Process Improvement for All: What to Expect from CMMI Version 1.3

Mike Phillips and Sandy Shrum
Software Engineering Institute

The next release of the CMMI Product Suite—an approach that provides organizations with the essential elements of effective processes that ultimately improve their performance—is expected in November 2010. This Version 1.3 (V1.3) release includes improvements to CMMI for Development (CMMI-DEV), CMMI for Acquisition (CMMI-ACQ), and CMMI for Services (CMMI-SVC) models all during the same development cycle. This cycle also includes improvements to the appraisal method (SCAMPI) and CMMI-related training. The improvements planned for CMMI models do not require major changes or retraining for those currently using CMMI.

Since 2000, the CMMI Product Suite—through three separate models—has given organizations a framework for improving their processes (see Figure 1). First was the CMMI-DEV model (created in 2000 and updated in 2002 and 2006), which helps product and service development organizations integrate their software and systems engineering while improving their processes and performance. The CMMI-ACQ model was then released in 2007 to help organizations that outsource, acquire, purchase, or otherwise acquire products and services for their customers. The most recent model, CMMI-SVC, was released in 2009. It helps service organizations to develop quality service processes that enable improved performance, customer satisfaction, and profitability.

During all of this development work on a product line, these models were used by various organizations, and some organizations even used more than one CMMI model. All three models follow the same structure, philosophy, and general approach. Furthermore, there are details that are common across all three models.

Even though these models were released in different years, Version 1.2 (V1.2) was the last release of all three CMMI models. Two major themes drove the changes that comprised V1.2:

1. Refining the CMMI model architecture to create CMMI constellations that served areas of interest (i.e., Development, Acquisition, Services). This change resulted in the creation of the CMMI-ACQ and CMMI-SVC models.
2. Improving the integrity of SCAMPI appraisals that use CMMI models as the reference model to measure process improvement achievement. SCAMPI appraisals are events that follow a standard method for evaluating how well an organization's processes conform to the practices in a CMMI model. When you use a CMMI model and conduct a SCAMPI appraisal, you receive appraisal results that reflect your organization's maturity and capability. Beginner organizations new to CMMI are typically considered low maturity, while those that have achieved exemplary appraisal results are considered high maturity.

Before the idea for a V1.3 release was settled on, the development team created and reviewed model updates that could be released as CMMI Version 1.2a (V1.2a). This version, considered a minor update, was to include updates made only to informative material[1].

The planned model updates for V1.2a were primarily to clarify high maturity practices. These updates were reviewed by a group of CMMI High Maturity Lead Appraisers and the CMMI Steering Group (the executive committee that guides all CMMI work) at a workshop in late September 2008. As a result of the review, the Steering Group determined that making changes to the normative material to modernize the practices for Maturity Levels 4 and 5 was a better choice than only clarifying the practices by updating informative material. So rather than releasing CMMI-DEV V1.2a, the development team is including these and other model updates in the planned release of CMMI V1.3 for all three CMMI models (CMMI-DEV, CMMI-ACQ, and CMMI-SVC).

The Development of V1.3

The CMMI V1.3 project was initiated in January 2009 when the plan to update the CMMI Product Suite was announced. The plan included two months for users to provide final change requests before the development team would begin reviewing and analyzing of the submitted requests.

During March through June of 2009, the development team reviewed more than 1,150 change requests submitted for the three CMMI models and 850 change requests for the SCAMPI appraisal method. Teams were formed to initiate the development of V1.3.

From March until June, the CMMI Steering Group provided criteria to guide the range of acceptable changes to the CMMI Product Suite. The "CMMI Version 1.3 – Plans for the Next Version" [1] was published by the SEI in August 2009. It stated that it will focus on (but not be limited to):

1. High maturity.
2. More effective GPs.
3. Appraisal efficiency.
4. Commonality across the constellations.

It also required that any changes to the CMMI Product Suite (i.e., model(s), training materials, and appraisal method) must meet the following primary criteria, which will likely do the following (also from [1]):

