Process Provides a Framework

A focus on people causes resistance to change – people naturally desire to do good work.

A focus on tools that do not fit into the process leads to ineffective automation – and shelfware.

A focus on procedures that do not match the process leads to unusable procedures – and shelfware.

The Process Management Premise

The quality of a (software) system is largely governed by the quality of the process used to develop and maintain it.

This premise implies focus on process as well as product.

The value of this premise is visible world-wide in the Total Quality Management movements in the manufacturing and service industries.

Total Quality Management

Total Quality Management (TQM) is the application of quantitative methods and human resources to improve:

- the material and services supplied to an organization
- all the processes within an organization
- the degree to which the needs of the customer are met, now and in the future

Department of defence, Total Quality Management Master Plan, August 1988.

Common Points in the Quality Movement

Enabling quality improvement is a management responsibility.

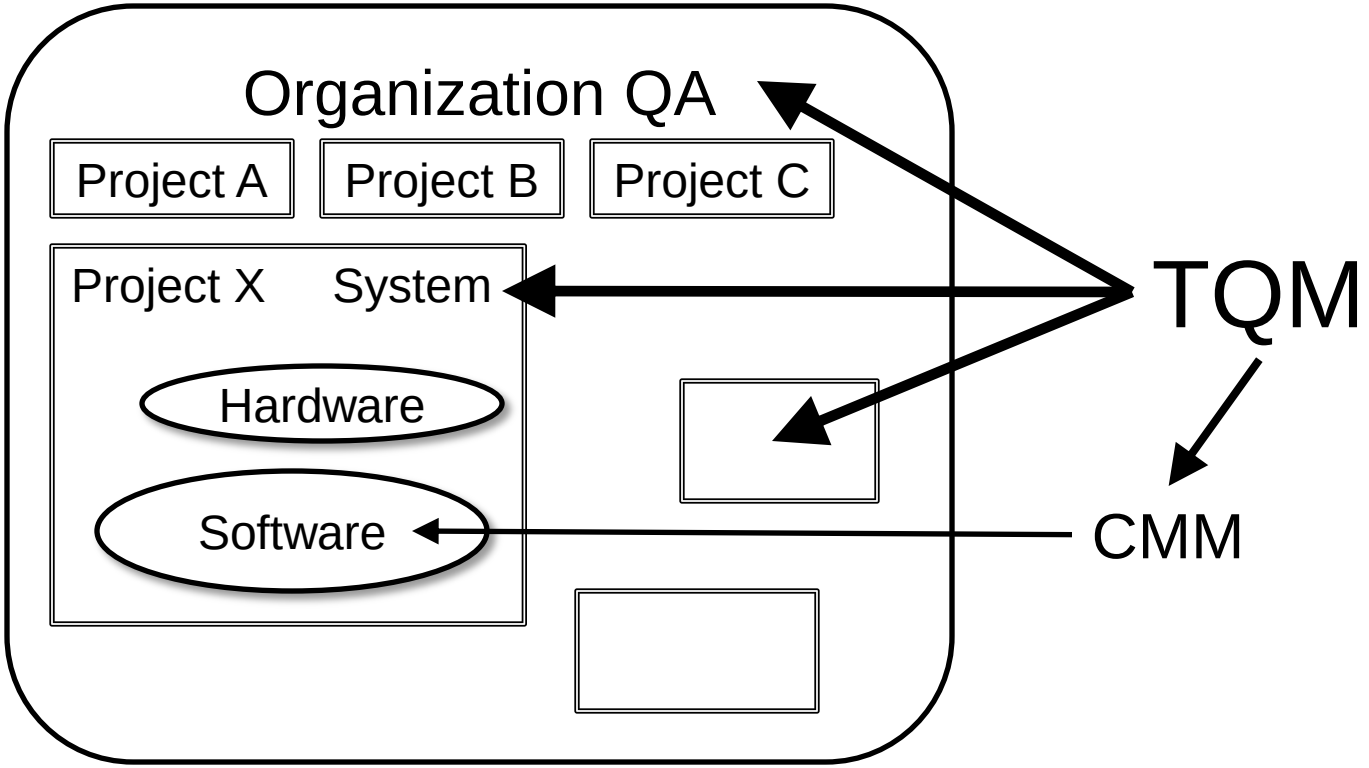
Quality improvement focuses on fixing the process, not the people.

Quality improvement must be measured.

Rewards and incentives are necessary to establish and maintain an improvement effort.

Quality improvement is a continuous process.

