
Keane White Paper

Outsourcing & the Capability Maturity Model (CMM)

Using the CMM in selecting
Application Outsourcing
Service Providers

EXECUTIVE SUMMARY

The Software Engineering Institute's Capability Maturity Model is a proven framework for improving the performance of an IT organization, be it a third party supplier, in-house IT function, or combination of both.

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Abstract

It is almost impossible to evaluate an application outsourcing provider today without encountering claims about CMM Level 3, 4, or 5 assessments. To the uninitiated, CMM is just another meaningless acronym, bandied about like so many buzzwords, with minimal explanation and even less corroboration. Unless a prospective buyer is familiar with CMM and process evaluation, he or she must simply accept sales' claims that being "compliant" is better than "non-compliant", and that higher levels beat lower levels. In this situation, it is tempting to dismiss CMM compliance efforts as just another shallow marketing ploy and accept (or ignore) vendor claims at face value. This viewpoint is unfortunate. However, research shows that behind the mysterious CMM acronym is an excellent means of evaluating outsourcer capabilities, although there is a world of difference between seemingly similar claims.

What is CMM and why is it important to application outsourcing? CMM is the Capability Maturity Model developed by the Software Engineering Institute (SEI) at Carnegie Mellon University. It is a model that provides a way to assess the maturity (i.e. strength) of the processes used by an organization to develop and support its information systems. Since these processes are the tools by which the organization accomplishes its work, the higher their quality, the higher the performance of the organization. An organization that employs processes that comply with a higher CMM level produces higher quality work products faster, for less cost, and with greater consistency.

Performance to these goals is at the heart of any

outsourcing service level agreement, and an outsourcer's ability to achieve its promised benefits are tied directly to the quality of its processes. So, far from being a meaningless acronym, CMM provides one of the best ways of evaluating and comparing outsourcing solution providers. Further, an outsourcer's ability to move a client up the CMM maturity ladder translates to direct, measurable benefits over the life of an outsourcing engagement.

Unfortunately, simply comparing the CMM ratings of competing vendors is not enough. Often, claims that seem similar on the surface are actually comparing "apples and oranges." While standards used to evaluate process maturity are defined and maintained by the renowned SEI, how and where those measurements are applied vary widely. For example, there is a world of difference between centrally measuring the maturity of the outsourcer's own processes and measuring the real life application of those processes at each client engagement. Likewise, knowing who performed the CMM assessment is essential for evaluating the credibility of that assessment. It is, however, easy to acquire the knowledge to differentiate between competing claims.

This paper is designed to help readers understand and take advantage of CMM discussions during application outsourcing evaluations. It provides a brief overview of CMM concepts and explores the benefits of moving up the CMM scale. It elaborates on the connection between CMM and application outsourcing, and it arms readers with know-ledge and the right questions to properly evaluate outsourcer claims.

Keywords

Capability Maturity Model, CMM assessment, SEI, Key Process Areas, Process Improvement, Reduced Cycle Times, Customer Satisfaction.

Introduction

Before discussing the benefits of the CMM and its role in outsourcing evaluations, it is helpful to have a rudimentary understanding of CMM principles and concepts. This section provides a brief overview. Interested readers are encouraged to obtain the “Capability Maturity Model for Software Version 1.1” white paper 1 offered by the SEI and to explore the other references cited at the end of this paper.

CMM History

With assistance from the Mitre Corporation, SEI began developing a process maturity framework in 1986. The impetus for the effort was a request from the federal government, which was looking for a way to assess the capabilities of software contractors. Over four years, this effort evolved into CMM for Software, which offers software organizations a defined evolutionary path for improving the maturity of their software processes.

CMM Basics

The best-known attribute of the CMM is its five levels of increasing process maturity, as illustrated in figure 1. In order of increasing maturity, these levels are Initial, Repeatable, Defined, Managed, and Optimizing. Starting from a base of ad hoc, chaotic

