

CMM - What is it and how important is it?

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The software industry finds itself at the same crossroads as the manufacturing industry was in the sixties and the seventies. Then Japanese manufacturers took a leaf out of the best Quality practices and set up their manufacturing processes to produce goods that were cheaper and more reliable. Mention Software and what comes to mind is bugs, blue screens, core dumps, unreliability. Talk to a Business Manager and he will talk to you about missed deadlines, missed requirements, high cost of software repair and a complete lack of traceability. In short a feeling of helplessness.

Is there a way out? Take a step back and look at some of the most complex programs, the space shuttle, the satellite systems, the missile programs and you have extremely complex subsystems that are required to be defect free. How do they manage that? Most of these projects are run in environments that have focused and invested heavily in building and managing the processes surrounding product development.

There are no shortages of articles on Project management, but what characterizes a sound repeatable practice is process management. CMM (Capability Maturity Model) is a framework that focuses on processes for Software development. This was articulated by the Software Engineering Institute (SEI) at the Carnegie Mellon University. The CMM/SEI framework aims to distinguish mature processes from immature processes. It provides quantitative measures to the outcome of a Software process- such measures can be baselined and define the software process capability, or the range of results that can be expected if the Software process is used. The software process performance is the actual result achieved in a particular project.

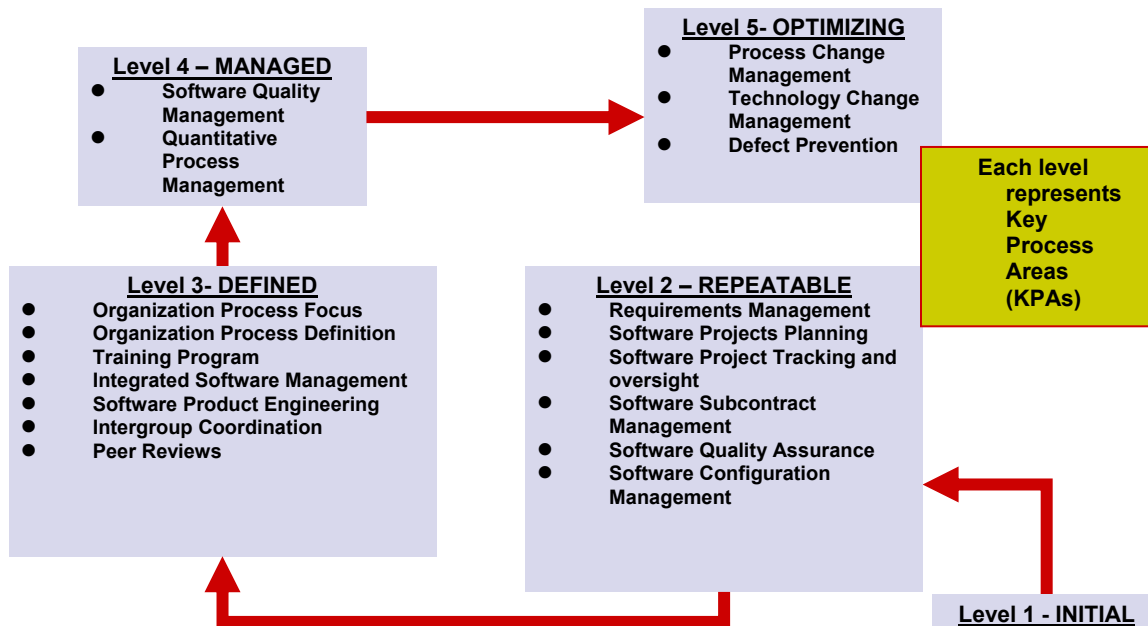
OBJECTIVES OF CMM/SEI

- Build strong software development processes
 - Reduce dependence on "champions" and ad hoc decisions
 - Regularly benchmark the process for process and capability maturity
 - Institutionalize process capability and maturity
- BENEFITS
 - Consistency across projects
 - Better Quality
 - Higher productivity
 - Predictable performance
 - Cohesive workgroups
 - Metrics for self improvement and not punishment
 - Better inter and intra team communication
 - Roles and Responsibilities well defined
 - SEPG for Quality assurances of "Process"
 - Continuous improvement goals

The focus of the framework is to have a standard set of processes that are followed across the Organization.

