Making Smart Choices: Strategies for CMMI Adoption

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Rick Hefner, Ph.D.
Northrop Grumman Corporation
rick.hefner@ngc.com

Background

- **An organization adopting the CMMI model has to make numerous decisions:**
  - Scope of the improvement effort
  - Model representation
  - IPPD extension
  - Structure of the policies and processes
  - Training program
  - Measurement repository
  - Etc.

- **These choices made have a profound effect on the value of the improvements, the buy-in of the organization, and the ultimate success of the CMMI effort**

- **This tutorial will discuss the key decisions to be made and options to be considered**

Topics

- **How decisions drive success**

- **Scope decisions**
  - Organizational scope
  - Model scope

- **Infrastructure decisions**
  - Policies, processes, procedures, and plans
  - Process asset library
  - Measures and measurement repository
  - Training

How Decisions Drive Success

Scope → **Infrastructure** → **Deployment**
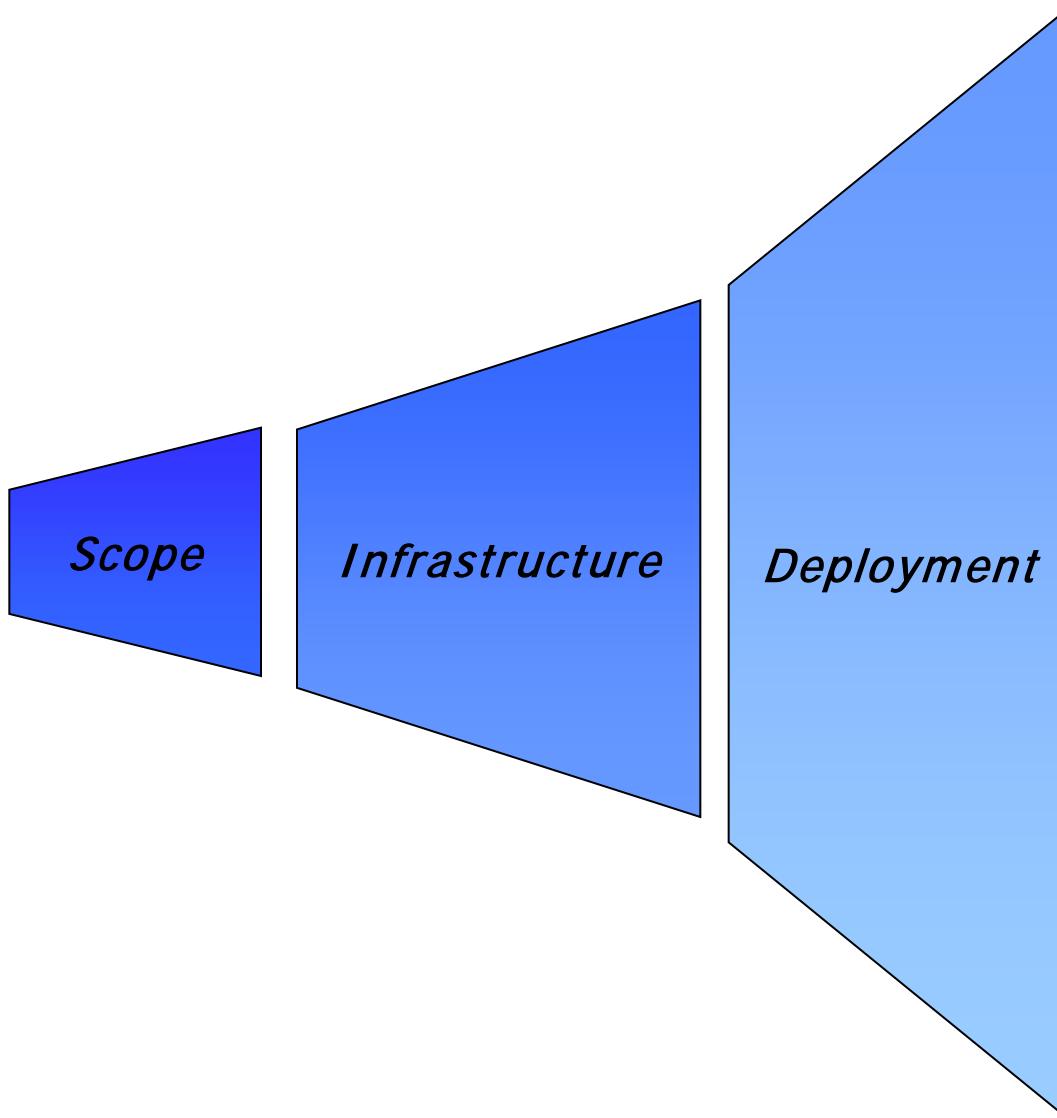
- *Value of the improvements*
- *Perceived value of the improvements*
- *Success of the improvements*
- *Cost of the improvements*
- *Speed of the improvement*
- *"Dead-ends"*
- *Fit with culture*
- *Strengthening of culture*
- *Perceived bureaucracy*
- *Buy-in*
- *Ability to address other improvement goals*

