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**CMMI: Guidelines for  
Process Integration and  
Product Improvement**

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and Product Improvement**

Reviewed by Paul Harmon

I'm the first to acknowledge that there are lots of different communities pursuing process change and quick to say that some of them don't communicate very well with the others. Six Sigma practitioners and software developers, for example, often act as if the other group doesn't exist. The CMMI community, however, would probably get a special prize, if anyone was to try to determine which business process movement was the most isolated in their thinking.

The subtitle of the book suggests that CMMI is about process integration and product improvement. The first sentence in the preface narrows that quite a bit and suggests that Capability Maturity Model Integration (CMMI) "consists of best practices that address the development and maintenance of products and services covering the product life cycle from conception through delivery and maintenance." It goes on to suggest that a product can be "an airplane...a software package...[or a] service such as delivering a training class, [or] technical support for a software product..."

The shift between process integration and products is a bit unnerving, but if you go to the index of the book, you begin to realize just how strange CMMI really is. There is no entry for Business Process Modeling, CRM, ERP, ISO9000, Supply Chain, Six Sigma, Sales, or Marketing.

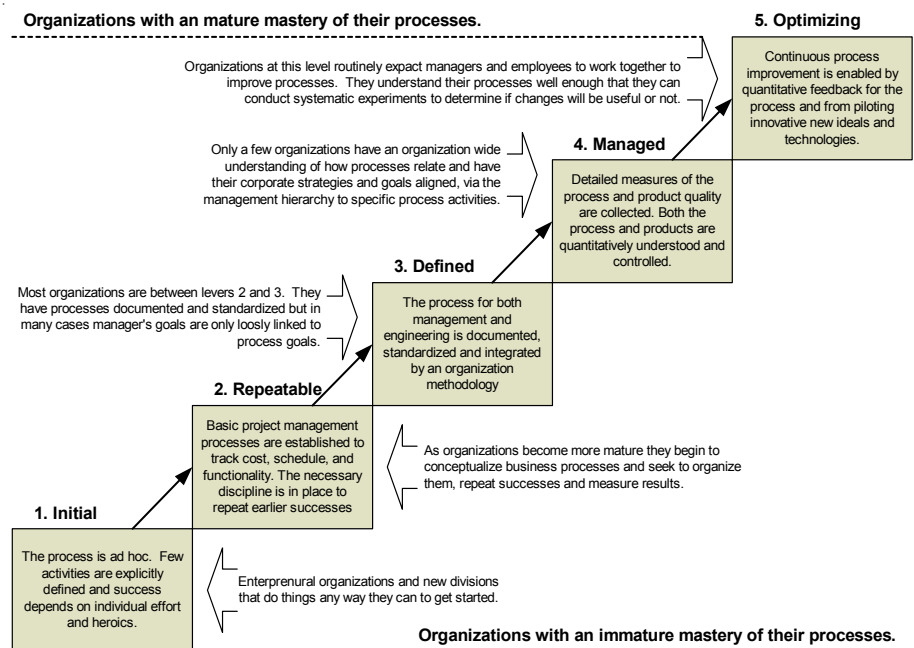
CMMI is the end result of a offshoot of the quality control movement that got started in Eighties, developed a special vocabulary and perspective, and has kept refining itself ever since. There are obvious affinities between CMMI and much of the other work going on in the world of process change, but you'd never know it from reading this book. You have to figure out the connections for yourself.

The essence of the CMMI movement is the idea of a Capability Maturity Model (CMM). The basic idea is that companies that are more systematic and process-oriented do better than those that don't have any underlying or repeatable processes. CMM frameworks describe a set of practices or stages that companies work through as they become more proficient. The Capability Maturity Model Integration (CMMI) framework attempts to combine and become the integrated successor for three earlier CMM frameworks:

- The Capability Maturity Model for Software (SW-CMM)
- The Systems Engineering Capability Model (SECM)
- The Integrated Product Development Capability Maturity Model (IPD-CMM)

Most software developers are familiar with SW-CMM, which is usually just called CMM. Figure 1 illustrates the five levels or stages through which CMM hypothesizes that software development groups evolve as they become more mature.





