Capability Maturity Model (CMM Model)

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Topics to be coverd

- SEI - CMM model
- Levels of CMM

SEI-CMM

- Software Engineering Institution system
- SEI-CMM helped organization to improve the quality of software that they develop.

What is CMM?

- CMM: Capability Maturity Model
- Developed by the Software Engineering Institute of the Carnegie Mellon University
- Framework that describes the key elements of an effective software process.

What is CMM?

- Describes an evolutionary improvement path for software organizations from an ad hoc, immature process to a mature, disciplined one.

- Provides guidance on how to gain control of processes for developing and maintaining software and how to evolve toward a culture of software engineering and management excellence.
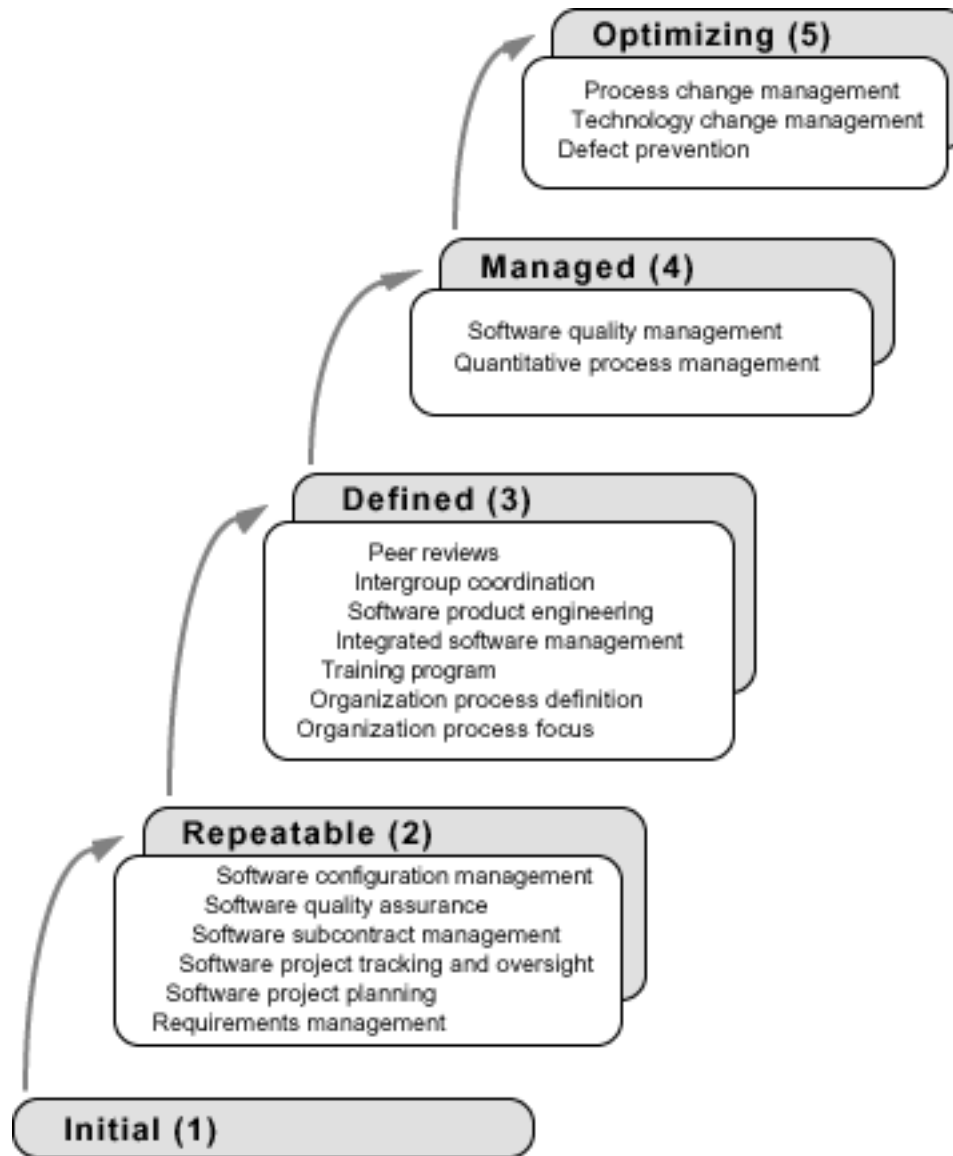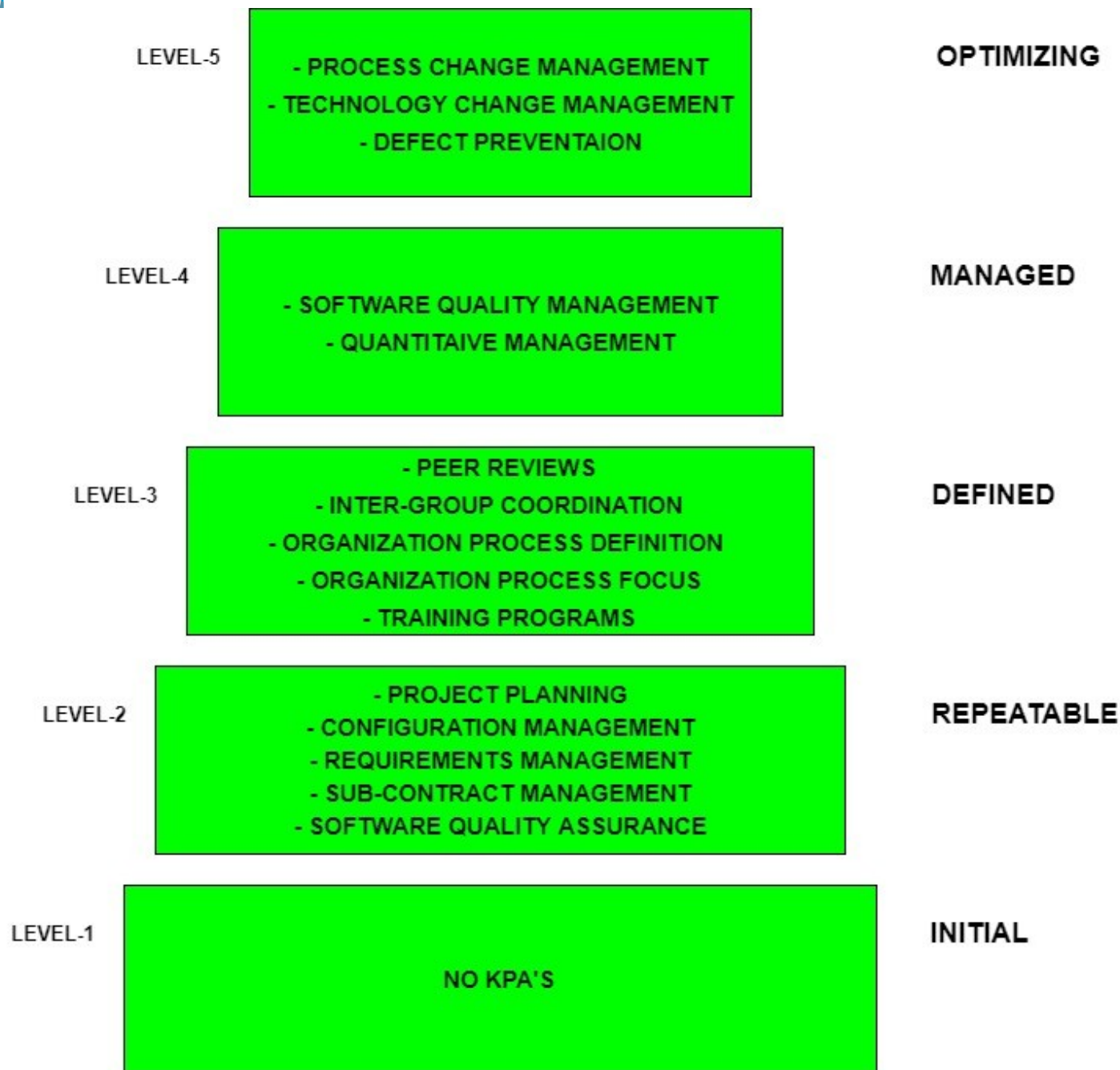
What are the CMM Levels?
(The five levels of software process maturity)

Maturity level indicates level of process capability:

- ❑ Initial
- ❑ Repeatable
- ❑ Defined
- ❑ Managed
- ❑ Optimizing

Optimizing (5)

    Process change management
    Technology change management
    Defect prevention

Managed (4)