Why Does an Organization Adopt CMMI?

- **CMMI supports successful, predictable program performance**
  - Lowered cost, reduced risk
  - Industry data indicates Level 3 is ~20% cheaper than Level 1

- **CMMI can be a program requirement**
  - RFPs may call out a requirement to be CMMI Level 3, across the team
  - Primes are anxious to team with CMMI Level 3 suppliers

- **CMMI can be a competitive discriminator**
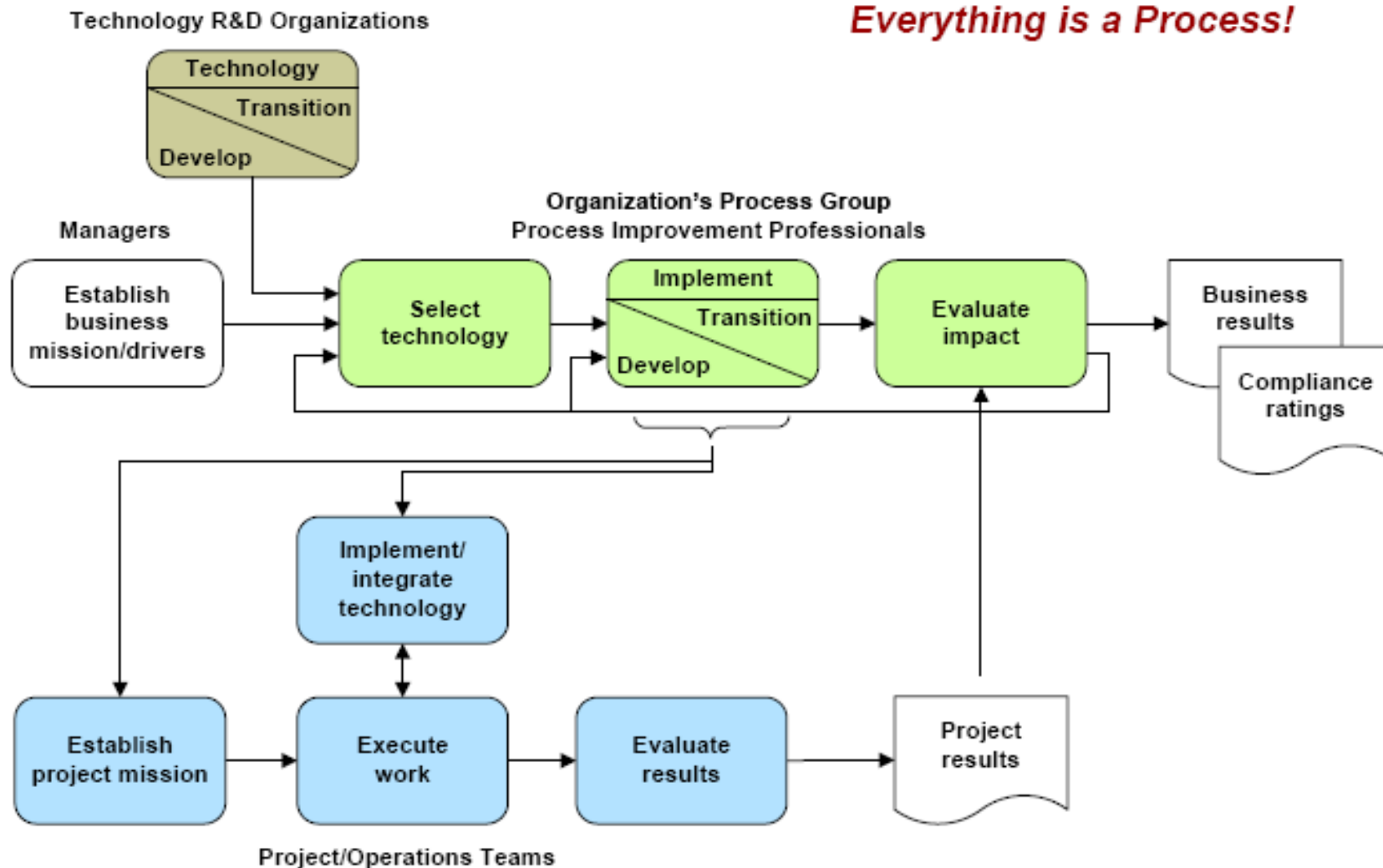 - Demonstrates your capabilities, against an well-known industry standard

