

Software Quality Assurance

What is 'Software Quality Assurance'?

- **Software QA involves the entire software development PROCESS - monitoring and improving the process, making sure that any agreed-upon standards and procedures are followed, and ensuring that problems are found and dealt with. It is 'prevention' oriented.**

Two aspects of Software Quality

- “q” – Intrinsic product quality, often limited to *defect rate* and *reliability*.
- “Q” – Customer Satisfaction, often includes product quality and process quality.

Objectives of Software Quality Assurance

- **Only Quality Control (testing) is not enough:**
 - What would you do if your software does not pass the QC test?
 - QC is a reactive approach, not proactive one.
- **Quality Assurance includes Proactive as well as Reactive approaches.**

Purpose of SQA Activities

- Practically, **zero defect** product is **not possible** to achieve.
- The purpose of quality assurance practices are to **minimize the number of defects**.
- **How much efforts** are needed to minimize the number of defects?
 - are you developing a **customized project or product**?
 - **how critical** your application is?

Major SQA paradigms for this module

- **ISO/IEC 12207**
- **Capability Maturity Model**
- **Capability Maturity Model Integrated (CMMI)**

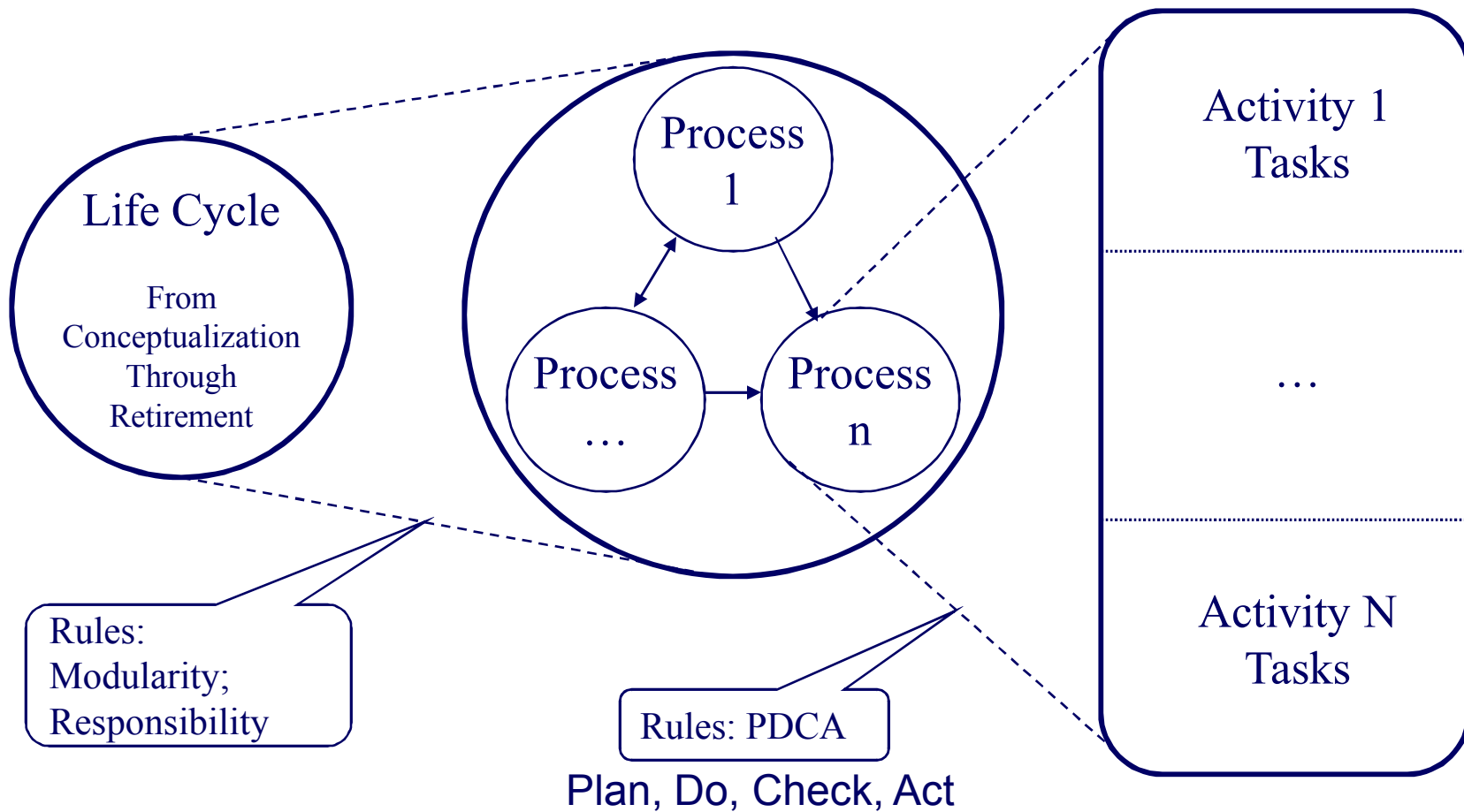
ISO/IEC 12207

Purpose

- **To establish a common framework for the life cycle of software:**
 - To acquire, supply, develop, operate & maintain software
 - To manage, control, and improve the framework

