Keane
an NTT DATA Company

Keane White Paper

From Model to Money

Using the CMM to Improve Financial Performance

EXECUTIVE SUMMARY

Starting from a base of ad hoc, chaotic processes, each level of the CMM 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.

About Keane

Keane, an NTT DATA Company, is an IT services firm headquartered in the US with more than 12,500 professionals worldwide. For 45 years, Keane has been an Application Services specialist with distinguished project management credentials. Today, we offer a flagship suite of Application Services, as well as Infrastructure and Business Process Outsourcing solutions delivered through onsite, nearshore, and offshore resources.

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Abstract

Application development is becoming ever more complex. The size and sophistication of software and applications have increased enormously in the last few years. In addition, the user base of these products has become more diverse, more demanding, and more unpredictable. With this complexity comes the attendant increase in costs for development and deployment. IT delivery is now such a costly business that the means to contain budgets and still deliver high value solutions is on the agenda in many boardrooms.

A plethora of tools and techniques are available to help organizations meet these dual objectives. However, most focus on a specific aspect of delivery, and the hard reality is that an all-encompassing approach to delivery must be taken to even begin to make a difference to the bottom line. So what can be done to achieve this coherent approach for delivery solutions? To provide a framework for delivery improvement, many organizations are working toward an organizational maturity model such as the Software Engineering Institute's (SEI) Capability Maturity Model© (CMM). Using the CMM can help an organization:

» Deliver solutions that meet the business and market requirements in shorter timescales than its competitors

» Significantly reduce software development costs

» Plan and manage its delivery capability to be as innovative as possible while still remaining cost effective

Yet, why should this model be successful in improving the bottom line when so many other solutions appear to have failed? To address this question, this paper describes the components and characteristics of the CMM that enable a business to improve its profitability.

Introduction: The Capability Maturity Model

The Software Engineering Institute's (SEI)

Capability Maturity Model (CMM) is the industry standard for measuring the maturity of an IT organization. The CMM was developed in the late 1980's by Watts Humphrey and other researchers at Carnegie Mellon University's Software Engineering Institute as part of a Department of Defense funded project. Their objective was to provide a method for evaluating the effectiveness of software vendors. The researchers analyzed the strengths and weaknesses of the organizations that they evaluated to ascertain which characteristics best dete rmined organizational capabilities. They discovered that the maturity of an organization's processes was directly related to its performance. As expected, organizations that follow formal, well-defined processes are far more effective than "ad hoc" organizations. Further, they found that organizations could be arranged into well-defined categories based upon their level of process maturity. These categories became the levels of the CMM.

Figure 1 illustrates the basic principles of the CMM.

Within each maturity level are a number of Key Process Areas (KPAs) as illustrated in Figure 2. These indicate the areas an organization should focus on to

improve its software process and performance. Associated with each KPA is a series of goals indicating the intent of this focus. Within each KPA is a series of practices to be undertaken to effectively implement and institutionalize the achievement of the goals.

This paper looks at some of the major issues organizations face that impact their financial performance. It also provides examples of how specific KPAs address these issues and can provide some big wins. Equally important are the costs and implications of moving up such a model. This is also examined.

How Can the CMM Help an Organization?

The CMM can help an organization in two fundamental ways. First, the CMM introduces specific practices, proven to increase profitability. Less immediate, but perhaps achieving a greater impact, are the associated changes in organizational culture and mentality that are required to move an organization up the CMM maturity ladder. This is harder to measure but can have a major impact on an organization.The CMM can help an organization in two fundamental ways. First, the CMM introduces specific practices, proven to increase profitability. Less immediate, but perhaps achieving a greater impact,

Figure 1: The Five Levels of the CMM
The CMM is a technology-neutral approach to defining levels of process maturity. Each stage of the model from 2 to 5 articulates the practices an organization should follow to improve its application development and management performance. The majority of organizations are at Level 1.