    Software quality management
    Quantitative process management

Defined (3)

    Peer reviews
    Intergroup coordination
    Software product engineering
    Integrated software management
    Training program
    Organization process definition
    Organization process focus

Repeatable (2)

    Software configuration management
    Software quality assurance
    Software subcontract management
    Software project tracking and oversight
    Software project planning
    Requirements management

Initial (1)

The Key Process Areas by Maturity Level

LEVEL-5	- PROCESS CHANGE MANAGEMENT - TECHNOLOGY CHANGE MANAGEMENT - DEFECT PREVENTAION	OPTIMIZING
LEVEL-4	- SOFTWARE QUALITY MANAGEMENT - QUANTITAIVE MANAGEMENT	MANAGED
LEVEL-3	- PEER REVIEWS - INTER-GROUP COORDINATION - ORGANIZATION PROCESS DEFINITION - ORGANIZATION PROCESS FOCUS - TRAINING PROGRAMS	DEFINED
LEVEL-2	- PROJECT PLANNING - CONFIGURATION MANAGEMENT - REQUIREMENTS MANAGEMENT - SUB-CONTRACT MANAGEMENT - SOFTWARE QUALITY ASSURANCE	REPEATABLE
LEVEL-1	NO KPA'S	INITIAL

Level 1: Initial

- Initial : The software process is characterized as ad hoc. Few processes are defined, and success depends on individual effort.
  - At this level, frequently have difficulty making commitments that the staff can meet with an orderly process
  - Products developed are often over budget and schedule
  - Wide variations in cost, schedule, functionality and quality targets
  - Capability is a characteristic of the individuals, not of the organization

Level 2: Repeatable

- Basic process management processes are established to track cost, schedule, and functionality. The necessary process discipline is in place to repeat earlier successes on projects with similar applications.
  - Realistic project commitments based on results observed on previous projects
  - Software project standards are defined and faithfully followed
  - Processes may differ between projects
  - Process is disciplined
  - earlier successes can be repeated

Level 3: Defined

❸ The software process for both management and engineering activities is documented, standardized, and integrated into a standard software process for the organization.

Level 4: Managed

- Detailed measures of the software process and product quality are collected. Both the software process and products are quantitatively understood and controlled.
  - Narrowing the variation in process performance to fall within acceptable quantitative bounds
  - When known limits are exceeded, corrective action can be taken
  - Quantifiable and predictable
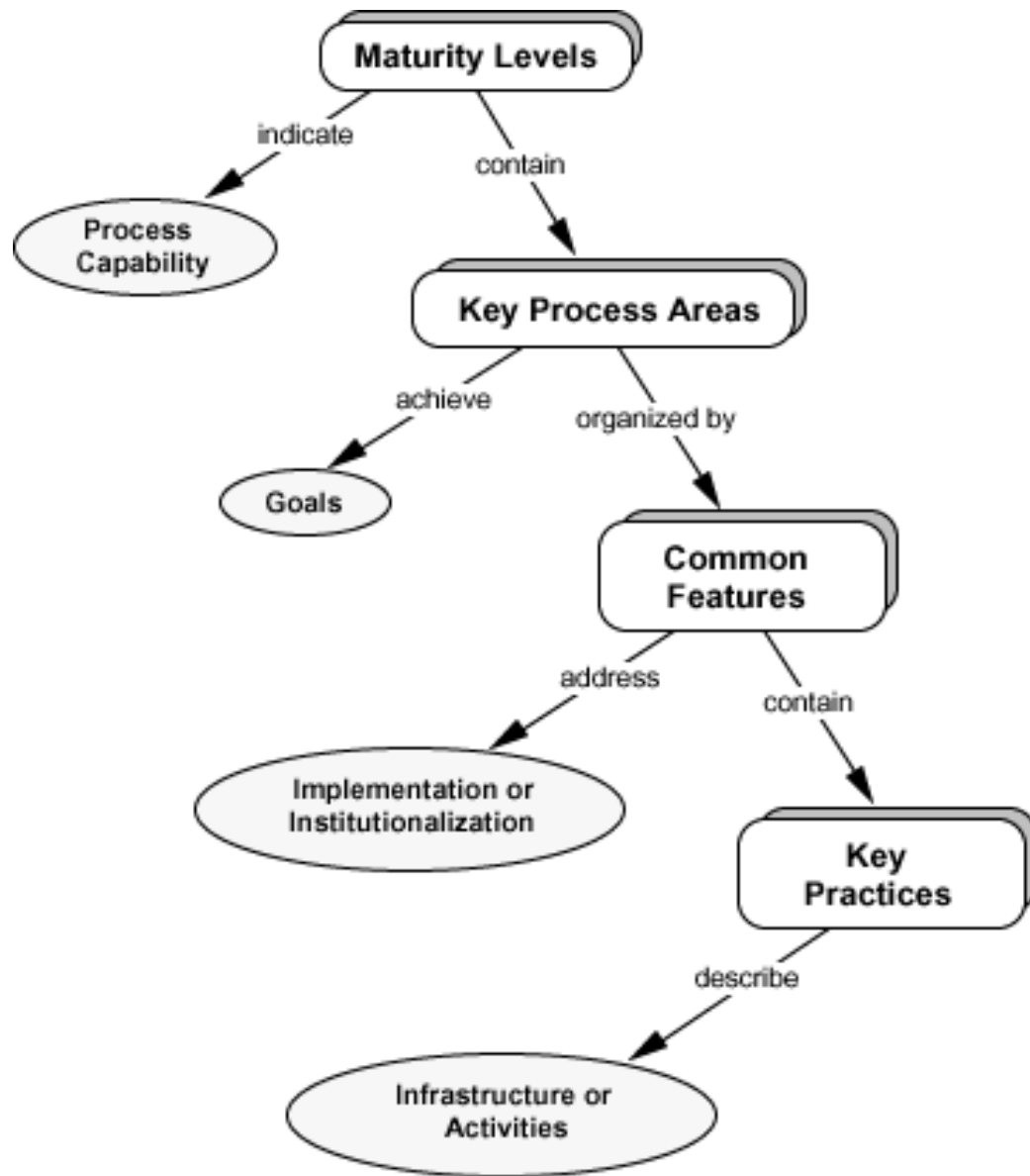   - predict trends in process and product quality