“facilitating international exchange of goods and services...” in software

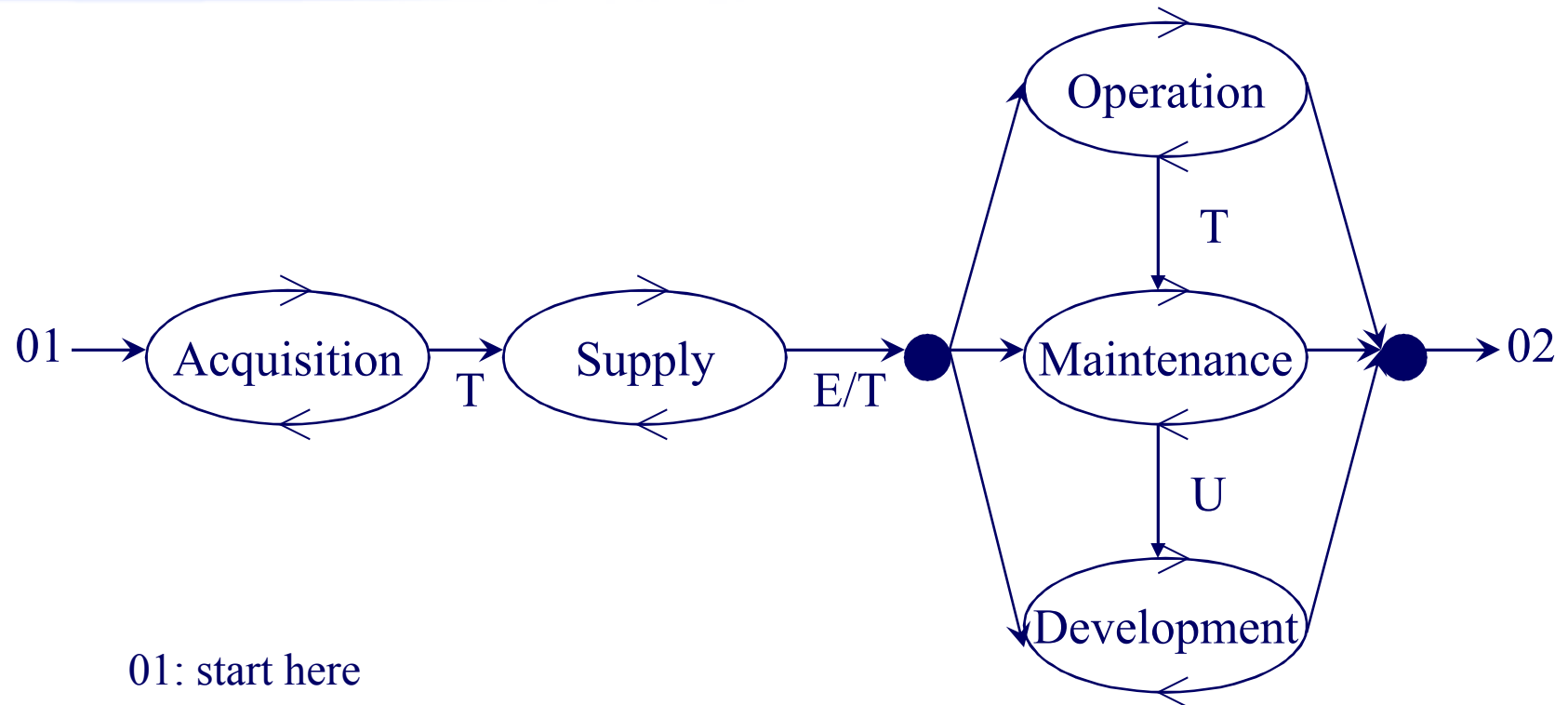
Basic Concepts - Architecture



Basic Concepts - Processes



Primary Processes

