



# CMMI-ACQ



**Guidelines  
for Improving  
the Acquisition  
of Products  
and Services**

**Brian P. Gallagher • Mike Phillips**

**Karen J. Richter • Sandy Shrum**



# Carnegie Mellon Software Engineering Institute

The SEI Series in Software Engineering

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# FOREWORD

## *A Commercial Perspective*

Every day more companies are realizing that their market, competition, and economics have changed. Supported by advances in technology, companies previously operating within a single country or region now find themselves competing in a global marketplace. Within these enterprises, the information technology (IT) organization must partner with business leaders to transform the organization, develop global business processes, and introduce technology that supports these processes and drives collaboration and innovation on a global basis.

Similar to the way that businesses must adopt a new operating model and grow new skills, IT organizations themselves must adopt new practices and develop new skills to be successful. One of the key skills necessary for organizational growth is the successful management of technology sourcing and acquisition. Creating business solutions today involves obtaining, integrating, and managing skills and services from a variety of sources. These include networking, security, hosting, and disaster recovery, in addition to the more commonly thought of tasks such as design and coding. In many instances, solutions involve ERP, COTS, or BPO deployments, where there is little, if any, actual development activity. Clearly, the operating model of technology organizations has shifted from internal development to acquisition. In fact, recent studies have shown that nearly 75 percent of total global IT

budgets are spent on purchases (Forrester 2006). In today's environment, it is difficult for IT organizations to be competitive unless they excel in acquisition. The SEI has recognized this and responded with the creation of the Capability Maturity Model for Acquisition (CMMI-ACQ).

In creating the CMMI-ACQ, the SEI realized that the process of acquiring technology is significantly different from running an internal development organization. Organizations that acquire technology must build strong relationships with the business, understand business strategy, develop enterprise-level technology architectures, protect intellectual property, and source technology that aligns with all of the above. Effective acquisition requires developing clear requirements, soliciting bids, negotiating scope and price, managing supplier commitment delivery, and ensuring that the business is prepared for the technology. The acquisition team must ensure that suppliers understand the business objective of the acquisition and are aligned to deliver the right value to the business.

At General Motors (GM), we sell and deliver the best transportation products and services to our customers in more than 200 countries around the globe. To accomplish this, our employees and partners collaborate globally on vehicle design, manufacturing, distribution, marketing, and sales of more than nine million vehicles annually. In addition, GM has an incredibly robust research organization that is pioneering the development of new technologies, including electric vehicles, hybrid drivetrains, and bio-fuel engines. To ensure that GM maintains a leadership position in the automotive industry, we continuously invest in system capabilities that drive collaboration and innovation throughout GM's global organization.

The Information Systems and Services (IS&S) organization is responsible for delivering and operating IT globally for GM. The IS&S organization is structured and operates in an acquisition model for the development, operation, and maintenance of all systems. GM has an internal staff responsible for business knowledge, technical strategy, and supplier management. Complementing the GM internal staff, we partner with the world's best IT suppliers for the actual design, construction, deployment, and operation of technology. This structure ensures that GM employees remain accountable for all aspects of IT performance while leveraging the talent, scalability, and global footprint of multiple suppliers.

When developing the organization structure and processes to support our acquisition model, we searched for frameworks and benchmarking tools to measure our performance against accepted

best practices. We reviewed many models and concluded that the existing models focused on best practices and maturity levels for organizations that develop technology. No models or guides were truly appropriate for the customers of the technology. Rather than developing an internal model unique to GM, we leveraged our successful history with CMMI-DEV and partnered with the Software Engineering Institute (SEI) to create a model for the acquirers, or customers, of technology. The SEI offered a wealth of expertise to support this. It contributed internal expertise and access to other major technology acquirers in both the government and commercial areas. Looking forward, the SEI is able to provide training, implementation assistance, and appraisals to support industry adoption.

The result of our partnership with the SEI was the CMMI-ACQ, the model upon which this book is based. This new CMMI model provides GM with a road map to help focus our resources on continuously improving the management of our global environment. The model reinforces key competencies that we must maintain within GM; these include business knowledge, requirement skills, and technical architecture to drive strategy. They also include program management, project management, and contract management, to drive delivery and value for our business.

With IT essential to virtually all aspects of world commerce, this landmark new model can produce broad benefits for businesses in all industries. Businesses that take full advantage of the model can enhance their IT operations and better serve their customers, just as we have done here at GM. Such organizations will understand that although they work with partners to design, develop, and operate systems, they must remain accountable to the business for the entire solution. The CMMI-ACQ describes the necessary practices in requirements, sourcing, architecture management, and project management to support this.

I believe the CMMI-ACQ will be adopted by many organizations and will continue to evolve. Our environment is one in which suppliers must work collaboratively with other suppliers and in which new systems need to integrate into a complex network of other systems. The technologies will continue to evolve, as will supplier and acquirer business models. The CMMI-ACQ will have to keep pace, and we look forward to our continued relationship with the SEI to make sure that the CMMI-ACQ continues to be a valuable tool for GM and other technology acquirers.