What Does It Mean to "Adopt" CMMI?

- **Organizations adopt CMMI to ensure they are implementing industry best practices**

- **This requires appraising whether or not the organization and its projects are currently performing these practices**

- **Based on the results of an initial ("gap") appraisal, the organization and projects implement improvements**
  - Often requires new practices, clearer documentation, consistency in following plans and processes, checks and balances

- **When the requires improvements have been made, the organization conducts a formal appraisal and receives their Level**
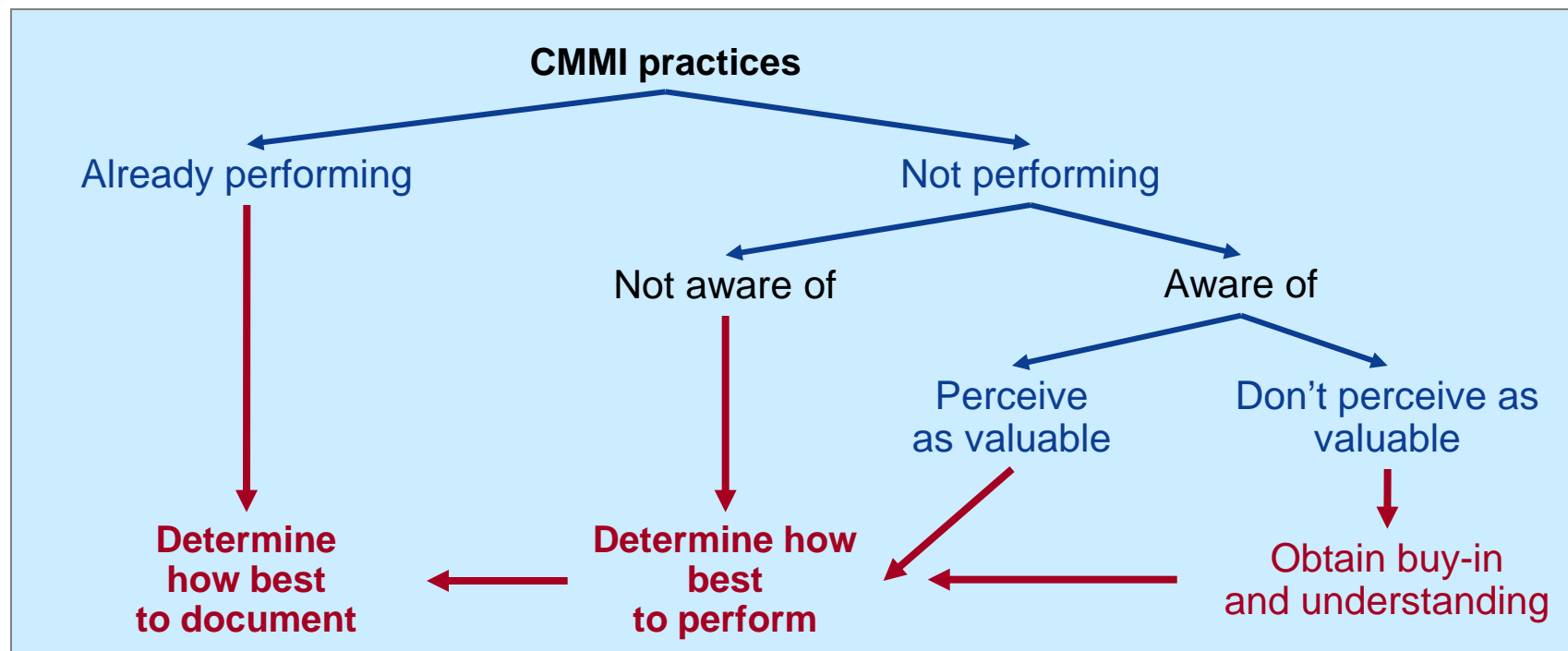
A Process Paradigm

