# Capability Maturity Model the most extensively used model in the software establishments

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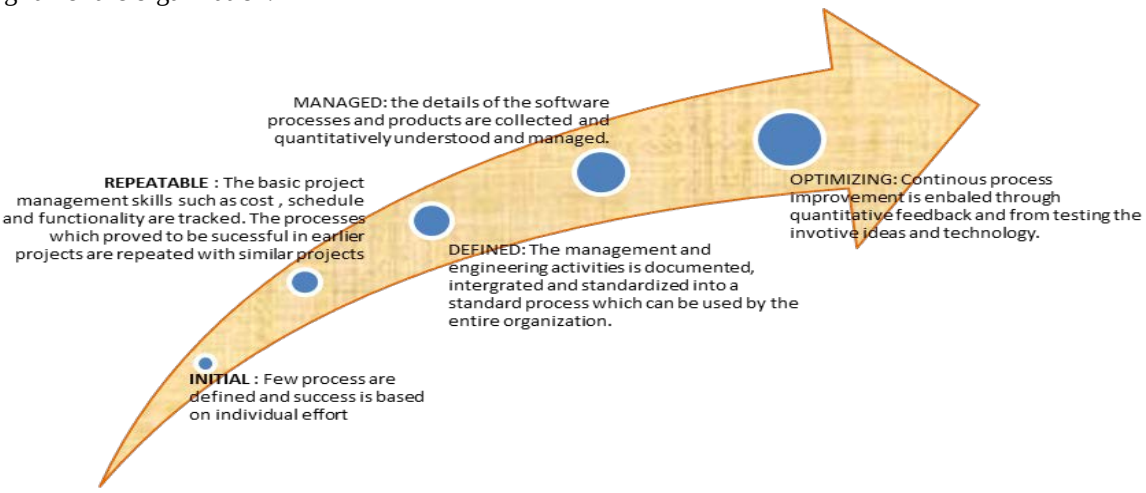
## I. INTRODUCTION

An organization develops software in order to meet the functional needs and to keep a track of the estimated budget and time. Though many tools such as Object Oriented Language, middleware have been introduced, the Capability Maturity Model is the most widely used model in the software organizations.

A software organization can be run in either as an immature software organization where the immediate crises are solved but the employees does not meet estimated budget and schedule. In this kind of organization the product functionality and quality will be compromised as there is no process improvement techniques used for the long run of the organization.

In order to meet the realistic schedules and the estimates and also improve the functionality, quality and cost of the product Capability Maturity Model is introduced. This Model is mainly implemented in software organizations for improving the current process by identifying critical software quality and process improvement issues in areas such as schedule, effort, and cost.
There are five maturity levels to check the maturity and capability of an organization's software process. These levels will also help the organization to identify its area for improvement. CMM is a descriptive model, where it explains use the key points that would group an organization into a particular level.




The initial level mainly deals with adhoc or chaotic tasks whose success rates depend entirely on the individuals working in the project.

The repeatable and defined levels will help the staffs to perform, document and build their skills from the documents written by the experienced employees in the team. These levels will also help people to continuously improve their knowledge and develop their skills.

Level 2 is the base for level 3; normally it will nearly take a year or two for an organization to move from level 2 to level 3.
The managed level is a process control level, where the software process is managed to operate in a stable manner within the zone of quality control.

The optimization process is a continuous process improvement, where the software process is changed to improve the quality of the product. The organizations which belong to this particular level will have the capability developing reliable software process within predictable limits and estimated costs.

**Overview of the five maturity levels**

LEVEL 1: THE INITIAL LEVEL

At this level, the organization lacks good management practices and the benefits of the good software engineering practices will lead to ineffective planning and reaction driven commitment system. In such systems, the success of the project entirely depends on the capability of the individuals working in that particular project. The schedules, functionality, budgets, and product quality at this level is highly unpredictable as the performance depends on the capability, skills, knowledge and motivation in the individuals working the particular projects.

LEVEL 2: THE REPEATABLE LEVEL

At this level, the organization will repeat the successful practices from its previous software projects. This is a more disciplined level as the planning and tracking of the software project becomes more stable and the software managers can track the cost, schedules and functionality.

LEVEL 3: THE DEFINED LEVEL

At this level, a standard document is created for developing and maintaining the software across the organization. There is a well-defined process such as readiness criteria, inputs, standards and procedure for performing the work, verification mechanism, outputs and completion criteria. As this software is well defined, the management system will have good control on the technical and functional progress of the project. This processes established will help the employees of the organization to perform effectively.

LEVEL 4: THE MANAGED LEVEL

At this level, the organization will set quantitative quality goals for the software products and processes. The success rate of the project is predictable as the entire process is estimated and operates under the estimated limits. In this level, the level of process capability will allow the organization to check if the process and product quality is still within the quantitative bounds of the measured limits.

LEVEL 5: THE OPTIMIZING LEVEL

This is a continuously improving level which continuously strives to improve the organizations process capability and also the performance of the project. The improvisation occurs mainly by implementing innovative ideas in new technologies and methods.

**Visibility into the software process at each level**

Apart from the software engineers who have the primary exposure to the project, there should be visibility for the managers to have idea about the nature and the work progress in the project.

The visibility in the project at different levels may vary accordingly. For instance, at the initial level, there will not be any clarity for managers about the project as there are no proper tracking and estimates done in the project. In the next level, the basic project management activities are taken care and the requirements from the customers and the work progress are captured in a systematic manner. As the level the project increases, there will be more clarity in the project; both the managers and the engineers will understand their roles and responsibilities. The accurate status and the work progress of the project can be obtained very easily. As the project grows to the next level, the accuracy and the success rates become high as the visibility into the project becomes high. The risk areas are identified in prior and appropriate measures are taken to rectify it.