Applying TQM to Software



Process improvement fits in an overall business context – CMM applies to software

Maturity Model Inspirations

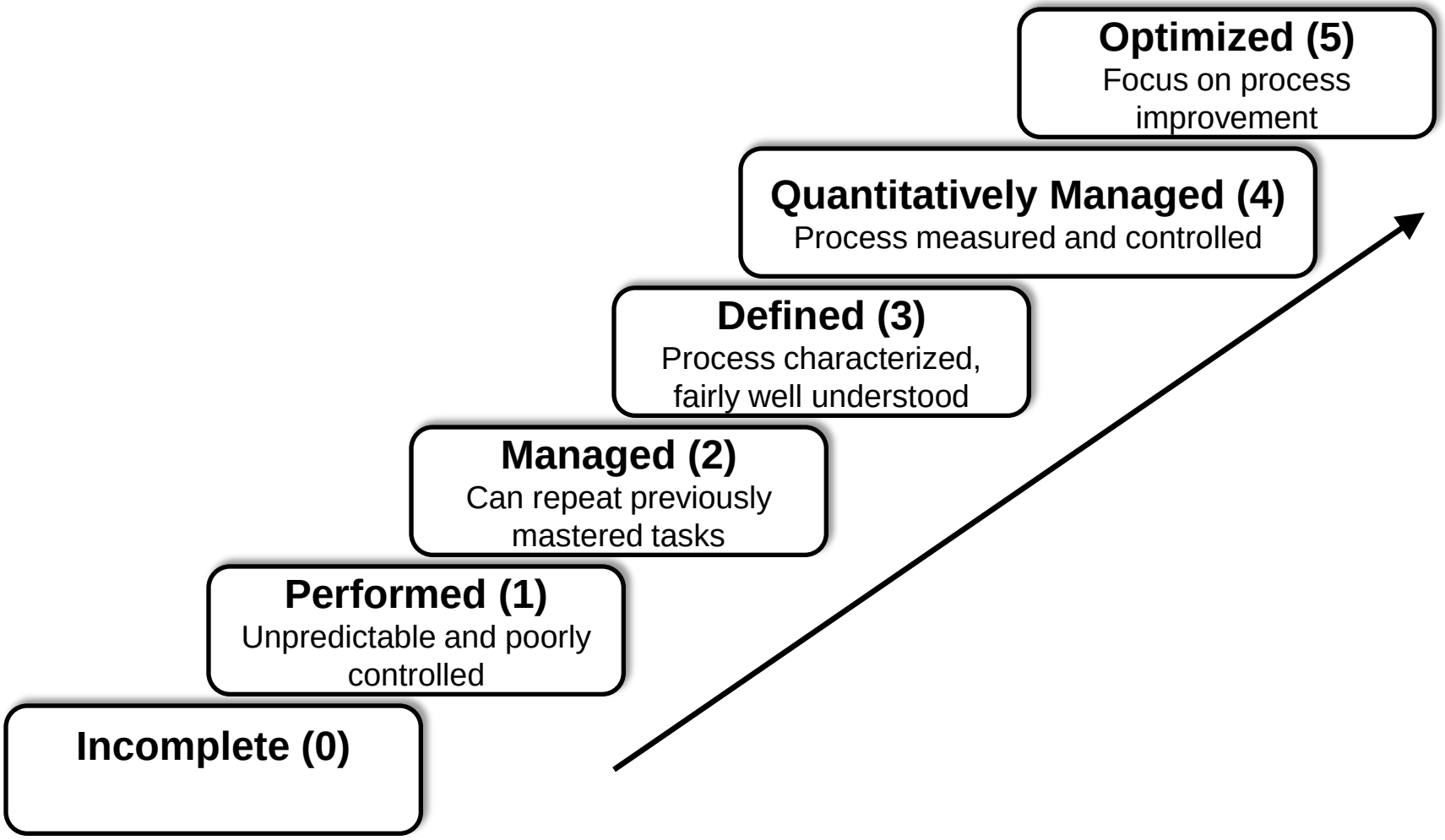
Process management concepts – Crosby, Deming, Juran, …

Experience

- 30 years of similar software problems
- commonly known software problems
- solutions exist

Application of common-sense engineering

CMMI Maturity Framework: Six Levels



CMM Definition

A description of the stages through which software organizations evolve as they define, implement, measure, control and improve their software processes

A guide for selecting process improvement strategies by facilitating:

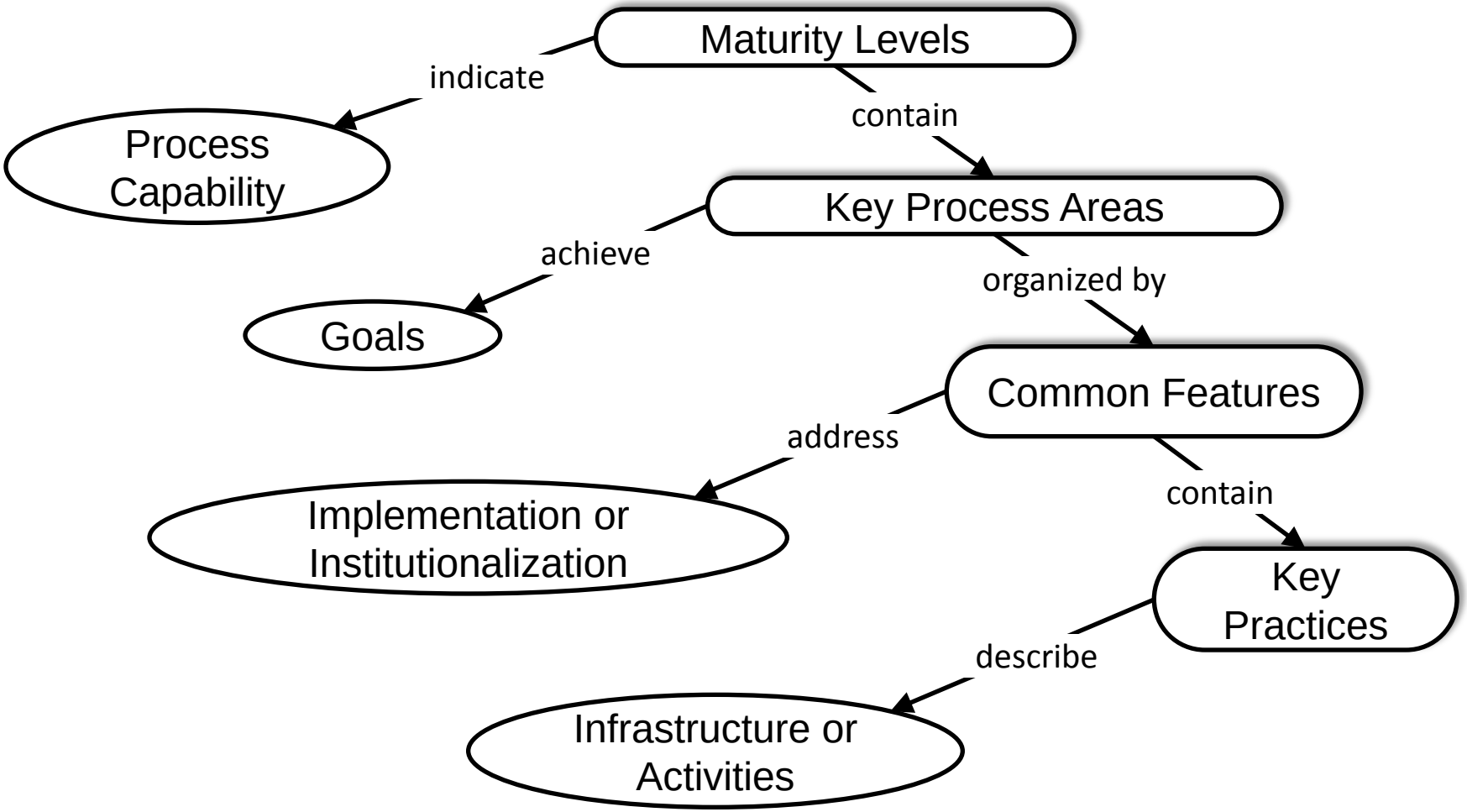
- determination of current process capabilities
- identification of the issues most critical to software quality and process improvement

CMM Supporting Role

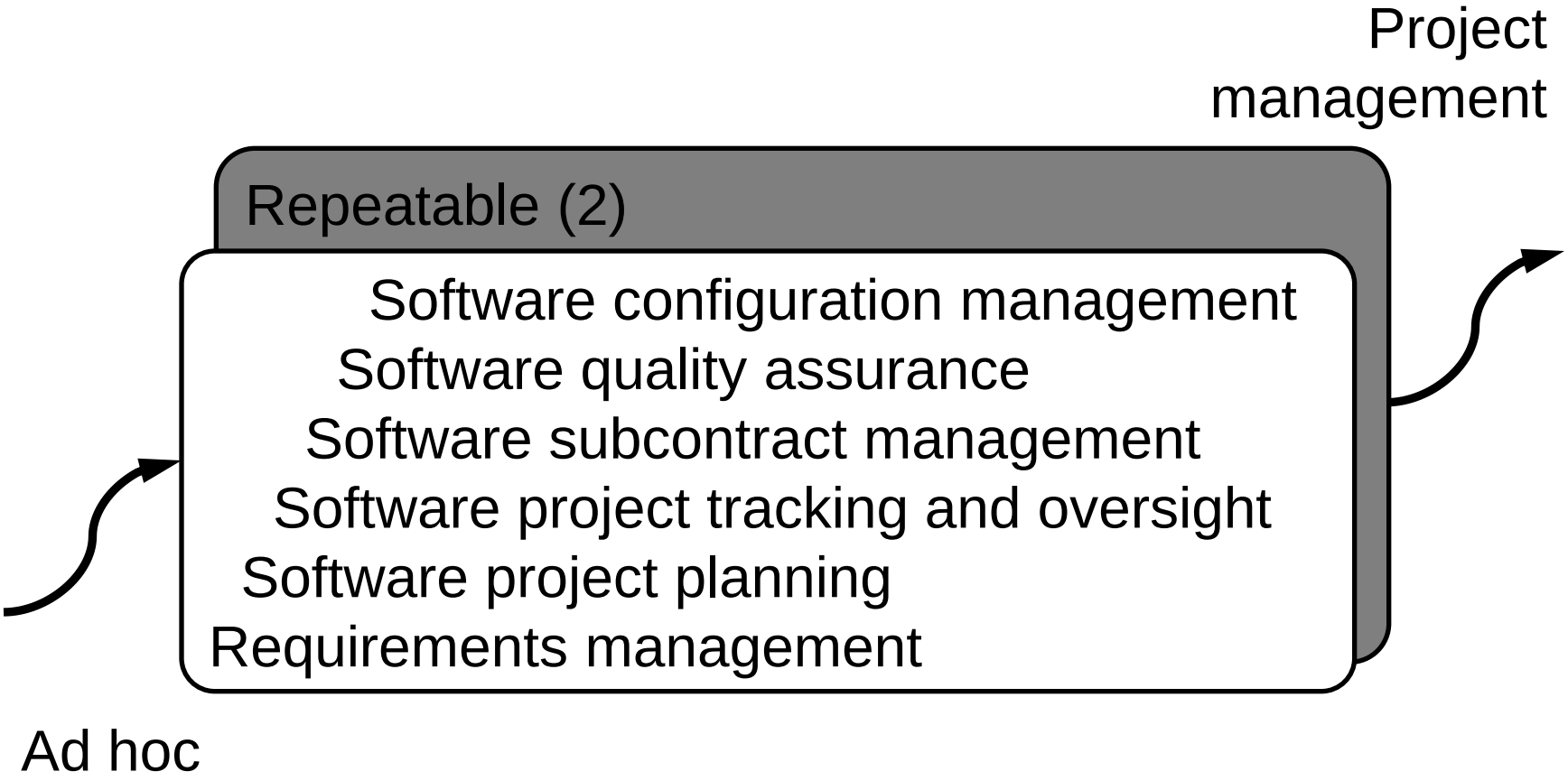
The CMM should support:

- setting goals for senior management
- identifying priorities for process improvement
- identifying process capability of organizations
- predicting future process performance of projects
- industry-wide comparisons of the state of the practice

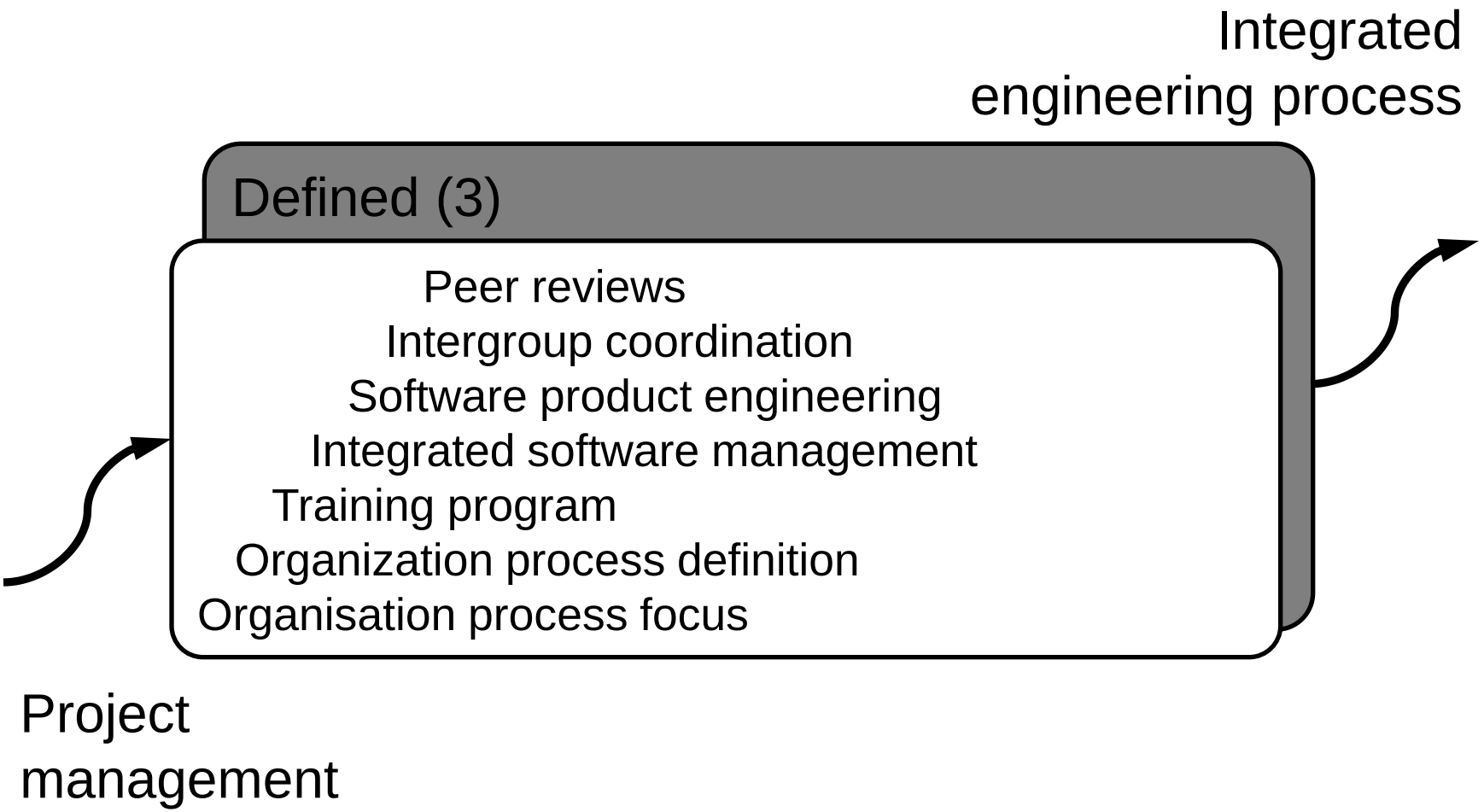
The CMM Structure



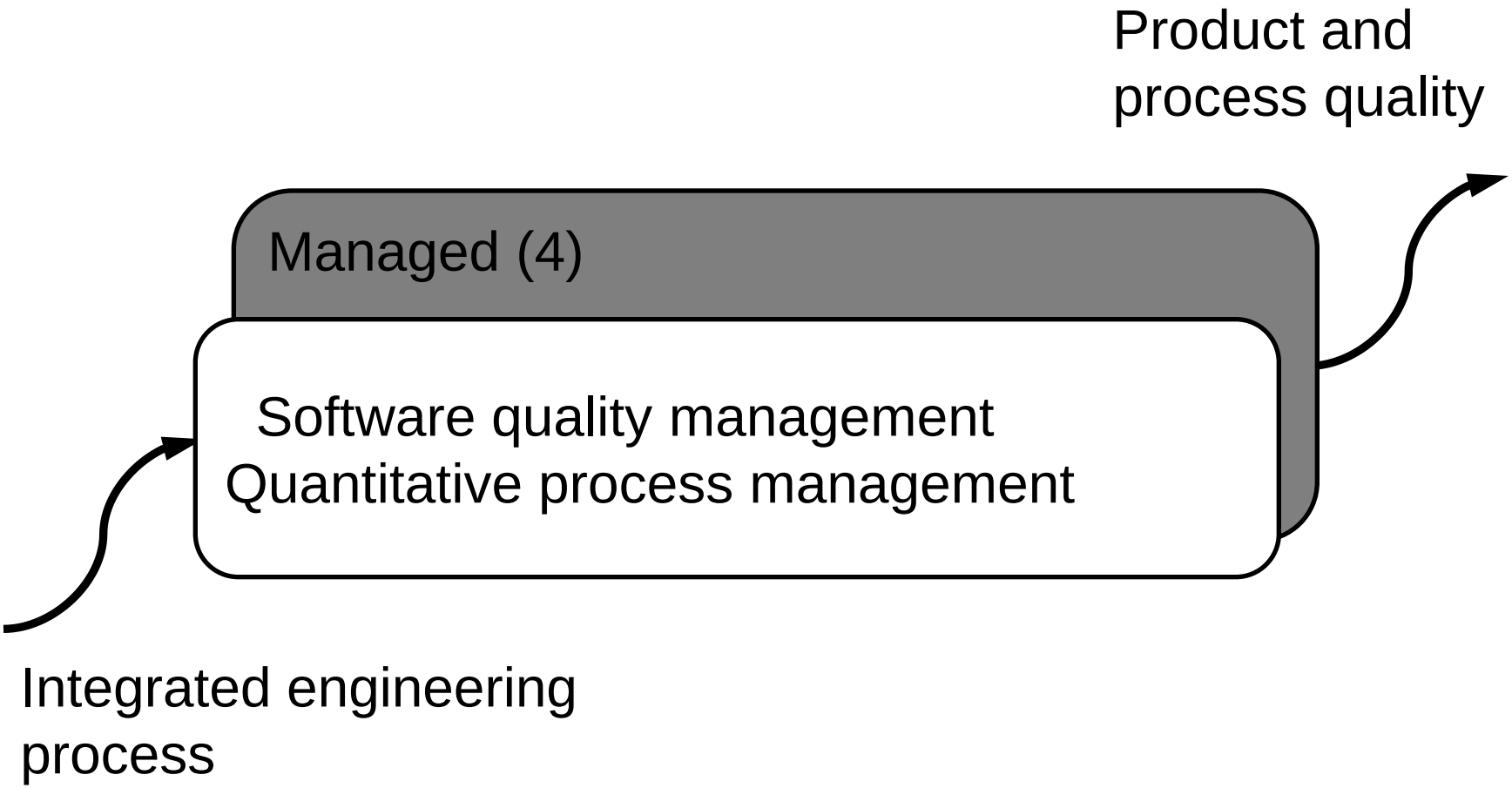
Key Process Areas to Achieve Level 2



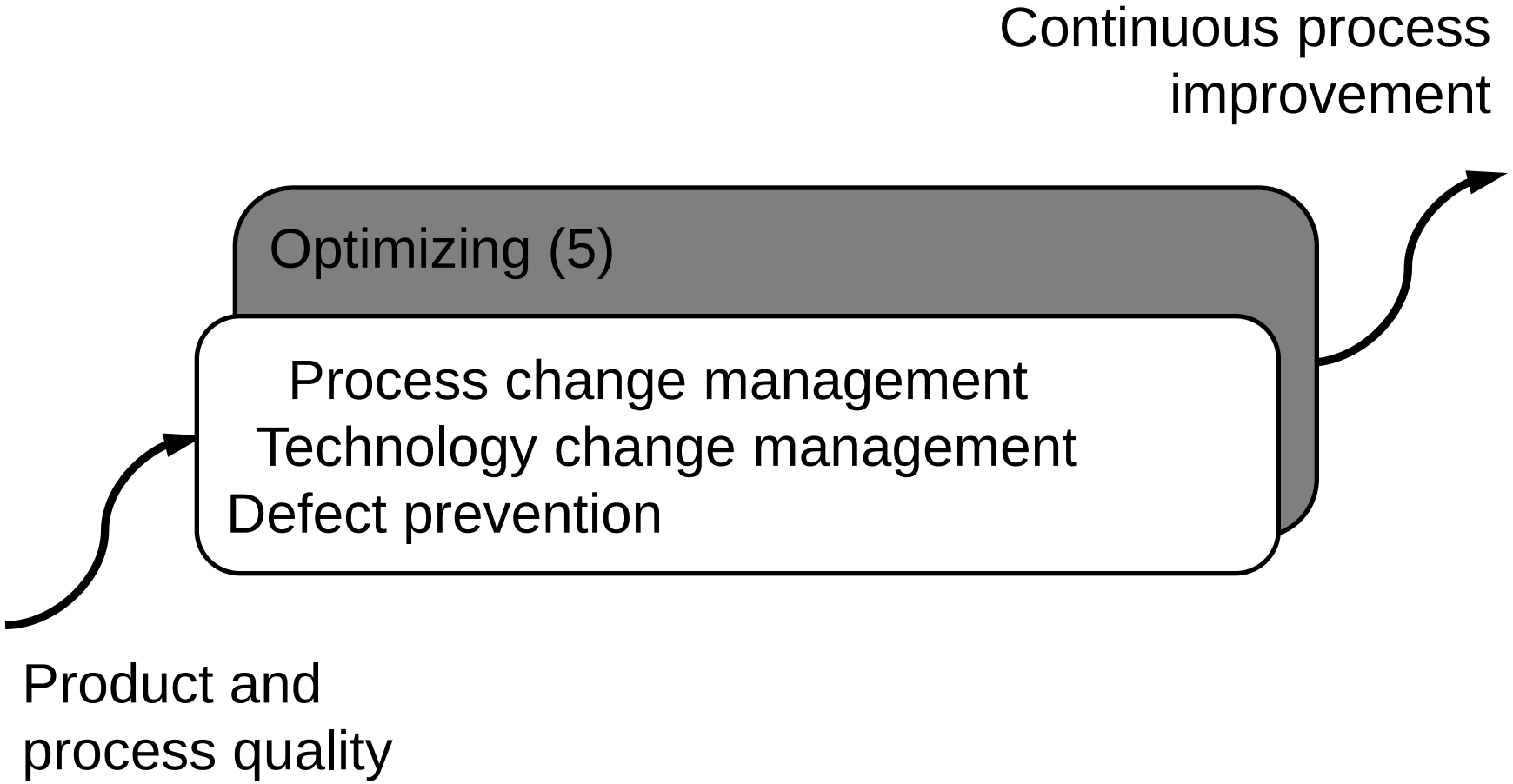
Key Process Areas to Achieve Level 3



Key Process Areas to Achieve Level 4



Key Process Areas to Achieve Level 5



Responsibility for Implementing Key Process Areas

The project is primarily responsible for addressing many key process areas.

The organization is primarily responsible for addressing other key process areas.

There are both project and organizational responsibilities in all key process areas.

Project Responsibilities

The project will have primary responsibility for acting on:

- Requirements Management