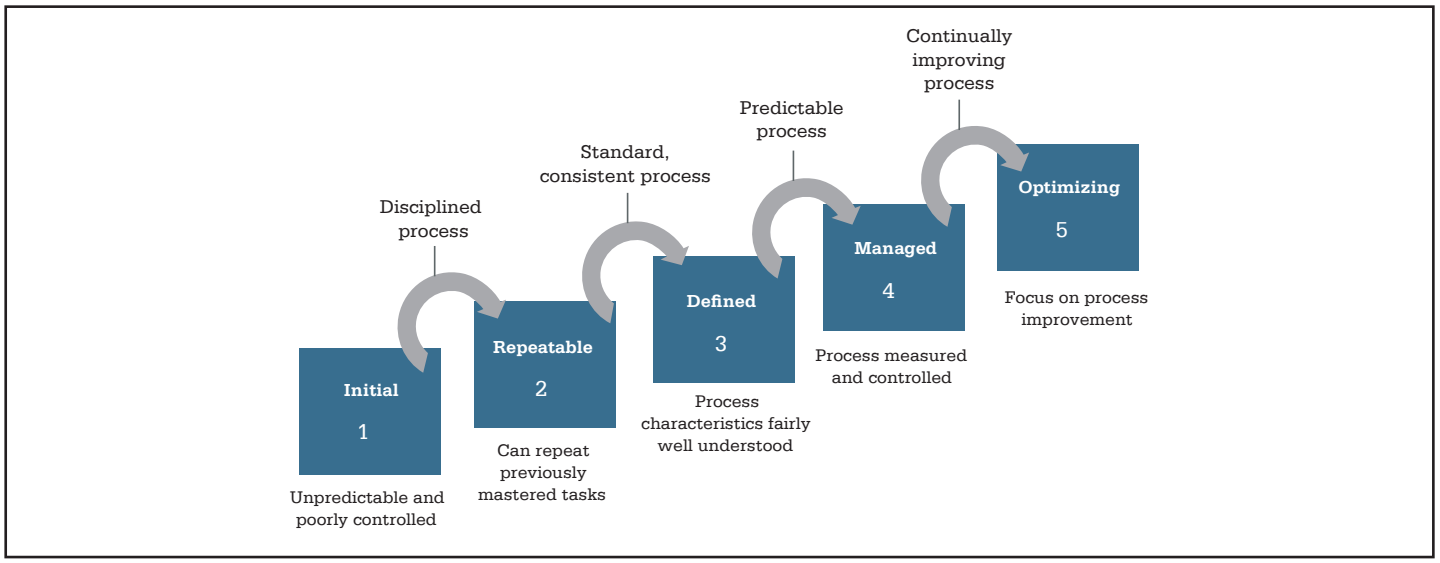
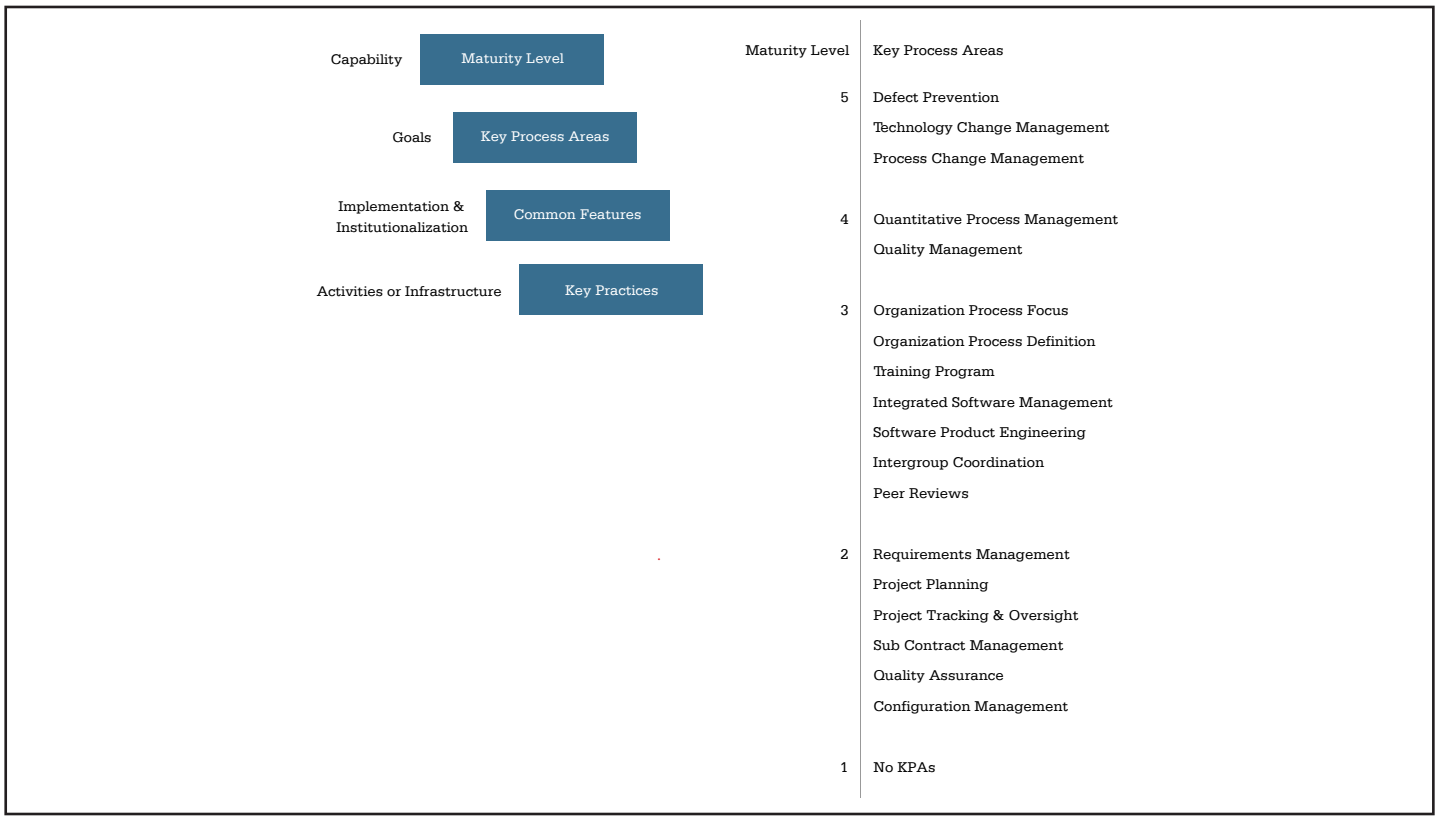