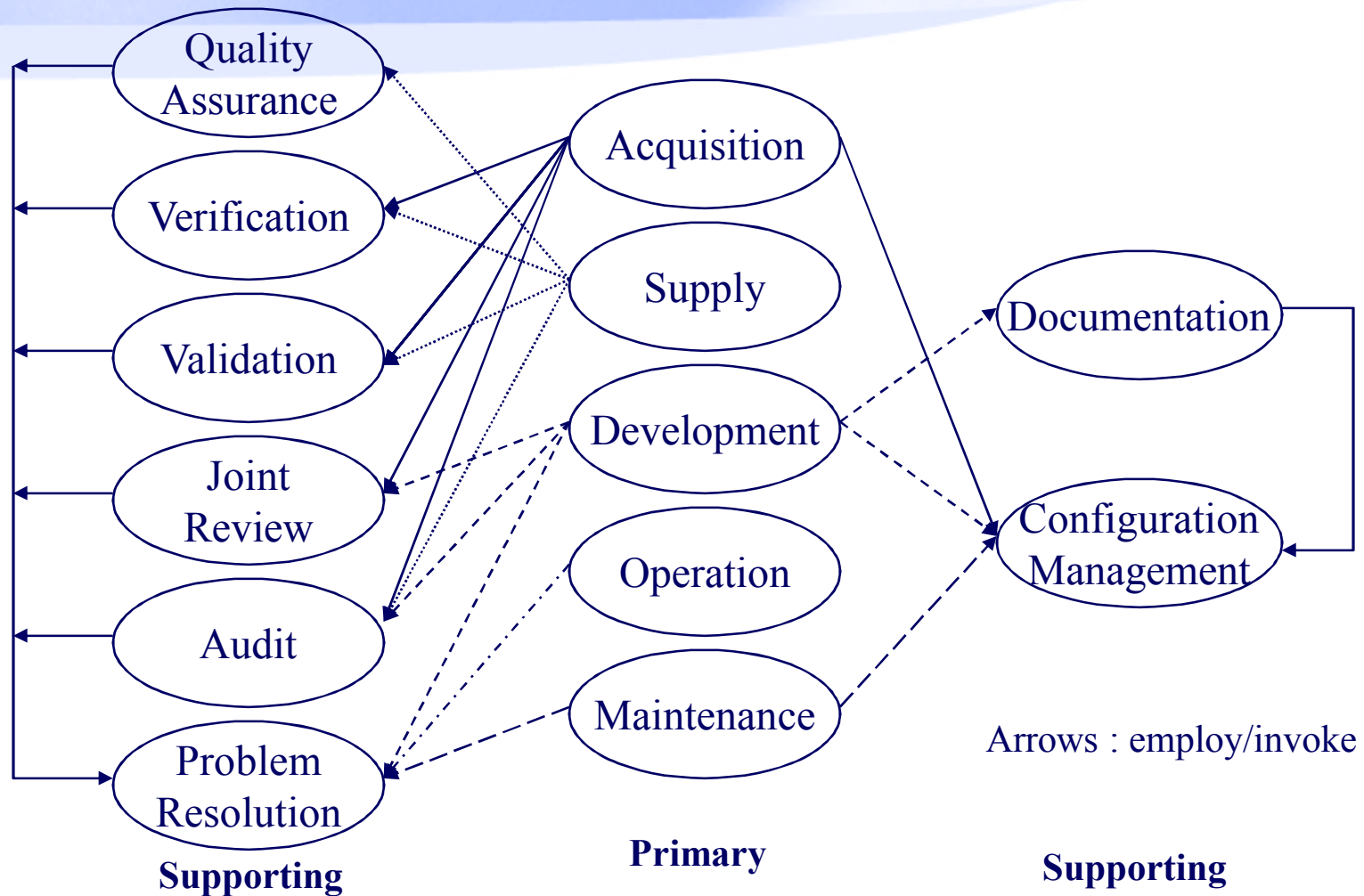


01: start here

01,02: the same points

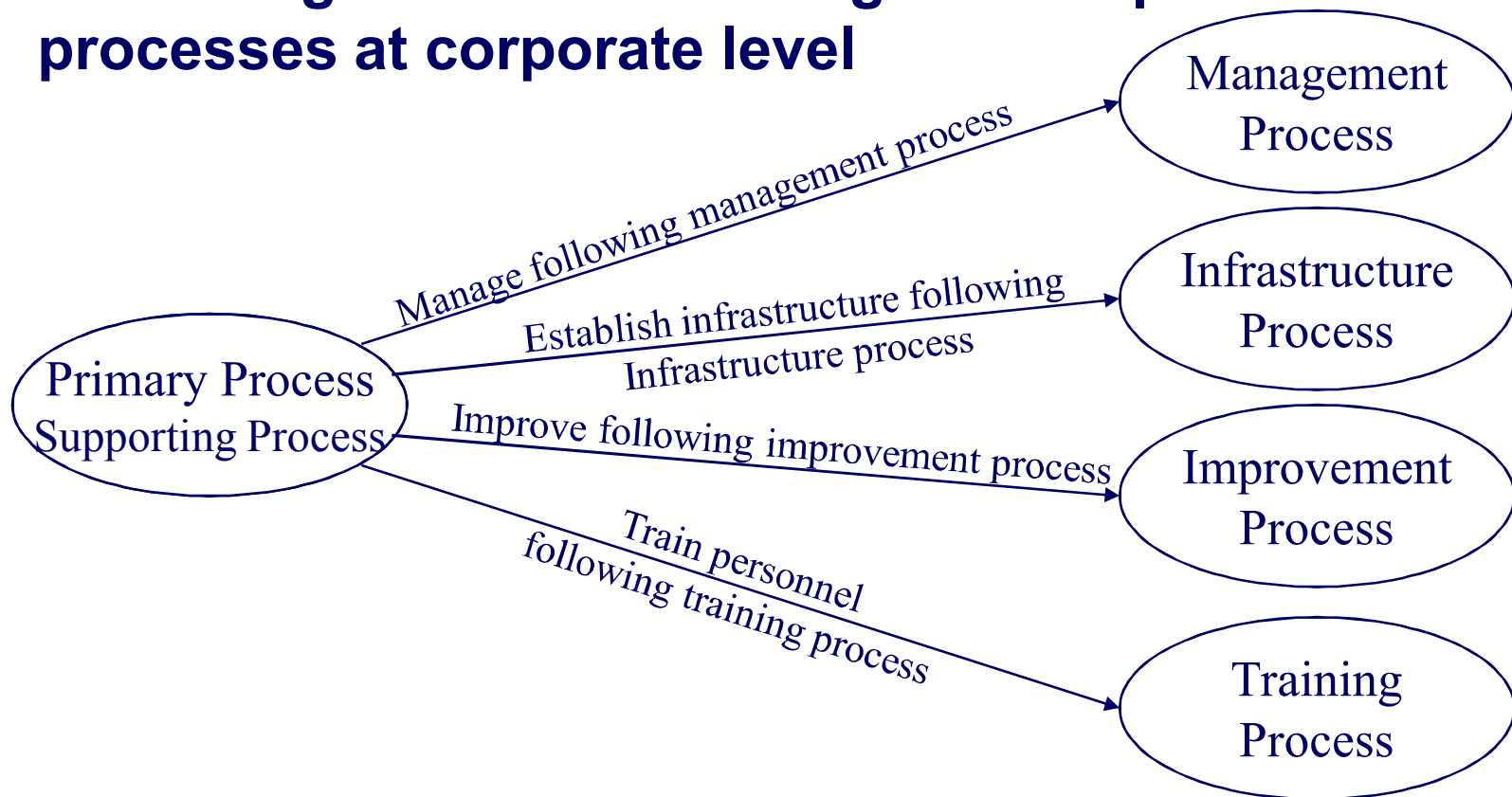
E: execute; T: task; U: use

Supporting Processes



Organizational Processes


- For an organization to manage and improve its processes at corporate level



Tailoring Process

A special process

- For basic tailoring of the standards for projects (all other processes)