Level 5: Optimizing

- Continuous process improvement is enabled by quantitative feedback from the process and from piloting innovative ideas and technologies.
- Goal is to prevent the occurrence of defects
  - Causal analysis
- Data on process effectiveness used for cost benefit analysis of new technologies and proposed process changes
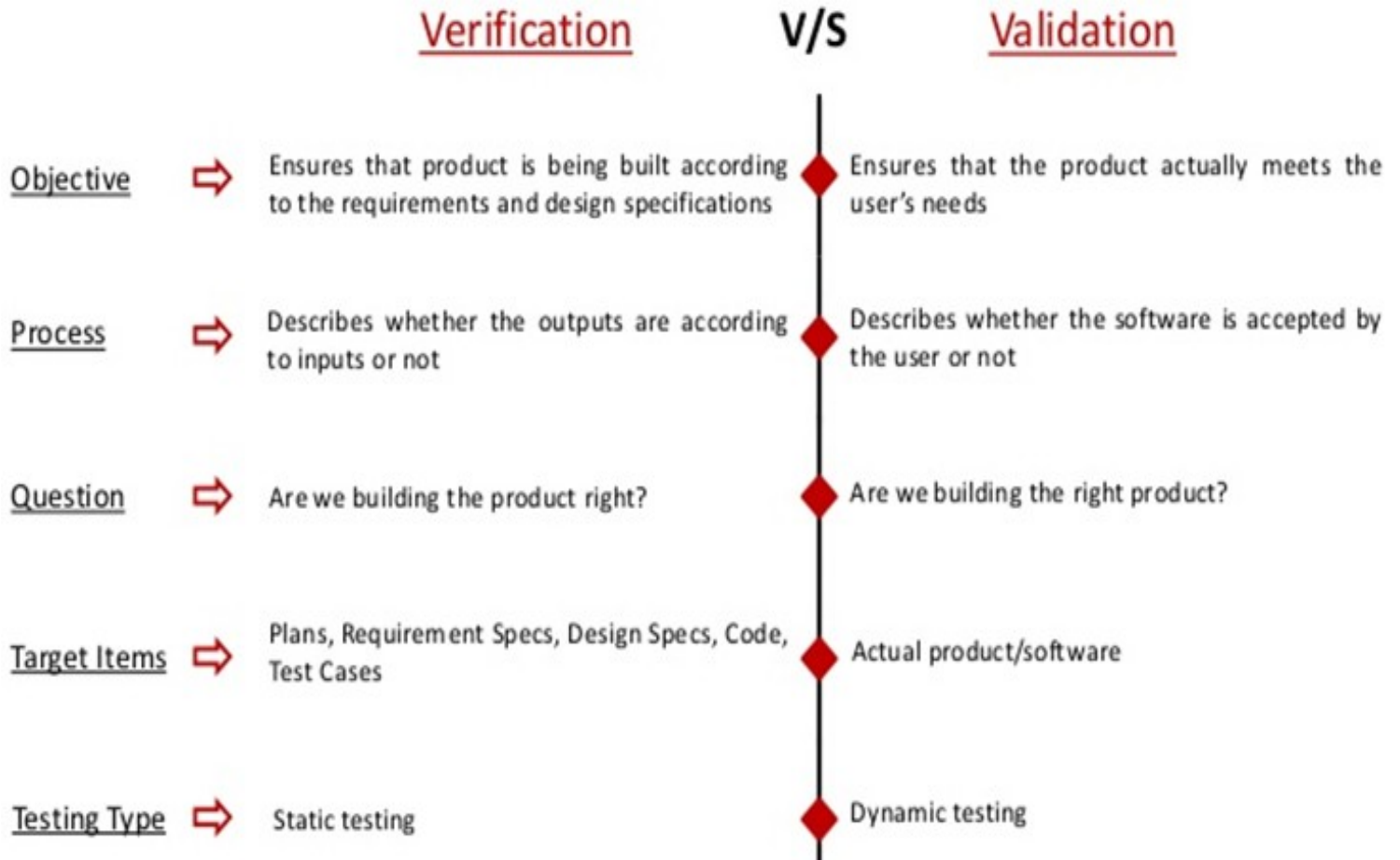
Internal Structure to Maturity Levels