Figure 2: Key Processes of the CMM
Starting from a base of ad hoc, chaotic processes, each level of the CMM focuses on a series of Key Process Areas (KPAs), which, when improved, enable an organization to advance to the next level of maturity. Each KPA is composed of a series of critical practices that 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.



are the associated changes in organizational culture and mentality that are required to move an organization up the CMM maturity ladder. This is harder to measure but can have a major impact on an organization.

It is worth highlighting that there has been no mention within this paper of specific technologies or tools. This is quitedeliberate. The increasing use of the CMM represents a genuine acknowledgement that many of the challenges faced by organizations today may seem technical in nature but are actually managerial. This is where the CMM comes into its own. Some of the major business challenges that the CMM supports particularly well are:

» Minimizing the time to market for products

» Providing a high-quality service at an appropriate price

» Improving management decision-making

» Managing resources cost-effectively

» Building a skilled and motivated workforce in a cost-effective fashion

» Avoiding re-invention of the wheel

» Introducing new technologies that create competitive advantage

Some of these are long-term gains that will be found after the model has been in use for some time, while others can be surprisingly quick wins.

Goal: Minimizing Time to Market

Increasingly, software development is the main activity on the critical path for a service or product to go to market. Indeed, in many e-solutions, the software can be considered to be the end product. Working at higher levels of maturity can reduce the time to market for a product. Figure 3 illustrates product development lead times for organizations at different levels of maturity

Figure 3: Impact of Higher Maturity on Time to Market
These figures are from a study of 1,000 projects and are based on delivery of equivalent functionality.The figures are based on median delivery times for each category of the organization. The associated level of effort for organizations assessed at Level 3 to deliver the projects was less than 1/5th of the effort for those at Level 1.

In sectors such as finance, this major improvement in delivery time can be the difference between meeting a window of opportunity for a product and the product not being viable. This decrease in lead time is achieved in two basic ways:

» Productivity gains within the project teams (driving factors such as increased personal effectiveness, decreased rework effort, and increased reuse)

» Elimination of unnecessary delays that impact the critical path

This minimizing of time to market is made possible through several practices within the CMM. As an example, project deadlines are often impacted by external forces, which in reality result from a lack of communication across the extended team and with subcontractors.

The Sub-Contractor Management and Intergroup Coordination KPAs of CMM Level 2 and 3 respectively provide guidance on avoiding these kinds of problems. Combined with the "planning" KPAs, discussed later in this document, this means that only the work that needs to be done is done. Rework time and associated testing overruns also impact productivity and product availability. The CMM has a number of KPAs that minimize rework effort throughout the lifecycle. For example, the Requirements Management KPA is aimed at ensuring that functional rework is kept to a minimum. The Peer Review KPA that is discussed in the next section is heavily orientated to minimizing total rework effort.