- Software Project Planning
- Software Project Tracking and Oversight
- Software Subcontractor Management
- Software Configuration Management
- Integrated Software Management
- Software Product Engineering
- Inter-group Co-ordination
- Peer Reviews
- Quantitative Process Management
- Software Quality Management
- Defect Prevention

Organization Responsibilities

The organization will have primary responsibility for acting on:

- Software Quality Assurance
- Organization Process Focus
- Organization Process Definition
- Training Program
- Technology Change Management
- Process Change Management

An Example of Goals: Software Project Planning

1. Software estimates are documented for use in planning and tracking the software project.

2. Software project activities and commitments are planned and documented.

3. Affected groups and individuals agree to their commitments related to the software project.

An Example Key Practice: Size Estimating

Software Project Planning

Activity 9

Estimates for the size of the software work products (or changes to the size of software work products) are derived according to a documented procedure:

This procedure typically specifies that ....

An Example of Decomposing the CMM Structure

Maturity Level	Level 2 - Repeatable
Key Process Area	Software Project Planning
Goal	1. Software estimates are documented...
Common Feature	Activities Performed
Key Practice	9. Estimates for the size of the software work products

Understanding the Initial Maturity Level

Performance driven by the competence and heroics of the people doing work

Consistency and compliance to standards driven by management priorities – usually schedule is top priority

High quality and exceptional performance possible so long as the best people can be hired

Unpredictability – for good or for ill – characterizes the initial level organization

Typical Level 1 Environments

"I'd rather have it wrong than have it late."