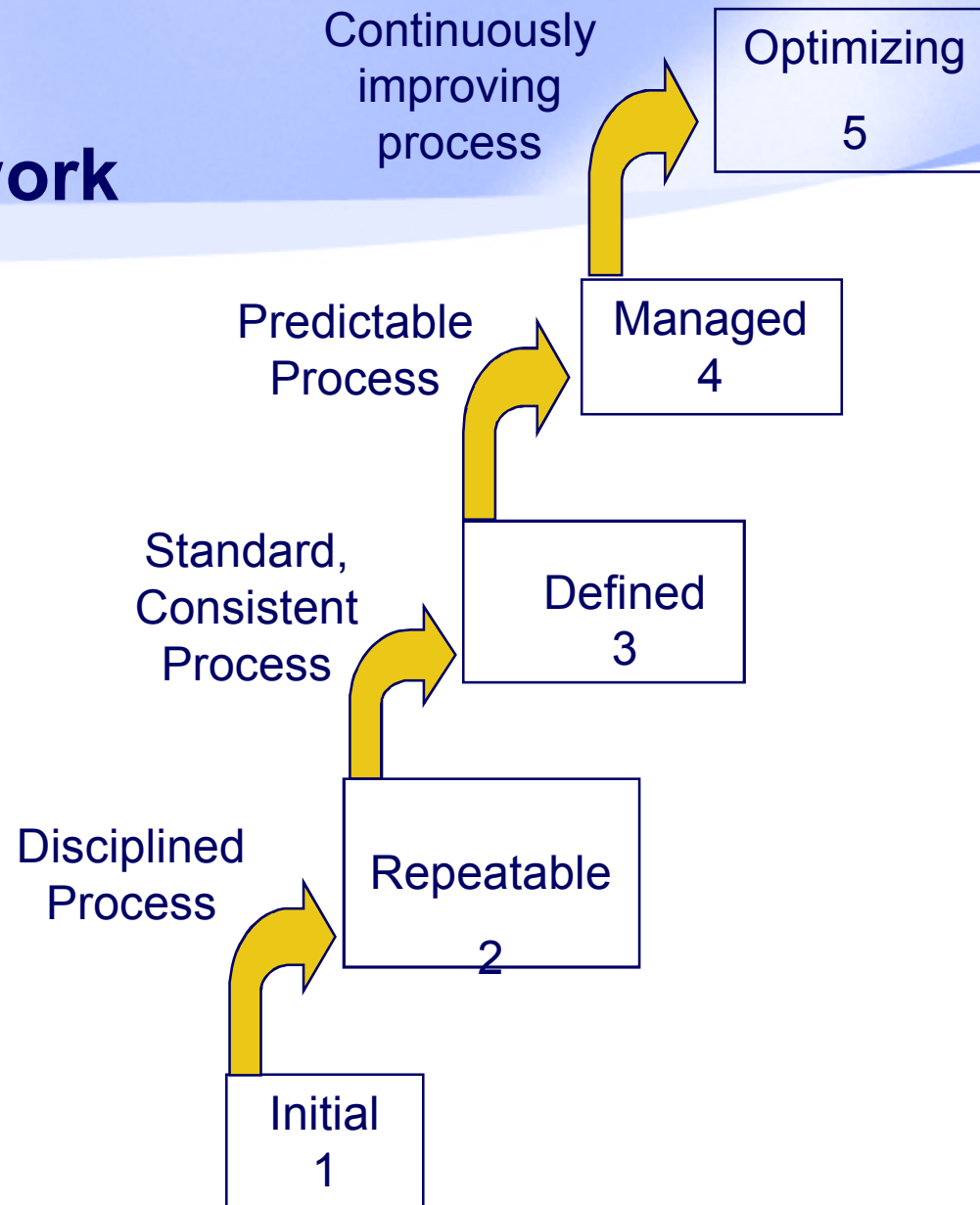


SW-CMM

Capability Maturity Model

- A strategy for improving the s/w process, **irrespective of** the process model used
- An organization **advances slowly** toward the **higher levels of process maturity**