Goal: The Right Product to the Right Level of Quality

Bringing a product to market faster than the competition is only of value if the product meets the expectations of clients. For long-term business growth and sustainability, being first is important, but not enough. Yet, achieving the balance between time, quality, and cost is becoming increasingly difficult, and it requires:

» Correct assessment and implementation of the product requirements and managing the inevitable change that comes with those requirements (as addressed by the Requirements Management KPA)

» Building the product to a level that means those requirements can be fulfilled in a production environment

Along with the increased complexities associated with testing software is the added complication that it is no longer possible to achieve quality predominantly through testing. It is simply too expensive. The only way to remain cost-effective is to build quality into the product that will go into the test Moneyprocess, rather than to purely improve the product quality via testing.

Many KPAs support this ethos, particularly Requirements Management and Software Quality Assurance. But on particularly powerful example is the concept of Peer Reviews, which is a critical KPA measured at Level 3. Organizations at Level 3 have found the value of appropriate peer review in reducing the cost of product development. Figure 4 illustrates the benefits of implementing an effective peer review process.

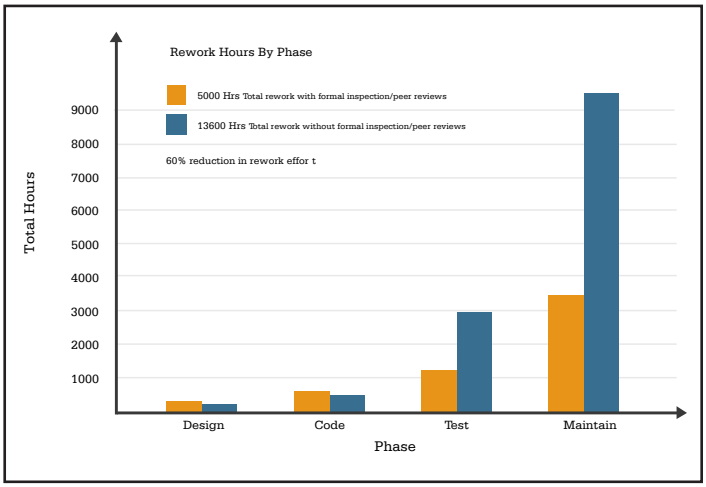
In addition, Figure 4 illustrates that the most costly area of rework is in the production environment. The typical software organization releases applications with 15% of the defects still in the product3. The consequential cost of production defects can range from insignificant to completely catastrophic in financial terms. In addition, as applications and the associated testing become more complex, the cost of retrospectively removing defects via the traditional testing process becomes massively more expensive and less reliable. Therefore, the cost of defect removal must be carefully controlled, and it can vary significantly depending upon factors such as:

» The point in the product lifecycle when it was introduced

» Where in the product lifecycle it was trapped

» The techniques that were used to trap the defects

Figure 4 : Saving Time, Effort, and Money by Reducing Rework



Many organizations simply do not have enough performance data to identify the most effective defect identification and prevention techniques. In the absence of useful information, organizations occasionally adopt a crude "if it moves, review it" approach, but this is costly in a number of ways:

» It leads to a blasé approach where work products are not correctly reviewed, thereby defeating the purpose

» Time and money are wasted on ineffective or unnecessary reviews

To know what is effective or required, it is necessary to quantify the impact of actions. This means identifying specific metrics, measuring them, and then analyzing them. The Peer Review KPA has an associated emphasis on measurement of impact and performance, and therefore allows the most effective techniques to be identified, which leads us to the next benefit of CMM.

Goal: Making Better Management Decisions

Many IT organizations have little true data on past or likely performance (or the consequences of specific courses of action) on which to base decisions. In the absence of such data, the decision-making process can be driven by a mixture of organizational politics, who shouts the loudest, and other techniques not noted for their effectiveness. Moreover, when the decision-making process is underway, the absence of objective data makes it difficult to assess or counter decisions that are high risk or untenable. It also makes it extremely difficult to proactively justify performance and value.

Ill-informed decisions often lead to project failure and ineffective expenditure of finances and staff time. The CMM counteracts this by placing emphasis on building up information on the organization's performance and capabilities, and on measuring the right things and adapting those measures to the changing circumstances of the organization.