Based on the maturity level, the software process can predict the project's ability to meet its goals. As the maturity level increase the difference between the estimated result and the actual result decreases across the projects. For example, a project in level 1 will find it difficult to meet its target delivery date and there will be wide differences in the actual project delivery date due to its unpredictable nature, whereas in a level 5 project, the difference between the actual and scheduled delivery date may vary with a small range of difference.

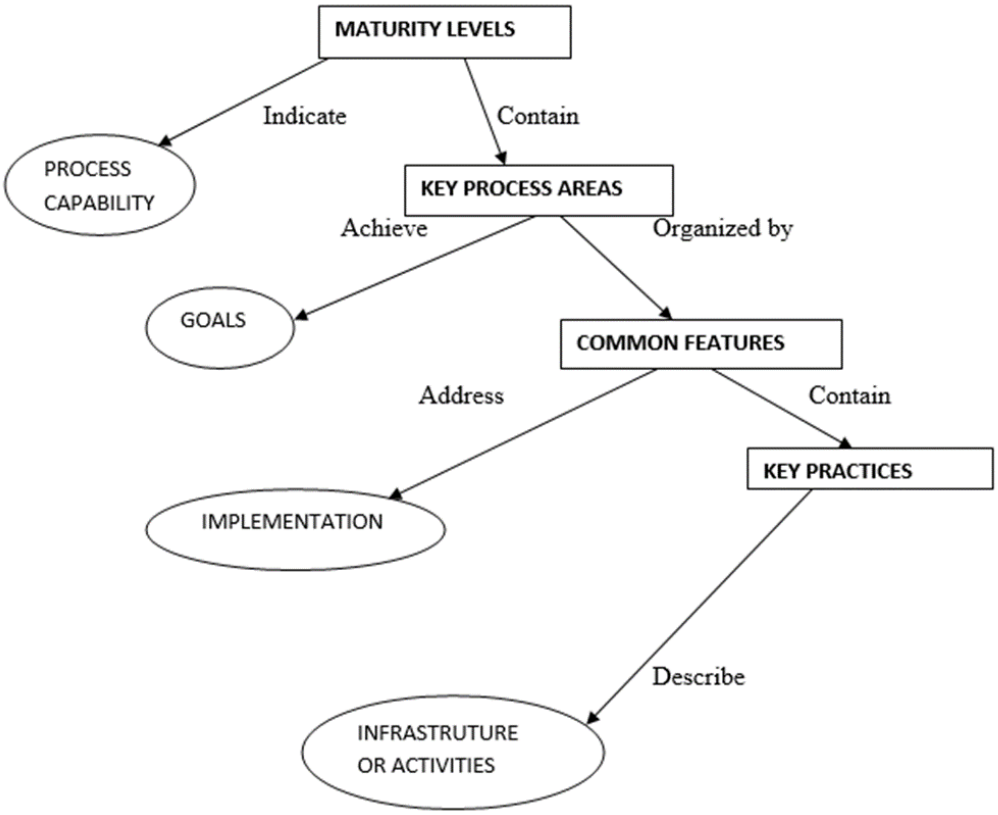
As the maturity of the organization increases, the targeted result also increases by reducing the cost, shortening the development time and increasing the productivity and quality of the project. At lower maturity level, the development time can be longer due to rework; this in turn will increase the cost of the project and decrease the productivity and quality of the product. At the same time in higher levels, there will be continuous process improvement and defect prevention techniques to increase the efficiency of the project.

Each maturity level acts as a foundation for the succeeding maturity levels, so skipping any of the above levels will not be productive. The processes without a proper foundation will fail at every step and there won't be any future improvements.

If a Level 1 organization skips level 2 and moves to level 3 directly, the management processes will be under pressure, due to which the engineering processes will be sacrificed to schedule and cost pressure. If the level 4 is implemented without implementing level 3, it will result to a failure in the organization as it's difficult to identify meaningful processes in the absence of level 3 (defined level). As a result, the organization should focus on the needs of improving the process; efforts need to be taken to implement processes from high maturity levels instead of skipping the levels.

The operational elaboration of CMM is made to support the different in which it can be used. The strengths and the weakness in the organizations can be identified using CMM by the assessment team. CMM helps to identify the risks in selecting the contractor for outsourcing and to monitor the contracts. CMM is used to understand the necessary activities to plan and implement a process improvement program in the organization. CMM helps to improve and define software processes in the organizations. Because of various uses of CMM, the actual process recommendations can be derived from the structure of maturity levels.