I congratulate the various contributors that delivered the CMMI-ACQ maturity model. I also want to commend the authors of this

book for taking the CMMI-ACQ and making it more relevant for commercial and government organizations. The authors' notes provide context and perspective for the reader to relate to these practical concepts. The case studies provide real-world examples that create a vision for organizations to pursue.

Effectively managing technology suppliers, while retaining business relationships and technology strategy, is a competence that virtually all organizations will need to develop. Until now, the resources to guide organization in this development were scarce. The CMMI-ACQ is a valuable guide in this area. It provides a framework based on proven best practices, a path for adopting the practices, and a standard method for assessing your progress and maturity. I commend the SEI for the creation of the model and encourage organizations to utilize it on their journey to acquisition maturity.

—Ralph Szygenda  
Chief Information Officer and Group Vice President  
General Motors Corporation  
Detroit, Michigan

# FOREWORD

## *A Government Perspective*

I do not often have the pleasure of writing a foreword for an extraordinary piece of work as that presented in this text. What the CMMI-ACQ team has done is unique and offers a tremendous tool to greatly improve the acquisition process within the Department of Defense (DoD). The twenty-first century is challenging our old ways of managing projects and programs—particularly, *complex* projects and programs. This text provides a method for meeting that *challenge*.

In my more than 30 years in the DoD acquisition business, I have worked on, reviewed, and assessed countless programs. All successful programs (despite what you may have heard, the successes far outnumber the failures) have a set of common traits that I call the “3 Rs.” The first “R” is the customer’s “requirement.” In the DoD, it is what the warfighter wants in order to accomplish his mission. The second “R” is for “resources.” Here “resources” refers not only to funding but equally to the presence of “the right processes” to acquire the capability the warfighter requested. And finally, the third “R” is for “the right people.” In other words, having the right people who are educated, trained, and experienced to understand the requirement and know how to use the right processes, and the funding to meet the cost, schedule, and performance demands of the program.

I have used the “3 Rs” approach for decades and I have encouraged others to use it. Although we strive to get requirement growth under

control and the right people in place for long periods of time, the truth of the matter is that we do neither very well. And that reality most likely will not change in the foreseeable future.

However, I have observed that if you have strong and effective processes, this reality is effectively addressed by accommodating the enviable changes in requirements and people. That is the SEI's strong suit as evidenced by its CMMI approach to software, which has helped scores of companies and government program offices with software-intensive programs. Now that approach is being applied to acquisition. In short, the CMMI-ACQ model offers a powerful tool to put in place strong, adaptive, effective processes to manage the acquisition of products and services for warfighters.

The timing of CMMI-ACQ could not be better. The DoD is suffering losses in all of its acquisition areas: in terms of numbers of people as well as expertise. As older employees leave government work, their expertise goes with them. And even though the DoD is projected to maintain its current acquisition work force numbers, the experience of the incoming work force has created a knowledge/expertise shortfall. The CMMI-ACQ tool offers a way for program managers and others to mitigate the impact of this shortfall.

It has been a joy reading and understanding what this text presents. I trust you will gain the same appreciation as you read and use this text. My hat is off to the world-class talent of the CMMI-ACQ team who devoted so much time and effort to this project, and to the SEI for constantly pushing the art of the possible and the pursuit of excellence.

And now, I invite you to read, learn, and help yourself and others meet the *challenge* of the twenty-first century.

—Hon. Claude M. Bolton, Jr., DSc  
DAU Executive in Residence  
Defense Acquisition University  
Fort Belvoir, Virginia

## PREFACE

A growing trend in business and government alike is one that has organizations purchasing, outsourcing, and acquiring products and services to deliver or assemble and deliver to their customers. Instead of focusing on the development of products and services, organizations are focusing on acquiring the best products and services developed by other organizations.

Because of this new emphasis in organizations, there is a lack of experience to draw on in the organization or even to hire that makes it difficult to be successful in this acquisition environment. The factors to consider are different.

The CMMI Product Team and its sponsors acknowledge this trend and have created the CMMI for Acquisition (CMMI-ACQ) model to help these organizations by codifying best practices. These best practices apply to processes critical to the successful acquisition of products and services and cover the important processes involved in an acquisition environment.

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### What Is CMMI?

CMMI (Capability Maturity Model Integration) is the name given to the collection of models that comprise best practices designed to help organizations improve the performance of their processes and the training and appraisals that support these models. A CMMI model

documents activities important to different aspects of the processes needed to deliver products and services to a customer. The CMMI model contained in this book, CMMI-ACQ, is a model designed specifically for organizations that acquire products and services, including large, complex systems.

The first CMMI model was developed by a product team from industry, government, and the Software Engineering Institute (SEI) for the application of process improvement in the development of products and services.

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## What Is CMMI for Acquisition?

The CMMI-ACQ model was developed in a slightly different way. The first step was taken by General Motors, in collaboration with the SEI and with approval of the CMMI Sponsors and Steering Group. An author team in its Information Technology department developed the initial draft of the Acquisition model as the special report *Adapting CMMI for Acquisition Organizations: A Preliminary Report* [Dodson 2006]. The SEI released this report on its Web site. The CMMI Product Team sought input about this report from organizations that acquire products and services as a major part of the business processes. Organizations were also recruited to pilot this report to see how well it helped those who used it.

