



Upgrading from SW-CMM[®] to CMMI[®]

Hundreds of organizations are upgrading to the CMMI Product Suite worldwide, including those in North America, Europe, India, Australia, Asia Pacific, and the Far East. By the end of 2002, over 7000 people had attended the *Introduction to CMMI* course offered by the SEI and its transition partners, 461 had attended the *CMMI Intermediate Concepts* course (a prerequisite for CMMI Instructor and SCAMPI Lead AppraiserSM training), 140 instructors had been trained to teach the *Introduction to CMMI* course, over 160 SCAMPI Lead Appraisers had become authorized, and all SCAMPI Lead Appraisers had upgraded to CMMI Version 1.1.

Compared to the early adoption of the SW-CMM, the adoption of CMMI has been more rapid by both industry and government. Many organizations are finding that upgrading from SW-CMM to CMMI-based process improvement is straightforward because implementing CMMI builds on their knowledge of the SW-CMM. Organizations can promptly move from a maturity level of the SW-CMM to the corresponding maturity level of CMMI.

The CMMI Product Suite is the future of process improvement. In particular, the CMMI models and SCAMPI appraisal method are world class. CMMI models are the most comprehensive process improvement models available for product and service development and maintenance. They build on and extend the best practices of the SW-CMM and other process improvement models. SCAMPI is the most comprehensive appraisal method available. It combines, builds on, and improves the CBA IPI and SCE methods, which became trustworthy and reliable from years of use with the SW-CMM and other process improvement models. SCAMPI builds on other appraisal methods and experiences as well.

Benefits of CMMI

If your organization is one of the thousands considering the upgrade to CMMI, the information presented here will help guide that upgrade. There are many good reasons to upgrade to CMMI. Some of the benefits that organizations have experienced as they complete the upgrade to CMMI include:

- more explicit linkage of management and engineering activities to business objectives
- improved visibility into the product life cycle and engineering activities to ensure that the product or service meets customer expectations
- leveraging from additional areas of best practice (e.g., measurement, risk management, and supplier management)
- more robust high-maturity practices
- visibility into additional organizational functions critical to their products and services
- tighter coupling with relevant ISO standards

Version 1.1 of the CMMI Product Suite was released in December 2001. Early benefits information reported by organizations now using CMMI that were presented at the *November 2002 CMMI Technology Conference and User Group* is available on the Web at <<http://www.dtic.mil/ndia/2002cmmi/index.html>>. You can also see this kind of information in the Software Engineering Information Repository (SEIR) on the Web at <<http://seir.sei.cmu.edu/>> and on the CMMI Adoption page on the CMMI Web site at <<http://www.sei.cmu.edu/cmmi/adoption/adoption.html>>.

Because the CMMI Product Suite has been in use for a relatively short period of time for a process improvement model, limited empirical data is available that demonstrates return on investment and other quantifiable benefits of using CMMI. Return on investment data takes time to gather, analyze, and report. However, the quantifiable benefits available from organizations that use the SW-CMM can be drawn upon to make the case for CMMI because nearly all SW-CMM concepts were incorporated into the CMMI Product Suite.

Differences Between the SW-CMM and CMMI

Although CMMI builds on and extends the best practices of the SW-CMM, you may not have a feel for the similarities and differences between the two. In fact, there are many similarities found between CMMI and the SW-CMM. The primary differences are valuable best practices added to round out your process improvement program.

As you analyze CMMI as an upgrade of the SW-CMM, you will notice that (1) new process areas were added, (2) modern best practices were added, and (3) a generic goal (i.e., implementation goal) was added that applies to each process area. Also, a continuous representation is available as well as the staged representation already familiar to you.

If you look at the differences by maturity level, you will see that the differences are not as daunting as they first appear. The following process areas (listed by maturity level) appear in CMMI models, but they do not appear in the SW-CMM model. However, as you look closer you see that these process areas are not entirely new to you as a SW-CMM user.

Process Areas at Maturity Level 2

- Measurement and Analysis

Measurement and analysis practices were scattered throughout the SW-CMM, but in CMMI they are formalized into the Measurement and Analysis process area.

Process Areas at Maturity Level 3

- Requirements Development
- Technical Solution
- Product Integration
- Verification
- Validation
- Risk Management
- Decision Analysis and Resolution

The Software Product Engineering key process area of the SW-CMM was replaced in CMMI by multiple, more detailed process areas: Requirements Development, Technical Solution, Product Integration, Verification, and Validation. The Peer Reviews key process area was incorporated into the broader Verification process area. Risk management was partially addressed in the Integrated Software Management key process area in the SW-CMM, but in CMMI it is formalized in its own process area. The Integrated Software Management and Inter-group Coordination key process areas were combined into the broader Integrated Project Management process area. A new process area, Decision Analysis and Resolution was not addressed in the SW-CMM, but is included in CMMI.