Jeanine Siviy and Eileen Forrester, Accelerating CMMI Adoption Using Six Sigma, CMMI Users Group, 2004

Adopting the CMMI

CMMI practices

Already performing → **Determine how best to document**

Not performing
- Not aware of → **Determine how best to perform**
- Aware of
  - Perceive as valuable → **Determine how best to perform**
  - Don't perceive as valuable → Obtain buy-in and understanding → **Determine how best to perform**

- **Key enablers**
  - Willingness to learn unfamiliar practices
  - Desire to extract value rather than "check the box"
  - Ability to interpret the CMMI in your context
  - Access to experts

Exercise – What are your organization's improvement goals?

- **What are your organization's business goals (beyond achieving some CMMI level)?**
  - E.g., reduce cost, increase quality, decrease schedule, increase market share, etc.

- **What does senior management really care about?**

- **In making the changes, what should not change?**

Topics

- **How decisions drive success**

- **Scope decisions**
  - Organizational scope
  - Model scope

- **Infrastructure decisions**
  - Policies, processes, and procedures
  - Process asset library
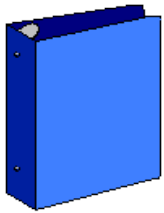 - Measures and measurement repository
  - Training

Organizational Scope

- **Must decide where to adopt the model**
  - Discipline: software, systems, hardware, services
  - Organizational scope: project, business unit, division, sector, company
  - Piloting vs. organizational-wide deployment
- **Key considerations**
  - Do you know how big the gaps are?
  - How much money and staff are available to assist the projects?
  - Where can you gain some early successes?
  - Where are you experiencing the most pain?
  - How much resistance will there be to the improvements?

Exercise

- **What choices should (has) your organization make (made) about CMMI adoption?**
  - Organizational scope
  - Model scope

- **What information is needed to make the choices (or ensure the choices were correct)?**

Topics

- **How decisions drive success**

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Project Use of Organizational Process Assets

Industry/Government Standards

CMMI

ISO

Customer Specific

Organizational Policies & Processes

Process Asset Library

Measurement Repository

Organizational Training

Organization

Project examples

Historical data

Project

Tailoring

Project Defined Process, Procedures, & Standards

Project Plans, Schedules, & Budgets

Project Results

Project-Specific Training

A Top-Level Comparison

Policy **High-level "what" to do**
(organizational guidance)

Process **High-level "how" to do**
(organizational standard, tailored by projects)

Procedure **Low-level "how" to do**
(details needed to follow a strategy)

Plan **Instantiation of the process**
(how often, when, etc.)

(Organizational) Policies

"A guiding principle typically established by senior management that is adopted by an organization to influence and determine decisions."
- Glossary, CMMI-DEV v1.2

- **Policies provide guidance, to <u>Project Managers and other functional groups</u>, on required activities (what to do)**

- **Example:**
  - "All projects shall establish and maintain a Risk Management Plan"

- **Performers follow their plans, processes, and procedures, which must reflect the policies**
  - Need not be familiar with the policies

GP 2.1   Establish an Organizational Policy
Establish and maintain an organizational policy for planning and performing the process.

- **"Establish and maintain" includes usage (see Glossary), suggests someone must audit for compliance with policies**
  - Both projects and functional groups

Constructing Policies – Option 1

- **Goals are required, so…**
  Make each specific and generic goal in CMMI into a policy statement

Risk Management
Policy 1   Projects shall conduct preparation for risk management.
Policy 2   Projects shall identify and analyze risks to determine their relative importance.
Policy 3   Projects shall handle and mitigate risks are handled and mitigated, where appropriate, to reduce adverse impacts on achieving objectives.
Policy 4   Projects shall institutionalize Risk Management as a defined process.