In the meantime, the CMMI Product Team formed a model development team that would use the report as a basis to form a CMMI model. Gathering input from those who piloted and reviewed the preliminary report, the CMMI-ACQ development team began work on just that. This team consisted of members from government, industry, and the SEI to ensure a wide variety of perspectives, just as other CMMI model development teams had in the past. This team subsequently created CMMI for Acquisition, Version 1.2 (CMMI-ACQ, V1.2). This model was released in November 2007 as a new member of the CMMI Product Suite and is included in this book with elements we've added.

We, as book authors, added tips and hints to all of the model's process areas to help you apply the practices in your organization. We've also added a case study from General Motors that describes how CMMI-ACQ has worked in that organization. Further, we've included important information about and for the government's use of CMMI-ACQ and the government's special needs.

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## **Purpose**

The purpose of this book is to present acquisition best practices by including the full CMMI-ACQ, V1.2 model as well as other information to help you apply these practices in your organization. This other information takes the form of tips, hints, and cross-references that supplement the model practices and additional chapters that focus on the needs of industry and government.

The CMMI-ACQ, V1.2 model is a collection of best practices generated from the CMMI V1.2 Architecture and Framework. This collection's best practices apply to professionals in both government and industry who acquire products and services for their customers and endusers.

The CMMI-ACQ model provides guidance for those who initiate and manage the acquisition of products and services that meet the needs of the customer and enduser. Although suppliers may provide artifacts useful to the processes addressed in CMMI-ACQ, the focus of the model is on the processes of the acquiring organization. CMMI-ACQ integrates bodies of knowledge that are essential to these processes.

The supplier-executed portion of the activities integral to the acquisition of products and services may use the CMMI for Development (CMMI-DEV) model [SEI 2006a]. In cases where the acquirer is also a product or service developer (e.g., taking responsibility for the first few layers of product development and integration), CMMI-DEV (in particular, the Requirements Development, Technical Solution, and Product Integration process areas) are useful for improving the acquirer's product or service development processes.

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## **Contributors to CMMI for Acquisition**

Many talented people were involved in the development of the CMMI v1.2 Product Suite, which includes both CMMI for Acquisition and CMMI for Development. Three primary groups involved in this development were the CMMI Steering Group, Product Team, and Configuration Control Board.

The Steering Group approved the architecture for adding additional areas of interest to the CMMI Product Suite by approving the concept of “constellations” built from the CMMI Model Framework (CMF) and CMMI Architecture. A *constellation* is a collection of components

used to construct models, training materials, and appraisal materials in an area of interest (e.g., acquisition and development).

The Steering Group initiated the development of the Acquisition constellation, recognizing the importance of providing best practices to acquirers. The Steering Group provided guidance for the development of the CMMI-ACQ model and its accompanying training materials by guiding and approving plans of the Product Team, providing consultation on significant CMMI project issues, and ensuring involvement from a variety of interested communities.

The Product Team wrote, reviewed, revised, discussed, and agreed on the structure and technical content of the CMMI Product Suite, including the framework, models, training, and appraisal materials. Development activities were based on multiple inputs. These inputs included an A-Specification and guidance specific to each release provided by the Steering Group, source models, change requests received from the user community, and input received from pilots and other stakeholders.

The CMMI Configuration Control Board (CCB) is the official mechanism for controlling changes to CMMI models, the SCAMPI appraisal method, and *Introduction to CMMI* training. As such, this group ensures integrity over the life of the product suite by reviewing all proposed changes to the baseline and approving only those changes that satisfy identified issues and meet criteria for the upcoming release.

The Acquisition Advisory Board acted as the configuration control board for the Acquisition constellation, approving all changes to the initial draft of the CMMI-ACQ contained in the special report. Consisting of experts in the field of acquisition, this group ensured the integrity of the constellation using the same review process as the CMMI CCB.

Members of the groups involved in developing CMMI-ACQ, V1.2 are listed in Appendix C.

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## Audience

The audience for CMMI-ACQ is anyone interested in process improvement in an acquisition environment. Whether you are familiar with the concept of Capability Maturity Models or are seeking information to get started on your improvement efforts, CMMI-ACQ will be useful to you. This model is also intended for organizations that want to use a reference model for an appraisal of their acquisition-related processes.<sup>1</sup>

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1. An *appraisal* is an examination of one or more processes by a trained team of professionals using a reference model (e.g., CMMI-ACQ) as the basis for determining strengths and weaknesses.

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## Organization of This Book

The organization of the book is similar to the CMMI-ACQ model available on the SEI Web site. However, we added a few features that are not found in that document.

- We added tips, hints, and cross-references in the margins throughout the process areas to help you better understand, apply, or find more information about the content of the process areas.
- We added two additional chapters in Part One. The first, Chapter 6, describes the special needs of government acquisition organizations and how CMMI-ACQ can support improving processes in that environment. The second, Chapter 7, demonstrates how CMMI-ACQ can successfully be applied in industry and the benefits that can result from its use.
- Process area sections have tabs that help you to quickly open the book to just the spot you need.
- An index is provided to help you find specific information quickly.