**Internal Structure of Maturity Levels**



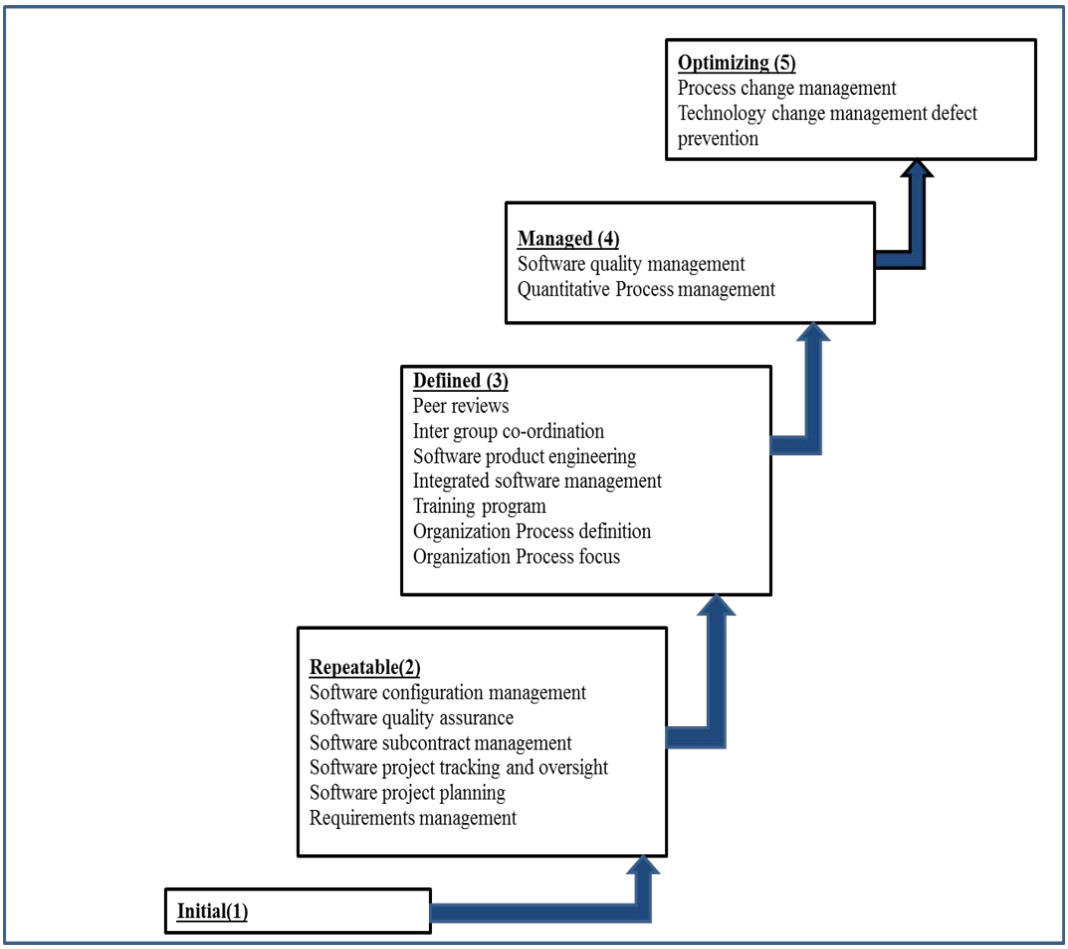

Maturity level:

Each maturity level will define the maturity of the organization. As the maturity level increases, the organizations will have a sound project management control and the activities will work in a disciplined manner.

Key Process Area:

It is a collection of activities which should achieve a set of goals to improve the process capability of the organization. At different levels, the path to achieve the key process area may differ across the projects based on the platform or domain of the project.

Key process areas by maturity level




The CMM does not describe all the processes areas that are involved in development; it will only describe the key processes which will enhance the process quality. Each maturity level has certain set of key processes which has to be satisfied. The key processes of CMM are one of the ways to describe the organizations maturity. Each of these key processes is set based on the experience in the software industry i.e both in the engineering and management fields.

Description of the key process areas at level 2

- Requirement management establishes an understanding with the customer and the organization on the customers' requirement. This agreement will act as the basis for planning and managing the software projects.
- Software Project Planning: a realistic plan is made for performing the software engineering and managing the project. As without a proper plan, project cannot be implemented effectively
- Software Project tracking and Oversight: provides more visibility into actual progress so that appropriate actions can be taken when software projects performance deviates from the actual plan.
- Software Subcontract management: it will select the qualified subcontractors to award them with business and manage them efficiently.
- Software quality assurance: will provide the management with the needed visibility into the project and the end products built by the project.
- Software configuration management: it is the integral part of most of the management and engineering process. It is mainly meant to provide integrity of the products built by the software projects throughout the projects software life cycle.

Description of the key process areas at level 3

- Organization Process Focus: it builds the organizational responsibilities for software process to improve the organizations overall process capabilities.
- Organization Process Definition: to improve the performance across the project, a usable set of software process assets is maintained and developed to provide basis for cumulative long term benefits to the organization.
- Training Program: to perform the roles and responsibility effectively, the individuals should be trained to develop their skills and knowledge. The software projects should identify their needed skills and train the employees based on the requirements of the project.
- Integrated software management: it integrates the software engineering and management activities to a well-defined software process that is tailored from organizations software process and assets. The software project planning and Software Project tracking and Oversight at Level 2 acts as a foundation for integrated software management.

- Software Product Engineering: this process integrates the software engineering activities to produce efficient and effective software products. It describes technical activities of the project such as requirements, analysis, design, code and test.
- Intergroup Co-ordination: it co-ordinates the software engineering groups to participate actively with other engineering groups so that the customer requirements can be satisfied effectively.
- Peer Review: is done to remove the defects from the software projects efficiently.

Description of the key process areas at level 4

- Quantitative process management: it quantitatively controls the performance of the software project. The performance of the software process depends on the actual results achieved by following the software process.
- Software quality management: this develops an understanding on the quality of the software projects product and achieves specific quality goals.

Description of the key process areas at level 5

- Defect Prevention: it identifies the defects, rectifies it in the software process from recurring.
- Technology change management: it identifies new technologies and transfers them into the organization in a disciplined manner.
- Process change management: this process continuously improves the software processes by improving the quality and productivity of the product and also by decreasing the cycle time required for the product development

Common features:

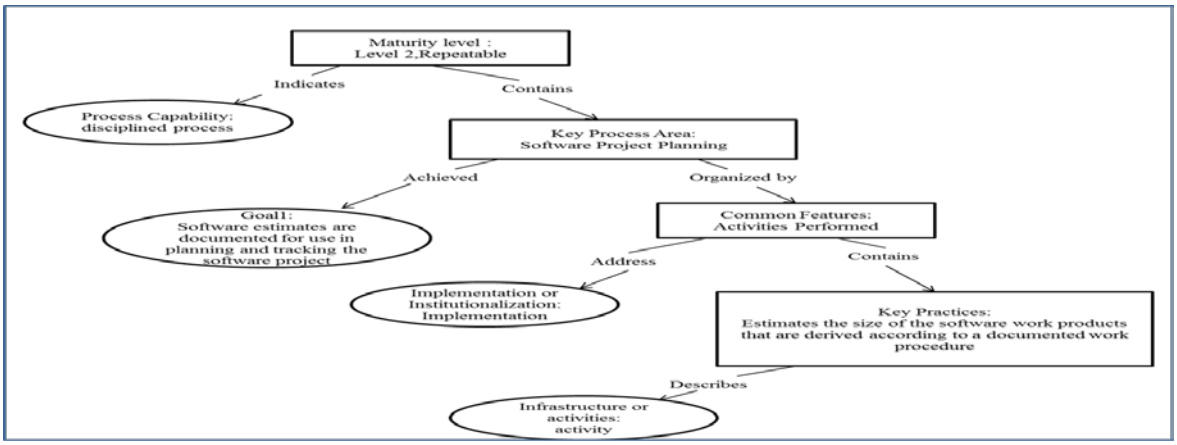
Common features are the attributes which ensures that the implementation of the key process areas is effective, repeatable and lasting. The five common features are:

- Commitment to perform: it describes the actions that will be taken by the organization to ensure that the process is established properly
- Ability to perform: It describes the preconditions such as resources, organizational structures and training that should exist in the project to implement software process.
- Activities performed: it describes the roles and procedures such as estimating the plans, tracking the completed work and taking corrective measures in case of any defects to implement a key process area.
- Measurement and Analysis: It describes the need to measure and analyze the process. It will check the status and effectiveness of the activities done in the project.
- Verifying implementation: it makes sure that the activities performed in the project are performed in compliance with the established process. These measures include reviews and audits by the management and software quality assurance team.

Key practices:

Each key process area is defined in terms of key practices that satisfies its goals. The key practices describe the infrastructure of an organization and the activities that contribute to the implementation of the key process area. The below given process diagram shows a detailed example of the structure underlying a key practice for the Software Project Planning key process.

The below figure makes sure that the goal for achieving the goals for documenting plans for planning and tracking the project, the organization should have an already documented procedure for deriving the estimated software size. The details of the expectations of this procedure would be historical size data, assumptions in documenting, and reviewing the estimates. The main idea of using key practices is that the goals set in the key process areas are achieved efficiently.




**Software Process Assessment and Software Capability Evaluation Methods**

Software Process Assessment: This process mainly focuses on identifying the improvement areas and prioritizing it using the CMM which will help them in identifying and prioritizing. The guidance provided by key practices in CMM helps to plan an improvement strategy for the organization.

Software Capability evaluation: This process focuses in identifying the risk related with a project or contract on building high quality software within the estimated schedule and budget. These types of evaluations are performed on the existing contracts to check their performance and identifying their potential improvement in software process.

Common Steps in Software Process Assessments and Software Capability Evaluations

Firstly a team which is well trained in CMM as well as assessment and evaluation method should be selected. The members in the team should have equal knowledge in both engineering and management areas.

The second part would be to have a representative from a site that would be assessed and evaluated to complete the maturity questionnaire. Once it is completed the team will perform a response analysis which tallies the questions and identifies the areas that needs more concentration.

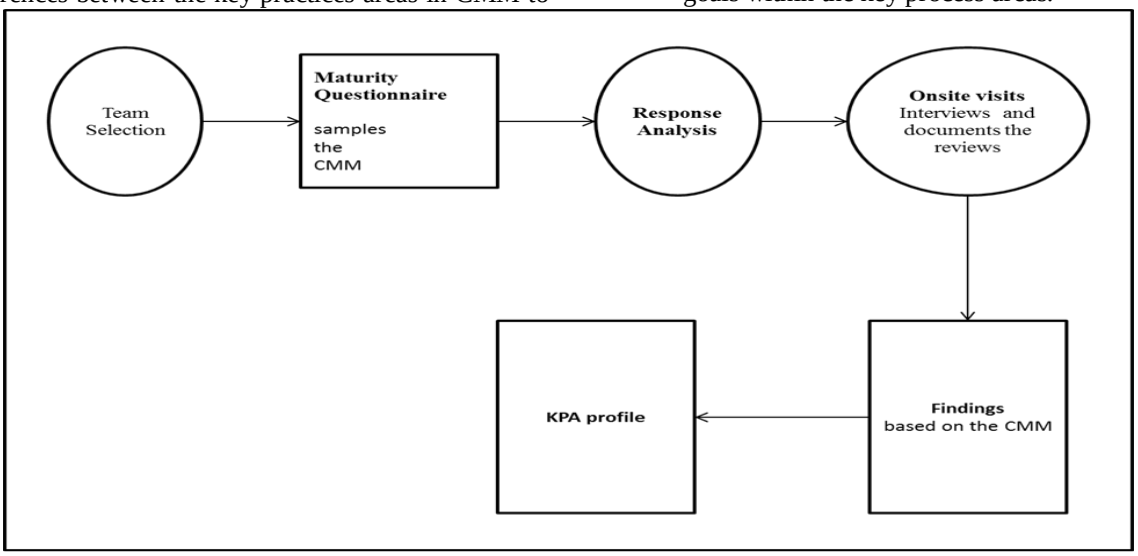
After tallying, the team will visit the site which has to assess and based on the results of response analysis, the team will conduct interviews and reviews documentation to gain understanding of the software process done in the site. The key process areas and the key practices acts as a guide to the team members for questioning, listening and reviewing the information's in the document. Based on the team's professional judgment, it has to be decided whether the implementation of key process areas will meet the relevant key process area goals. If there are differences between the key practices areas in CMM to that seen in the site, the team should document its rationale for judging that key process areas.