At the higher levels of maturity, the model has KPAs, such as Quantitative Process Management and Software Quality Management, encouraging sophisticated management of the metrics collected. These effectively place the software process and products under statistical process control. This is a powerful technique used in many industries and can be found in the Six Sigma approach, which is a proven system for improving the quality of organizational processes. Six Sigma was invented in the 1980s at Motorola and has since been adopted by many Global 2000 companies to achieve millions of dollars in annual cost savings and significant product quality improvements.others can be surprisingly quick wins.

Goal: Cost-Effectiveness Achieved

For most software projects the single greatest direct cost is that of the labor involved. Often, labor costs exceed those anticipated and contribute to significant overruns against project budgets. In the worst cases this can impact the achievement of the anticipated ROI for a particular project. Many organizations have witnessed projects where:

Figure 5 : Impact of Reducing Staff Turnover in Organizations with Software Process Improvement Programs
Starting from a base of ad hoc, chaotic processes, each level of the CMM 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.

	Before	After
Turnover Ratio	10%	5%
New Hires Required	20	10
Recruitment Costs / Employee	$30,000	$30,000
Training Costs / Employee (Y1)	$7,500	$7,500
Annual Turnover Costs	$750,000	$375,000
Turnover Cost Savings	ñ	$375,000

- Additional short-term contract staff had to be brought in at inflated rates to cope with overruns
- Existing contract staff needed to be extended at short notice and on relatively short-term contracts with commensurate increases in rates
- Staff who are over-skilled and too expensive were assigned to activities well within their skills base
- Inappropriately skilled staff spent long periods of time struggling to achieve very little quality or value

A root cause for these kinds of problems is poor estimation and the subsequent planning. Allied to this is the lack of sufficiently robust tracking of actual progress against that plan. These are simple yet prevalent problems and are addressed within the CMM. The CMM has a number of KPAs that proactively deal with these kinds of problems. Software Project Planning and Software Project Tracking and Oversight are crucial KPAs at Level 2 maturity (the lowest targeted level) and provide a cornerstone for much of the subsequent practices that lead to higher levels of maturity. Following these KPAs assists an organization to manage its skills base effectively. They cannot eliminate adverse labor market conditions, but they can help minimize their impact.

At a less basic level, organizations may undertake estimation, but it tends to be unreliable and is ultimately discarded. It is here that the CMM's emphasis on measurement and analysis of performance is useful. Within each KPA, there is a focus on collecting information about the organization's performance in the relevant practice. In doing this, a valuable information repository is built up. The repository is then used for current trend analysis and to aid in the process of ongoing performance prediction, including estimation. The CMM considers estimation in multiple dimensions: size, effort, and schedule. This approach increases accuracy of estimation and drives better project planning.

In addition, all of the KPAs place heavy emphasis on advanced resource planning to ensure the right skills are deployed at the right time. This is described in more detail in subsequent sections of this paper, but it is important to note here that coherent management of current and anticipated capability minimizes the amount of overrun experienced from using inappropriate staff.

Of course, not all project resources are human. Therefore, the CMM KPAs also address management of critical computer resources. Effective integration of project and infrastructure planning is critical to maximizing the 'up-time' of the team and avoiding unnecessary delays. Increasing the planning horizon for infrastructure improves cost control on infrastructure procurement. It also minimizes the indirect project costs of infrastructure implementation and support by ensuring that this is also well planned. delays. Increasing the planning horizon for infrastructure improves cost control on infrastructure procurement. It also minimizes the indirect project costs of infrastructure implementation and support by ensuring that this is also well planned.

Goal: Building an Effective Team for the Right Price

Many organizations turn a blind eye to training models. They view training as a potential disruption to productivity and picture their entire workforce attending prolonged and costly classroom training programs for skills they will never use. This often leads to a misunderstanding of the purpose and nature of the activities within the CMM Training Program KPA at Level 3. Appropriate training at all levels is a critical part of the CMM, and the keyword here is 'appropriate'. The focus on appropriate training planning and management allows the management team to ensure that:

» The training program is aligned ooto the business needs and project requirements. The only training that gets done is the training that needs to be done to support the business.

» The training program interfaces with the short, medium, and long-term planning activities undertaken elsewhere in the model. This ensures that the organization has the right people available at the right time to support its project needs, a critical factor for project success.

