CMMI Overview

Quality Frameworks

Outline

- Introduction
- High level overview of CMMI
- Questions and comments

What is CMMI?

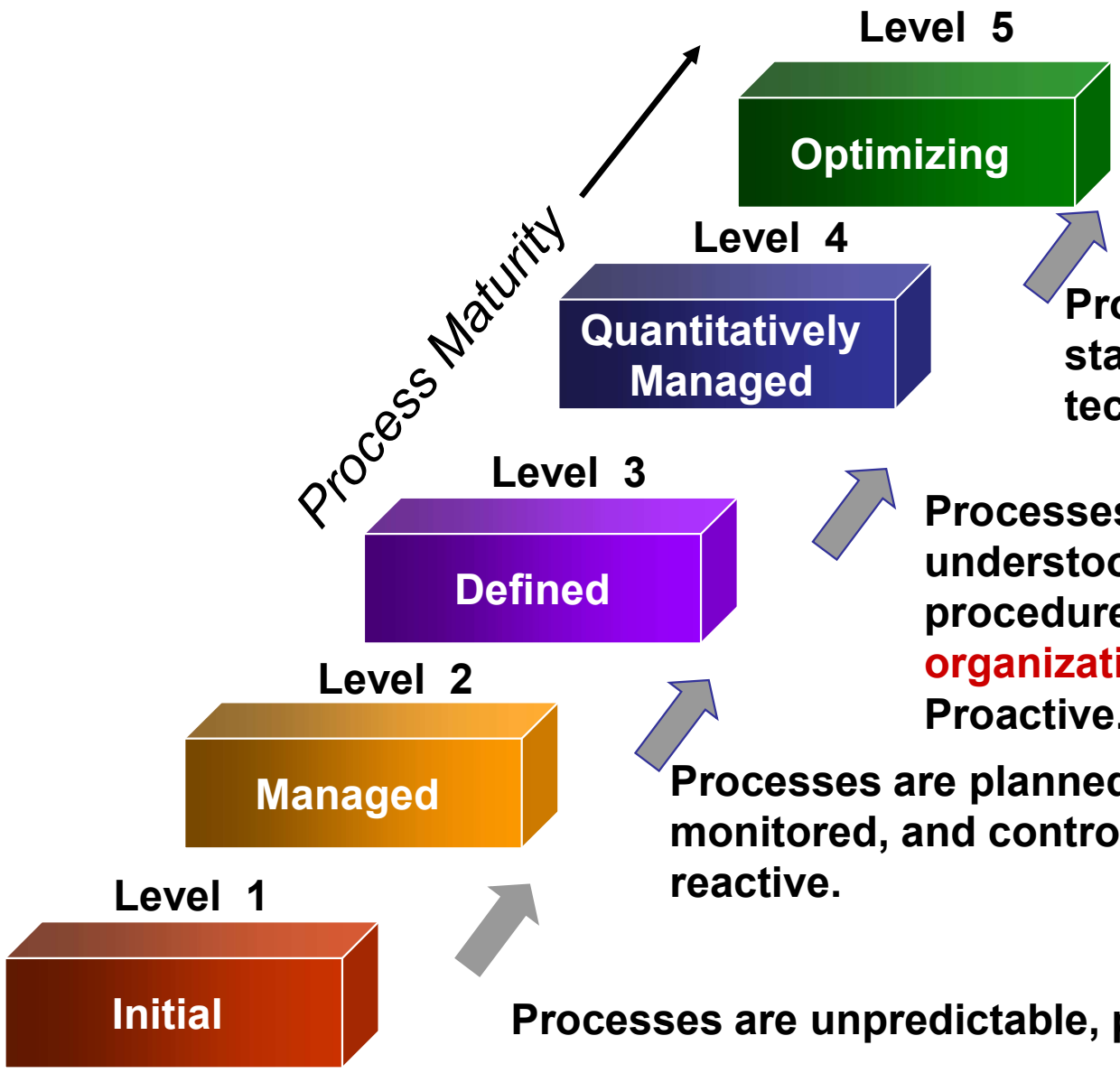
- CMMI (Capability Maturity Model Integration) is a proven industry framework to improve product quality and development efficiency for both hardware and software
  - Sponsored by US Department of Defence in cooperation with Carnegie Mellon University and the Software Engineering Institute (SEI)
  - Many companies have been involved in CMMI definition such as Motorola and Ericsson
  - CMMI has been established as a model to improve business results
- CMMI, staged, uses 5 levels to describe the maturity of the organization, same as predecessor CMM
  - Vastly improved version of the CMM
  - Emphasis on business needs, integration and institutionalization