1. Correct identified model, training material, or appraisal method defects or provide enhancements.
2. Incorporate amplifications and clarifications as needed.
3. Accommodate potential additions to model coverage (e.g., safety, security, and life cycle) only by specific direction of the CMMI Steering Group.
4. Decrease overall model size in V1.3 if possible; increases, if any, must not be greater than absolutely necessary.
5. Model and method changes should avoid adversely impacting the legacy investment of adopting companies and organizations.
6. Changes to model architecture will only be incorporated with specific CMMI Steering Group authorization.
7. Changes can only be initiated by Change Requests or by the CMMI Steering Group.
8. Editorial changes to training may be released in advance of V1.3.
9. Changes must not require retraining the nearly 100,000 (as of Dec. 2008) personnel already trained in CMMI. Upgrade training may be needed, especially for instructors, lead appraisers, and appraisal team members.

Each of the recent CMMI releases has

been guided by criteria for acceptable change provided by the CMMI Steering Group. These criteria are typically similar to the criteria in [1]; however, each set of criteria also has some aspects that characterize the version being released.

The correction of defects is an obvious reason for change. The SEI has identified corrections with errata sheets published on their Web site between formal releases. These corrections are then incorporated into the next version. Besides outright corrections, submitters of change requests submit what they think are improvements to the model. These improvements are often clarifications of existing model material. The second criterion encourages clarifications that may be needed to fully understand the intent of model goals and practices.

Excessive model growth is a significant concern, and therefore criteria 3 and 4 seek to limit additions to this release. These criteria couple nicely with criterion 5, which reminds the team to protect the legacy investment of the thousands of organizations who are using the CMMI Product Suite already. Criterion 9 adds a further constraint so that no one will have to start over with the Introduction to CMMI course simply because of the release of V1.3.

The Major Elements of V1.3

Many improvements will be incorporated into the CMMI Product Suite for V1.3. Some of the more significant improvements are described here.

High Maturity Clarifications

As already mentioned, when you conduct a SCAMPI appraisal, you receive appraisal results that reflect your organization's maturity. Beginner organizations that are new to CMMI are typically considered low maturity while those that have achieved exemplary appraisal results are considered high maturity. A focus of current model development is on clarifying the practices associated with high maturity for organizations using the staged approach—and high capability in process areas (PAs) for organizations using the continuous approach[2].

A High Maturity Team was formed. This team's members have been focusing on making changes that improve the clarity of what high maturity is and providing the guidance needed to achieve it. A team leader was chosen from industry project participants to ensure that the improvements made are representative of current best practices in the community.

The High Maturity Team recognized that high maturity practices are currently unclear, leading to a variety of interpretations by users. As they work on V1.3, the team's main objective is to ensure that all CMMI users have a common understanding of high maturity practices in all three models.

Thus far, the team intends to clarify the following:

- The role of informative material in high maturity appraisals.
- The meaning and use of process models and process modeling.
- How business objectives are related to and lead to high maturity.
- What common causes are and how they are expected to be used.
- What high maturity expectations are on individual PA performance.
- The selection, definition, and level of instantiation of subprocesses.

The high maturity changes to the informative material, produced in the V1.2a effort mentioned earlier, are only a part of the full array of change requests now being reviewed by this team in its V1.3 model development effort. Also planned are changes to the structure of high maturity in the model, which includes changes that strengthen the alignment between Maturity Level 4 and 5 practices.

This team's work focuses on the high maturity PAs: Organizational Process Performance, Quantitative Project Management, Causal Analysis and Resolution, and Organizational Innovation and Deployment.

