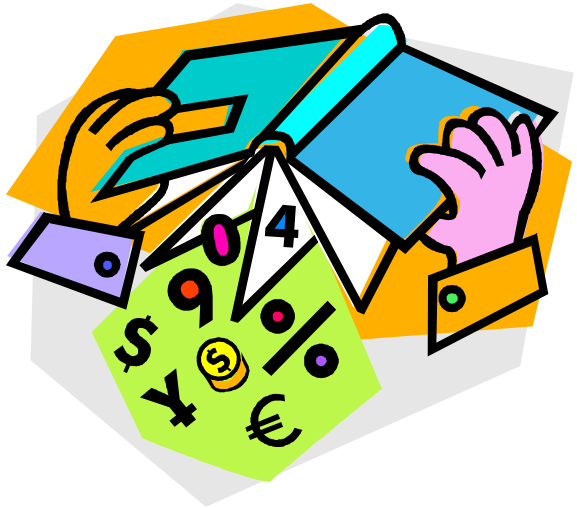
Record causal analysis and resolution data for use across the project and organization

A more detailed understanding the value of information is one of the most notable attributes of highly mature organizations.



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Schedule For The Day

Start	Finish	Duration	Topic
8:30	9:00	30 min	Introduction
9:00	10:00	60 min	Level 4 Practices
10:00	10:30	30 min	Break
10:30	11:30	60 min	Level 5 Practices
11:30	12:00	30 min	Prepare for Break Outs
12:00	1:00	60 min	Lunch
1:00	2:30	90 min	Subgroup Work Session
2:30	3:00	30 min	Break
3:00	3:30	30 min	Prepare Report Out
3:30	5:00	90 min	Reports and Discussion