Effectiveness of training is intelligently reviewed. This means that:

» Training that is not contributing oovalue for the money invested in it is identified and replaced with cost-effective approaches as soon as possible

» Gaps in the training program oothat are costing money in lost productivity are quickly identified and rectified

» People are not sent on unnecessary ootraining that is expensive and adds no or limited value

» Training courses and programs ooare updated to stay aligned with business need

While there is limited research in this area, early indicators show that introduction of Software Process Improvement programs using models such as the CMM have a beneficial impact on staff turnover and associated recruitment activities. The Software Process Improvement effort improves employee morale by providing:

- A high degree of empowerment on how the job is done
- Improved succession planning which gives staff a clearer career framework
- Removal of the frustrations associated with being under or over-qualified to undertake a job
- Coherent training programs that proactively develop staff
- Clear definition of roles and expectations of individuals, and consistent management of performance

The resulting reduction in turnover can have significant business benefit by minimizing:

- Recruitment costs of replacement staff
- Relocation costs
- Training costs for replacement staff
- Lost performance until replacement staff are in place
- Initial lower productivity from replacement staff

Based on studies conducted within a number of organizations there is evidence that well-executed Software Process Improvement programs can increase staff satisfaction and indirectly reduce turnover.4 Figure 5 illustrates what even modest turnover reduction (less than is evident in the available studies) can achieve in a 200 person IT function, based on Keane's experience in this arena.

This shows significant expenditure savings and does not account for another significant cost saving: removing the impact of losing key personnel. Having an organization's best personnel on projects can reduce project costs by 25%. If some of the best personnel have left, the impact will be felt by the projects they leave.

Goal: Stop Re-Inventing the Wheel

Continuously reinventing the wheel is particularly a problem for larger and distributed organizations or organizations that are involved in acquisition or merger activities. Many large organizations have significant and costly issues with duplicated effort.

Another significant issue for many organizations is that groups undertaking similar types of project work do so in different ways. This results in:

- Only small pockets of the organization using the most cost-effective approaches
- Increased training costs
- Decreased deployment flexibility

In considering whether the CMM is relevant to an organization it is worth asking the following questions:

- **Are my teams working to a common vision of what is known to be effective practice?**
- **Do we consistently move our best practices forward?**
- **Do teams implement these new and better ways of working in a timely fashion?**

Previously, we mentioned the value of repositories of historical performance data in predicting and improving capability. In many organizations where this data is available, it is too often not available to the right people at the right time. This kind of data is only of value if:

» Everyone knows it exists

» It is easily accessible

» Its scope and basis is understood

» Everyone continues to contribute to it

» There is a process for managing the information (many organizations' Knowledge Management Systems fail to live up to expectations because the process of managing the system and content is insufficient).

Addressing all of these issues is a key strength of CMM Level 3. It has a number of KPAs that address these kinds of issues. Organization Process Focus and Organization Process Definition focus on ensuring that the development and deployment of working practice is coherent across the organization.

They ensure that the infrastructure is in place so this remains the case. The KPAs also provide effective channels to review performance, revise practices, and effectively disseminate these revised practices around the organization. Other KPAs, such as Integrated Software Management, support the development of standardized approaches to delivery and how these should be tailored to meet differing project types and needs.

In considering whether the CMM is relevant to an organization it is worth asking the following questions:

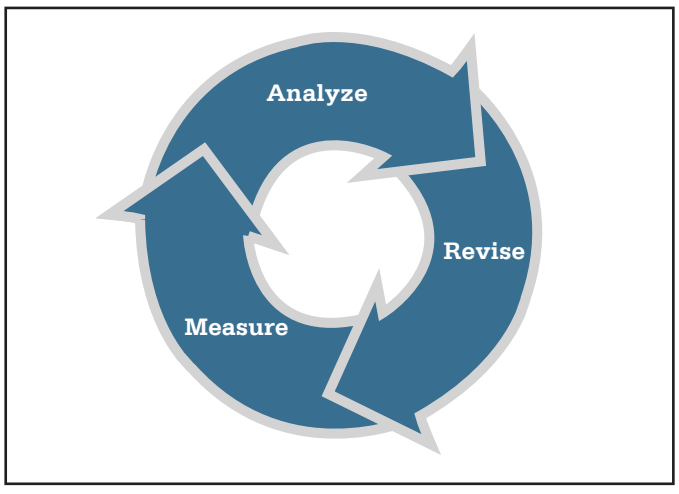
» Are my teams working to a common vision of what is known to be effective practice?

» Do we consistently move our best practices forward?

» Do teams implement these new and better ways of working in a timely fashion?

In many ways, the answers to these questions are the essence of the CMM.

