

# How the CMMI™ Can Benefit You, Your Processes, and Your Company

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Several recent developments in Model-based process improvement are important since they can have an impact to daily work as well as help drive changes in business performance. A significant one for focus on here is the *version 1.2 Capability Maturity Model Integration* (CMMI) from the Software Engineering Institute (SEI), now being adopted in leading-edge initiatives across many organizations.

## **The CMMI™ and Improving Your Processes**

A distinction can be made between daily process(es) that govern the product realization work, on one hand and a *process (reference) model* such as the CMMI as a guide to improve the processes on the other. The CMMI is a set of industry best practices to measure processes against to see how effective they are and to identify possible gaps to help guide their improvement. As new processes evolve, measuring results (in areas such as product quality, cycle time, and productivity) provides understand of benefit(s) achieved and helps drive their *institutionalization* (the process steps all follow) and *continuous improvement*.

The CMMI was developed by a cross-functional team with broad based experience in Product realization best practices and is also based on long-term usage experience of earlier process improvement models and best practices such as the SEI CMM (Capability Maturity Model) and the Systems Engineering Process Model (CMM-SE and EIA/IS-731). Some of the earlier models were developed as a response to software cost and schedule overruns plus quality issues that arose in programs such as space flight and aviation with little tolerance for products with less than optimal performance. To stay current with user needs, the CMMI itself has gone through two revisions (with many draft review cycles before final release) since its inception in 2002 with version 1.2, released in late 2006, as the current representation (CMMI v1.2).

The *Process Management Premise* states that “the quality of a system is highly influenced by the quality of the process used to acquire, develop, and maintain it.” This premise implies a focus on processes as well as on products: This is a long-established premise in manufacturing. Belief in this premise is visible worldwide in quality movements in manufacturing and service industries (e.g., ISO standards). This premise is also applicable to development. It was the basis for the founding of the SEI Process Program (which now includes the CMMI and other improvement tools and methods) by Watts Humphrey, when the SEI was just being formed. It also strongly suggests that the *purpose of process improvement is to achieve better business performance* along with better products and their associated processes.

The value of process is that it serves to capture best practices and lessons learned in a way that fosters continued use of those practices and lessons by future projects. The CMMI model is built on this premise.

Data from companies and other CMMI users provide a strong case for this as shown in the following SEI Table (for more details from many sources see <http://www.sei.cmu.edu/cmmi/results.html> and for a full report see *Performance Results of CMMI-Based Process Improvement* (CMU/SEI-2006-TR-004 at the SEI web site).

### Performance Results Summary (SEI Data)

Improvements	Median	# of data points	Low	High
Cost	20%	21	3%	87%
Schedule	37%	19	2%	90%
Productivity	62%	17	9%	255%
Quality	50%	20	7%	132%
Customer Satisfaction	14%	6	-4%	55%
Return on Investment	4.7 : 1	16	2 : 1	27.7 : 1

- N = 25, as of 15 December 2005
  - Organizations with results expressed as change over time
- "CMMI@ Version 1.2 and Beyond", December 15, 2005 - Mike Phillips, Software Engineering Institute, Carnegie Mellon University  
<http://www.sei.cmu.edu/cmmi/semite.htm>

### Capability Maturity Model Integration - Content

The functional content of the CMMI (v1.2) has 22 Process Areas (PAs). The span of coverage for most product realization life cycles indicates for the CMMI a case can be made for coverage of processes spanning the entire product cycle from early requirements creation to product retirement.

The CMMI focuses on Software, Systems, Supplier Sourcing, and a new concept called *Integrated Product and Process Development* (IPPD). The CMMI also adds a new process role called *relevant stakeholder(s)*, those who are associated with the project; management, developers, suppliers, customers, and others. The main difference is that their function is defined in project plans at the outset. They may be included at reviews, signoff approvals and milestones to ensure progress and expectations are being met along the entire lifecycle and objections or improvements can be considered earlier by a wider knowledge base.

The following table shows the 22 CMMI Process Areas.

#### CMMI Continuous Representation – PA Categories (22 PA)

Category	Process Areas Including IPPD
<b>Process Management</b>	Organizational Process Focus Organizational Process Definition + IPPD (SG 2) Organizational Training Organizational Process Performance Organizational Innovation and Deployment
<b>Project Management</b>	Project Planning Project Monitoring and Control Supplier Agreement Management Integrated Project Management + IPPD (SG 3) Risk Management Quantitative Project Management
<b>Engineering</b>	Requirements Management Requirements Development Technical Solution Product Integration Verification Validation
<b>Support</b>	Configuration Management Process and Product Quality Assurance Measurement and Analysis Decision Analysis and Resolution Causal Analysis and Resolution

The chart shows the Process Areas are grouped into four related Categories. The PAs can provide best practices to help build or improve existing associated processes across multiple domains or *disciplines* including software engineering, hardware engineering and systems engineering. *Appraisal Methods* are available to assist in the gap analysis and determining next steps to take.

### **Integrated Product and Process Development (IPPD)**

IPPD considers teams of developers, a concept that is important when considering new team-driven approaches, such as agile programming methods. They may be cross-functional or similar functions but the key is to achieve a timely collaboration of relevant stakeholders throughout the life of the product to satisfy customers' needs, expectations, and requirements. Sometimes this will be covered by an organizational matrix concept. All members own their team charter and shared vision and agree upon their roles. In this way, the decision making process can often be pushed down to the lowest level possible for detailed understanding and effective decision making. The CMMI has additional extensions in two PAs to support IPPD.

### **Improvement Implementation Flexibility**

The CMMI is more flexible than earlier models. Two *representations* exist, each of which is analogous to an architectural format or view into a data set. The *staged representation*, which says you must satisfy a prescribed set of Process Areas to achieve a process maturity level. The CMMI is additionally available in a *continuous representation*, which allows any PA to be at any capability level (similar to staged level of maturity, but for one or several PAs). The content of each representation is the same. No matter what sequence is taken, the goal should be to (over time) continuously improve its processes, measure the gains, and to *institutionalize* the new process across the entire organization such that the product realization process is "what everyone always does" in a consistent and repeatable way.

### **Other Significant CMMI Features**

If you wish to find out more about the CMMI model and the supporting Appraisal Method, please visit the SEI web site at <http://www.sei.cmu.edu/cmmi/>.

As many companies are not only focused on Software, but rather on multiple disciplines (and IPPD), the CMMI should cover most business processes to provide significant benefit in "Appraising" the processes and the products they help to produce. This will help drive institutionalization and continuous improvement in both products and processes, and make your company more competitive.

### **Biography:**



*Bud Glick is a Consultant for Process Improvement on the Software Engineering Services Quality Management Team. He is also an SEI-certified High Maturity Lead Appraiser and authorized course instructor for the SEI Introduction to the Capability Maturity Model Integration (CMMI™) for Development. Bud was a member of the SEI CMMI v1.1 Product Development Team with a focus on the Appraisal Method development.*

### **Bibliography:**

*CMMI – Second Edition Guidelines for Process Integration and Product Improvement –* Chrissis, Konrad and Shrum, Addison Wesley, 2007, ISBN 0-321-27967-0