NORTHROP GRUMMAN
DEFINING THE FUTURE

CMMI for Development
Version 1.2

Although the primary emphasis of the Risk Management process area is on the project, the concepts can also be applied to manage organizational risks.

Related Process Areas

Refer to the Project Planning process area for more information about identification of project risks and planning for involvement of relevant stakeholders.

Refer to the Project Monitoring and Control process area for more information about monitoring project risks.

Refer to the Decision Analysis and Resolution process area for more information about using a formal evaluation process to evaluate alternatives for selection and mitigation of identified risks.

Specific Goal and Practice Summary

SG 1 Prepare for Risk Management
- SP 1.1 Determine Risk Sources and Categories
- SP 1.2 Define Risk Parameters
- SP 1.3 Establish a Risk Management Strategy

SG 2 Identify and Analyze Risks
- SP 2.1 Identify Risks
- SP 2.2 Evaluate, Categorize, and Prioritize Risks

SG 3 Mitigate Risks
- SP 3.1 Develop Risk Mitigation Plans
- SP 3.2 Implement Risk Mitigation Plans

Specific Practices by Goal

SG 1 Prepare for Risk Management
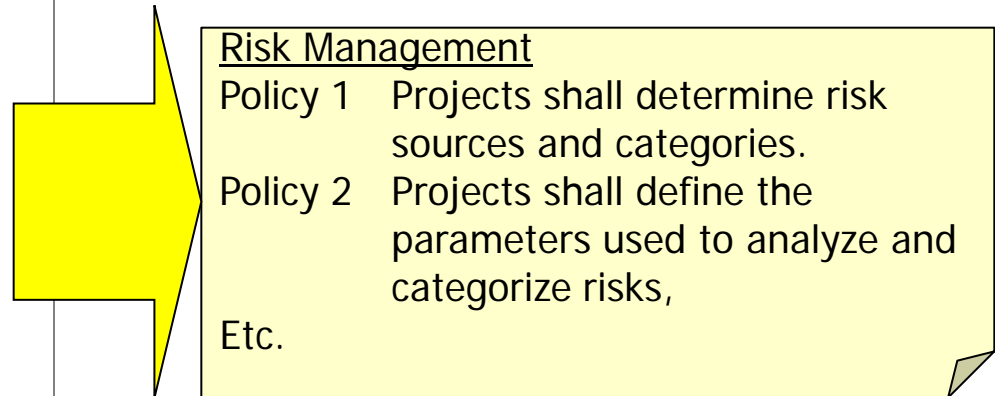*Preparation for risk management is conducted.*

Preparation is conducted by establishing and maintaining a strategy for identifying, analyzing, and mitigating risks. This is typically documented in a risk management plan. The risk management strategy addresses the specific actions and management approach used to apply and control the risk management program. This includes identifying the sources of risk; the scheme used to categorize risks; and the parameters used to evaluate, bound, and control risks for effective handling.

SP 1.1 Determine Risk Sources and Categories
Determine risk sources and categories.

Identification of risk sources provides a basis for systematically examining changing situations over time to uncover circumstances that

Risk Management (RSKM) 421

- **Practices are expected, so…
Make each specific and generic practice in CMMI into a policy statement**

Risk Management
Policy 1 Projects shall determine risk sources and categories.
Policy 2 Projects shall define the parameters used to analyze and categorize risks,
Etc.

- **Since practices are only expected, must create an opportunity for the unexpected – a deviation!**
  - Does the approach still meet the CMMI goal?

Process (Description)
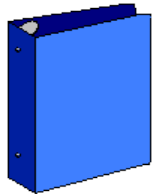
"A documented expression of a set of activities performed to achieve a given purpose. A process description provides an operational definition of the major components of a process. The description specifies, in a complete, precise, and verifiable manner, the requirements, design, behavior, or other characteristics of a process."

- *Glossary, CMMI-DEV v1.2*

- **Processes describe the steps to be taken**
  - Typical process established in the organizational standard process
  - Tailored by the project to fit their needs

GP 3.1   Establish a Defined Process
Establish and maintain the description of a defined process.