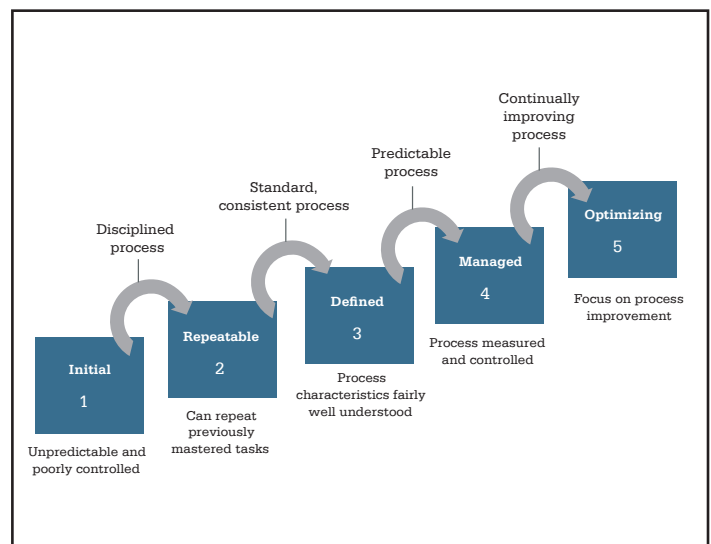
processes, each level focuses on a series of Key Process Areas (KPAs), which, when improved, enable an organization to advance to the next level of maturity. Each KPA is composed of a series of critical practices that must be in place to satisfy process goals. These practices describe the activities and infrastructure needed to ensure the effective implementation and assimilation of the KPA.

Level 1 - Initial

At this level, organizations perform their work on an “ad hoc” basis. Few formal processes are defined, and project management disciplines are lax at best. Programmers are left to their own devices for the quality of their efforts. Hence successes are difficult to repeat and failures difficult to avoid. Results are unpredictable, processes are poorly controlled, and successes are due to the efforts of dedicated individuals rather than the organization.

Key Process Areas: none.

Figure 1: SEI Capability Maturity Model



Level 2 - Repeatable

Organizations at this level rely heavily on basic project management processes to control their efforts and meet project cost, time, and functionality commitments. Although these enhancements are still rudimentary from a process perspective, they are sufficient to allow the organization to successfully repeat previously mastered tasks and avoid the repetition of failures. At this level, the bulk of the organization's processes remain institutionalized through staff experience rather than documentation.

Key Process Areas: Software configuration management, software quality assurance, software subcontract management, software project tracking and oversight, software project planning, and requirements management.

Level 3 - Defined

At this level, the processes for management and engineering activities have been formally defined, documented, and integrated into a standard process that is understood and followed by the organization's staff when developing and maintaining software. Once an organization has reached this level, it has a foundation for continuing progress. New processes and tools can be added with minimal disruption and new staff members can be easily trained to adapt to the organization's practices.

Key Process Areas: Peer reviews, inter-group coordination, software product engineering, integrated software management, training program, organizational process definition, and organizational process focus.

Level 4 - Managed

This level of process maturity focuses on the quality of the products delivered by each process. Detailed

measures of the software process and product quality are collected and used to identify and correct issues with process performance. When new tools or processes are added or adjustments are made to existing processes, measurement data enables the organization to assess the success of the adjustment.

Key Process Areas: Software quality management, software assurance, and quantitative process management.

Level 5 - Optimizing

Level 5 organizations focus their efforts on continuous process improvement. They have the means and motivation to proactively address the strengths and weaknesses of their processes and successfully exploit innovations in software engineering. Their pool of process measurement data enables them to perform cost/benefit analyses for new technologies easily and accurately. Rather than simply correcting defects as they are found, quality efforts focus on preventing the creation of future defects by identifying and addressing the root causes of those defects.

Key Process Areas: Process change management, technology change management, and defect prevention.

CMM Applicability

Since CMM focuses on basic software processes, such as project management and quality assurance, it is applicable to all software creation and support efforts. Its usefulness for both maintenance and development projects makes it especially attractive as a tool for

evaluating application outsourcing engagements. SEI has also developed other special purpose models for topics such as package evaluation and people skills.

Advancing up the CMM Ladder

The average IT organization would find itself rated at CMM Level 1 -- far from the level of flexibility required for today's competitive and fast-moving business environment. Even among the 901 organizations contributing assessment data to SEI (a self-selecting list interested in process improvement), the majority fall within Level 1 (34.9%) and Level 2 (38.2%).² Reaching the higher levels of process maturity takes a considerable investment in time and effort. The SEI found that, of the organizations that began CMM-based improvement efforts in 1992 or later, the median time to move between levels is:

- » 25 months from Level 1 to 2
- » 22 months from Level 2 to 3
- » 36.5 months from Level 3 to 4.3

Given this investment, the percentage of organizations reaching higher levels of maturity is small, although growing. Within SEI's assessment data pool, the statistics are 18.5%, 5.5%, and 2.9% for levels 3, 4, and 5 respectively.⁴ These statistics should be kept in mind when evaluating the veracity of CMM level claims by outsourcers.