CMM Framework



Capability Maturity Model (cont.)

Five levels of the capability maturity model (CMM)

Maternity level

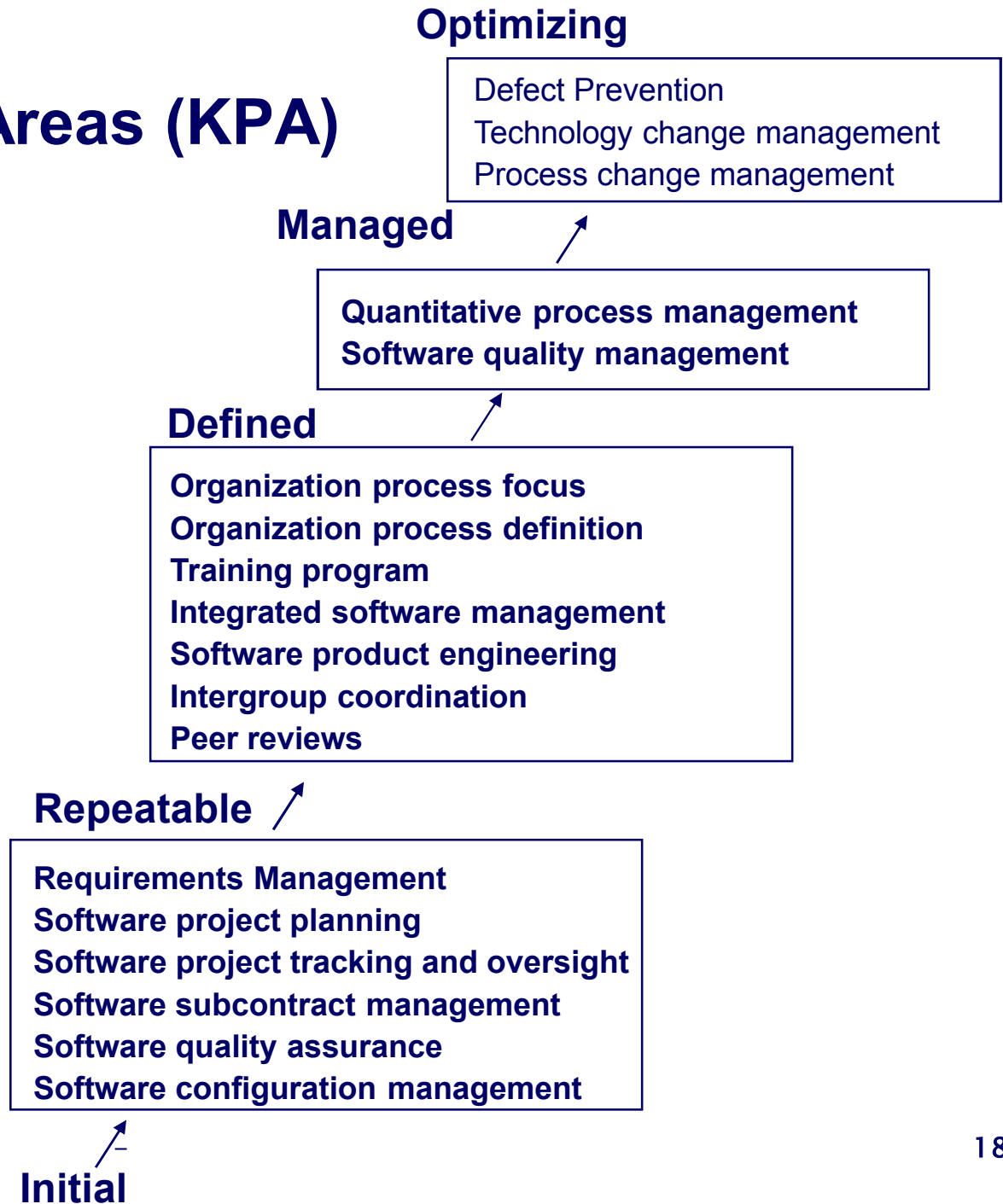
- 1 Initial
- 2 Repeatable
- 3 Defined
- 4 Managed
- 5 Optimizing