A senior software manager (industry)

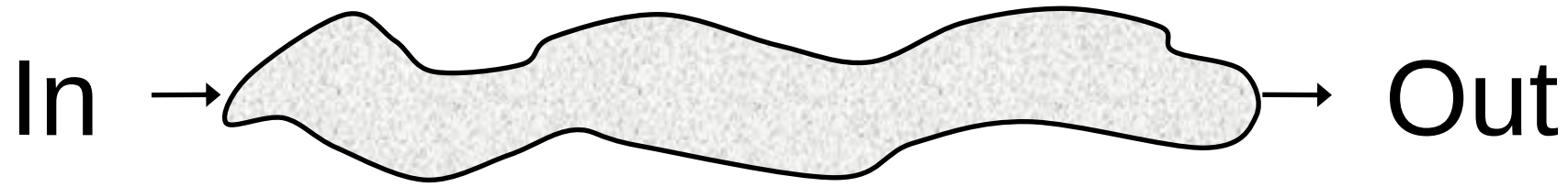
"The bottom line is schedule. My promotions and raises are based on meeting schedule first and foremost."

A program manager (government)

"By regularly putting the development process under extreme time pressure and the accepting poor-quality products, the software user community has shown its true quality standard"

DeMarco and Lister (*Peopleware*, 1987)

The Management View of the Software Process at Level 1

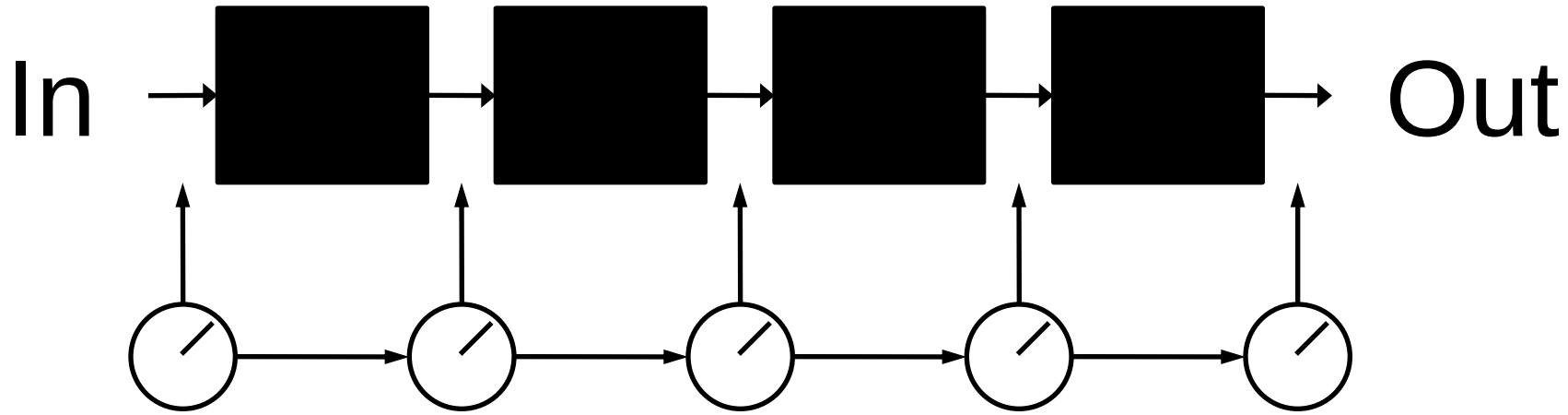


Requirements flow in.

A software product is (usually) produced by some amorphous process.

The product flows out and (hopefully) works.

The Management View of the Software Process at Level 2

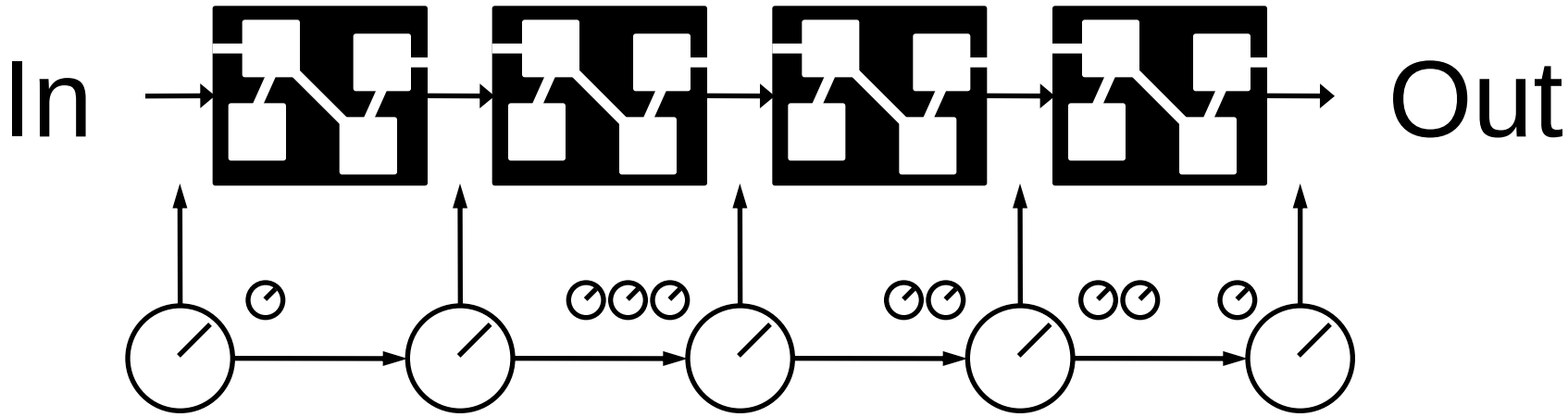


Requirements and resources flow in.

