

Closing the Capability Gap

Using the Capability Maturity Model



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 departments have historically been challenged to reliably deliver application software on time and to budget. The increased business demands of the e-world are now accentuating this problem even further. This paper outlines the background to this problem and argues that to achieve longterm success, ineffectual software development processes need to be replaced with those that meet the requirements of the Software Engineering Institute’s Capability Maturity Model. This delivery capability ensures business and IT directors can positively answer the challenges of a continually evolving business landscape.

Keywords

Internet Time, Capability Maturity Model, Reduced Cycle Times, Customer Satisfaction.

Introduction

Twenty years ago, the applications software industry had a poor reputation for delivering to its customers’ needs. Typically, projects were condemned as being a combination of late (or cancelled), over budget, or not meeting users’ needs.

The good news is that over the years the industry has listened and responded

by pouring millions of dollars into tools and techniques to address these issues and improve IT delivery performance. The bad news is that in real terms only limited progress has been made, as evidenced by the 1999 Standish Group survey illustrated in figure 1.

The really bad news is that the demands of business are increasing at a rate which outstrips the improvements that the average IT function is able to make in delivery. Nowhere is this more visible than in the e-business arena.

Running on ‘Internet Time’?

Many organizations talk about operating on ‘Internet time’. Organizations in the e-business arena believe three months is the equivalent of a year, and twelve months the equivalent of a lifetime. This is driving up the demands on IT functions to:

- Deliver in significantly reduced cycle times
- Quickly develop new skills and be highly adaptive, as they will never be asked to do exactly the same thing twice
- Avoid mistakes, because there is no longer any window to rectify them
- Deliver to a wider and more unpredictable user base than ever before
- Deliver a holistic approach that

integrates properly with the rest of the business

Moreover, most organizations are realizing that the Internet and all the challenges associated with it are not a ‘nice to have’ but a critical channel for conducting business. Software is now strategically important to most organizations. In other words, we cannot quietly ignore the capability gap between business demand and IT delivery if the business is to thrive. As the question of e-business migrates from the marketing department into the boardroom, businesses need to be able to show that they have the visible capability to do things faster, better, and cheaper. This, of course, assumes a common understanding in the organization of what ‘faster’, ‘better’, ‘cheaper’ actually mean.

The unfortunate reality for many organizations is that the advent of Internet time means that the gap between need and IT delivery capability is widening, not narrowing. As illustrated in figure 2, use, complexity, and demands of software are growing at a rate with which many organizations cannot cope.

We all seem to know what our businesses need, but we aren’t as sure that our current approach to software development will allow us to provide it. So if we’re not sure we are closing

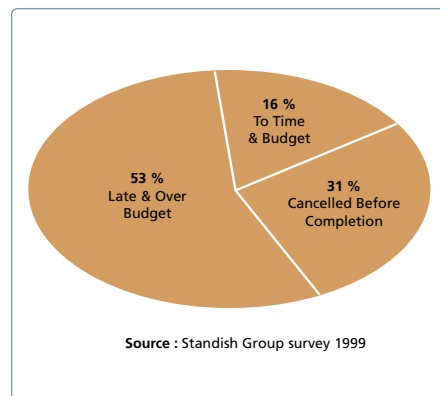


Figure 1 Standish Group survey 1999

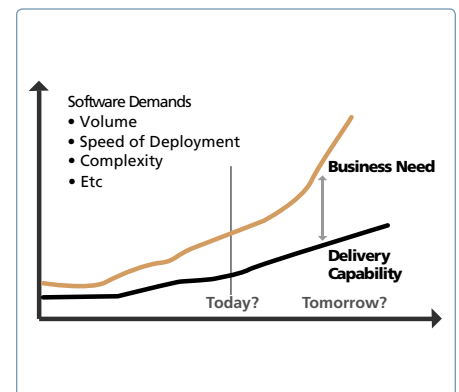


Figure 2 Use, Complexity, and Demands of software



the capability gap, how do we look to improve our capacity to really deliver?

Maturing Delivery Capability

As successive technology silver bullets have failed to slay the ‘faster, better, cheaper’ dragon, progressive organizations have looked to address wider organizational issues to improve performance. It is in this arena that models such as the Capability Maturity Model (CMM) come into their own. The CMM has been developed over a number of years by the Software Engineering Institute (SEI) under the sponsorship of the U.S. Government and is being increasingly used throughout the world.