The book is organized into three main parts:

- Part One—About CMMI for Acquisition
- Part Two—Generic Goals and Generic Practices, and the Process Areas
- Part Three—The Appendices and Glossary

Part One, “About CMMI for Acquisition,” consists of seven chapters.

- Chapter 1, “Introduction,” offers a broad view of CMMI and the Acquisition constellation, concepts of process improvement, the history of models used for process improvement, and different process improvement approaches.
- Chapter 2, “Process Area Components,” describes all of the components of the CMMI-ACQ process areas.
- Chapter 3, “Tying It All Together,” assembles the model components and explains the concepts of maturity levels and capability levels.
- Chapter 4, “Relationships among Process Areas,” provides insight into the meaning and interactions of the CMMI-ACQ process areas.
- Chapter 5, “Using CMMI Models,” describes paths to adoption and the use of CMMI-ACQ for process improvement and benchmarking of practices in an acquisition organization.
- Chapter 6, “Using CMMI-ACQ in Government,” describes the special needs of the government acquisition environment and how CMMI-ACQ provides a helpful tool for improvement.

- Chapter 7, “Using CMMI-ACQ in Industry: General Motors Case Study,” describes the experiences of General Motors as it applied CMMI-ACQ best practices in the organization and the benefits that resulted.

Part Two, “Generic Goals and Generic Practices, and the Process Areas,” contains all of the CMMI model’s required and expected components. It also contains related informative components, including subpractices, notes, examples, and typical work products.

Part Two contains 23 sections. The first section contains the generic goals and practices. The remaining 22 sections each represent one of the CMMI-ACQ process areas.<sup>2</sup> To make these process areas easy to find, they are organized alphabetically by process area acronym and have tabs on the outside edge of the page. Each section contains descriptions of goals, best practices, and examples. Plus, we’ve added tips, hints, and cross-references in the outer margins to help explain concepts and relationships and to provide other useful information.

Part Three, “The Appendices and Glossary,” consists of four sections.

- Appendix A, “References,” contains references you can use to locate documented sources of information such as reports, process improvement models, industry standards, and books that are related to CMMI-ACQ.
- Appendix B, “Acronyms,” defines the acronyms used in the model.
- Appendix C, “Project Participants,” contains lists of team members and their organizations who participated in the development of CMMI-ACQ, Version 1.2.
- Appendix D, “Glossary,” defines many of the terms used in CMMI-ACQ.

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## How to Use This Book

Whether you are new to process improvement, new to CMMI, or already familiar with CMMI, Part One can help you understand why CMMI-ACQ is the guide to use for improving your acquisition processes.

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2. A *process area* is a cluster of related best practices in an area, which when implemented collectively, satisfies a set of goals considered important for making significant improvement in that area. This concept is covered in detail in Chapter 2.

### **Readers New to Process Improvement**

If you are new to process improvement or new to the Capability Maturity Model (CMM) concept, we suggest that you read Chapter 1, “Introduction,” first. Chapter 1 contains an overview of process improvement that explains what CMMI is all about.

Next, skim Part Two, including generic goals and practices and specific goals and practices, to get a feel for the scope of the best practices contained in the model. Pay close attention to the purpose and introductory notes at the beginning of each process area.

In Part Three, look through the references in Appendix A and select additional sources you think would be beneficial to read before moving forward with using CMMI-ACQ. Read through the acronyms and glossary to become familiar with the language of CMMI. Then, go back and read the details of Part Two, including the tips and hints.

### **Readers Experienced with Process Improvement**

If you are new to CMMI but have experience with other process improvement models, such as the Software Acquisition CMM, you will immediately recognize many similarities in their structure and content.

We recommend that you read Part One to understand how CMMI is different from other process improvement models. If you have experience with other models, you may want to select which sections to read first. Read Part Two with an eye for best practices you recognize from the models that you have already used. By identifying familiar material, you will gain an understanding of what is new and what has been carried over or is familiar from the models you already know. Review the tips, hints, and cross-references to see details and relationships that will help you understand CMMI better.

Next, review the glossary to understand how some terminology may differ from that used in the process improvement models you know. Many concepts are repeated, but they may be called something different.

### **Readers Familiar with CMMI**

If you have reviewed or used a CMMI model before, you will quickly recognize the CMMI concepts discussed and the best practices presented. Focus in on the tips, hints, and cross-references in the process areas to discover new ideas, relationships, or details you may have missed before.

## **Additional Information and Reader Feedback**

Many sources of information about CMMI are available, such as the background and history of the CMMI models, as well as the benefits of using CMMI models. Many of these sources are listed in Appendix A and are also published on the CMMI Web site—[www.sei.cmu.edu/cmmi/](http://www.sei.cmu.edu/cmmi/).

Your suggestions for improving CMMI are welcome. For information on how to provide feedback, see the CMMI Web site at [www.sei.cmu.edu/cmmi/models/change-requests.html](http://www.sei.cmu.edu/cmmi/models/change-requests.html). If you have questions about CMMI, send e-mail to [cmmi-comments@sei.cmu.edu](mailto:cmmi-comments@sei.cmu.edu).

