The Capability Maturity Model Of Software Development

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Motivations

Major software developments fail in three important ways:

- Budget overruns,
- Slipped delivery,
- Incomplete functionality.

Examples

- An unpublished review of 17 major department of defense (DoD) software contracts found that the average 28-month schedule was missed by 20 months.
- one 4-year project was not delivered for 7 years;no project was on time.
- Deployment of the B1 bomber was delayed by a software problem,and the $58 billion.
- A12 aircraft program was canceled partly for the same reason.

Capability Maturity Model

- The CMM for software is one of the products of the SEI.

- The CMM covers practices for planning, engineering, and managing software development and maintenance.

- The CMM describes an evolutionary improvement path for software organization from immature process to a mature.

Sign Of Immaturity:

- Software processes are either improvised or if in place not rigorously followed.
- Organizations are reactionary and focused on solving the immediate problem (fire fighting).
- Schedules and budgets are not based on realistic estimates and routinely exceeded.

Sign Of Immaturity ... cont'd

- Product functionality and quality are often compromised to meet schedules.
- Immature organization have no objective way to judge a product quality or solve product or process problems.
- The customer has little insight in to the product until delivery.

Sign Of Maturity:

- Work activities are carried out according to the planned process.
- Managed processes are usable and consistent with the way the work is actually carried out.
- Defined processes are updated when necessary.

Sign Of Maturity ... cont'd

- Schedules and budgets are based on historical performance and are realistic.

- Cost,schedule, functionality, and quality estimates are usually achieved.

Sign Of Maturity ... cont'd

- Improvement are through controlled pilot tests and cost-benefit analysis.

- Roles and responsibilities are clear within a project and across organization.

- Managers can accurately communicate the software process to staff and new employees.

Enterprise as an Organization Entity:

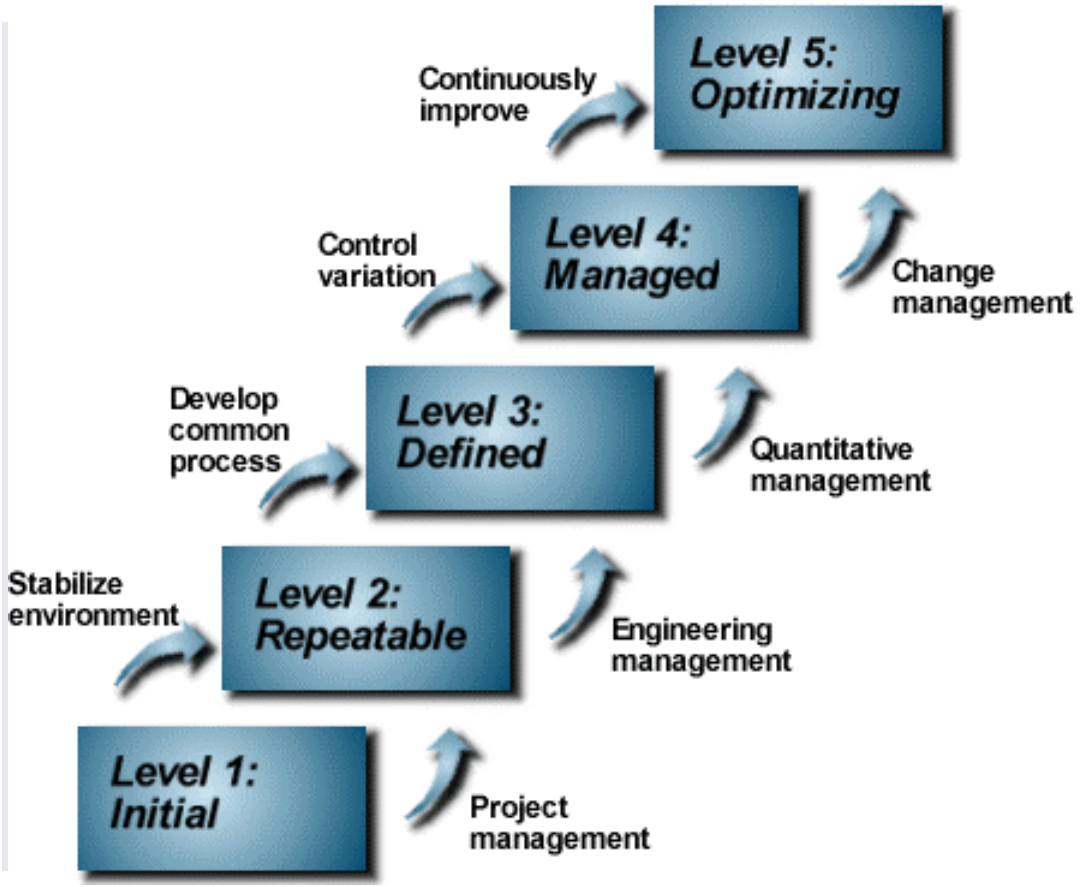
So far, enterprises have been recognized as:

- **Legal** and
- **Financial** entities.

Now, CMM would like them also to be recognizable as:

- **Organizational** entities.

CMM Levels of Organization



CMM Level 1: The Initial Level

The software process is characterized as ad-hoc, and occasionally even chaotic.Few processes are defined, and success depends on individual effort.

- Reaction driven commitment systems.State of constant crisis!
- During crisis, projects abandon planned procedures and revert to coding and testing.

CMM Level 1: The Initial Level

- Schedule, budget, functionality, and product quality are generally unpredictable.

- Capable individuals take their stabilizing influence with them when they leave the projects.Capability is a characteristic of individuals, not organization.

CMM Level 2: The Repeatable Level

Basic project 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.

- Planning and managing new projects is based on experience with similar projects and the requirements of the current project.

CMM Level 2: The Repeatable Level

- Projects have installed basic software management controls.
- Software managers track software costs, schedules, and functionality.
- The earlier successes can be repeated.

CMM Level 3: The Defined Level

The software process for both management and engineering activities is documented, standardized, and integrated into a standard software process for organization. All projects use an approved, tailored version of the organization's standard software process.

- There is a group that is responsible for the organization's software activity.

CMM Level 3: The Defined Level

- An organization-wide training program is implemented to ensure staff and managers have the knowledge and skills required to fulfill their assigned roles.

- Projects tailor the organization's standard software process to develop their own defined software process.

CMM Level 4: The Managed Level

Detailed measures of the software process and product quality are collected and quantitatively understood and controlled.

- Productivity and quality are measured for important software processes.

- The measurements establish the quantitative foundation for evaluating projects' software processes and products

CMM Level 4: The Managed Level

- The risks involved in moving up the learning curve of a new application domain are known and carefully managed.

- Software processes can be summarized as predictable because the process is measured and operates within measurable limits.

CMM Level 5: The Optimizing Level

- Continuous process improvement is enabled by quantitative feedback from the process and from piloting innovative ideas and technologies.

- The organization has the means to identify weaknesses and strengthen the process proactively.

CMM Level 5: The Optimizing Level

- Innovation that exploit the best software engineering practices are identified and transferred throughout the organization.

- Software process capability can be characterized as continuously improving.

- Improvement occur both by incremental advancements in the existing process and by innovation using new technology and methods.

The Key Process Area

- The key process areas an organization should focus on to improve its software process and achieve a maturity level.

- Each KPA identifies a cluster of related **activities (key practices)** that,when performed collectively,achieve a set of **goals** considered important for enhancing the process capability.

Key Process Area for Level 2

- Requirements Management
- Software Project Planning
- Project Tracking and Oversight
- Software Subcontract Management

Key Process Area for Level 2

- Quality Assurance
- Software Configuration Management

Key Process Area for Level 3

- Organization Process Focus
- Organization Process Definition
- Training Program
- Integrated Software Management

Key Process Area for Level 3

- Product Engineering
- Inter group Coordination
- Peer Review

Key Process Area for Level 4

- Quantitative Process Management
- Software Quality Management

Key Process Area for Level 5

- Defect Prevention
- Technology Change Management
- Process Change Management

Summery

The CMM is a useful tools for guiding software process improvement efforts.

The CMM is a well-defined evolutionary path toward achieving a mature software process.

References:

Books:

•The Capability Maturity Model:Guidelines for Improving the Software Process. M. C. Paulk, C. V. Weber, B. Cutis, and M. B. Chrissis.

•The Software Engineering Project Management. R. H. Thayer.

Webpages:

http://www.sei.cmu.edu/cmm/cmms/cmms.html

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