CMMI Models within the Framework

- Models:
  - **Systems Engineering + Software Engineering (SE/SW)**
  - Systems Engineering + Software Engineering + Integrated Product and Process Development (IPPD)
  - Systems Engineering + Software Engineering + Integrated Product and Process Development + Supplier Sourcing (SS)
  - Software Engineering only
- Representation options:
  - **Staged**
  - Continuous
- The CMMI definition of “Systems Engineering” -

  “The interdisciplinary approach governing the total technical and managerial effort required to transform a set of customer needs, expectations and constraints into a product solution and to support that solution throughout the product’s life.” **This includes both hardware and software.**

CMMI Staged Representation - 5 Maturity Levels



Process performance continually improved through incremental and innovative technological improvements.

Processes are controlled using statistical and other quantitative techniques.

Processes are well characterized and understood. Processes, standards, procedures, tools, etc. are defined at the organizational (Organization X) level. Proactive.

Processes are planned, documented, performed, monitored, and controlled at the project level. Often reactive.

Processes are unpredictable, poorly controlled, reactive.

Maturity Level 1
Initial

- Maturity Level 1 deals with performed processes.
- Processes are unpredictable, poorly controlled, reactive.
- The process performance may not be stable and may not meet specific objectives such as quality, cost, and schedule, but useful work can be done.

Maturity Level 2
Managed at the Project Level

- Maturity Level 2 deals with managed processes.
- A managed process is a performed process that is also:
  - Planned and executed in accordance with policy
  - Employs skilled people
  - Adequate resources are available
  - Controlled outputs are produced
  - Stakeholders are involved
  - The process is reviewed and evaluated for adherence to requirements
- Processes are planned, documented, performed, monitored, and controlled at the project level. Often reactive.
- The managed process comes closer to achieving the specific objectives such as quality, cost, and schedule.

Maturity Level 3
Defined at the Organization Level

- Maturity Level 3 deals with defined processes.
- A defined process is a managed process that:
  - Well defined, understood, deployed and executed across the entire **organization**. Proactive.
  - Processes, standards, procedures, tools, etc. are defined at the organizational (Organization X) level. Project or local tailoring is allowed, however it must be based on the organization's set of standard processes and defined per the organization's tailoring guidelines.
- Major portions of the organization cannot "opt out."

Behaviors at the Five Levels

Maturity Level	Process Characteristics	Behaviors
5 Optimizing	Focus is on continuous quantitative improvement	Focus on "fire prevention"; improvement anticipated and desired, and impacts assessed.
4 Quantitatively Managed	Process is measured and controlled	Greater sense of teamwork and inter-dependencies
3 Defined	Process is characterized for the organization and is proactive	Reliance on defined process. People understand, support and follow the process.
2 Managed	Process is characterized for projects and is often reactive	Over reliance on experience of good people – when they go, the process goes. “Heroics.”
1 Initial	Process is unpredictable, poorly controlled, and reactive	Focus on "fire fighting"; effectiveness low – frustration high.

