A More Practical Set of High Maturity Practices

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Background

- **There is great confusion about the meaning of the CMMI high maturity practices, even among lead appraisers**
  - Terms and concepts are confusing and ambiguous
  - Unclear how the practices and process areas relate to each other
  - Few examples presented, and no pictures

- **This presentation will offer a clear practical understanding of the practices, by presenting them in a more logical sequence, and by addressing the inherent interfaces between the practices**

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Management Styles in the CMMI

Project

Organizational

Level	Process Areas
5 Optimizing	**Causal Analysis and Resolution** **Organizational Innovation and Deployment**
4 Quantitatively Managed	**Quantitative Project Management** **Organizational Process Performance**
3 Defined	**Requirements Development** **Technical Solution** **Product Integration** **Verification** **Validation** **Organizational Process Focus** **Organizational Process Definition (for IPPD)** **Organizational Training** **Risk Management** **Integrated Project Management (for IPPD)** **Decision Analysis and Resolution**
2 Managed	**Requirements Management** **Project Planning** **Project Monitoring and Control** **Supplier Agreement Management** **Measurement and Analysis** **Process and Product Quality Assurance** **Configuration Management**
1 Performed	

Quantitative management

Proactive management

Reactive mgmt. (plan, track, and correct)

Quantitative improvement

Qualitative improvement

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The Project Manager's Dilemma at Level 3

I want to use the organization's standard process, but…

… Does it's performance and quality meet my customer's expectations?

… If not, how should I tailor the process?

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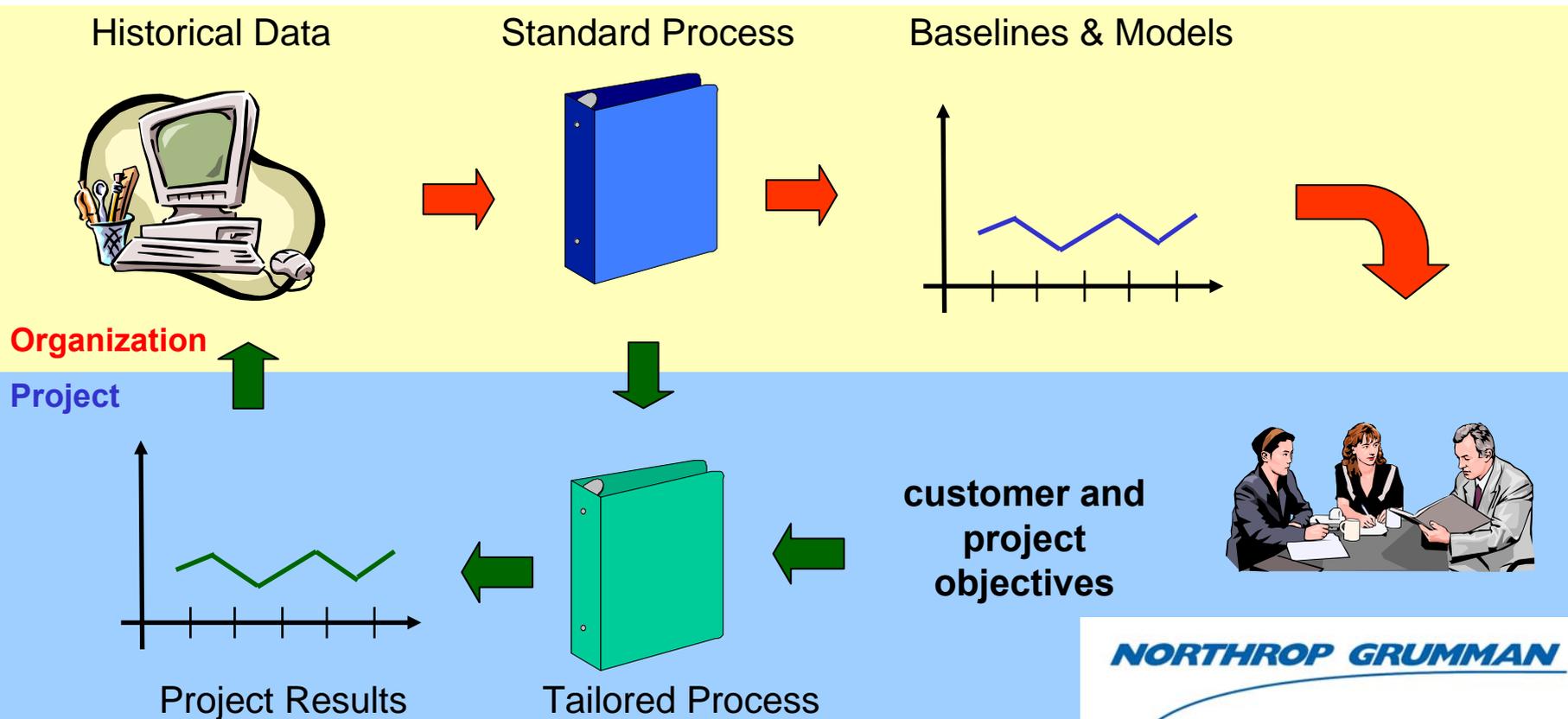
Hearing Voices