Level 1 organizations seeking to climb the maturity ladder by themselves face significant cultural and management challenges. These challenges include:

- » obtaining and implementing the necessary processes

- » overcoming human resistance to change and increased oversight
- » maintaining momentum on an effort that spans many months
- » gaining sufficient management support to ensure the new processes are properly assimilated and followed

Outsourcing provides an effective means of overcoming these issues and accelerating the adoption of CMM-based practices. By bringing in its own processes, tools, staff, and training, an effective outsourcer can instill the disciplines and implement the infrastructures needed to reach higher levels of maturity quickly. Through outsourcing, a company can gain the benefits of advanced processes in a fraction of the time required for traditional approaches.

Based on its experience, Keane is able to contractually commit to moving its outsourcing client engagements to CMM Level 3. Keane's clients have moved from CMM Level 1 to CMM Level 3 in as little as 12 months.

Benefits of CMM

The rush of outsourcers embracing CMM as a way to measure their offerings testifies to their strong belief in the value of CMM assessments. To understand their enthusiasm and to evaluate the benefits of CMM assessments to your organization, it is necessary to distinguish between the model itself, the usefulness of organizational comparisons, and the value of software process improvements.

The Value of CMM as an Assessment Tool

It is important to remember that the CMM is merely a tool for assessing the maturity of an organization's software processes. The CMM does not measure the benefits of increasing process maturity; it simply outlines a framework for recognizing higher quality processes. That said, the CMM's greatest direct benefit is its ability to allow simple, objective, and credible comparisons of organizational processes. Developed by SEI, an independent and thought-leading organization, the CMM's premises have been validated by dozens of studies and thousands of evaluations. As a result, the CMM has been adopted as the process assessment model of choice by hundreds of companies around the world.

The Value of Organizational Comparisons

The CMM provides an objective way of predicting the likely performance of two organizations working on the

same type of project. Simply put, an organization with a higher CMM level assessment outperforms a similar organization with a lower level assessment, as illustrated in figure 2.

The table predicts the performance of a 200,000 line of code development project at different CMM levels. These predictions were developed from a database of 1,300 completed projects, and costs were calculated using a burdened rate of \$110,000/year per programmer.

As figure 2 illustrates, when evaluating outsourcers, the benefits of selecting a vendor with more mature processes are clear. A higher performing outsourcer will produce better work products, deliver faster, and cost less. Further, higher CMM levels bring greater predictability in performance and enhanced ability to adapt to changes in work environments and requirements.

Figure 2 : CMM Project Statistics for a 200,000 LOC Development Project

Organization's CMM Level	Calendar Months (duration)	Level Effort	Number of Defects Shipped	Median Cost (\$M)	Lowest Cost (\$M)	Highest Cost (\$M)
Level 1	30 months	600 person months	61	\$5.5M	\$ 1.8M	\$ 100+M
Level 2	18.5 months	143 person months	12	\$1.3M	\$.96M	\$ 1.7M
Level 3	15 months	80 person months	7	\$.728M	\$.518M	\$.933M

Source: Master Systems Inc., All Rights Reserved

The Value of Software Process Improvements

As implied in figure 2, a company should gain significant benefits by reaching higher levels within the CMM. Moving to the next level of process maturity requires an investment in software process improvement (SPI). The implementation and active use of higher quality processes provides the claimed productivity benefits at each level of improvement. The value of software process improvement can be staggering. For example, one SEI study⁵ on software process improvements in 13 organizations identified the results listed in figure 3. Note that these results reflect the yearly levels of improvement obtained across the life of the SPI effort.

Other benefits associated with process improvements include reduced training time, greater staffing flexibility, and stronger management control.

While companies can, and do, implement their own SPI initiatives, outsourcing often provides a faster path to these benefits. An experienced outsourcer has the methodology, experience, and cultural motivation to implement process improvements quickly and effectively. If the engagement involves acquisition of existing functions and their staff, the outsourcer can use its expertise to quickly raise the performance level of that organization. A co-located engagement may include training your internal staff in the procedures used in the outsourced portion of the project or the transfer of the improved process environment back to your company at the end of the assignment.

Evaluating the CMM Claims Made by Outsourcers

The credibility of CMM, coupled with the compelling benefits of measured process improvements, make CMM compliance an irresistible marketing tool for outsourcing vendors. Virtually every outsourcer claims some level of CMM compliance in its marketing and sales pitches. Nevertheless, these claims cannot universally be taken at face value, and two seemingly identical claims may have very different meanings when carefully examined. Figure 4 illustrates the variety of possible meanings in claims of CMM compliance.

The concepts and questions below will help you interpret these claims and determine if a given outsourcer can provide the types of benefits previously described.

What is covered by an outsourcer's rating claim?