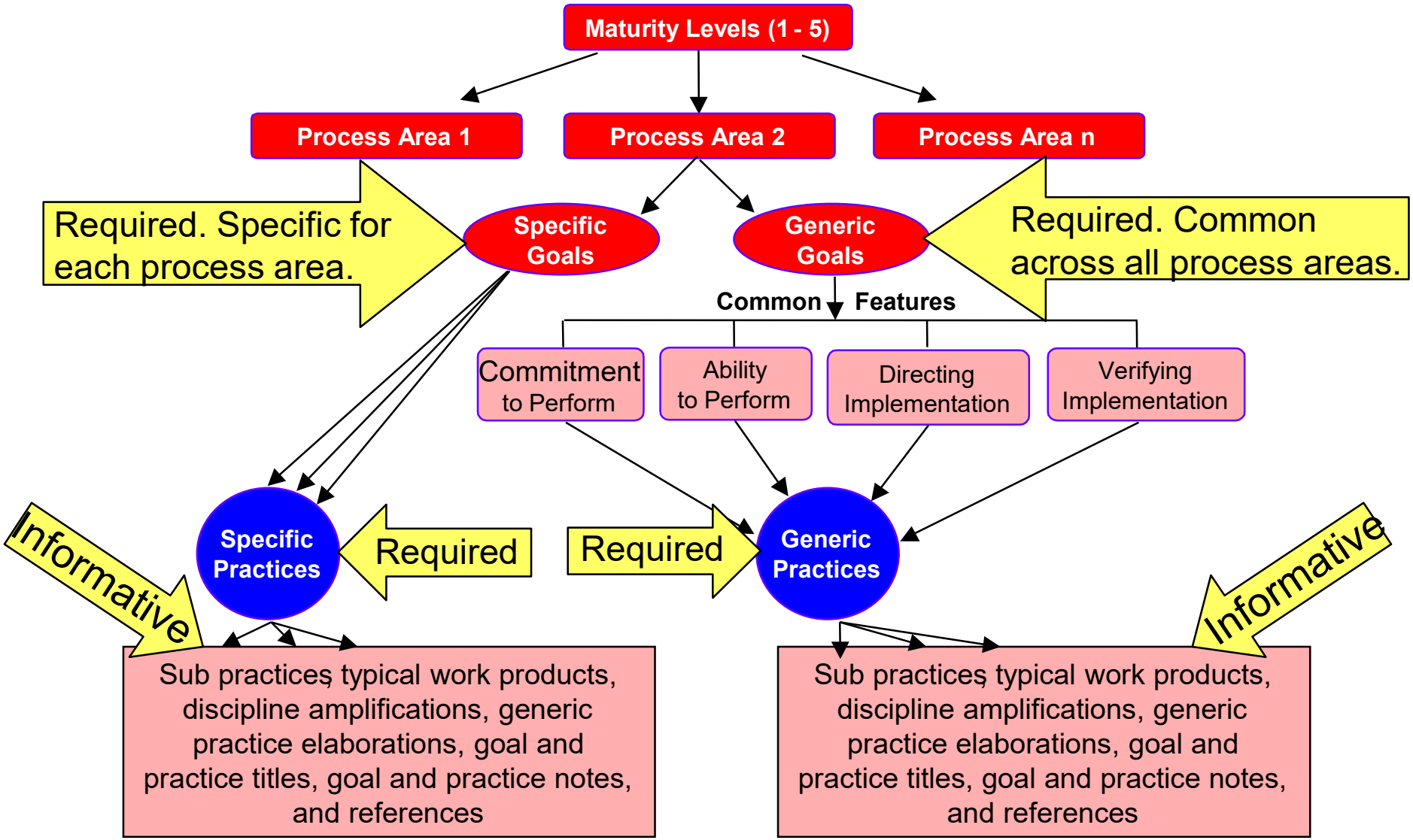
CMMI Components

- Within each of the 5 Maturity Levels, there are basic functions that need to be performed – these are called Process Areas (PAs).
- For Maturity Level 2 there are 7 Process Areas that must be completely satisfied.
- For Maturity Level 3 there are 11 Process Areas that must be completely satisfied.
- Given the interactions and overlap, it becomes more efficient to work the Maturity Level 2 and 3 issues concurrently.
- Within each PA there are Goals to be achieved and within each Goal there are Practices, work products, etc. to be followed that will support each of the Goals.

CMMI Process Areas

Maturity Level	Project Managment	Engineering	Process Management	Support
5 Optimizing			Organizational Innovation & Deployment	Causal Analysis & Resolution
4 Quantitatively Managed	Quantitative Project Mngt		Organizational Process Performance	
3 Defined	Integrated Project Mngt Risk Management	Requirements Development Technical Solution Product Integration Verification Validation	Organizational Process Focus Organizational Process Definition Organizational Training	Decision Analysis & Resolution
2 Managed	Project Planning Project Monitoring & Control Supplier Agreement Mngt	Requirements Mngt		Measurement & Analysis Process & Product Quality Assurance Configuration Mngt
1 Initial				

CMMI Terminology & Structure



Example

For the Requirements Management Process Area:

An example **Goal** (required):

"Manage Requirements"

An example **Practice** to support the Goal (required):

"Maintain bi-directional traceability of requirements"

Examples (suggested, but not required) of typical **Work Products** might be

Requirements traceability matrix or

Requirements tracking system

Yet another CMMI term: Institutionalization

- This is the most difficult part of CMMI implementation and the portion where managers play the biggest role and have the biggest impact
- Building and reinforcement of corporate culture that supports methods, practices and procedures so they are the ongoing way of business……..
  - Must be able to demonstrate institutionalization of all CMMI process areas for all organizations, technologies, etc.
- Required for all Process Areas

CMMI Resources

- Software Engineering Institute's CMMI website:

  http://www.sei.cmu.edu/cmmi/