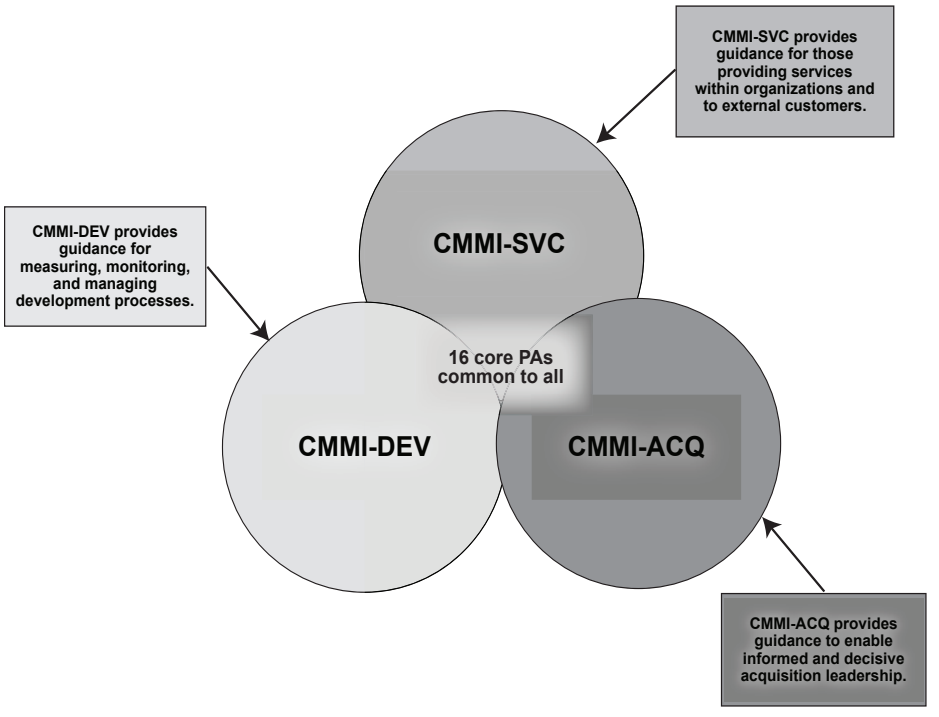
Constellation Commonality

As the development team built on the content of the CMMI-DEV model to create the CMMI-ACQ and CMMI-SVC models, it modernized some of the material in the 16 core PAs that are common to all three constellations. This modernization meant that the development team knew it had to eventually revisit CMMI-DEV and modernize it as well. Even though some differences between the constellations is intentional and makes sense, some of the differences can be eliminated to make the three constellations more consistent and easier to use together.

Here are some examples of the changes being made to improve commonality across the three CMMI models:

- **Core PAs.** These are PAs that appear in all CMMI models. In V1.3, these core PAs can have different expected and informative material. For example, Project Planning can have a specific practice in the Service constellation that is absent in the version of the PA in the Development constellation. Likewise, a few PAs are shared and appear in more than one (but not all) models. Shared PAs also can have different expected and informative material. However, work has been done to ensure that core PAs are as common as it makes sense for them to be. If material can work well in all three models, it is made consistent. If not, the material remains different.
- **Teaming.** There are two different approaches to integrated teaming in CMMI models: in CMMI-DEV, teaming is covered in two goals which are treated as optional, or additions; in

Figure 1: *The Three CMMI Models Now Available*



CMMI-ACQ and CMMI-SVC, teaming is covered in two specific practices in two process areas (Organizational Process Definition and Integrated Project Management). These practices are expected model components and are not optional.

In CMMI V1.3, the development team determined that the best approach to use in all three CMMI constellations is the one used in the CMMI-ACQ and CMMI-SVC models. This work to ensure commonality of the approach to teaming has gained importance since the Team Software Process has demonstrated the performance potential of high performing teams.

- **PA Categories.** There are six PA categories for V1.3: Process Management, Project Management, Support, Engineering, Acquisition, and Service Establishment and Delivery. All PAs that are core must have the same PA category in all three models and this PA category must be one of the following: Process Management, Project Management, or Support. PAs that are not core must be assigned to one of the following PA categories: Engineering, Acquisition, or Service Establishment and Delivery. As a result, Requirement Management will be assigned to the Project Management PA category in all V1.3 CMMI models.
- **Generic goals and practices.** In V1.2 models, generic goals, generic practices (GPs), and GP elaborations are presented differently across models. The CMMI-DEV model presents a portion of these elements in Part One and others are included at the end of each PA in Part Two. In CMMI-ACQ and CMMI-SVC, these elements appear in a single section in Part Two before the PAs. In V1.3, these generic elements will all appear in all three models in one central location as the first section of Part Two.
- **Glossary.** The glossaries in all three models have become inconsistent simply because of the gaps between publication dates of the models. In V1.3 models, the glossaries will be exactly the same, even though some terms defined may not appear in one or more of the models. The format of the glossary will also be modified to differentiate the definition from the notes.