Thus, the CMM/SEI model provides for a structured way to define a process capability, allowing quality practitioners to look for ways and means to analyze, assess and continuously improve the software process. CMM is a framework and does not provide prescriptions.

The CMM categorizes software process maturity at 5 Levels:



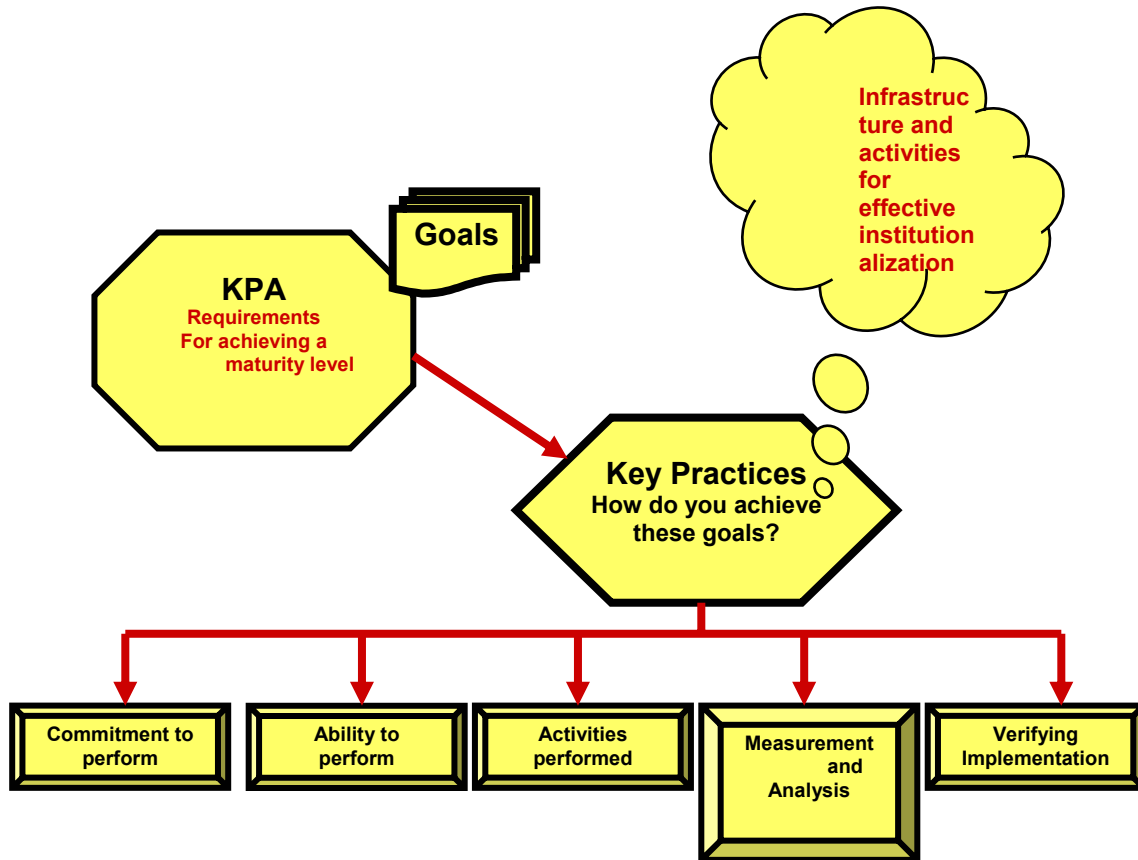
Each level represents the phases observed in companies as their development processes begin to evolve and mature. Each level is a step ahead of the other level and represents a level of "acquired and institutionalized" capability. For each level the CMM specifies some Key Process Areas (KPAs) and goals to be achieved. A KPA is a set of activities that when executed achieve certain goals for that level. A KPA is satisfied ONLY when all the goals have been met. To be certified at a Level all KPAs at that level AND all KPAs at lower levels MUST be satisfied at all times. Each KPA specifies a group of activities called Key Practices. Key practices define the infrastructure that has to be in place or activities, actions or conditions that must exist for the goals to be achieved. Key practices are grouped by common features across a group:

Key Practices are grouped by:

- Commitment to perform
 - Describes actions that the organization takes to support the KPA
- Ability to Perform
 - Focuses issues such as training, resource requirements, control structures
- Activities performed
 - Actual process activities that are recommended
- Measurement and Analysis
 - Measurements that need to be done for the activities in the KPA
- Verifying implementation
 - Activities that focus on ensuring that independent verification of the implementation of the process is done by individuals or senior management

CMM is a corporate commitment and not an individual or departmental initiative and part of the certification process focuses on corporate investment and endorsement to the program.

The CMM KPA can be pictorially represented as follows:



CMM-Key Process Areas (KPA):

KPA	GOALS
KPA at LEVEL 2	
Requirements Management	<ul style="list-style-type: none"> ❖ Software Requirements are controlled to establish a Baseline for Software Engineering ❖ Software plans, products and activities are kept consistent with requirements
Software Project Planning	<ul style="list-style-type: none"> ❖ Estimates are documented for use in planning and tracking the Project ❖ Project activities and commitments are planned and documented ❖ Affected groups and individuals agree to their commitments related to the project
Software Project Tracking and Oversight	<ul style="list-style-type: none"> ❖ Actual results and performances are tracked against the software plans ❖ Corrective actions are taken and managed to closure when

KPA	GOALS
	<p>actual results and performance deviate significantly from the software plans</p> <ul style="list-style-type: none"> ❖ Affected groups and individuals agree with changes to commitments
Software Subcontract Management	<ul style="list-style-type: none"> ❖ The prime contractor and subcontractor agree to their commitments ❖ The prime contractor tracks the subcontractor's actual results against its commitments ❖ The prime contractor and the subcontractor maintain ongoing communications ❖ The prime contractor tracks the subcontractor's actual performance against its commitments
Software Quality Assurance	<ul style="list-style-type: none"> ❖ Software Quality Assurance activities are planned ❖ Adherence of software products and activities to the applicable standards, procedures and requirements is verified objectively ❖ Affected groups and individuals are informed of Software Quality Assurance activities and results ❖ Non compliance issues that cannot be resolved within the projects are addressed by senior Management
Software Configuration Management	<ul style="list-style-type: none"> ❖ Software Configuration Management activities are planned ❖ Selected software work products are identified, controlled and available ❖ Changes to identified software work products are controlled ❖ Affected groups and individuals are informed of the status and content of software baselines

KPA	GOALS
KPA at LEVEL 3	
Organization Process Focus	<ul style="list-style-type: none"> ❖ Software process development and improvement activities are coordinated across the organization ❖ The strengths and weaknesses of the software process used are identified ❖ Organization level process development and improvement activities are planned
Organization Process Definition	<ul style="list-style-type: none"> ❖ A standard software process for the organization is developed and maintained ❖ Information related to the use of the organization's standard software process by the software projects is collected , reviewed and made available
Training Program	<ul style="list-style-type: none"> ❖ Training activities are planned ❖ Training for developing the skills and knowledge needed to perform software management and technical roles is provided ❖ Individuals in the software engineering group and software

KPA	GOALS
	related groups receive the training necessary to perform their jobs
Integrated Software Management	<ul style="list-style-type: none"> ❖ The projects defined software process is tailored version of the organizations standard software process ❖ The project is planned and managed according to the project's defined software process
Software Product Engineering	<ul style="list-style-type: none"> ❖ The software engineering tasks are defined, integrated and consistently performed to produce the software ❖ Software work products are kept consistent with each other
Intergroup coordination	<ul style="list-style-type: none"> ❖ All affected groups agree to the customer's requirement ❖ All groups agree to the commitments between different groups ❖ The groups identify, track and resolve intergroup issues
Peer Reviews	<ul style="list-style-type: none"> ❖ Peer review activities are planned ❖ Defects in the software work products are identified and removed