The production of the software product is visible at defined points.

Artefacts of the process are controlled.

The Management View of the Software Process at Level 3

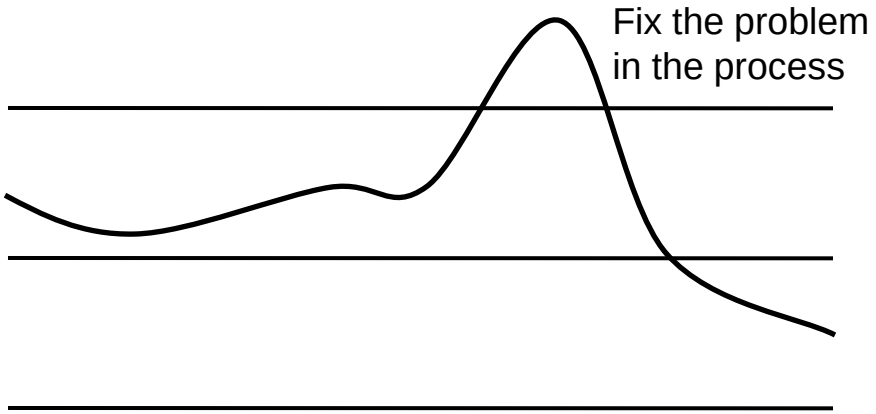


Roles and responsibilities in the process are understood.

The production of the software product is visible throughout the software process.

Understanding the Managed Maturity Level

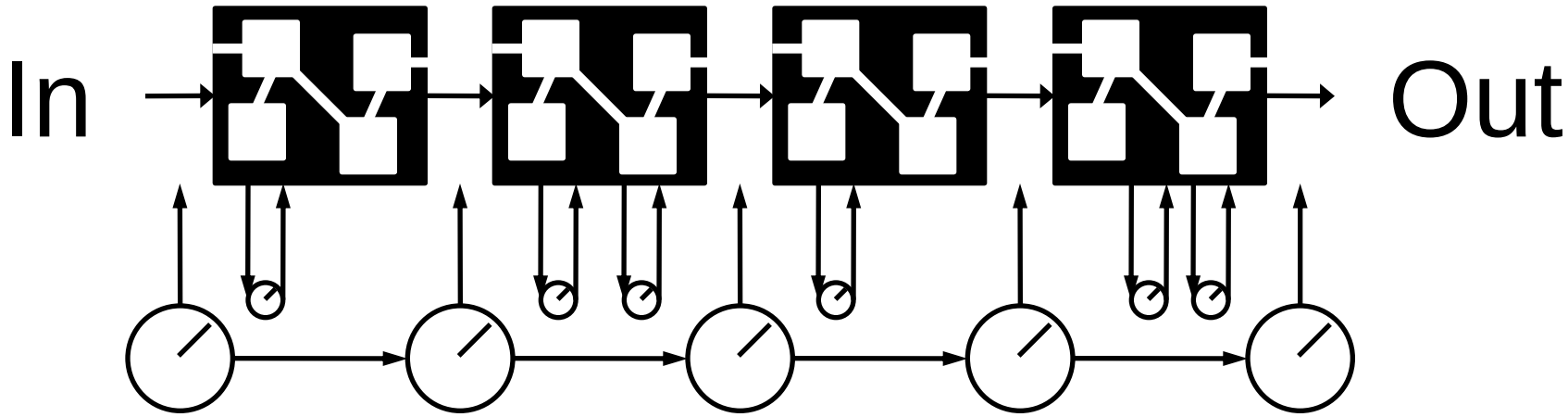
Applying the principles of statistical process control, address special causes of process variation.



Control Chart With Special Causes

Explicitly address the customer's need as part of a philosophy of quality management.

The Management View of the Software Process at Level 4



The production of the software product is quantitatively understood throughout the process.

Measurement Across Maturity Levels

Myth that measurement occurs only at Level 4

Level 5 – improvement and cost/benefit data

Level 4 – process and product quality data

Level 3 – process data

Level 2 – planning and tracking data

Level 1 – haphazard data

Using Higher Level Practices

Processes at higher maturity levels may be performed, although perhaps ineffectively, even by Level 1 organizations.

Peer reviews can help even a Level 1 project.

Building an organizational capacity means institutionalizing good practices on a firm foundation.

Scope of the CMM: Using “Key”

The CMM is not exhaustive.

There are software management and engineering processes and practices that are not described in the CMM.

KEY indicates a focus on the major leverage points.

CMM and Business Context

The CMM is an application of Total Quality Management principles to software engineering.

Emphasis should be on customer satisfaction.

The result should be higher quality software products produced by more competitive companies.