Modernized Practices

Improvements to the practices in multiple process areas will be updated to ensure they are modern and reflect the best practices available.

- **Agile.** Material will be added to the model to help those in Agile environments to correctly interpret practices that may not seem applicable.
- **Architecture-Related Development.** Material will be updated and added to include the consideration of both non-functional and functional requirements during product development.
- **Supplier Agreement Management.** The scope of supplier agreement management will be clarified, particularly in regards to COTS, internal sourcing, and customer property.
- **Organizational Training.** Organizational training practices will be updated so that they apply to more than classroom instruction.

Translations

CMMI models are now available in French, German, Japanese, Spanish, and traditional Chinese. By the time this article is published, a version in Portuguese will also be available. The teams that created these translations have requested that the models' ease of translation be improved. A simple example of a change that can be made to the model to ease its translation is eliminating the use of the word *stovepipe*. This word is one of many that are difficult to interpret into different languages appropriately because its literal meaning is different from how it is used in CMMI models.

Expanded Coverage

A number of change requests have suggested further expansion of CMMI models in new areas. The CMMI Steering Group and the development team do not see this release as being suitable for major expansions like the addition of the two recent constellations, but the team will likely add updated information on architecture, software assurance, Agile, and Lean Six Sigma. The development team has also been encouraged to add more emphasis on customer satisfaction. These types of expansions modernize model coverage without adding new PAs.

Multi-Constellation Coverage

Many students who take either of the one-day supplement courses that cover acquisition or service delivery have commented that many organizations span more than one area of interest. One theme for the V1.3 release is to enable as much sharing of best practices across the constellations as possible. Once some effective pilots are conducted, the development team plans to improve the SCAMPI Method Definition Document to facilitate appraisals that use PAs from multiple constellations.

Appraisal Efficiency

The SCAMPI appraisal method was based (in part) on the CMM-Based Appraisal for Internal Process Improvement (CBA-IPI) assessment method used with the Software CMM, a predecessor of CMMI. The SCAMPI appraisal method moved from the discovery focus of CBA-IPI to a verification focus. This change was designed to save significant appraisal time. The Practice Implementation Indicator Documents (PIIDs) were introduced to reduce on-site appraisal time. These documents list work products that the appraisal team can look for as evidence that a practice was implemented. However, the development team is investigating whether organizations are spending excessive time preparing PIIDs. If they are, the development team will examine ways of upholding appraisal confidence without driving up preparation expenses. The SCAMPI upgrade team is looking for innovative ways to achieve this goal.

Other improvements to the SCAMPI Method Definition Document that will likely be included in V1.3 include:

- Providing SCAMPI support for all three CMMI models by removing problematic terminology, addressing appraisal scoping considerations, and identifying appropriate prerequisites for appraisal team members.
- Correcting all errors identified during the use of SCAMPI V1.2, including common pitfalls encountered by users and problems frequently encountered in reviews of appraisals by the SEI.
- Clarifying the meaning of focus and non-focus projects as well as direct and indirect artifacts.
- Clarifying guidelines for scoping appraisal in a wide range of organization types and sizes.
- Providing guidelines to ensure consistent handling of GPs.
- Resolving issues related to characterization rules and rating rules.

Model Sizing

To meet the fourth criterion that limits the overall size of CMMI models, the development team looks for ways to balance model additions with deletions. Feedback resulting from an effort collecting input from multiple lead appraisers called ATLAS[3]—short for "Ask The Lead AppraiserS," facilitated by Pat O'Toole—was received. This group submitted change requests that identified lower value practices that might be removed to add others now viewed as more important. As mentioned earlier, additional PAs are not encouraged for V1.3.

Upgrade to V1.3

The CMMI Steering Group has approved a significant period of overlap between the release of CMMI V1.3 and the retirement of CMMI V1.2. The development team is also investigating innovative ways of providing information about CMMI improvements to users in draft form. However, no one is encouraged to delay their process improvement programs just to wait for the release of V1.3.