- **"Defined process" means tailored from an organizational standard process**
  - Both projects and functional groups must tailor

- **The detail of the processes is driven by the similarities between project needs**
  - If projects are similar, one size fits all
  - The more your project is different than the typical project in the organization, you more tailoring you need

- **Tailoring does not require approval**
  - Policies already define the acceptable limits (i.e., tailor as much as desired as long as you don't violate policy)

Constructing Processes

Typical attributes of each process element (per CMMI)

- Process roles
- Applicable standards
- Applicable procedures, methods, tools, and resources
- Process-performance objectives
- Entry criteria
- Inputs
- Product and process measures to be collected and used
- Verification points (e.g., peer reviews)
- Outputs
- Interfaces
- Exit criteria

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Specific Practices by Goal

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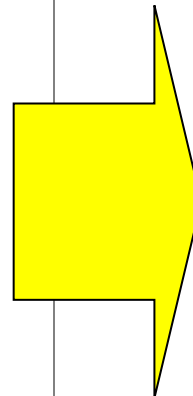   Preparation for risk management is conducted.

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Identification of risk sources provides a basis for systematically examining changing situations over time to uncover circumstances that

Risk Management (RSKM)   421

- **Practices are expected, so…
  Make each specific and generic practice in CMMI into a process description step**

Risk Management
Step 1   Project determines risk sources and categories.
Step 2   Project defines the parameters used to analyze and categorize risks,
Etc.

- **Tailoring may create a problem in meeting the goal**

Constructing Processes – Option 2

- **If more detail is desired, add subpractices**
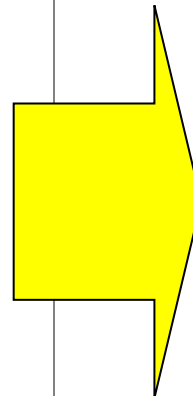
> Risk Management
> Step 1   Project determines risk sources.
> Step 2   Project determines risk categories.
> Step 3   Project defines consistent criteria for evaluating and quantifying risk likelihood and severity risks.
> Step 4   Project defines thresholds for each risk category.
> Step 5   Project defines bounds on the extend to which thresholds are applied against or within a category.
> Etc.

- **Note: subpractices only represent one way practices might be met**

Constructing Processes – Considerations

Typical attributes of each process element (per CMMI)

– Process roles
– Applicable standards
– Applicable procedures, methods, tools, and resources
– Process-performance objective
– Entry criteria
– Inputs
– Product and process measures to be collected and used
– Verification points (e.g., peer reviews)
– Outputs
– Interfaces
– Exit criteria
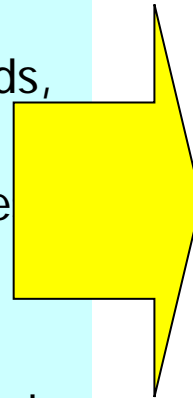
Risk Management
Step 1   Project manager determines risk sources.
Step 2   Project will use the XXX risk categories.
Step 3   Project defines consistent criteria for evaluating and quantifying risk likelihood and severity risks in the Risk Management Plan.
Step 4   Project defines thresholds for each risk category.
Step 5   Project defines bounds on the extend to which thresholds are applied against or within a category as per procedure YYY.
Etc.

GP 2.2   Plan the Process
Establish and maintain the plan for performing the process.

- **Plan = description of activities + budget + schedule**
  - Description of activities is addressed in GP 3.1 (process description)
  - Budget is addressed in GP 2.3; resources in GP 2.4

- **Schedules for some process areas may be tied to program events**
  - E.g., DAR events may not be separately shown on a schedule, but plans should make clear the conditions under which a DAR is to be conducted

Documenting Choices in Plans

- **Policies identify what must happen**
- **Process descriptions and procedures describe the steps to be performed**
- **Plans describe how the process is instantiated**

Policy

The fence must be painted each spring.