Process Areas at Maturity Level 4

There are no new process areas at level 4, although the Quantitative Process Management and Software Quality Management key process areas were restructured into the Quantitative Project Management and Organizational Process Performance process areas.

Process Areas at Maturity Level 5

There are no new process areas at levels 5, although the Technology Change Management and Process Change Management key process areas were combined into a single process area, Organizational Innovation and Deployment. The Defect Prevention key process area was restructured and became Causal Analysis and Resolution.

Goals and Practices

CMMI models have generic goals that address whether the in-use process continually achieves its implementation goal. Generic goals (i.e., implementation goals) were included in Version 2.0 Draft C of the SW-CMM. These goals explicitly address the institutionalization of CMMI best practices. Although these goals are new, they should have little impact on organizations that currently use the SW-CMM skillfully.

Practices added in CMMI models are improvements and enhancements to the SW-CMM. Many of the new practices in CMMI models are already being implemented by organizations that have successfully implemented processes based on the improvement spirit of SW-CMM best practices.

Refer to the mapping of the SW-CMM and CMMI-SE/SW/IPPD models at the STSC Web site at <<http://www.stsc.hill.af.mil/consulting/cmmi/cmmiseswippdv11.pdf>> for more detailed information about how these models compare.

What to Do Before Upgrading

Before upgrading to the CMMI Product Suite from the SW-CMM, performing the following analyses are highly recommended:

1. Review the CMMI models and other CMMI information and determine how CMMI models can best meet the needs of your organization.
2. Develop a strategy for upgrading from the SW-CMM to a CMMI model (see the next section for ideas).
3. Ensure that the investment you have made in the SW-CMM is retained and used in your strategy for upgrading from the SW-CMM to CMMI.
4. Inform your customers that you plan to upgrade to CMMI.
5. Budget for the modification of existing processes, inclusion of new processes, and the delivery of new training required to upgrade to CMMI.
6. Identify the benefits and risks of your organization's upgrade plan and manage those risks. It is critical to understand what is different between the SW-CMM and CMMI, how those differences affect your organization, and how the use of CMMI will be supported.
7. Stay informed about the CMMI Product Suite by monitoring the CMMI Web site at <http://www.sei.cmu.edu/cmmi/>.



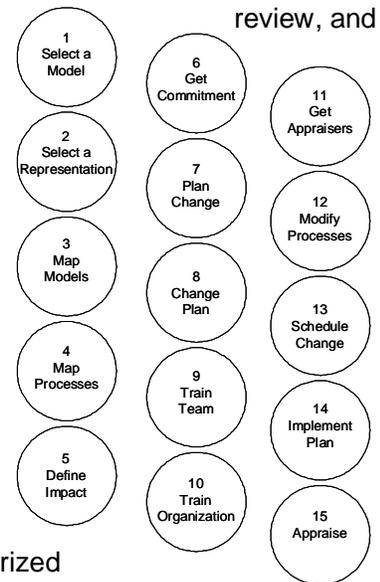
Approaches to Upgrading

Once you understand the benefits and costs of upgrading, you can begin taking steps to implement CMMI in your organization. A typical approach to upgrading consists of the following activities. Of course, some of these activities are iterative.

1. Select the CMMI model that best meets the needs of your organization. CMMI models cover multiple bodies of knowledge, including project management, software engineering, systems engineering, Integrated Product and Process Development, and supplier sourcing. When selecting a model, your organization's business objectives should guide you.
2. Select the representation that best meets the needs of your organization. Since you have been using the SW-CMM, you are familiar with the staged representation. For most of you, selecting the staged representation will ease the upgrade to CMMI. Once you are comfortable with CMMI, you may then decide to use the continuous representation. For a detailed discussion about selecting a representation, see the CMMI FAQ on the Web at <http://www.sei.cmu.edu/cmmi/adoption/cmmi-faq.html>.
3. Compare the CMMI model you selected to the SW-CMM to understand the scope and nature of change required. The mapping available on the STSC Web site at <http://www.stsc.hill.af.mil/consulting/cmmi/cmmiseswippdv11.pdf> may be helpful in completing this task.