- **Voice of the Process**
    = the natural bounds of process performance

- **Voice of the Customer**
    = the goals established for the product/process performance

- **Voice of the Business**
    = process performance needed to be competitive

- **Process capability may be determined for the**
    - Organization
    - Product line
    - Project
    - Individual

- **Typically, the higher the level of analysis, the greater the variation**

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What Should the Organization Do to Help the Project Manager?

- **Characterize the performance of the organization's standard process statistically**

- **Develop models to help a project manager determine the performance they would be likely to get by using the standard organizational process model, given their project's characteristics**

Historical Data   Standard Process   Baselines & Models

Organization

Project

customer and project objectives

Project Results   Tailored Process

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Organizational Process Performance

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.

SP 1.1 Select Processes

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

SP 1.2 Establish Process Performance Measures

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

SP 1.3 Establish Quality and Process-Performance Objectives

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

SP 1.4 Establish Process Performance Baselines

Establish and maintain the organization's process performance baselines.

SP 1.5 Establish Process Performance Models

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

Baselines characterize the "voice of the process", based on the existing historical data
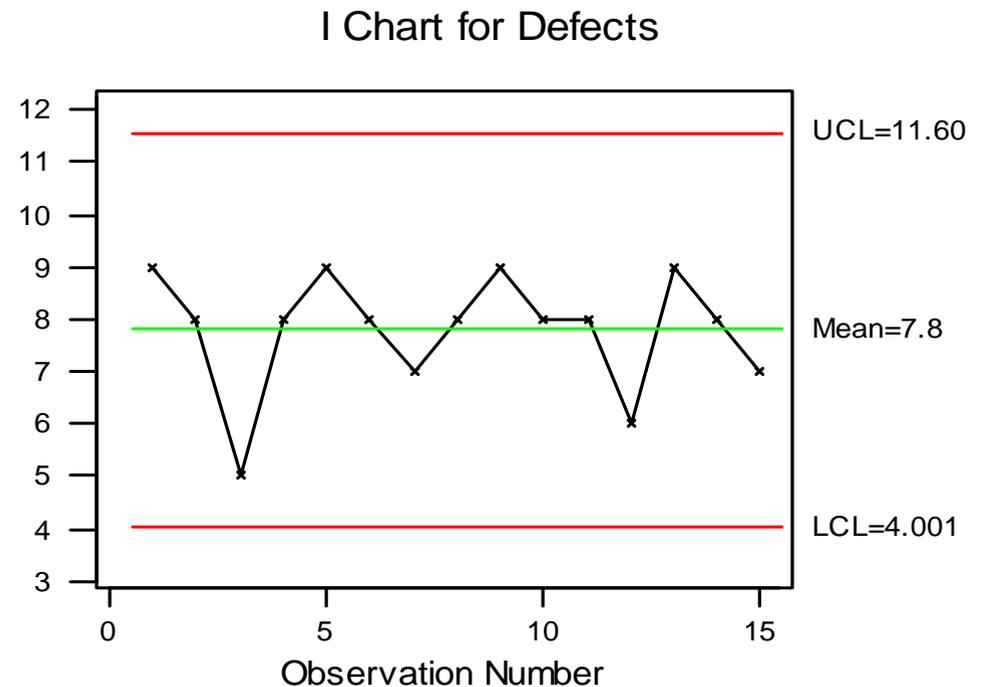- What is the current mean and variation?