Characterization

Ad hoc process
Basic project management
Process definition
Process measurement
Process Control

Key Process Areas (KPA)

Process Areas
18



1 Initial Level

- **No sound S/W engineering practices**
- **The usual pattern is time and cost overruns caused by a lack of sound management in general, and planning in particular**
- **Highly depends on the current staff**
- **Impossible to predict with any accuracy such important items as the development time and cost**
- **The majority of S/W organizations all over the world are level 1 organization**

2 Repeatable Level

- **Planning and management techniques are based on experiment with similar products**
- **Measurements are taken**
- **The problems are identified as they arise, and corrective action is immediately taken, before the problem gets out of control**

3 Defined Level


- Both the managerial & technical aspects of the process are clearly defined, and continual efforts are made to improve the process wherever possible
- Reviews are used to achieve S/W quality
- At this level, it makes sense to introduce, new technology in order to increase quality and productivity further
- The process for S/W production is fully documented

4 Managed Level

- Sets **quality & productivity** goals for each project
- **Statistical quality controls** are in place
- These **two quantities** are continually measured, and corrective action is taken

5 Optimizing Level

- Continues process improvement
- Statistical **quality** and **process control** techniques are used
- The knowledge gained from each project is utilized in future project



SW-CMMI

Changes from SW CMM v1.1

- **Inclusion of Systems Engg.**
- **Two Representations**
- **New Process Areas (22/cmmi versus 18/cmm)**
- **New Generic Goals**
- **New Practices**

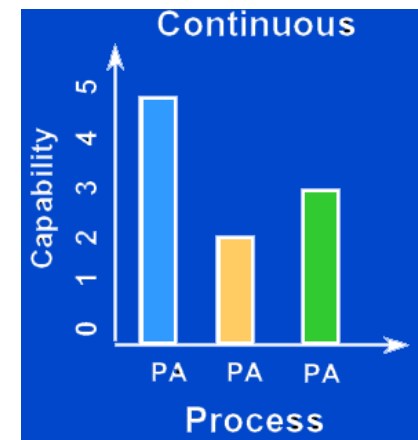
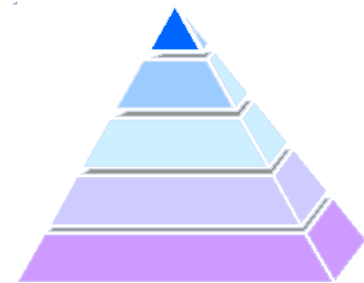
Representation

1. Staged

- 5 Maturity Levels
- From SW CMM

2. Continuous

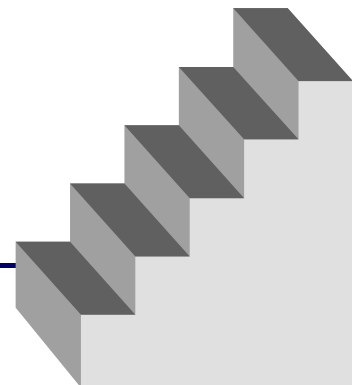
- 6 Capability Levels (for each process)
- From EIA/IS 731 ISO 15504
- All 22 processes can be started



Representation – Difference

Staged Representation –

- We have the (Maturity Level) MLs as they are found in CMM.
- Process Areas are assigned to the UPPER fours of the five maturity levels (Managed, Defined, Quantitatively Managed, Optimizing)
- Provides a pre- defined roadmap for organizational improvement.