The list of findings which identify the strengths and weakness of the team at the end of the on-site period act as the basis for process improvement in software process assessment, whereas it becomes a part of risk analysis in software capability process.

Finally the key process area profile is prepared by the team which gives the details of the areas where the organization has achieved the goals and not achieved the goals.

To summarize both the software process assessment and software evaluation method, few points are mentioned below:

- The maturity questionnaire is used as reference during the on-site visit
- CMM is used as a map for guiding the on-site investigation
- Finds the strengths and weaknesses in terms of key process areas in CMM
- Based on the analysis, a profile is created to satisfy the goals within the key process areas.




Differences between software process assessment and software capability evaluation

Though there are some basic similarities as mention in the above paragraph, the Software Process Assessment and Software Capability Evaluation differs in factors such as motivation, objective, outcome, and ownership of the results. The detailed difference between the software assessment and Software Capability process are given below:

Software Process assessment: The success of this process depends on the commitment and the success of the staffs to improve the organization. The questionnaires used in this process are used for testing the maturity levels issues. The interviews play a vital role in understanding the organizations software process. Besides the above factors, the motivation and enthusiasm in executing the scheduled plans are most valuable outcome of the assessment.

Software Capability evaluation: it is based on an audit oriented method. One of the main objectives is monetary consideration, as the teams evaluation will select the contractors and select the award fees. The documentation also plays a vital role, and the documented audit trail proves that the software process is implemented by the organization.

Other Uses of the CMM in Process Improvement

CMM can be used in other areas such as action planning, implementing the action, and defining the processes. For example, in Action Planning the members of the software process management team who have good knowledge on the issue in their project can compare their current issues with that of the goals set by the key process areas in CMM.

Future Directions of the CMM:

CMM is mainly developed to obtain an orderly, disciplined framework to address the management and software issues. It does not cover various others factors such as address expertise in a particular domain, how to select, hire and retain expert staffs.

Short-term activities:

Across United States, many tutorials and conferences are held to create awareness among the organizations in the industry to provide adequate knowledge about CMM and its associated tools, Software Process Assessment training, Software Process Capability evaluation. As a short term focus, a tailored version of CMM should be developed in small projects or small organizations.

Long –term activities

In the coming years, CMM will continue to improve its standard through continuous testing through use in software process assessments and software capability evaluations. Though the document will be continuously modified, CMM v1.1 will always remain as the base version.

The next version, CMM version 2, more priority will be given to levels 4 and 5 than to level 2 and 3. Further, CMM will also include various technology and human resource issues and become a multi-dimensional process.

A study was done, to assess the perceptions of personnel within the process improvement and process maturity work groups. Using the CMM architecture as the base, the Industrial Process Maturity Model (IPMM) was proposed. The data was tested with the help of various tools such as ANOVA and Pearson correlation coefficients. A set of survey questionnaire was circulated randomly to the Forbes 500 listed companies in US for the year 2001 and 2002. For the statistical purpose, respondents were grouped as management and non-management personnel.(Varkoi, Makinen, Mäkinen, & Makinen, 1998)

On comparing the both the methods, CMM and the proposed IPMM, there are similarities and differences. Each level of the proposed IPMM method relates to the philosophical description of CMM. And the key difference between both the methods are, CMM contains many Key process areas within its architecture which decides the maturity level of the organization, but the proposed IPMM does not contain any key process in its current design.

Based on the questionnaire, the first five questions is directly related to CMM's five maturity levels, and formed as the basis for the proposed IPMM maturity levels. The series of questions from proved that the system/organization was chaotic and continuous evaluation for improvement of the production process was not taken care.

The questions were taken as the organizations additional attributes that was supported by both CMM and IPMM architectures. The testing results proved that the procedural documentation and training for the employees were carried out properly. This survey also proved that the process maturity was not considered within previous and existing improvement initiatives.

The questions for comparing the relation between maturity level production process grouping and categorical grouping of processes for improvement facility, a slight positive relation was found.

**CMM and Six Sigma model**

CMM provides organization with a framework to improve their process areas and to reach higher maturity levels. However at times the organization finds it difficult to match the goals set for process improvement with that of the customer expectations and to predict and estimate the schedule, effort and quality. In order to address these issues, six-sigma is introduced.

This research mainly explains the idea of introducing the six-sigma to gain statistical insight of achieving goals set by the software organization and customer needs. This research is carried in an organization named Tata Consultancy Services (TCS). The below given are the measures taken by TCS to include the CMM based process framework. To meet the business goals, various quality concepts are included into TCS-QMS. Currently out of 17devlopment centers, 15 are operating with SW-CMM level 5 maturity level. TCS ensures customer satisfaction in the following ways:

- Designing good product and service quality
- Quality control activities are integrated into software development.
- Quality assurance is stressed to prevent defects
- The process and quality is managed using metrics
- Continuous improvement is tested by introducing new technologies.

Features of TCS-QMS framework

- It provides a foundation for good project management by tracking cost, schedule, quality, and functionality. It also satisfies project level 2 KPA goals by estimation guidelines, checklists, procedures, project management review meetings, and automated project-tracking
- It provides architecture, for sharing the knowledge across the organization. The process engineering group and process owners implemented the process improvement techniques' in the software development life cycle such as training programs service level agreement and product peer reviews.
- It gives importance to data-driven management of software product and process quality.
- Statistical tools are used to identify the source of process problems and to identify and improve them.

CMM provides the basic infrastructure to the organization, which along with implementing the six sigma technique will help the organization to improve their market place competition and achieve their business goals.

Six-sigma focuses mainly on reducing the process variation and trying to make the process mean to coincide with the process target. It also helps to build the knowledge and skills necessary to address the key requirements in CMM such as quantitative process management, software quality management, defect prevention, technology change management, and process change management.