Process

1. Wash fence
2. Sand fence
3. Apply primer
4. Apply paint

Plan

Rick
Saturday morning
Fine sandpaper
White paint

Process Asset Library
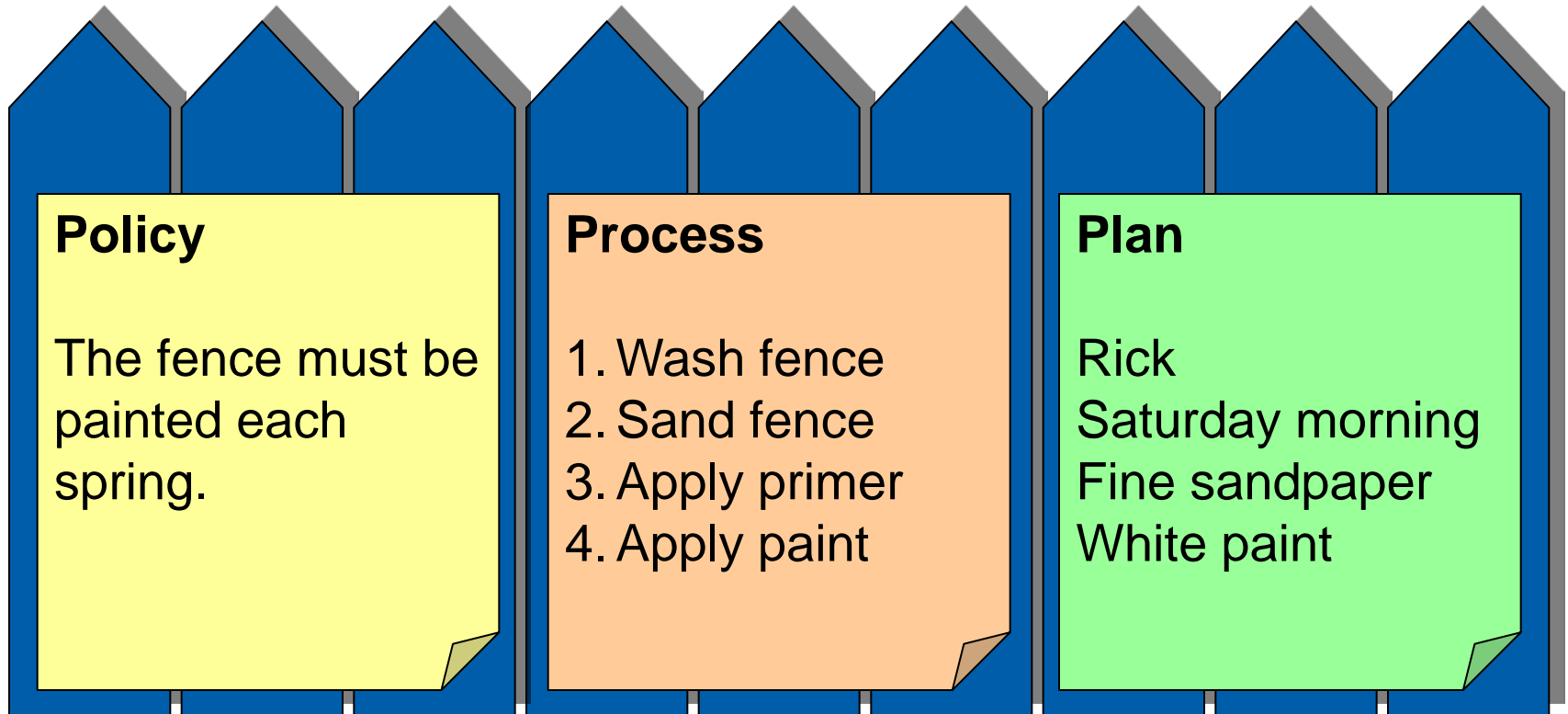
- **The organization's process asset library is a collection of items maintained by the organization for use by the people and projects of the organization**
  - Organizational policies
  - Defined process descriptions
  - Procedures
  - Development plans
  - Acquisition plans
  - Quality assurance plans
  - Training materials
  - Process aids (e.g., checklists)
  - Lessons-learned reports

Keys to Quickly Establishing an Effective PAL

- **Section 1 – Organizational materials**
  - Policies, processes, procedures, templates, tools, etc.
  - Provides central access to all projects
  - "Blessed" by the process group

- **Section 2 – Project examples**
  - Plans, tailored processes, specs, etc.
  - Provides examples – helps some visual the desired state
  - Submitted by the projects at their own discretion, or as identified by the process group