# CHAPTER 1

## INTRODUCTION

Now more than ever, organizations are increasingly becoming acquirers<sup>1</sup> of needed capabilities by obtaining products and services from suppliers and developing fewer of these capabilities in-house. The intent of this widely adopted business strategy is to improve an organization's operational efficiencies by leveraging suppliers' capabilities to deliver quality solutions rapidly, at a lower cost, and with the most appropriate technology.

### AUTHORS' NOTE

It has been challenging to name the CMMI for Acquisition (CMMI-ACQ) model and this book. The reason is that the activities covered in these documents are called different things in different industries, organizations, and even countries. Instructors who teach CMMI-ACQ ask their students to tell the class what these activities are called in their organizations. At last count, more than 20 different terms were used to refer to what we call "acquisition." Our choice to use "acquisition" is consistent with the term used to describe these activities in ISO 15288.

Acquisition of needed capabilities is challenging because acquirers must take overall accountability for satisfying the user of the needed capability while allowing the supplier to perform the tasks necessary to develop and provide the solution.

According to recent studies, 20 percent to 25 percent of large information technology (IT) acquisition projects fail within two years and 50 percent fail within five years. Mismanagement, an inability to articulate customer needs, poor requirements definition, inadequate supplier selection and contracting processes, insufficient technology selection procedures, and uncontrolled requirements changes are factors that

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1. In CMMI-ACQ, the terms *project* and *acquirer* refer to the acquisition project; the term *organization* refers to the acquisition organization.

contribute to project failure. Responsibility is shared by both the supplier and the acquirer. The majority of project failures could be avoided if the acquirer learned how to properly prepare for, engage with, and manage suppliers.

**AUTHORS' NOTE**

A March 2008 report from the Government Accountability Office (GAO) found that 95 programs in the 2007 portfolio of major defense acquisition programs exceeded original estimates by \$295 million, with deliveries almost two years late, on average. Total acquisition costs for these 95 programs had risen 26 percent, compared with 6 percent in 2000. Sixty-three percent had changed requirements after starting development, and about half of the programs experienced at least a 25 percent increase in expected lines of software code [GAO: Defense Acquisition, 2008].

In addition to these challenges, an overall key to a successful acquirer–supplier relationship is communication.

**AUTHORS' NOTE**

General Motors Information Technology is a leader in working with its suppliers. See the case study in Chapter 7 to learn more about how sophisticated the relationships and communication can be with suppliers.

Unfortunately, many organizations have not invested in the capabilities necessary to effectively manage projects in an acquisition environment. Too often acquirers disengage from the project once the supplier is hired. Too late they discover that the project is not on schedule, deadlines will not be met, the technology selected is not viable, and the project has failed.

The acquirer has a focused set of major objectives. These objectives include the requirement to maintain a relationship with the final users of the capability to fully comprehend their needs. The acquirer owns the project, executes overall project management, and is accountable for delivering the needed capabilities to the users. Thus, these acquirer responsibilities may extend beyond ensuring that the right capability is delivered by chosen suppliers to include such activities as integrating the overall product or service, transitioning it into operation, and obtaining insight into its appropriateness and adequacy to continue to meet customer needs.

CMMI for Acquisition (CMMI-ACQ) provides an opportunity to avoid or eliminate barriers in the acquisition process through practices and terminology that transcend the interests of individual departments or groups.

**AUTHORS' NOTE**

If the acquirer and its suppliers are both using CMMI, they have a common language they can use to enhance the relationship even further.

This document provides guidance to help the acquirer apply CMMI best practices.

CMMI-ACQ contains 22 process areas. Of those, 16 are CMMI Model Foundation (CMF) process areas that cover process management, project management, and support. We will discuss CMF in more detail later in this chapter.

**AUTHORS' NOTE**

The CMF concept is what enables CMMI to be integrated for both supplier and acquirer use. The shared content across models for different domains enables organizations in different domains (e.g., acquirers and suppliers) to work together more effectively. It also enables large organizations to use multiple CMMI models without a huge investment in learning new terminology, concepts, and procedures.

Six process areas focus on practices specific to acquisition addressing agreement management, acquisition requirements development, acquisition technical management, acquisition validation, acquisition verification, and solicitation and supplier agreement development.