Using the six sigma technique, a metrics was designed to convert the customer needs into operational measurements. The analysis of different types of metrics is given in detail below:

Customer-centric metrics program

The quality functional track is used to identify the software process and product metrics. This quality tool translates the customer needs into manageable actions. The below table shows the QFD house of quality matrix. The column total represents sum of products of each customer requirement and product

requirement rating. The relationship between product characteristics and customer requirements is rated based on the relationship's strength (9- strong relationship, 3 medium relationship, 1-weak relationship).Then the team will further analyse the product requirements to design features that needs to meet these requirements.

| **Quality Function deployment** | | | | | |
|---|---|---|---|---|---|
| **First House of Quality deployment function** | **Product Requirements** | | | | |
| **Customer Requirements** | **Rating** | **Object Oriented design** | **Use cases** | **Traceability** | **Coding standards** |
| Reliability | 10 | 9 | 9 | 9 | 3 |
| Maintainability | 10 | 9 | 3 | 9 | 9 |
| Portability | 7 | 9 | 3 | 3 | 3 |
| Testability | 5 | 3 | 9 | 9 | 1 |
| Total Of rating X requirement | | 258 | 186 | 246 | 146 |

Based on the above test results, the team will select the in-process metrics, to meet the objectives specified by the customer:

- Strict measures are taken to align business priorities.
- Process and product performance against client-established targets, operational requirements, and quality objectives are benchmarked.
- Processes are improved to attain the defined performance limits.
- Facilities are given to achieve the goal of continuous improvement.

Metrics Analysis and Management:

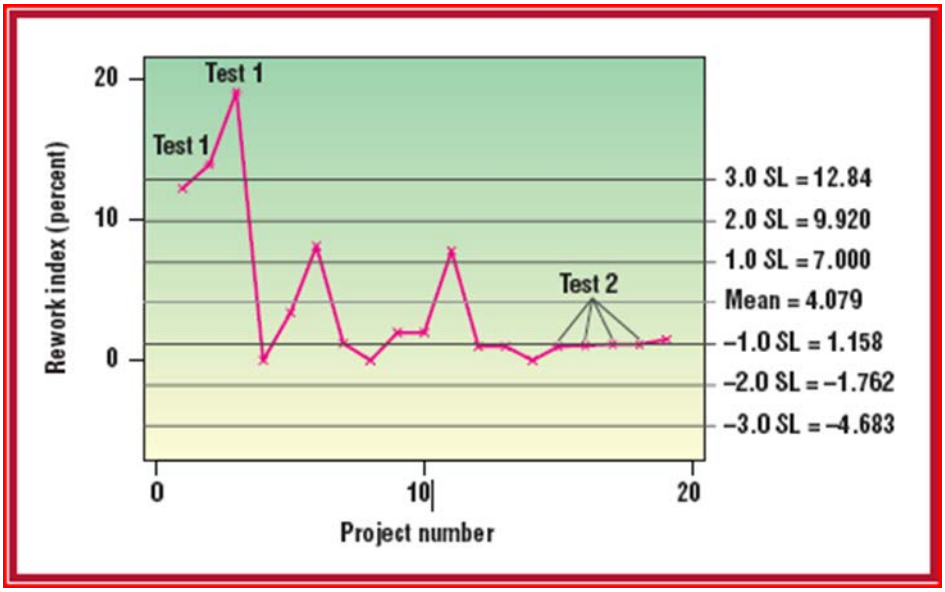
The process variability is the basis for process metrics analysis. Process variation has two components:

Natural process variation /common-cause or system variation: These variations happen naturally in all the process.

Special cause variation: it is caused by some extra-ordinary situations in the project.

To produce a good output, both types of variations should be reduced to make the system more predictable. The special causes are identified through the presence of points outside the control limits of ± 3σ limits. The below figure represents the two process tests carried out. The test1 shows the limits outside ± 3σ and the points that are 1σ from the center line.

Control chart patterns for a sample process. The process failed two tests: Test 1 identified points two and three as outside the 3.00 sigma limit (SL); Test 2 identified points 15–18 as 1.00 sigma from the center line.




Test 1 showed special variation and failed the test as it resulted from the strict schedules which had to be re-worked after internal reviews. This test was corrected by loading project teams more uniformly which helped to reduce the re-work as the team members had experience in their prior project. This test yielded

good result and proved that there was knowledge sharing in the team.

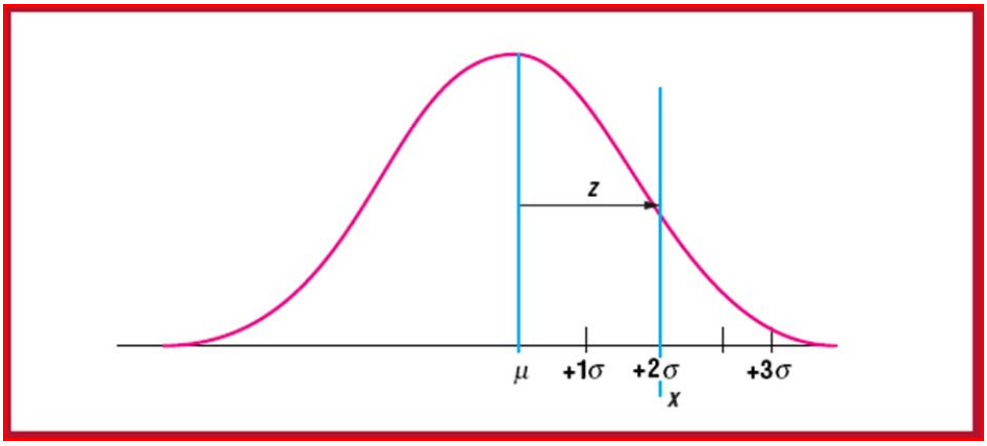
Process Capability Calculation:

Six-sigma monitors the process using control charts, which compares the control limits with that of the specification limits. Process capability is measured in terms of capability indices Cp, Cpk, and Cpm. Capability indices are not used to describe the process, instead they are used to compare the process capability.

