



Why Go To CMMI Levels 4 and 5?

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Abstract

Following the Capability Maturity Model Integration (CMMI®) Level 4 and 5 guidance, organizations have used a rational, proven approach for selecting and implementing a set of best practices and institutionalizing the use of sophisticated techniques to realize significant improvements to their business. This paper highlights the publicly reported and anecdotal benefits of organizations that are performing at CMMI higher maturity level (Levels 4 and 5), including cost, schedule, and quality improvements as well as better estimation and prediction capability and improved decision making.

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Introduction

So here you are, relaxing after a grueling appraisal where your organization achieved CMMI Maturity Level (ML) 3. You and your group stayed late for weeks making sure all of the documentation for the appraisal was ready. You have received a list of improvement activities. And now *someone wants you to look at going to Level 4/5?* Why in the world would you want to do this? By the end of this short article, you should have a better understanding of the range of benefits that could be achieved by continuing your process improvement maturity trek.

Benefits of Levels 4/5

In the CMMI, a maturity level rating provides an indication of process improvement achievement associated with a set of process areas and corresponding expectations on the performance of those processes from a business standpoint. At ML3, an organization's processes are expected to be rigorously defined, tailored for individual projects from a common set of standard processes, and well managed. The business benefits at ML3 typically include improved process performance predictability (even if the process performance is only qualitatively predictable).

At ML4, quality and process performance objectives are expected to be quantitatively predictable. There is considerable emphasis on establishing and using current process performance baselines along with process performance prediction models. Through the statistical management of selected sub-processes' variations and capabilities, key quality and process performance is understood, controlled and managed throughout the life of the processes and project. However, in ML4 organizations, current process performance may not be sufficient to meet changing business objectives (e.g., improved product quality, increased productivity, decreased cycle time) (Chrissis, M., M. Konrad, and S. Shrum 2007).

At ML5, the organization focuses on techniques to improve and/or optimize the performance of processes based on a quantitative understanding of the common causes of variation inherent in the processes. This optimization is accomplished by applying root cause analysis techniques and managing continuous process improvements through the use of quantitative objectives with explicit cost/benefit targets. At both ML4 and ML5, the use of statistical and quantitative analysis is essential to understanding as well as improving the business.

The decision, therefore, to continue your process improvement maturity trek to ML4/5 may depend largely on your understanding of the need to improve the business and the range of benefits that may be achieved as a result of this continued investment. The actual return on this investment, however, will depend on the business and process improvement objectives for your organization.

The following subsection highlights some of the quantitative and qualitative benefits reported by organizations that are performing at a higher maturity levels as well as derived from our experience working with high maturity organizations.

Published Benefits

It's not difficult to find published reports of cost, schedule, quality, productivity, and customer satisfaction improvements received by achieving certain CMMI Levels such as those identified

in (Gibson, D. L., and D. R. Goldenson 2003), (Goldenson, D. R. and D. L. Gibson 2004), (Goldenson, D. R., D.L. Gibson, and R. W. Ferguson 2004), (Hefner, R. 2005), and (Gibson, D. L., D. R. Goldenson, and K. Kost 2006), to cite a few. While the reported results are impressive, there are some caveats to consider when evaluating whether to continue your organization's journey to ML4/5.

First, an organization's baseline data is the basis for determining the quantitatively-based improvement. Your baseline measurement data is most likely different than that for the reporting organizations. Second, the reported improvement is based on changes made over a period of time and from different starting points. Table 1, summarized from (Gibson, D.L., D.R. Goldenson, and K. Kost 2006), indicates the starting maturity level and the targeted maturity level. In the examples in Table 1, various maturity levels of the Capability Maturity Model for Software (SW-CMM®) were the starting points. Third, the organization's improvement goals and/or targets may be quite different than your organization's goals. However, a key message in reviewing the results summarized in this table and in our anecdotal evidence is that organizations are realizing significant cost, schedule, productivity, quality, and customer satisfaction improvements as a result of performing at the higher maturity levels.

It should also be noted that performing as a higher maturity organization requires the ability to apply sophisticated prediction and decision making techniques to achieve business goals. The CMMI set of process goals and best practices provides the framework to help organizations achieve this success.

Table 1: Industry Reported Benefits (Gibson, D.L., D.R. Goldenson, and K. Kost 2006)

Company	ML Change	Cost Impact	Schedule Impact	Quality Impact	Other Impacts
IBM Australia Application Management Services	SW-CMM ML3 to CMMI ML5	On-budget delivery improved from over 90% to nearly 100%	Improved on time delivery improved from 97% to 99%	40% reduction in all production problems; over 80% reduction in Severity 1 problem	Over 20% improvement in account productivity; Increased productivity resulting in: \$103 million dollars saved in maintenance costs \$99 million dollars saved in development costs
Lockheed Martin Management and Data Systems	SW-CMM ML2 to CMMI ML5				55% increase in award fees compared to SW-CMM baseline at ML2
Lockheed Martin Maritime Systems & Sensors - Undersea Systems	SW-CMM ML5 to CMMI ML5			Defect rate reduced approximately 2/3 compared to performance at SW-CMM ML5	
Lockheed Martin Systems Integration, Owego, NY	SW-CMM ML5 to CMMI ML5			Reduced software-defects-per-million-delivered-SLOC to 80% from a SW-CMM ML 5 baseline figure of 50%	
Reuters	SW-CMM ML3 to CMMI ML5		Schedule variance improved from approximately 25% to 15%		
SAIC System and Network Solutions Group (SNSG)	SW-CMM ML3 to CMMI ML5				Doubled labor productivity; Steady increase in customer satisfaction during this period
Siemens Information Systems Ltd.	SW-CMM ML5 to CMMI ML5	Cost of poor quality reduced from over 45% to under 30%		Improved defect removal before test from 50% to 70%	25% productivity improvement; Estimation accuracy improved significantly during this period
Systematic Software Engineering	SW-CMM ML3 to CMMI ML4		On-time deliveries improved from 79% to 89%		
The Boeing Company	SW-CMM ML4 to CMMI ML5		Schedule variation declined by 63%		

Anecdotal Benefits

In addition, a number of qualitative benefits have been reported from organizations performing as a higher maturity organization, including:

1. Better understanding of how project decisions impact project success
2. Better understanding of how process selection impacts project success
3. Better understanding of organizational impacts to new processes or technology
4. More accurate estimates due to greater consistency of process execution
5. Better understanding by project teams of the key activities needed to achieve project success

You may notice the word “understanding” occurring many times in these benefits. It is true that the main focus of higher maturity is towards *understanding* the process and how decisions impact a project. ML4 focuses on understanding the process impacts, and ML5 focuses on understanding how process and technology changes impact the organization. Once you understand these impacts, the modeling of these impacts provides decision makers with information they may need to take the necessary actions that ensure project success.

Conclusion

The most powerful reason to move to higher maturity is because, at these levels, the organization has the infrastructure and knowledge in place for managers to truly guide their projects to success. Managers that have been able to work in this type of environment are excited at the possibilities and potential for improving performance, and resist going back to less mature projects.

It is also important to note that “performing as a higher maturity organization” and “being certified as a high maturity organization” are two different things. Organizations interested in “being certified” tend to focus on gathering the data that will corroborate their claims of high maturity, whereas an organization interested in “performing at high maturity” tends to emphasize the implementation and use of statistical and quantitative techniques to improve program performance and sustain these improvements.

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