Figure 6 : Driving toward Continuous Improvement



Goal: Gaining a Competitive Edge

For many organizations, the early introduction of leading-edge technologies and techniques is not a realistic option. In fact, some organizations have an avowed trailing-edge policy on the basis that many of the new technologies will turn out to be mere fads. The problem with this approach is that not all

technologies are fads, and some will deliver real competitive advantage. Conversely, there are organizations that continuously adopt new technologies early, but don't seem to gain any benefit other than a lot of PR in the trade press (some good, some not so good). Neither approach is sustainable or consistently competitive. So how to strike a balance and do it with confidence?

At the highest level of maturity, CMM Level 5, the Technology Change Management KPA combines with a number of other KPAs to provide the mechanisms to undertake an evaluation of the viability of introducing leading edge technology. It also provides the practices to do this without putting the business at risk, and describes the infrastructure required to sustain this approach. Successful implementation of the Technology Change Management KPA is only possible because of the foundation set by KPAs in earlier levels of maturity that allow the organization to accurately monitor and predict its capabilities.

All the KPAs Working Together for Business Benefit

In this paper, we have concentrated on specific practices, embodied in each individual KPA, which can improve performance. However, more powerful than the practice of individual components is the ability to achieve a working environment in which all of the KPAs are being met within a single, mature approach, as illustrated in figure 6. Once the practices of the CMM are institutionalized and become 'business as usual', a mentality develops that is probably the real essence of continuous improvement.

When appropriately applied, the CMM can provide three-fold improvements in productivity, 40-70% improvements in time-to-market, and a 90% decrease in product defects.

This questioning also extends to the model itself. For instance, "Is the value of the information provided via a metric worth the cost of collecting the metric?" A by-product of this new mentality is that only the necessary things are done. This can result in the powerful elimination of a whole raft of non-value activities. For example, on numerous application outsourcing engagements, Keane has found that as soon as appropriate management metrics are in place, thenumbers of certain types of work requests drop significantly. This drop is immediately replaced by increased demand for higher value work types.

The Cost of Using the CMM

Organizational Infrastructure

Two primary examples of the required organizational infrastructure are a Software Engineering Process Group (SEPG) and a Software Quality Assurance (SQA) function. The SEPG is a fundamental component of the CMM Level 3 Organization Process Focus KPA. It is a group drawn from the ranks of the delivery personnel, whose role is to steer and make policy with respect to driving forward process and delivery improvement. They are at the heart of any CMM initiative. Although for the majority of personnel this is a part time role,

considerable effort is required, especially during the early stages of the initiative.

The SQA function supports the SEPG by providing objective insight into the current compliance, capabilities, and outcomes within the project teams. Many organizations have some semblance of these functions, but they are often inappropriately resourced and not operating at the level they need to fulfill the requirements of the CMM. Similarly, formal software change control and configuration management groups need to be established.

Development of Initial Process Assets

Depending upon an organization's starting point, the development of initial process assets can be a major expense. The good news for many organizations is that they have some process and methodology within the organization, but it may need rationalizing or upgrading. Even for organizations with defined process, there is typically work required to improve these assets. This is an iterative job that will become part of business as usual. The improved visibility of performance data will drive further changes and improvements to processes and approaches on an ongoing basis.predict its capabilities.

Bottom Line Costs and Return on Investment

Bottom Line Costs and Return on InvestmentBottom Line Costs and Return on InvestmentThe costs for implementing a software process improvement program like the CMM will vary from organization to organization depending on a wide variety of factors, such as:

» Starting point in terms of infrastructure and assets

» Scope of Software Process Improvement initiative

» Speed at which the Software Process Improvement initiative is undertaken

Indicative costs for implementing CMM processes and other similar software process improvement programs are in the range of $9,000-$45,000 per employee5 with these total costs typically incurred over a period of 3-6 years. The high-end figure tends to exist where a significant number of new software tools are deployed, which is not usual.

The return on investment from Software Process Improvement initiatives can be spectacular, ranging from 3:1 to 30:1 depending on the type of project involved. A typical ROI can be 7:16. Some specific initiatives in isolation, for example formal peer reviews and inspections, can return even higher ROI. and approaches on an ongoing basis.predict its capabilities.

Weighing the Pros and Cons of a CMM Initiative

Given the apparent benefits and potential ROI for this kind of program, it is reasonable to ask why there are still relatively small numbers of organizations who have adopted this, or a similar, model. There are a number of ways to answer this, but first this should be put in context:

» The numbers of organizations adopting these types of programs is increasing. SEI surveys show

a year-on-year increase in the use of the CMM. In addition, META Group research indicates that an increasing number of organizations have or will adopt programs requiring Software Process Improvement models like the CMM.