In terms of sigma capability ( as shown in the below graph), process capability is the number of standard deviations that is accommodated within the mean and the specification limits. This corresponds to defect probability and is computed as :

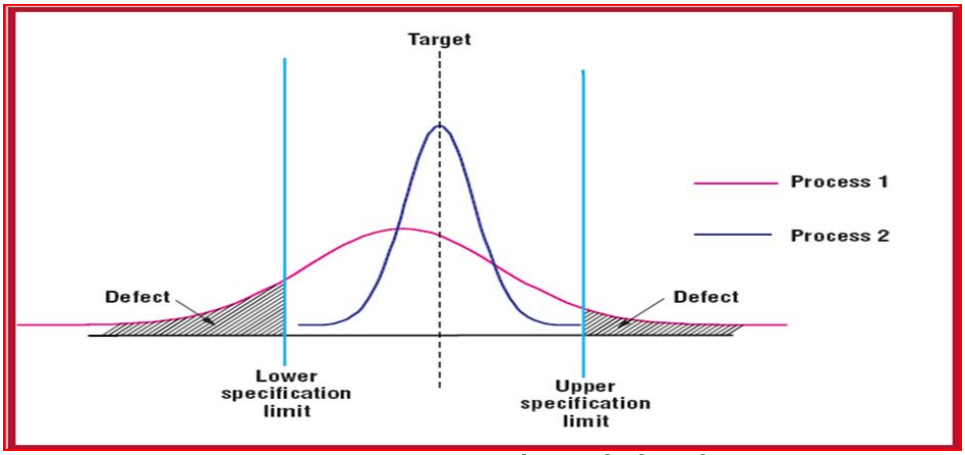
$Z = (x-\mu)/\sigma$

Where x is the specification limits,μ is the mean, and σ is the standard deviation



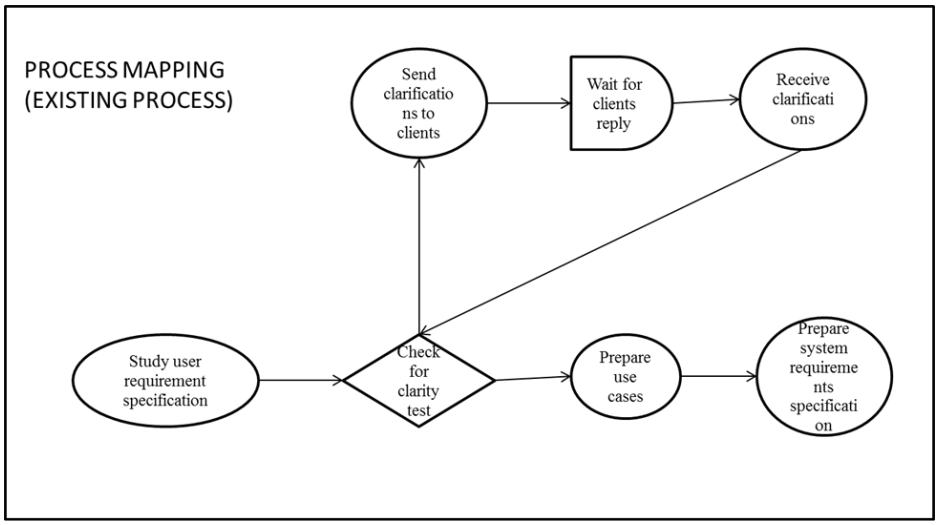

The Z capability is the area under the normal curve up to the specification limit. Tracking the process capability in terms of Z makes sure that the process variations are reduced and also the process centering objectives.

To test the variations, two processes were taken as example. The process 1 has large variations and produces many defects outside the specification limits whereas process has less variation and fewer defects. Therefore by calculating the process capability, it helps to estimate the acceptable and unacceptable characteristics in the process. The below figure shows the graphical representation of both the processes:




Continuous improvement:

Blending six-sigma along with CMM will help in continuous improvement as six sigma is the foundation to define, measure, analyze, improve, and control the processes. There are other methods such as process mapping and Failure Modes and Effects Analysis (FMEA) which will understand the defects and prioritize process improvement. The below figure represents the process mapping which is implemented in CMM level 3 practice to understand the software process




Process mapping shows the order of the process elements and its interfaces, and interdependencies among the elements. It also helps to identify any process delays and loops, identify problem spots and improvement targets.

**Comparing ISO 9001 with CMM**

There are lots of differences and similarities between ISO 9001and CMM. The below table describes the clauses of ISO 9001 with that of CMM key process areas and that are not well addressed in CMM. The Column named 'Strong relationship contains a straightforward relationship between the key process areas in CMM and common features in ISO 9001. The column named 'Judgmental relationship' contains certain points which needs detail explanation in determining a reasonable relationship. The clauses control of customer supplied product (4.7) and handling, storage, Packaging Preservation, and delivery (4.15) are not well addressed in CMM. There are other clauses such as corrective and preventive action (4.14) and statistical techniques (4.20).

The main difference between ISO 9001 and CMM is that CMM mainly concentrates on the software industry whereas as ISO has a much wider scope that includes hardware, software process materials, and services. Another point of difference is that CMM mainly concentrates on continuous improvement, but ISO 9001 addresses only the minimum criteria necessary for acceptable quality system. The fundamental principle in ISO 9001 is that organization should document which contains instructions on how or what should be done in certain process, whereas CMM gives importance to processes that are documented and practiced as per document.