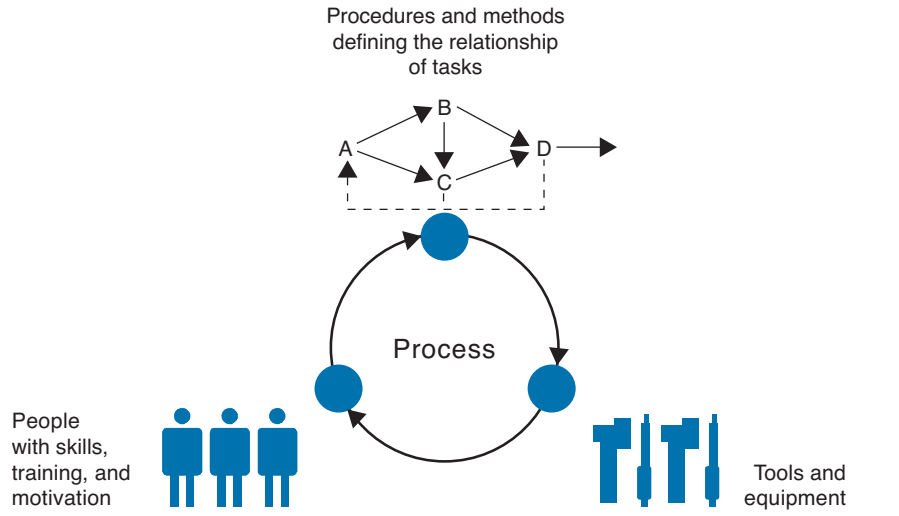
All CMMI-ACQ model practices focus on the activities of the acquirer. Those activities include supplier sourcing, supplier agreement development and award, and management of the acquisition of capabilities, including the acquisition of both products and services. Supplier activities are not addressed in this document. Suppliers and acquirers who also develop products and services should consider using the CMMI for Development (CMMI-DEV) model.

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## About Capability Maturity Models

In its research to help organizations develop and maintain quality products and services, the Software Engineering Institute (SEI) has identified several dimensions that an organization can focus on to improve its business. Figure 1.1 illustrates the three critical dimensions on which organizations typically focus: people, procedures and methods, and tools and equipment.

But what holds everything together? It is the processes used in your organization. Processes allow you to align the way you do business.



**FIGURE 1.1**  
The Three Critical Dimensions

They allow you to address scalability and provide a way to incorporate knowledge of how to do things better. Processes allow you to leverage your resources and to examine business trends.

#### **AUTHORS' NOTE**

Another advantage of using CMMI models for improvement is that they are extremely flexible. CMMI doesn't dictate what processes to use, what tools to buy, or who should perform particular processes. CMMI provides a framework of flexible best practices that can be applied to meet the organization's business objectives, no matter what they are.

This is not to say that people and technology are not important. We are living in a world where technology is changing by an order of magnitude every ten years. Similarly, people typically work for many companies throughout their careers. We live in a dynamic world. A focus on process provides the infrastructure and stability necessary to deal with an ever-changing world and to maximize the productivity of people and the use of technology to be more competitive.

Manufacturing has long recognized the importance of process effectiveness and efficiency. Today, many organizations in manufacturing and service industries recognize the importance of quality processes. Process helps an organization's work force meet business objectives by helping them work smarter, not harder, and with

improved consistency. Effective processes also provide a vehicle for introducing and using new technology in a way that best meets the organization's business objectives.

In the 1930s, Walter Shewhart began work in process improvement with his principles of statistical quality control [Shewhart 1931]. These principles were refined by W. Edwards Deming [Deming 1986], Phillip Crosby [Crosby 1979], and Joseph Juran [Juran 1988]. Watts Humphrey, Ron Radice, and others extended these principles even further and began to apply them to software in their work at IBM and the SEI [Humphrey 1989]. Humphrey's book, *Managing the Software Process*, provides a description of the basic principles and concepts on which many of the Capability Maturity Models (CMMs) are based.

The SEI has taken the process management premise, "the quality of a system or product is highly influenced by the quality of the process used to develop and maintain it," and defined CMMs that embody this premise. The belief in this premise is seen worldwide in quality movements, as evidenced by the International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) body of standards.

CMMs focus on improving processes in an organization. They contain the essential elements of effective processes for one or more disciplines and describe an evolutionary improvement path from ad hoc, immature processes to disciplined, mature processes with improved quality and effectiveness.

The SEI created the first CMM designed for software organizations and published it in a book, *Capability Maturity Model: Guidelines for Improving the Software Process* [SEI 1995].

Today, CMMI is an application of the principles introduced almost a century ago to this never-ending cycle of process improvement. The value of this process improvement approach has been confirmed over time. Organizations have experienced increased productivity and quality, improved cycle time, and more accurate and predictable schedules and budgets [Gibson 2006].

---

## Evolution of CMMI

Figure 1.2 illustrates the models that were integrated into CMMI-DEV and CMMI-ACQ. Developing a set of integrated models involved more than simply combining existing model materials. Using processes that promote consensus, the CMMI Product Team built a framework that accommodates multiple constellations.