**Figure 1. Five Levels that Software Organizations Evolve Through as the Gain Mastery of the Software Development Process.**

Anyone who has studied CMM accepts that there's something intuitive about it. First you have to define your processes (1>2). Then you need to create some standards so you do the same processes the same way each time (2). Having done some processes in a consistent (repeatable) manner, you should move on to define and standardize all your processes (2>3) and so forth.

The original SW-CMM model was developed by the Software Engineering Institute (SEI) which was initially funded by the DOD and is located at Carnegie-Mellow University. SEI remains the font of CMM research and assessment. Software organizations have followed CMM guidelines, documented the results and submitted themselves to audits. As a result, companies are able to claim that their software groups are operating at CMM level 3 or 4 or 5.

In the mid-Nineties, people began to talk about CMM as an approach that could be applied to an entire organization and to processes other than the software development process.

The Electronic Industries Alliance (EIA) created the Systems Engineering Capability Model (SECM) to describe any product development process. Since the EIA team realized that a description of an organizations product development processes would include various processes that were at a very different levels of maturity, it abandoned the idea of giving a single maturity measure, and opted, instead, to focus on Capability Levels. In essence, SECM beings by creating groups or sets of processes and then assigns a capability level to each group of processes. Thus, the same organization might be very good at developing chips, but still rather immature in developing employee training, or marketing plans.



CMMI sets out to synthesize the two approaches. It ends by keeping both and telling the reader he or she can choose whichever overall approach works best for his or her purposes. More important, however, CMMI defines 25 Process Areas, and points out that both Maturity Levels and Capability Levels rely on these Process Areas and that there is an 80% overlap.

Process Area	Category	Maturity Level
Causal Analysis and Resolution	Support	5
Configuration Management	Support	2
Decision Analysis and Resolution	Support	3
Integrated Project Management	Project Management	3
Integrated Supplier Management	Project Management	3
Integrated Teaming	Project Management	3
Measurement and Analysis	Support	3
Organizational Environment for Integration	Support	3
Organizational Innovation and Deployment	Process Management	5
Organizational Process Definition	Process Management	3
Organizational Process Focus	Process Management	3
Organizational Process Performance	Process Management	4
Organizational Training	Process Management	3
Product Integration	Engineering	3
Project Monitoring and Control	Project Management	2
Project Planning	Project Management	2
Process and Product Quality Assurance	Support	2
Quantitative Project Management	Project Management	4
Requirements Development	Engineering	3
Risk Management	Project Management	3
Supplier Agreement Management	Project Management	2
Technical Solution	Engineering	3
Validation	Engineering	3
Verification	Engineering	3

Most of the CMMI book is devoted to describing the Process Area's in more detail, though only in its own terms. For example, it is hard to imagine a discussion of Process and Product Quality Assurance that doesn't consider that Six Sigma or some of the Six Sigma tools might be a best practice, or that BAM might be appropriately mentioned.

To gain a better understanding of the focus of CMMI, consider the categories described above. If I was going to translate the categories into everyday business process language, I'd suggest the following:

**Process Management** Refers to Strategic Process Management Planning. In one of its few efforts to cross reference, CMMI suggests, that the Process Area: Organizational Process Definition, is sometimes called "process architecture."

**Support** Refers to what managers do when they manage business processes. They Plan, Organize, Monitor and Control the work of those actually implementing the process.



Engineering	Refers to the analysis and design of new hardware or software products. In essence, one would say this was a key part of the New Product Development Process.
Project Management	Refers to the lifecycle management of new product development efforts.

If you are focused on business process architecture, or day-to-day business process management, this book has some interesting ideas. If you are involved in new product development or software engineering, then this book has lots of very valuable information.

If you are interested in supply chain systems, the improvement of sales or marketing activities, or accounting processes, this book has nothing to offer, except indirectly, in the sense the process management practices apply to all processes.

More important, this isn't a book about process integration or improvement in any ordinary sense of the word. There are no specifics on how to analyze actual processes or how to improve actual practices. There is nothing like SCOR's definitions of specific supply chain processes or metrics that supply chain managers can use to evaluate their supply chain processes. Instead, there is advice on how to analyze the process management policies of a company, and specific advice on how to organize product development and software engineering processes.