ISO 9001 describes minimum criteria for a good quality – management system but CMM does not address any specific issues but is generally holds the concerns of ISO 9001.

There are similarities which has a high degree of overlap between ISO 9001 and CMM. To conclude, the below points are derived based on the comparison of ISO and CMM. An ISO complaint organization need not be satisfy all the key processes in level 2 of CMM as ISO doesn't address all the CMM practices.

- A level 2 or 3 organization can be considered as complaint with ISO as long as the delivery and installation process is correctly addresses as in clause 4.15 of ISO 9001.
- An organization would need both ISO and CMM practices. An ISO certification is required in the market. In order to achieve it the organization may need to follow the CMM practices.
- In any way, the organization should mainly focus on process improvement not on achieving the score i.e., either the maturity level or certification.

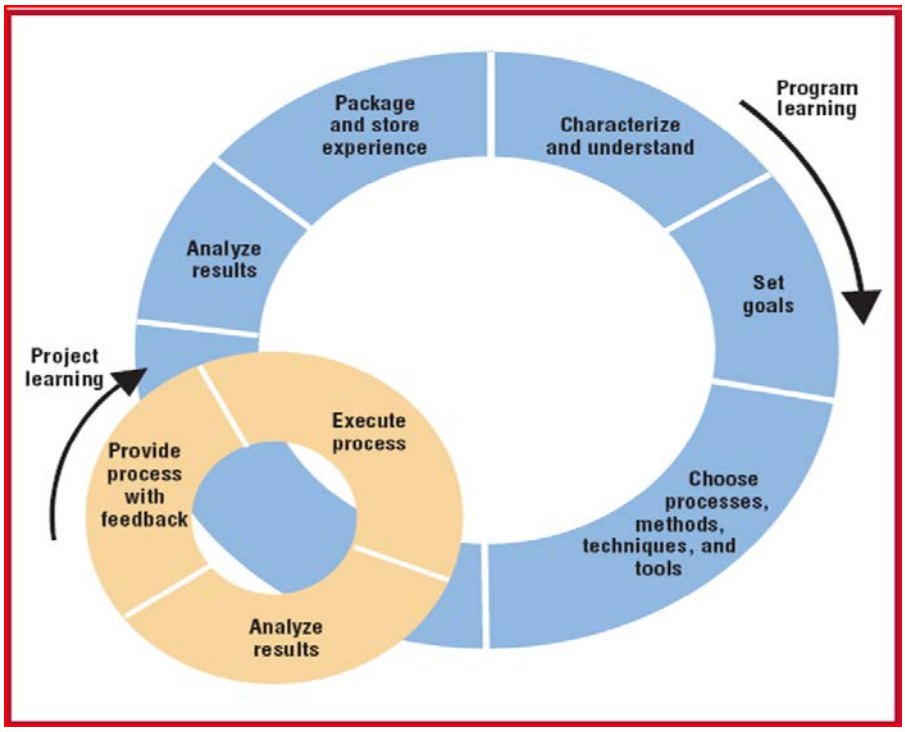
**Attaining Level 5 Maturity**

The Systems, Engineering, and Analysis Support Center (SEAS) of the Computer Sciences Corporation attained the Software Engineering Institute's Capability Maturity Model Level 5 in 1998 by adopting certain approach which will help an organization of any size to attain CMM level5 maturity.

SEAS achieved level 5 maturity by identifying four strategies:

- Learning from experience concept was enhanced
- The appearance of an overwhelming number of written processes and standards were addressed.
- The best practices on the projects are sustained.
- Focus should be given to the improved end product rather than the benchmark and detailed standards.

The below figure shows the process improvement technique which is driven from the concept of learning from experience. In this concept the project is treated as an experiment. The attention is given to the key activities such as communication, establishment of goals, measurement of change and experience sharing. The SEAS has built its foundation on the QIP model to improve its program.




After adopting QIP method, SEAS adopted fives changes in its approach towards process improvement:

Coordinating the initiatives taken for process improvement: The QIP assigns a separate team to analyze and capture relevant data from production. This is done in two ways namely Shepherd method and Process deployment team meetings. The Shepherd method, the process engineers or the QA personnel's work closely with the project to guide process implementation and to avoid issues which was faced in other or previous projects. The Process Deployment Team conducts team meetings on a weekly basis, where the staffs from all levels of management attends the meeting to discuss about the goals set in the project, and to discuss any other queries or status of the project.

Setting Product related goals: To improve the products and customer satisfaction, the QIP model is accepted once the value of experienced based learning is appreciated. Some of the examples of product based goals are lower defect rates, shorter development cycle time, and increased productivity.

Using industry benchmarks: The SEAS has adopted the ISO benchmark as it is used in all the units in the organization. It also adopted the CMM to improve and measure progress in the process. The Comparisons of benchmarks served as checkpoints in verifying the process maturity and external assessor measured progress towards the improved process.

Using a 'Separation of concern' Strategy: SEAS does not expect the project personals to know the details about the QIP, ISO or CMM, these concepts are assigned to the process engineers. In addition to this, the shepherd and PDT meetings are held as guidance to improve their products and services.

Capturing the organizations profile and setting the improvement goal: To apply the QIP model, it requires understanding in the current product characteristics such as defect rates, cycle time, and accuracy of the estimate. The SEA has currently documented the organizational and product characteristics which later turned as a roadmap to process improvement.

CMM provides a conceptual structure for improving the management and developments in an organization in a much disciplined manner. It identifies the practices in a mature organization and addresses all the issues faced in a successful project, which includes people, technology and processes. The scope of CMM is confided to the software product. A CMM level 2 or 3 maturity organization can have an ISO certification, it is not necessary that an ISO certification can only be achieved by a level 5 maturity organization.

## AUTHORS

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