May need to subgroup the data

Models allow projects to estimate their quantitative performance based on the historical data of other projects executing the process

This helps them decide whether they need to tailor the organizational standard process to meet their project objectives, and if so, how

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An Example of OPP

- **The organizational baselines show that the organizational standard process is capable of a fielded product with a mean of 7.8 defects/ KSLOC with 3σ control limits of 4.001 to 11.60 defects/ KSLOC**

- **The customer wants his software to have no more than 8 defects/KSLOC**

- **Does the project manager need to tailor the organizational standard process?**
  - Does the Voice of the Process meet the Voice of the Customer?

I Chart for Defects

UCL=11.60

Mean=7.8

LCL=4.001

Observation Number

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Why is SP 1.3 there?

SG 1 Establish Performance Baselines and Models

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Establish and maintain the organization's process performance baselines.

SP 1.5 Establish Process Performance Models

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

Organizational objectives deal with improving overall performance or reducing variation (making the process more predictable), **not setting "stretch" goals for projects**

The organization meets these goals by modifying the standard process, **not driving the projects**

These improvements are handled via OPF or OID

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Organizational Innovation and Deployment

SG 1   Select Improvements

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

SP 1.1   Collect and Analyze Improvement Proposals

Collect and analyze process- and technology-improvement proposals.

SP 1.2   Identify and Analyze Innovations

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

SP 1.3   Pilot Improvements

Pilot process and technology improvements to select which ones to implement.

SP 1.4   Select Improvements for Deployment

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

These are **proactive** improvements driven by organizational objectives (based on business needs) beyond the current performance of the organizational standard process

- **Voice of Process** does not meet the **Voice of Business**

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The Project Manager's Challenge at Level 4

I understand the capabilities of the organization's standard process, but…

… What are the project's quality and process performance objectives?

… How should I tailor the process?

… What project subprocesses must be stable (predictable) and perform well, for me to meet my project's objectives?

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Quantitative Project Management (Goal 1)

SG 1   Quantitatively Manage the Project

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

Quality: defect levels of key work products or deliverables

Process: productivity, efficiency, effectiveness of the project's processes

SP 1.1 Establish the Project's Objectives

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

SP 1.2 Compose the Defined Process

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

Rationale for how the project tailored the organization's standard process, in order to meet their quality & process performance objectives
- E.g., adding procedures to reduce variation

SP 1.3 Select the Subprocesses that Will Be Statistically Managed

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

Assumes the standard process includes subprocesses to select from

SP 1.4 Manage Project Performance

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

Monitoring against the objectives established in SP 1.1

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Outer Loop

SP 1.1 Establish the Project's Objectives

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

SP 1.3 Select the Subprocesses that Will Be Statistically Managed
Select the subprocesses of the project's defined process that will be statistically managed
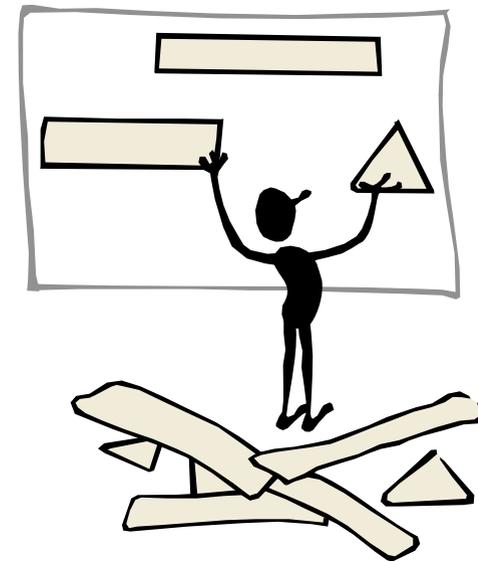
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Selecting Subprocesses to be Statistically Managed

> **SP 1.3 Select the Subprocesses that Will Be Statistically Managed**
> *Select the subprocesses of the project's defined process that will be statistically managed*

- **Which processes do you need to be stable (predictable) in order to achieve your project's objectives?**
  - For these, eliminate special causes, characterize the process, and predicatively manage

- **The time needed to perform this practice is long and often unpredictable**
  - Many processes can not be made predictable

- **Example – objectives for delivered defects**
  - Defect detection (peer review, unit testing, system testing)
  - Defect insertion (requirement definition, architecture, design, integration)

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Tailoring

Organization

Process Tailoring	Project Planning	Project Tracking	Risk Management	Supplier Management

Requirements Analysis	Architectural Design	Detailed Design	Fabrication	Integration & Test

Quality Assurance	Configuration Management	Data Management	Measurement & Analysis	DAR

Project

Process Tailoring	Project Planning	Project Tracking	Risk Management	Supplier Management

Requirements Analysis	Architectural Design	Detailed Design	Fabrication	Integration & Test

Quality Assurance	Configuration Management	Data Management	Measurement & Analysis	DAR

Integration | Peer Review | Systems Testing | Systems Validation

Fagan Inspection | Walkthrough | Desk Check

SP 1.2 Compose the Defined Process
Select the subprocesses that compose the project's defined process based on historical stability and capability data.