The CMM 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. The framework provides a five-stage roadmap through which an organization can mature its processes

Most organizations intuitively assume they are operating ‘somewhere in the middle’ of the model. Upon investigation, many organizations find they are at Level 1 and that moving up to Levels 2 and 3 represents a major challenge.

and practices, as illustrated in figure 3.

The CMM is not a specific delivery methodology — it is a means for increasing organizational capability. Its underlying philosophy is that software development is a management discipline undertaken as part of achieving other business plans. Moreover, the effectiveness starts with truly understanding the needs of the business and users, and proactively measuring the ability to meet those needs.

Most organizations intuitively assume they are operating ‘somewhere in the middle’ of the model. Upon investigation, many organizations find

they are at Level 1 and that moving up to Levels 2 and 3 represents a major challenge. An organization using the CMM may set itself the sole target of achieving Level 2, which focuses predominantly on individual project-related processes. Some of these organizations then consider moving to Level 3, where the emphasis is on the wider organization. There are a smaller number of organizations that have moved to the higher levels of maturity, where quantitative management techniques (such as statistical process control) are used.

Too Busy Drowning to Inflate the Life Raft

Often organizations caught in Internet time believe they cannot afford to look to process maturity frameworks and programs to increase performance. There is sometimes a misconception with frameworks such as the CMM that they are only suitable for stable, ‘traditional’ environments and that the hectic pace of e-development in many organizations makes it inappropriate. Sometimes it is assumed they will actually increase implementation times for products.

The reality is that it is exactly the

dynamic organizations that deliver e-business solutions that cannot afford to ignore the CMM and process maturity issues. The CMM offers these organizations the opportunity to intelligently manage the challenges of operating on Internet time.

First, the CMM does not mandate a specific development process model and is highly appropriate for controlling iterative and incremental developments when onerous time to market demands must be met. For example, the Rational Unified Process (RUP) can operate highly effectively within the CMM framework. As organizations move through the levels of maturity they often recognize that ‘less is more’ and develop a highly sophisticated understanding of when to apply particular techniques and tools to a business problem, because they have a true understanding of their relative benefits. Moreover, at the higher levels of maturity the organization becomes much more adept at predicting the impact of introducing new technologies and approaches. This is critical to providing confidence that the organization can cope with pioneering projects that will deliver competitive

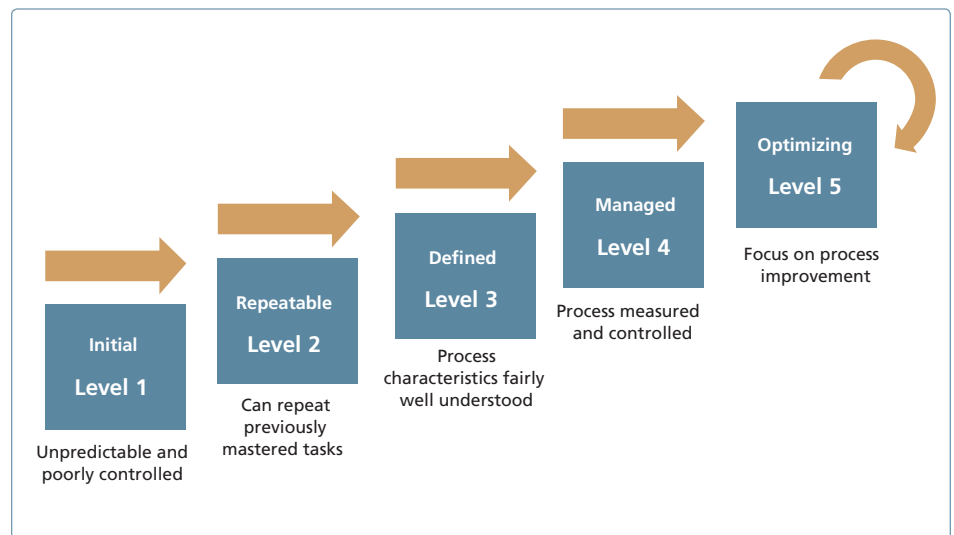


Figure 3 SEI Capability Maturity Model

The CMM is a technology neutral approach to defining levels of process maturity. Each stage of the model from 2 to 5 consists of key process areas, the application of which contribute to improving the organization’s capability. The current reality is that the majority of software organizations are at Level 1.



advantage.