Representation – Difference

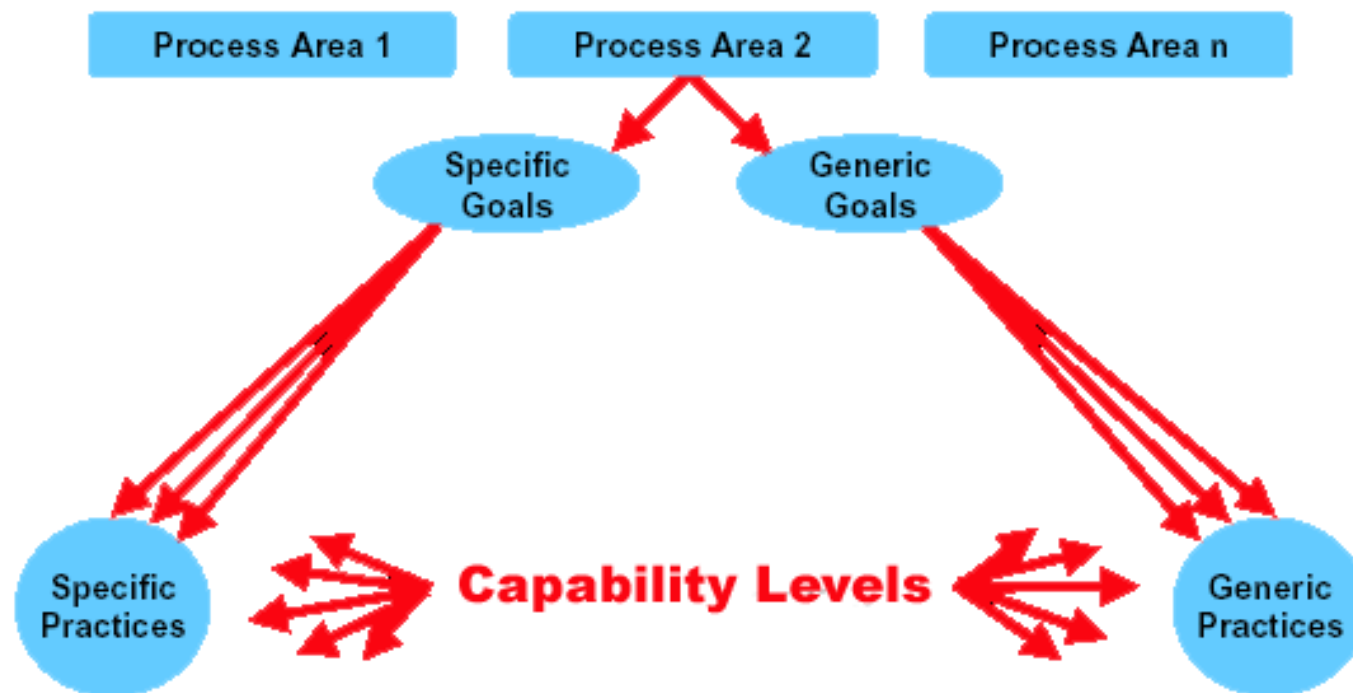
Continuous Representation –

- **Maturity Levels** are replaced by **Capability Levels (CL's)** as a measure assigned individually to each PA.
- Provides maximum flexibility for organizations to choose which processes to emphasize for improvement.

Staged



Continuous



Comparison



Continuous Representation		Staged Representation
Level	Capability Levels	Maturity Levels
0	Incomplete	N/A
1	Performed	Initial
2	Managed	Managed
3	Defined	Defined
4	Quantitatively Managed	Quantitatively Managed
5	Optimizing	Optimizing