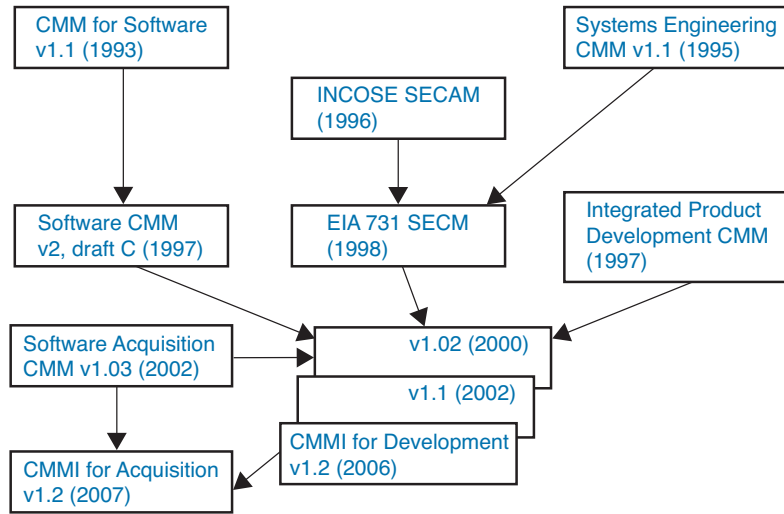


FIGURE 1.2  
The History of CMMs<sup>2</sup>

#### AUTHORS' NOTE

Another CMMI model is currently “in the works” as this book is being written. In 2009 the CMMI for Services model will be released. It supports organizations that establish, manage, and delivery services.

## CMMI Framework Architecture

The CMMI Framework Architecture provides the structure needed to produce CMMI models, training, and appraisal components. To allow the use of multiple models within the CMMI Framework, model components are classified as either common to all CMMI models or applicable to a specific model. The common material is called the *CMMI Model Foundation*, or *CMF*.

The components of the CMF are required to be a part of every model generated from the framework. Those components are combined with material applicable to an area of interest to produce a model. Some of this material is shared among areas of interest, and other portions are unique to only one area of interest.

A *constellation* is defined as a collection of components that are used to construct models, training materials, and appraisal materials in an

2. EIA 731 SECM is the Electronic Industries Alliance standard 731, or the Systems Engineering Capability Model. INCOSE SECAM is the International Council on Systems Engineering Capability Assessment Model [EIA 2002].

area of interest (e.g., acquisition and development). The Acquisition constellation's model is called *CMMI for Acquisition*, or *CMMI-ACQ*.

---

## CMMI for Acquisition

The CMMI Steering Group initially approved an introductory collection of acquisition best practices called the *Acquisition Module (CMMI-AM)*, which was based on the CMMI Framework. Although it sought to capture best practices, it was not intended to become an appraisable model or a suitable model for process improvement purposes.

### AUTHORS' NOTE

The Acquisition Module was updated after CMMI-ACQ was released. Now called the “CMMI for Acquisition Primer, Version 1.2,” it continues to be an introduction to CMMI-based improvement for acquisition organizations. The primer is an SEI report (CMU/SEI-2008-TR-010) that you can find at [www.sei.cmu.edu/publications/](http://www.sei.cmu.edu/publications/).

General Motors partnered with the SEI to create the initial draft Acquisition model that was the basis for this model. This model represents the work of many organizations and individuals.

Acquirers should use professional judgment and common sense to interpret this model for their organizations. That is, although the process areas described in this model depict behaviors that are considered best practice for most acquirers, all process areas and practices should be interpreted using an in-depth knowledge of CMMI-ACQ, organizational constraints, and the business environment.

### AUTHORS' NOTE

Every CMMI model must be used within the framework of the organization's business objectives. An organization's processes should not be restructured to match a CMMI model's structure.

This document is a reference model that covers the acquisition of needed capabilities. Capabilities are acquired in many industries, including aerospace, banking, computer hardware, software, defense, automobile manufacturing, and telecommunications. All of these industries can use CMMI-ACQ.

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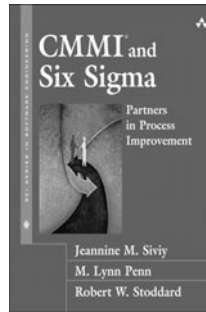


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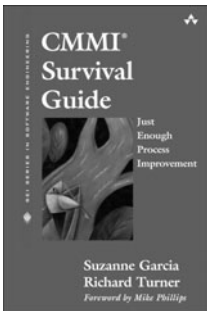


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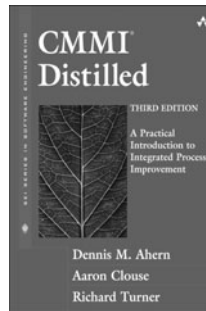


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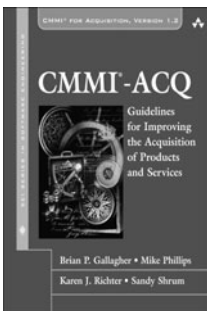


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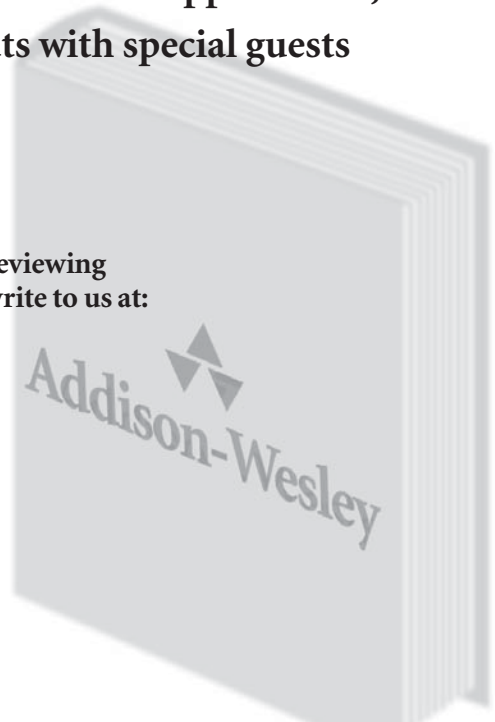