Lower maturity organizations can find themselves mired in paperwork that doesn't seem to positively effect the outcomes of their projects. The CMM is not about generating reams of paper for no visible benefit. It's about the things that are really important in modern software development, such as:

- Project teams of business and IT personnel that consistently hit the ground running
- High levels of confidence in the organization's risk management skills, which allows leading edge development to take place
- Recycling and learning from experience, avoiding costly mistakes

The Benefits of CMM

The benefits of moving up the CMM scale are evidenced in a wide number of organizations and studies. Moving up even a single level in the model can result in major performance improvements, including:

- Improved delivery of requirements and customer satisfaction
- Improvement in software product quality and robustness
- Shortened (and more predictable) delivery schedules and the ability to deliver more product with the same level of resources
- Cost reductions in development and support for systems
- A shift from reactive to proactive management

The matrix in figure 4 illustrates how these benefits translate across a sample of 1000 projects. Such results have been in the public domain for some time.

What the figures don't necessarily illustrate, however, are some of the more intangible cultural benefits that operating at higher levels of the CMM can instill. High maturity organizations develop a mentality of focusing on the important things, always questioning

and measuring the real value of the work they undertake; stripping out the unnecessary while ensuring the essential is executed well. This organizational mentality is a pre-requisite to operating effectively in the moving target that is the e-business environment.

Dynamic organizations that deliver e-business solutions cannot afford to ignore the CMM and process maturity issues. The CMM offers these organizations the opportunity to intelligently manage the challenges of operating on Internet time.

- It takes time and commitment for an organization to move through the levels of the CMM. It is, after all, as much about organizational change as anything else. Many organizations take approximately 18 months to move from one level of maturity to another. The good news is that there are ways to accelerate the process, which are discussed later in this paper.
- The CMM provides an answer to 'what should I take care of' not 'how do I do it'. While this is one of its great strengths, it does mean it requires time and effort to establish the initial 'how' within the organization. This includes developing an understanding

Organization's CMM Level	Calendar Months (duration)	Level Effort (person months)	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

Figure 4 CMM Project Statistics for a 200,000 LOC Development Project
 The statistics above are based upon a sample of 1000 projects delivering 200,000 lines of code each.

- Avoiding the commercial exposure of relying on the heroic efforts of one or two individuals who are increasingly burnt-out (or restless)
- An ability to discern vendor hype on tools and techniques from those things that can add real value

Still No Silver Bullet

When used correctly, the CMM is undoubtedly a powerful tool, which can help an IT organization turn itself into a high performance service provider. However, it is not a universal panacea, and organizations considering its use need to take into account a number of important points:

- of the model and how current working practices align with the organization's goals. There is a variety of external consulting organizations that can assist in this learning curve.
- There is a risk of becoming bogged down in hitting a specific maturity level. While many organizations find the staged model an excellent way of defining achievable improvement goals for software capabilities, it is more important to do the right things needed for the business at that time. A potential risk is that in going for a specific level of maturity, the organization ignores individual key practices at higher levels of maturity



that could also add immediate benefit. This is particularly true in the e-business environment when early introduction of some of the higher maturity practices can provide additional benefit.

- One of the initial drivers for the development of the CMM was improved supplier performance and management. However, organizations should avoid trying to railroad a supplier down the CMM road at double speed. If the supplier does not currently understand it, it will take the supplier just as long as the internal organization. More importantly, for its use to be effective it should be something the supplier believes in the value of, rather than a badge that must be gained in order to do business.

These issues lead to the question...

What can be done to minimize the timetables involved in achieving higher maturity, and how can the organization take advantage of CMM benefits immediately?

One powerful approach to addressing some of the issues and a fast track to the benefits of CMM is the selective outsourcing of application portfolios to organizations experienced in the use of such models. This allows the business to:

- Quickly establish maturity for particular areas of the business that may need it more than others, for example, e-business programs that need to be brought quickly under control and start delivering real benefits in shortened timetables
- Deliver some 'quick wins', which build credibility and organizational commitment
- Use the supplier's expertise to assist in helping the user community work at high levels of maturity
- Capitalize on the supplier's experience to increase maturity within internal IT functions
- Share supplier assets and approaches

across the rest of the organization to accelerate internal improvement programs

Of course there are potential pitfalls in using this approach. Most notably, there is no single right way to do it (that's the point of the CMM), so it is important to ensure the supplier approach is not too prescriptive and will truly work for your organization. Also, this approach should be used realistically. Outsourcing will not automatically ensure the rest of the internal IT function develops the equivalent level of maturity by osmosis, and setting any expectations that it does will disappoint people. What it does provide is a springboard for extending increased maturity across the wider IT organization.