- **Eventually…**
  - Process group can "bless" best-in-class examples
  - Good examples can be turned into templates

Measures

- **The CMMI discusses measures in several ways**
  - PMC SP 1.1: Monitor the actual values of the project planning parameters against the project plan.
    (estimates of Work Product and Task Attributes, effort, cost)
  - GP 2.8: Monitor and control the process against the plan for performing the process and take appropriate corrective action. (activities vs. plan, achievements vs. schedule, effort vs. budget)

- **The Measurement & Analysis process area suggests that measurement system be defined, but does not specify measures which must be used**

SG 1 Align Measurement and Analysis Activities	SG 2 Provide Measurement Results
SP 1.1 Establish Measurement Objectives	SP 2.1 Collect Measurement Data
SP 1.2 Specify Measures	SP 2.2 Analyze Measurement Data
SP 1.3 Specify Data Collection and Storage Procedures	SP 2.3 Store Data and Results
SP 1.4 Specify Analysis Procedures	SP 2.4 Communicate Results

Keys to Quickly Establishing an Measures

- **Section 1 – Organizational-wide measures**
  - Focus on enabling future projects to estimate based on past projects
  - Common Work Breakdown Structure (or mapping to one)
  - Effort expended, by WBS element (all time accounting)
  - Size, characteristics of the project, product
  - Clear operational definitions of the base measures
  - Capture the measures in an organizational measurement repository
- **Section 2 – Project-specific measures**
  - Identify (but don't collect) the project-specific measures used (e.g., customer dictated metrics)
- **Eventually…**
  - Add organizational-wide metrics as you see the need or opportunity
  - Consider collecting metrics to allow the organization to calibrate a cost estimation model (e.g., COCOMO, COSYSMO)
  - Be patient!

Measurement Repository

organization's measurement repository - A repository used to collect and make available measurement data on processes and work products, particularly as they relate to the organization's set of standard processes. This repository contains or references actual measurement data and related information needed to understand and analyze the measurement data.

- Glossary, CMMI-DEV

- **Initial focus in on supporting estimation**
  - Effort expended
  - Product size and other attributes
  - Project characteristics

- **Later…**
  - Quality measures
  - Statistical management data, causal analysis data

Training

- **Purpose**
  - Develop the skills and knowledge of people so they can perform their roles effectively and efficiently

- **Key actions**
  - Identifying the training needed by the organization
  - Obtaining and providing training to address those needs
  - Establishing and maintaining training materials
  - Establishing and maintaining training records
  - Assessing training effectiveness

Training Scope

- **Skills and knowledge may be:**
  - Technical – ability to use the equipment, tools, materials, data, and processes
  - Organizational – behavior within and according to the employee's organization structure, role and responsibilities, and general operating principles and methods
  - Contextual – self management, communication, and interpersonal abilities needed to successfully perform in the organizational and social context of the project and support groups

- **Training options**
  - Classroom training
  - Web-based training
  - Guided self study
  - Formalized on-the-job mentoring

Is the Staff Qualified to Do Their Work?

An organizational responsibility!

- **What are the minimum skills and knowledge needed to perform their job function?**

- **Does each individual possess these skills?**
  - If not, training is expected to address the gaps

How does the organization maintain
a skilled and knowledgeable workforce?

- **Start by defining the key job functions in the organization**
  - E.g., project manager, software engineer, quality assurance specialist
- **Identify the requisite knowledge associated with each function**
- **Define a set of course modules that impart this knowledge**
  - Map modules to job functions
  - Some modules will be common to multiple job functions
- **Acquire training materials and trainers**
  - Should reflect the organization's policies and processes
  - Unlikely that standard vendor/university courses will fit
- **Ensure all the CMMI process areas are addressed**
  - Knowledge needed to perform the process, NOT a course about the CMMI requirements for that process area
  - Include performers of the process, and those supporting

- **Identify each employee by their job function(s), map to required courses**
  - If the employee already has the identified minimum knowledge, they do not need to take the course

- **Establish student records**
  - Who has completed what course, waivers

- **Review required training with employees**
  - Career-planning, promotions, new hires

- **Where additional project-specific training is required (e.g., tools, methods), adopt a similar approach at the project level**
  - Project Planning SP 2.5 addresses project specific training

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