4. Map your organization's processes to the best practices of the CMMI model you are using. Upgrading from the SW-CMM to CMMI is straightforward because many of the practices in each model are comparable, making this mapping activity less difficult than it would be using another model. Modification of existing processes and plans to include practices and process areas that were not included in the SW-CMM are activities to expect.
5. Define the impact of upgrading from the SW-CMM to a CMMI model.
6. Obtain senior management commitment to upgrade to CMMI.
7. Determine how your current process improvement plan must change to support the upgrade to CMMI. The plan may need to reflect new priorities and new parts of the organization that will participate in process improvement. You may decide to postpone or defer current improvement targets to maintain a manageable plan and set of concurrent process improvement activities while upgrading.

8. Update the improvement plan, distribute it for obtain commitment and agreement from key stakeholders. The plan should identify specific management and schedule risks incurred by the upgrade. The plan should also identify necessary training, tools, and support services. Communicate and periodically revise the plan to keep everyone informed and up to date.



9. Ensure that Engineering Process Groups, Technical Working Groups, Process Action Teams, Management Steering Groups, and other appropriate staff receive CMMI training or orientation, including understanding and supporting the revised process improvement plan.
10. Obtain or develop an internal competency for CMMI training. When obtaining CMMI training, hire an authorized instructor trained in delivering CMMI model training at your site or sign up for publicly offered courses available from the SEI. The SEI Web site lists courses offered by the SEI at <http://www.sei.cmu.edu/cmml/training/training.html>. SEI-authorized Transition Partners also offer the same SEI-authorized *Introduction to CMMI* training. The SEI Web site lists Transition Partners that offer this training at <http://www.sei.cmu.edu/collaborating/partners/partners-tech.html#ICMMI>. The SEI Web site lists these organizations at <http://www.sei.cmu.edu/collaborating/partners/cmml-sesw.html>. When developing internal competency, investigate opportunities to become an SEI Transition Partner at <http://www.sei.cmu.edu/collaborating/partners/cmml-sesw.html>.
11. Obtain or develop an internal competency for SCAMPI appraisal support. To obtain CMMI appraisal support, retain an SEI-authorized SCAMPI Lead Appraiser available from the SEI or from an SEI Transition Partner. The SEI Web site lists all those who have satisfied all of the technical requirements to be an SEI-authorized SCAMPI Lead Appraiser at <http://www.sei.cmu.edu/collaborating/partners/scampi.html>. To develop internal competency, investigate opportunities to become an SEI Transition Partner at <http://www.sei.cmu.edu/collaborating/partners/scampi.html>.

12. Modify each project's defined process as necessary to be consistent with the revised process improvement plan.
13. Schedule upgrade tasks for projects. Different projects may have different schedule requirements for upgrade tasks (some may receive a waiver if they are near completion).
14. Implement other parts of the revised process improvement plan.
15. Conduct a SCAMPI appraisal to determine whether all targeted process areas and goals are satisfied.

Upgrade Considerations

There are a number of considerations which affect the scope and pace of the upgrade. Your organization's ability to deal with change is an issue that must be addressed. If your organization has recently gone through a restructuring or it is close to getting its maturity level 2 or 3 processes in place, you may want to delay the upgrade. The SEI has established a two-year transition period to help organizations avoid model changes in the middle of an improvement cycle. See the terms of the sunseting of the SW-CMM on the SEI Web site at <http://www.sei.cmu.edu/cmml/adoption/sunset.html> for details.

Depending on the maturity of your organization, the impact of upgrading to CMMI may be quite different. If you are a maturity level 1 organization, this change may cause you to restart your improvement efforts. If you are a maturity level 2 organization, you may be able to incorporate changes as part of your improvement plan, if you properly plan the effort. If you are a maturity level 3, 4, or 5 organization, you should have little problem determining the impact of the upgrade and planning for it.

For example, suppose you are 6-12 months away from achieving maturity level 3 using the SW-CMM. Is it better to continue your SW-CMM-based effort or slow down to upgrade to CMMI? It might be wiser to defer an organization-wide upgrade for now, limiting the use of CMMI to piloting within a single division or business unit to better understand the implications and impact of the upgrade. On the other hand, it is possible that upgrading to CMMI is an urgent need to improve enterprise integration, meet contract requirements, or remain ahead of the competition. In these cases it might be better to establish additional areas of improvement and address those right away.

The costs of upgrade depend on variables that differ from organization to organization. We have found the following are some of the cost factors experienced by organizations we have worked with as they upgraded from the SW-CMM to CMMI:

Rate of Upgrade. Decide whether to pursue a rapid and full upgrade to CMMI or a gradual approach. A rapid approach is more expensive in the short term than a gradual upgrade, but the benefits accrue earlier.