When Keane undertakes an engagement for its clients, it uses its own Application Management Methodology. This is an approach, which provides a customizable 'how' to complement the CMM 'what'. This gives an accelerated kick-start to the maturity effort and in Keane's experience allows Application Management teams to achieve Level 3 maturity in 12 months. From this platform the team can then move into the quantitative management techniques of Levels 4 and beyond if there is a case for doing so. Moreover, the Keane approach is customizable to the individual client's needs, because accelerating the maturity improvement program at the expense of providing the organization with the flexibility it needs is counter-productive.

Conclusion

It is tempting to ask the question 'can the CMM be of benefit to my organization?' However, a more relevant set of questions might be:

- Are we under pressure to reduce time to market?
- Are we under pressure to increase product quality?
- Are we under pressure to develop and learn new ways of doing things faster

than the competition?

If the answer to these questions is 'No', then you are either very lucky or exist in a parallel universe to many organizations that need to develop software. Either way, you should savor your haven of tranquility - it may not stay that way for very long, time, and make this visible within the organization?" Put another way, "Can we show we are closing the capability gap, or is it becoming a chasm that is in danger of swallowing us up?"

The CMM has been shown to offer many organizations a proven framework to increase their capabilities. First, you need to have a true idea of where you are, and the CMM is a useful tool against which you can baseline your current capability. After all, "if you don't know where you are, a map won't help" (Watts Humphrey). Only then can you choose the map that's right for your organization and begin learning how to read it.

Keane's extensive experience of working with customers to implement Application Development and Management teams that work at Level 3 maturity and above continues to reinforce its belief in the CMM. Keane's view is that the CMM acts as a catalyst to, not only reduce both costs and time to market, but also to give business and IT managers alike the confidence to positively answer the challenges that today's e-business landscape provides us.

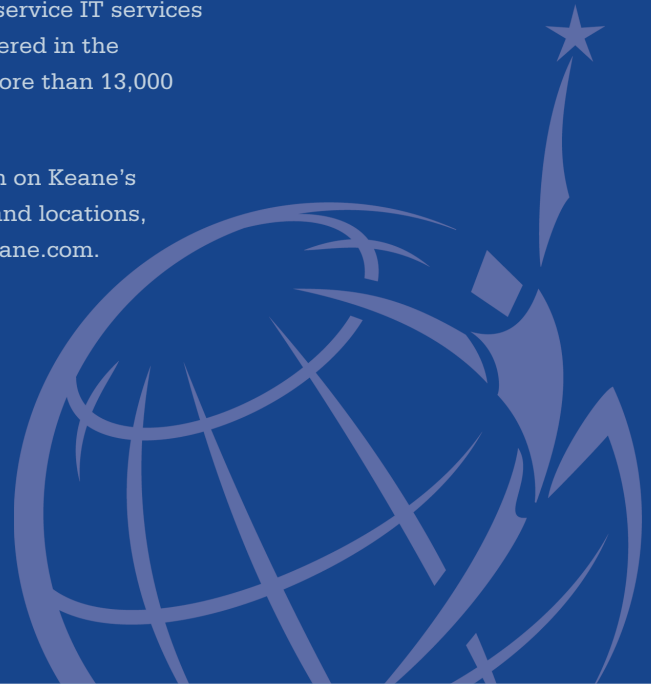


About Keane

Keane partners with businesses and government agencies to *optimize* IT investments by delivering exceptional operation, maintenance, and evolution of mission-critical systems and business processes. Keane helps clients realize the greatest value from their IT investments by leveraging an insider's hands-on understanding of the nuances and subtleties of their applications, processes and infrastructure making the recommendations we give more actionable, the work we do more pragmatic, and the results realized more measurable.

In business since 1965, Keane is an agile, mid-sized, full service IT services firm with headquarters in the United States and more than 13,000 employees globally.

For more information on Keane's services, solutions, and locations, please visit www.keane.com.



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