KPA	GOALS
KPA at LEVEL 4	
Quantitative Process Management	<ul style="list-style-type: none"> ❖ The quantitative process management activities are planned ❖ The process performance of the project's defined software process is controlled quantitatively ❖ The process capability of the organization's standard software process is known in quantitative terms
Software Quality Management	<ul style="list-style-type: none"> ❖ The project's software quality management are planned ❖ Measurable goals for software product quality and their priorities are defined ❖ Actual progress toward achieving the quality goals for the software products quantified and managed

KPA	GOALS
KPA at LEVEL 5	
Defects prevention	<ul style="list-style-type: none"> ❖ Defect prevention activities are planned ❖ Common causes of defects are sought and identified ❖ Common causes of defects are prioritized and systematically eliminated
Technology Change Management	<ul style="list-style-type: none"> ❖ Incorporation of technology changes is planned ❖ New technologies are evaluated to determine their effect on quality and productivity ❖ Appropriate new technologies are transferred into normal practice across the organization
Process Change Management	<ul style="list-style-type: none"> ❖ Continuous process improvement is planned ❖ Participation in the organization's software process improvement activities is organization wide ❖ The organization's standard software process and the project's defined software process are improved continuously

What is the state of an Organization at various levels?

LEVEL 1 ORGANIZATION

- No set processes- processes used on an ad-hoc basis
- Each project implemented in a manner that the Project manager and Team see fit
- Software Management is people centric
- Heavy dependence on "Champion" Project Managers for project success
- People centric and determined process – if it works great

LEVEL 2 ORGANIZATIONS

- Project Management Practices are well established
- Work breakdown structure with requirements management and traceability
- Projects planning and tracking
- Quality Assurance - Problems identified and corrective action taken
- Infrastructure processes
- Cost, schedule and functionality can be tracked
- Disciplined processes
- Work products baselined

LEVEL 3 ORGANIZATIONS

- Software processes properly defined and regularly followed
- These are denoted as standard processes
- Tailoring guidelines provide for deviating in a controlled manner
- A Software Engineering Process Group (SEPG) oversees these processes and its implementation
- Structured peer reviews
- Integrated Software Management
- Best practices cut across projects- inter-group coordination
- Process assets are maintained and managed
- Training programs and guidelines are established
- Management insight exists by measurement

LEVEL 4 ORGANIZATIONS

- Capability of the Organization process is understood quantitatively
- Process capability is employed to set quantitative goals for a project
- Decisions are made based on objective data
- Measurement and analysis at every stage of the development process
- Data on actual performance of the current project compared with past performance
- Causative analysis is performed.
- Monitoring and corrective action will take place on an ongoing basis
- Set quantitative goals for the projects and have suitable plans to achieve these goals
- Actual performance measured against planned - If there are deviations proper corrective actions are taken

LEVEL 5 ORGANIZATIONS

- Focus on improving the capability of the process
- Systematic analysis of cause of defect that has to be eliminated
- Introduction of technology to improve quality and productivity- measure effect quantitatively
- Innovative ideas are tested and quantitatively measured

- Process strength and weaknesses are identified proactively - Quantitative measurements
- Assess benefit for any changes
- Continuous product and process improvement
- Improvement takes place continuously in a planned manner with the involvement of a large cross section of the organization

How important is CMM to you?

CMM by itself will not guarantee that the work being done would be an outstanding or sure success. There have been instances where CMM certified organizations have not performed on projects. What CMM ensures is that the practicing organizations have set up systems, checks and balances to make sure that results would be predictable. If things are not going right you will get a better picture early on. The focus is on defect identification efficiency so downstream defects will be significantly reduced. CMM certified companies have shown defect injection reduction significantly some have demonstrated quality improved from about 60% to around 99% just in defects.

CMM converts an art to a more defined and repeatable process thus you can be assured of a certain consistency in the delivery. Defect prevention at every stage of the process improves productivity and the "cost" of development. It is a systematic approach to software development.

As an outsourcing Company take advantage of the CMM process, it brings immense discipline and visibility to ongoing activities. As an outsourcing company you are part of the production process- it would help to imbibe the methodology for your own benefit. At least, understand the methodology so you do not become a bottleneck in the process. There is a lot to gain by practicing it.