Scope of Improvement. Determine how many and which business units and projects are affected by the upgrade. Your organization may include legacy projects or only new development projects. The larger the scope, the higher the cost.

Piloting. Decide if you want to conduct pilots. Piloting can help identify support costs and impacts, minimize risks, foster buy-in, and more. What you learn from piloting may reduce the risks and costs of upgrading the entire organization.

Training. Assess your training needs. CMMI training is required for trainers, appraisers, SEPG members, process definers, and implementers. The whole organization, business partners, and subcontractors may also require a CMMI orientation. Weigh the costs of in-house training versus attending publicly offered training courses.

Retooling. Decide which tools you need to revise or create to support the upgrade to CMMI. Special tools, templates, spreadsheets, databases, and other support developed for SW-CMM training, appraisals, and process improvement may require revision to accommodate CMMI.

Vendors. If your organization has worked with process improvement consultants and vendors, account for their readiness.

Process Improvement Plans. Carefully examine the priorities and direction of your SW-CMM based process improvement efforts to determine how they are affected by the upgrade to CMMI. Then decide whether to stay the course or make minor revisions to these efforts. Review these plans before scheduling your next appraisal to determine whether to defer the appraisal until a sizeable increment of change can be demonstrated.

OSSP. Identify the process areas your organization's standard processes cover and decide whether to broaden that coverage.

In summary, any analysis of costs must account for your organization's current processes and the changes required in becoming compliant with CMMI.

Resources Available to Help You Upgrade

The following resources are available to help organizations upgrade from the SW-CMM to a CMMI model:

Experiences. Information is being gathered to inform those that have been using the Software CMM about the benefits experienced by those now using CMMI. Experience reports and return-on-investment information is currently being sought. As it is collected from the community, you will be able to see this kind of information in the Software Engineering Information Repository (SEIR) on the Web at <http://seir.sei.cmu.edu/>.

Adoption Information. Information that is helpful to the software community's adoption of CMMI is also being made available on the CMMI Adoption page at <http://www.sei.cmu.edu/cmmi/adoption/adoption.html>.

Training. CMMI training courses are available from the SEI and its Transition Partners. See CMMI course information on the Web at <http://www.sei.cmu.edu/cmmi/training/>, including the schedule of SEI course offerings and course descriptions. See a complete list of SEI Transition Partners that offer SEI-authorized *Introduction to CMMI* courses on the Web at <http://www.sei.cmu.edu/collaborating/partners/partners-tech.html#ICMMI>. *Introduction to CMMI* courses provide an overview of CMMI best practices. There are also more advanced courses available from the SEI to those planning to become authorized as *Introduction to CMMI* instructors and SCAMPI Lead Appraisers.

Process Improvement Expertise. Members of the Technical Staff at the SEI and SEI Transition Partners have years of experience collaborating with government and industry to achieve transition and process improvement objectives. Consider contacting the SEI to engage Members of the Technical Staff to help you or contacting SEI Transition Partners to help you. Information about engaging with the SEI is available at <http://www.sei.cmu.edu/collaborating/sponsorship/sponsor.html>. Information about engaging with SEI Transition Partners is available at <http://www.sei.cmu.edu/collaborating/partners/partners-alpha.html>.

Book. The book *CMMI: Guidelines for Process Integration and Product Improvement* provides a single source for all CMMI model information—the equivalent of the entire set of CMMI models. Readers can get started without having to select a model first—all of the choices are compiled into one book and explained in detail. See <http://www.sei.cmu.edu/cmmi/publications/cmmi-book.html> for more information.

Mapping. A model comparison of the SW-CMM and CMMI models is available at the STSC Web site at <http://www.stsc.hill.af.mil/consulting/cmmi/documents.html>.

Take Action

Enroll in an *Introduction to CMMI* course to learn more about CMMI. Attend a CMMI workshop or conference. Explore the CMMI Web site for more information about other organizations that have successfully upgraded from the SW-CMM to CMMI at <<http://www.sei.cmu.edu/cmmi/adoption/adoption.html>>. Sign up for CMMI discussion groups at <http://groups.yahoo.com/group/cmmi_process_improvement/> and <<http://seir.sei.cmu.edu/>>. Join the hundreds of organizations that are upgrading to the CMMI Product Suite and experience the benefits of CMMI-based process improvement.

More Questions?

If you have questions or comments, send email to: cmmi-comments@sei.cmu.edu