Like ISO standards, CMMI provides a way of defining and documenting process management activities. It's a pity the authors didn't take a few pages to compare and contrast their work with the various ISO efforts. (They do include the ISO standards in an appendix with pointers to appropriate URLs, but there's no mention of the standards in the index or in the text itself and one is left wondering if they duplicate each other's work, or are somehow compatible.)

CMMI provides a nice review of the CMM movement and a good handbook that describes best practices in process management, new product development, and product lifecycle management. For business process managers focused on those issues, start by checking the SEI site: [www.sei.cmu.edu/cmmi](http://www.sei.cmu.edu/cmmi). It will provide you with an idea of what is on offer. If you then want a good index and a general description of each of the various "process areas" that CMMI embraces, this is the book for you.

There is a lot of good stuff here. It's a pity that this group of practitioners have allowed themselves to become so introverted that they seem unable to position their work relative to the broad trends within the business process movement, as a whole, or to establish pointers between their work and similar work in other areas.

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### The Author's Response

Thank you for reviewing our book and for giving us the opportunity to respond to your comments. After reading your review, we realized that your expectations for the book varied from the vision we had for the book. Our purpose in writing this book was to provide a single source for all CMMI® model information. We wanted to help CMMI users make their selection of one or both of the two model representations over time, when they knew more about CMMI best practices and how they might best be applied in their organization. We also wanted to provide a complete and understandable description of what CMMI is all about.

Please understand that CMMI, as well as other CMM®s, were developed to be used with judgment in the context of the organization's unique environment. The power of CMMI is that it can be flexibly and purposefully implemented by organizations to achieve their business objectives. CMMs are not how-to manuals that provide a step-by-step method to achieve process improvement because such a cookie-cutter approach doesn't address the individual needs of organizations or support the dynamic environments organizations must cope with daily. In other words, CMMI best practices do not judge or recommend particular approaches or tools for achieving CMMI practices and goals (e.g. Six Sigma, ERP, etc.).

Organizations have business objectives that are unique and that change over time. The decision on what method is best to help them achieve their business objectives and CMMI best practices, rests with the organization. The widespread adoption of CMMI has confirmed our belief in this approach. Although CMMI has been widely available less than two years, over 9000 people have attended Introduction to CMMI training. There are over 200 lead appraisers authorized to objectively appraise organizations using CMMI models. There are over 100 organizations licensed by the SEI<sup>SM</sup> that are providing services that support CMMI-based process improvement.

CMMI has been applied in different industries by organizations of different sizes in different cultures. For example, CMMI has been adopted by organizations in the U.S., India, Japan, Australia, France, and other countries. Organizations in automotive, consumer electronics, aerospace, defense, telecommunications, finance, insurance, health care, and other areas have adopted CMMI in addition to traditional audiences of process improvement such as software development and information technology organizations. Huge multi-national corporations as well as small corporations employing less than 100 people have adopted CMMI. You can see the overall picture of CMMI adoption in the CMMI Maturity Profile on the SEI Web site (<http://www.sei.cmu.edu/sema/profile.html>).

Comparing CMMI best practices to other process improvement vehicles, such as ISO and Six Sigma, is a great idea for a future book. Initially, however, we did not include this information because CMMI is relatively new. We also believe that comparisons made by impartial and objective sources are the most credible and reliable for this kind of information. We do, therefore, provide links to the SEI Web site ([www.sei.cmu.edu](http://www.sei.cmu.edu)) in the book where mappings and comparisons of CMMI to other process improvement methods developed by knowledgeable and



objective sources are provided as they become available.

The intuitive nature of CMMI and its flexibility are no accident. You are right about the special vocabulary used by the CMM. CMMI has reversed the trend by selecting, where possible, terminology that is not discipline-specific or CMM-specific. We hope that you and others will find that CMMI is easier for the layman to pick up and read than older CMMs.

As CMMI continues to be used throughout the world, we will learn more about how organizations are choosing to implement CMMI best practices. Then, perhaps, we can recommend tools, approaches, methods, and strategies for effective CMMI-based process improvement programs. Until then, we will rely on the knowledge within the organization to decide what is best for them.

Thanks again for your review and the opportunity to respond.

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