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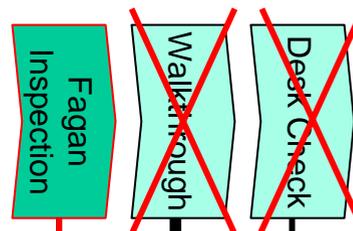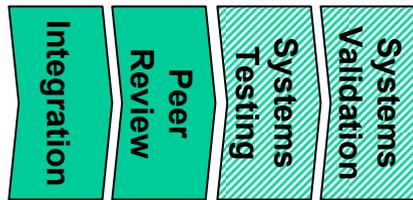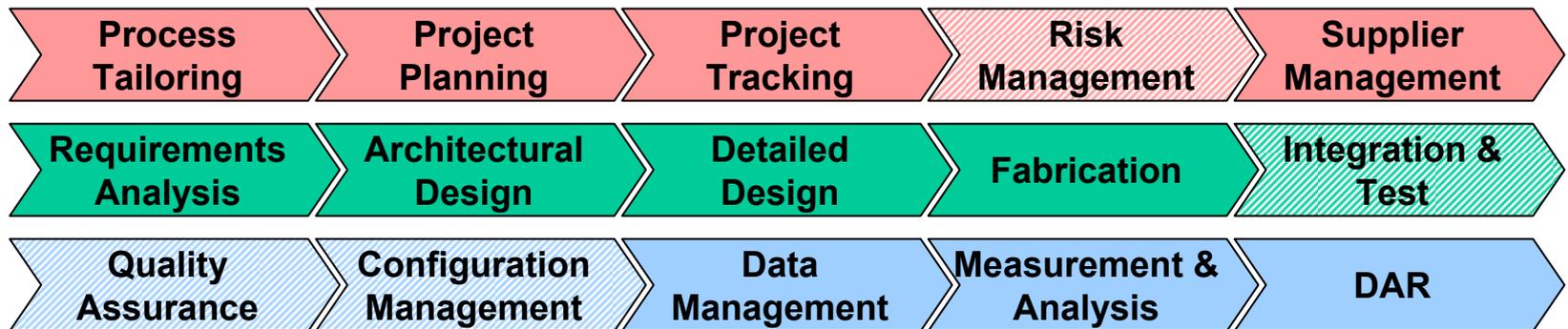# Quantitative Project Management (Goal 2)

SG 2 Statistically Manage Subprocess Performance

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

Type of analysis to be performed (e.g., control charts)

SP 2.1 Select Measures and Analytic Techniques

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

SP 2.2 Apply Statistical Methods to Understand Variation

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

Key is understanding variation in the selected subprocesses (e.g., be able to compute standard deviation), NOT just metrics

SP 2.3 Monitor Performance of the Selected Subprocesses

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.

Given the stability and variation in the subprocesses, will we be able to meet our project-level quality and process performance objectives?

SP 2.4 Record Statistical Management Data

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

This data is used to help select subprocesses in tailoring (SP 1.2)

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Inner Loop

SP 1.1 Establish the Project's Objectives
Establish and maintain the project's quality and process performance objectives.

SP 1.3 Select the Subprocesses that Will Be Statistically Managed
Select the subprocesses of the project's defined process that will be statistically managed

SP 2.2 Apply Statistical Methods to Understand Variation
Establish and maintain an understanding of the variation of the selected subprocesses using the selected measures and analytic techniques.

SP 1.4 Manage Project Performance
Monitor the project to determine whether the project's objectives for quality and process performance will be satisfied, and identify corrective action as appropriate.