» It is interesting to note that the kinds of organizations that have been early adopters of these models were those for whom applications development was absolutely critical and where it was a necessity rather than a luxury

» to improve margins. Organizations involved in safety-critical software development or developments where project failure would have catastrophic financial impacts were typically the first to deploy CMM-based programs. For more and more organizations, the health of the company is inextricably linked with its ability to develop and manage software applications. This may explain why an increasing number of organizations are looking to models like the CMM for support.

There are, however, a number of inhibitors that must be addressed by an organization considering a software process improvement initiative like the CMM:

» The investment costs per employee are significant, even spread over a number of years. These are not the kind of numbers IT management is used to considering in internal investment. Key to this is the fact that the CMM framework provides a comprehensive 'what' should be done, but leaves the 'how' to the individual organization.

» The CMM and similar programs are a longterm endeavor, and senior management needs to buy into the vision as the benefitswill not be realized overnight. It takes time to reach the higher levels of maturity, at which point the organization really begins to benefit.

» Consequently, organizations find it difficult to put together a specific cost justification for a Software Process Improvement program and therefore do not even try, assuming that it will not receive senior management backing. The initial investment involved is seen as prohibitive as well as what are perceived as unacceptable payback periods. In many cases, this may be due to an inappropriate strategy and plan. For instance, it should be possible to incorporate quick win initiatives into a Software Process Improvement program that not only give early impressive pay back but build credibility within the organization to continue further investment. The key is to ensure that the quick wins are aligned with the overall approach and objectives. Fortunately, recent improvements in frameworks for developing such a strategy, justification, and plan are beginning to make this easier.

» Some organizations embark upon a Software Process Improvement program but terminate it because insufficient benefit has been accrued. Again, this is typically due to poor strategy and planning.

» The volume of work involved in an initial assessment of current capability can seem overwhelming. This, tied with typical time-scales for moving up a single maturity level of 18-24 months, results in the Software Process Improvement program being reprioritized down the list of initiatives.

» Furthermore, the comprehensiveness of models like the CMM are their strength but also the thing that makes them daunting for organizations. For many organizations, there are the questions of where to begin and how to prioritize improvement

efforts. and approaches on an ongoing basis. predict its capabilities.

Keane's Commitment to the CMM

Through its experience in delivering Application Development and Management services to its clients at CMM Level 3 or higher, Keane has learned how to help organizations overcome these challenges. While we would like to claim to have an alchemist's touch, the reality is that this capability has been built up over a significant period of time. Keane regularly moves its application management teams, placed within client environments, to CMM Level 3 within 12-18 months (less time than the average time to move one maturity level). The reason Keane is able to accelerate times to maturity levels is because it has at its disposal a wide range of experience and tools that it has developed as a result of its 36 years of experience in the industry. Keane engagements have access to assets such as:

» Methodologies that articulate the 'how' for a specific service to complement the CMM's 'what'

» Complementary training programs and functions developed and refined over a period of years, a number of which are provided to our customer base to enable us to work as an effective partnership

» Process toolkits for quick tailoring to specific client environments

Many organizations do not have the critical mass or the time to play catch-up. Consequently, partnering can be the key to realizing the benefits of achieving the process maturity assessed at high CMM levels. By using a specialized firm providing consultancy in Software Process Improvement and the CMM, organizations can leverage their partner's experience and assets to accelerate improvement programs and realize the benefits earlier than would otherwise be the case. and approaches on an ongoing basis.

Conclusion

It might appear that this paper has circumnavigated the entire globe of potential issues and challenges facing IT departments, from the cost of short-term extensions on niche contractors to the early adoption of new technologies. But that is exactly the point: the CMM seeks to take a holistic approach to these issues. We have only sampled a few components and aspects of the model to illustrate that the CMM can:

» Support the introduction of practices and behavior that significantly reduces the total cost of software development

» Actively contribute to the goal of reducing time to market of business solutions while maintaining and increasing product quality

» Help the software delivery function develop a sustainable capability that positions it well for current and future developments The fundamental point is that the CMM provides a proven framework for sustainable increase in delivery productivity, and therefore, business effectiveness and profitability. Implementing effective initiatives based on models like the CMM is undoubtedly difficult and requires investment on a variety of

fronts, but there is an increasing amount of help in the marketplace to support organizations, and the potential rewards are enormous.

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