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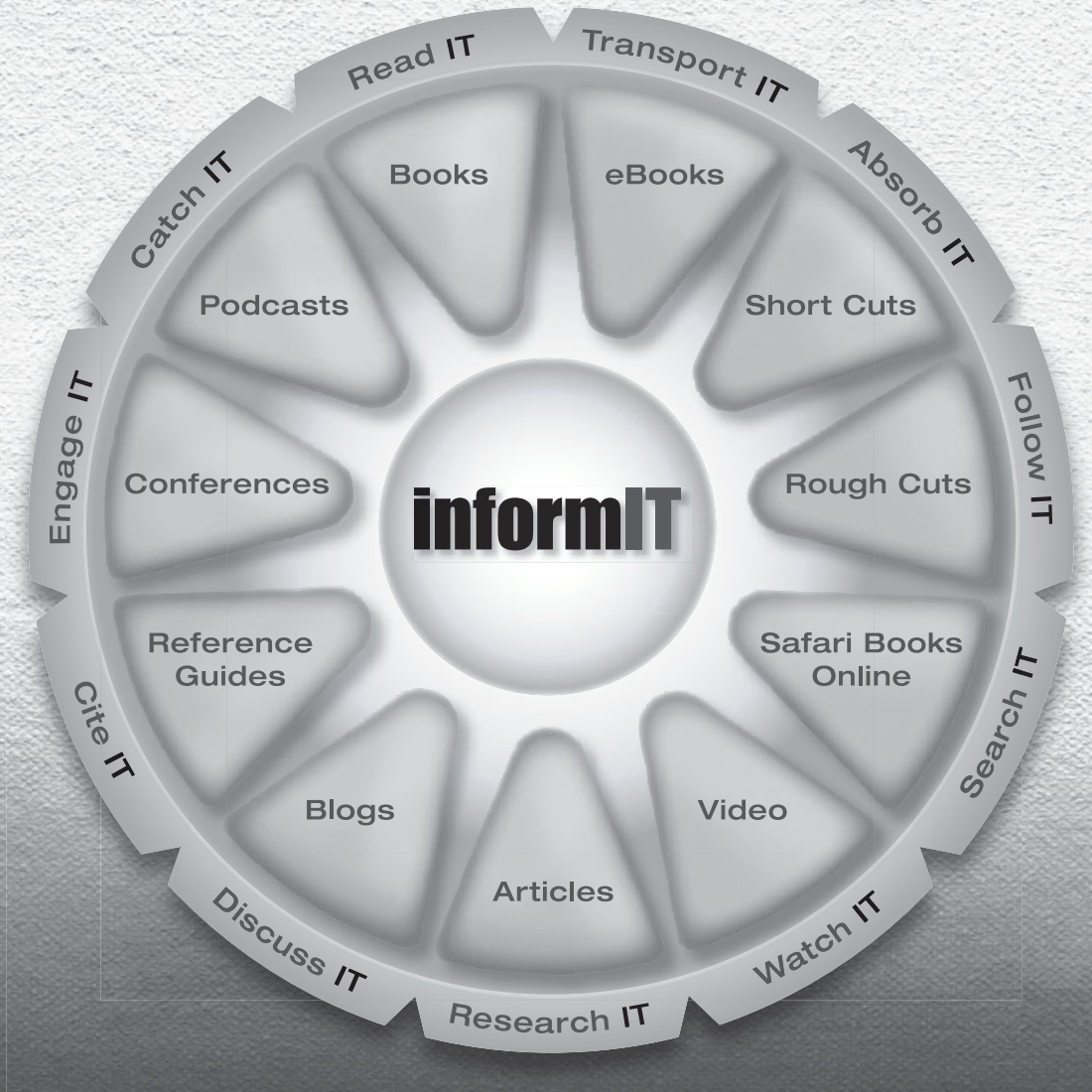
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GP 1.1 Perform Specific Practices

### ***GG 2 Institutionalize a Managed Process***

GP 2.1 Establish an Organizational Policy

GP 2.2 Plan the Process

GP 2.3 Provide Resources

GP 2.4 Assign Responsibility

GP 2.5 Train People

GP 2.6 Manage Configurations

GP 2.7 Identify and Involve Relevant Stakeholders

GP 2.8 Monitor and Control the Process

GP 2.9 Objectively Evaluate Adherence

GP 2.10 Review Status with Higher Level Management

### ***GG 3 Institutionalize a Defined Process***

GP 3.1 Establish a Defined Process

GP 3.2 Collect Improvement Information

### ***GG 4 Institutionalize a Quantitatively Managed Process***

GP 4.1 Establish Quantitative Objectives for the Process

GP 4.2 Stabilize Subprocess Performance

### ***GG 5 Institutionalize an Optimizing Process***

GP 5.1 Ensure Continuous Process Improvement

GP 5.2 Correct Root Causes of Problems

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