SP 2.3 Monitor Performance of the Selected Subprocesses
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.
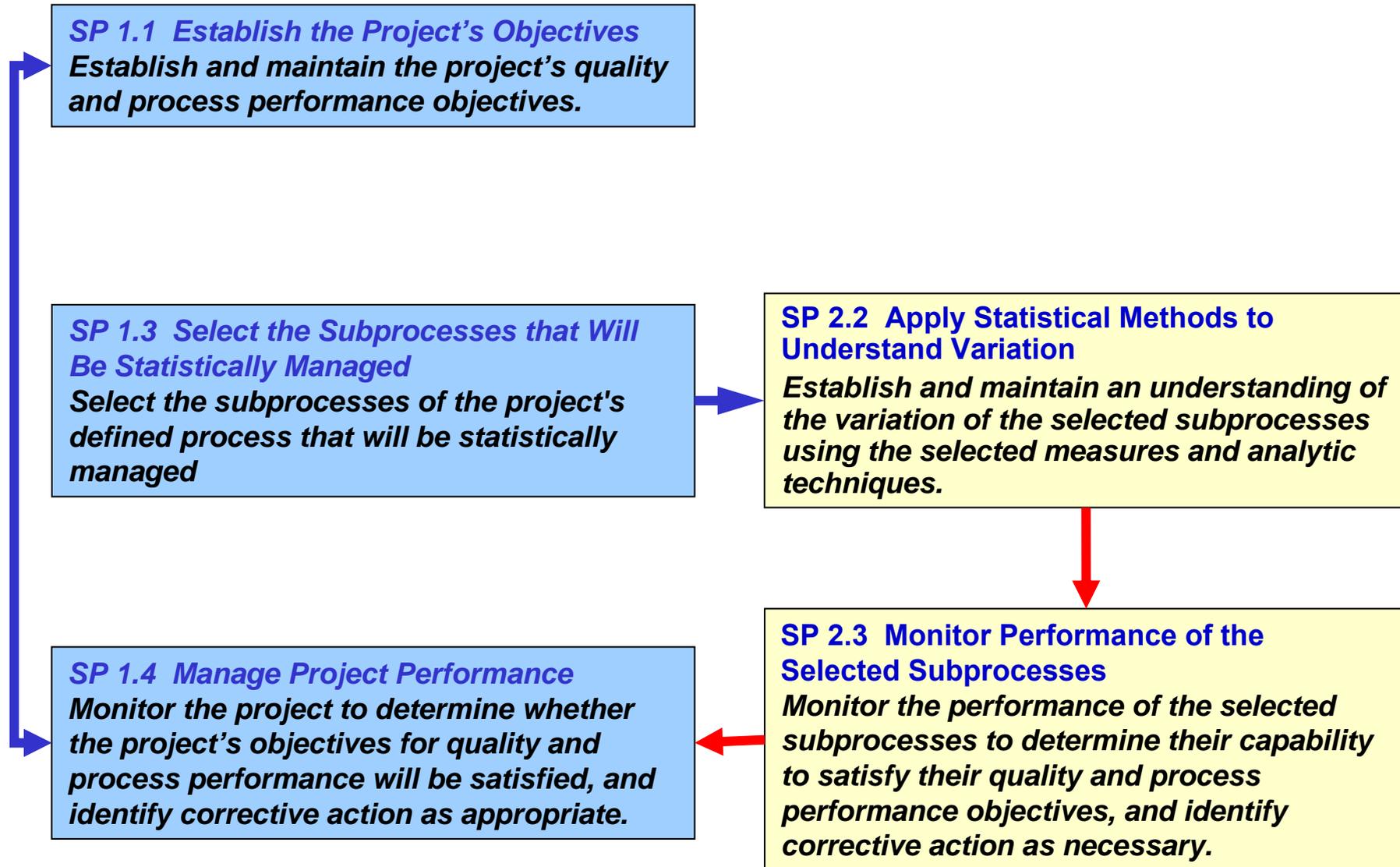
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New Questions at Level 4

- **What characteristics of the organizational standard process would be useful to understand?**

- **Which subprocesses would be useful to understand, for predictive purposes?**

- **Are these subprocesses predictable (stabilizable)?**

- **What data should the organization collect?**

- **To what level of detail should the organizational standard process go?**

- **What differences in project subprocesses are permissible? How do they impact the historical data?**

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Summary

- **It is possible to "go through the motions" of Level 4/5, with realizing the business benefits**

- **An organization should recognize the purpose behind the practices and interconnections between practices**
  - Characterizing performance of the standard organizational process (OPP)
  - Improving performance of the standard organizational process (OID)
  - Assisting tailoring decisions (OPP $\rightarrow$ QPM)
  - Characterizing performance of key project subprocesses for use in predicting project success (QPM)

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