When considering a CMM rating, you must take into account what has been rated. Otherwise, you may be comparing "apples to oranges." For instance, a given "Level 3 assessment" could apply to the outsourcer's own internal IT organization, its offsite development facility, or a specific client engagement. The result, in many cases, is intentional confusion. CMM compliance of the outsourcer's internal operations, while laudable, will have relatively little effect on your engagement.

If your engagement is going to use offsite development facilities, comparing the ratings of competing facilities is valid and important, but a "Level 5" assessment does not necessarily translate to improvements in your on-site project. If the rating refers to a client engagement, you need to determine

whether it is an isolated case or whether the outsourcer has a solid track record of process improvement across multiple engagements. To date, Keane has 32 client projects independently assessed at Level 3 and 2 projects assessed at Level 4 by trained, SEI-authorized assessors.

Was the assessment thorough?

A given CMM claim could be backed by an assessment as superficial as a single project at a single location. CMM assessments are therefore often performed by sampling, especially at large organizations. A given organization may have many separate projects operating at different CMM levels. Inaccurate or misleading results may occur unless an adequate sample size is used. Generally, experts recommend that at least three projects covering at least 20% of the organization's work force be assessed to obtain an accurate reading.

Is the assessment current?

There is no requirement that an organization undergo reassessment to maintain its CMM level rating. Without continual training and management reinforcement, organizations can relapse into less productive practices. Before accepting the CMM assessment of a vendor's offsite facility, ensure that the assessment has occurred within the past 18 to 24 months.

Who performed the assessment?

While SEI maintains CMM and collects information across the IT industry, it does not certify or validate CMM level claims. SEI does train and authorize assessors, but companies can, and do, self-measure, and third parties can offer CMM assessment services without official training. Not surprisingly, the accuracy, completeness, and objectiveness of these

Figure 3 : Benefits Gained through Software Process Improvement

Category	Range	Median
» Years engaged in SPI	1 to 9	3.5
» Productivity gains per year	9% to 67%	35%
» Early detection gains per year (defects discovered pre-test)	6% to 25%	22%
» Yearly reduction in time to market	15% to 23%	19%
» Yearly reduction in post-release defect reports	10% to 94%	39%
» Business value of investment in SPI (value returned on each dollar invested)	4.0 to 8.8	5.0

measurements can vary widely. Before relying on a vendor’s claims of compliance, verify that an independent, trained, SEI-authorized assessor has performed the assessment.

Can you visit an active project?

One of the best ways to evaluate the validity of an outsourcer’s CMM claims is to visit an active project and ask to examine its CMM documentation. To achieve higher levels of CMM compliance, the project must have specific, high-quality project and process documentation. Each CMM level has its own documentation requirements and must collect measurement and analysis data. Evaluating the presence, quality, and usage of this information speaks volumes on the accuracy of the outsourcer’s claims and its true commitment to CMM requirements. CMM documentation requirements for each compliance level can be found in the resources listed at the end of this report.

How deep is the outsourcer’s own commitment to CMM and process improvement?

As discussed previously, CMM is merely an assessment approach. As a buyer of outsourcing services, your real benefits come from a supplier’s commitment to software process improvement. This commitment can be as shallow as obtaining a CMM assessment for one engagement to include in a competitive press release, or so deep that it forms the core of the outsourcer’s offerings. The strongest outsourcers invest heavily in best practices, metrics analysis, and continuous process improvement efforts. They ensure these improvements are shared across clients through a central practice group, detailed methodologies, and rigorous management oversight.

When evaluating candidate outsourcers, spend time to analyze how each company manages its outsourcing practice. Review their outsourcing methodologies and ask to visit their offsite development centers. If the outsourcer is not following the tenets of CMM in its own practices, it surely will not follow them at your site.

Figure 4 : Why CMM Claims Can Be Confusing

Coverage Possibilities	Thoroughness Possibilities	Assessment Possibilities
» Outsourcer’s Internal IT Operations	» A single project	» Independent, SEI-trained Assessor
» Outsourcer’s Development Facility	» Sample of active projects	» Independent, Self-trained Assessor
» Outsourcer’s Practices/ Methodologies	» All active projects	» Internal, Self-trained Assessor
» Single Client	» An engagement	» Internal, SEI-trained Assessor
» Multiple Clients		

Is the outsourcer committed to CMM measured process improvements at your organization?

Outsourcer claims of CMM compliance are promising, but the ultimate test is whether your vendor is willing to commit contractually to implementing those improvements and sharing their performance benefits

with you on your project. Make sure commitments are documented along with specific “deliver by” dates and proof of benefits. Don’t accept the outsourcer’s word on whether those commitments have been met; hire an authorized independent CMM assessor to validate the outsourcer’s performance.