- Except for level 1, each level is decomposed into key process areas (KPA)
- Each KPA identifies a cluster of related activities that, when performed collectively, achieve a set of goals considered important for enhancing software capability.
  - commitment
  - ability
  - activity
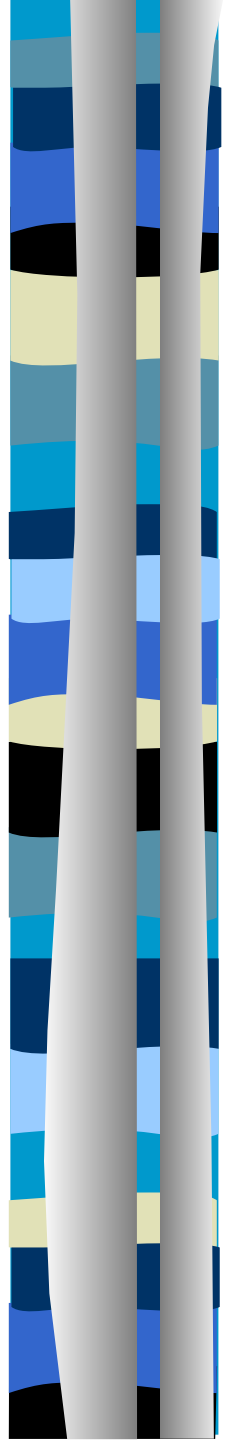 - measurement
  - verification

Verification vs Validation

	Verification	V/S	Validation
Objective	Ensures that product is being built according to the requirements and design specifications		Ensures that the product actually meets the user's needs
Process	Describes whether the outputs are according to inputs or not		Describes whether the software is accepted by the user or not
Question	Are we building the product right?		Are we building the right product?
Target Items	Plans, Requirement Specs, Design Specs, Code, Test Cases		Actual product/software
Testing Type	Static testing		Dynamic testing

ISO vs CMM

ISO	CMM
1. Generic Standard	1. Maturity Model
2. Applicable for all kinds of organization.	2. Applicable only to Software organizations.
3. Contain cluster	3. Contain Key Process Area(KPA)
4. Certification audit is like an examinations.	4. Final assessment is collaborative.
5. Result of certification is pass/fail.	5. The result of assessment is a quantitative score of maturity of software.

Thank You.