V1.3 Training

Training will be developed that will provide an easy upgrade from V1.2 to V1.3 for all three models. This training will be made available online. The Introduction to CMMI course will be updated as will the three-day Introduction to CMMI-SVC. The current supplement courses for CMMI-ACQ and CMMI-SVC will be retained and updated appropriately.

Development Schedule for V1.3

Given the number of change requests and the span of contentious issues to be resolved by the teams, the development team has been concerned about declaring a schedule for V1.3. The current estimate is to release the three constellations by November 1, 2010, but this date assumes few changes are needed after analyzing feedback on the drafts. Figure 2 provides a high-level view of the V1.3 schedule for the models, and Figure 3 provides a similar view of the schedule for the SCAMPI improvements.

Figure 2 shows that the model development project started in January 2009 and will conclude in November 2010. Preparation activities included planning, forming teams, and defining processes and occurred from January to May 2009. Following that, from June to October 2009, change packages (CPs) were created, reviewed, and approved. CPs are descriptions of planned change based on change requests received; they are reviewed and approved by the development team and then by the CMMI Configuration Control Board (CCB), which is responsible for controlling change to the CMMI Product Suite.

Once these are approved, actual changes to model components are proposed in redlines. These redlines are scheduled to be created, reviewed, and approved from August 2009 to April 2010. These redlines are also reviewed and approved by the development team and CCB.

Piloting is also scheduled to enable organizations willing to pilot improvements before release and provide feedback on their utility. There are three pilot drafts currently planned: a November 2009 draft included changes that improve the consistency of all three models with one another, a January 2010 draft will include many of the model improvements (in particular all of the high maturity improvements), and a June 2010 draft will include all model changes minus the polishing provided by quality assurance (QA). Updates based on feedback from piloting will be made from May to July of 2010. Finally, QA will begin in July to prepare the models for November 2010 release.

By the time this article is published, much of the development of model improvements should be determined and piloting will have begun. If your organization is interested in participating in piloting by reporting on your use of draft versions of a CMMI V1.3 draft model (CMMI-DEV, CMMI-ACQ, CMMI-SVC), contact SEI customer relations at <customer-relations@sei.cmu.edu>. The development team will send you details of how you can receive drafts and how to provide structured feedback.

Figure 3 shows the CMMI V1.3 SCAMPI Method Definition Document development project schedule, which parallels the previously described model development effort.

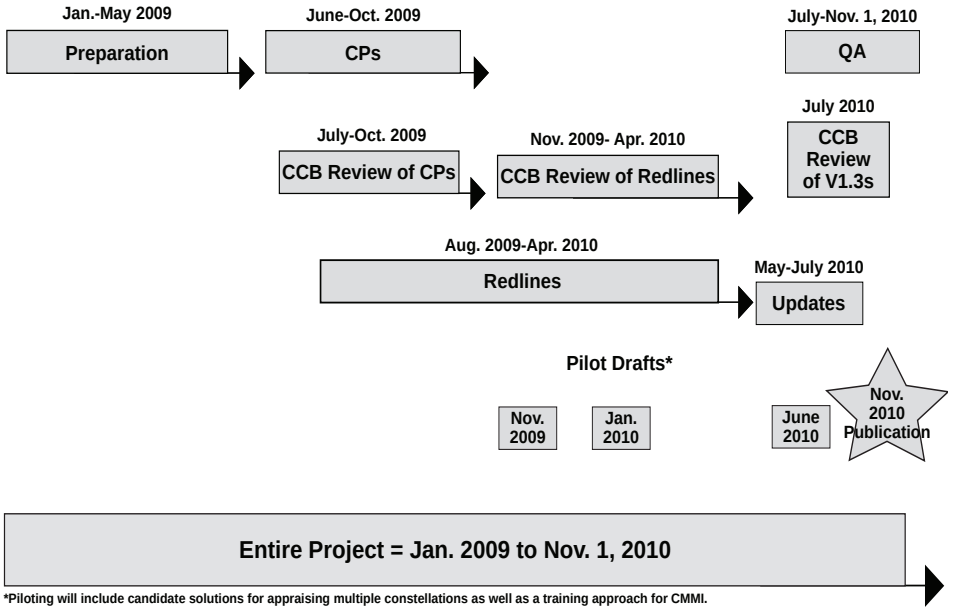
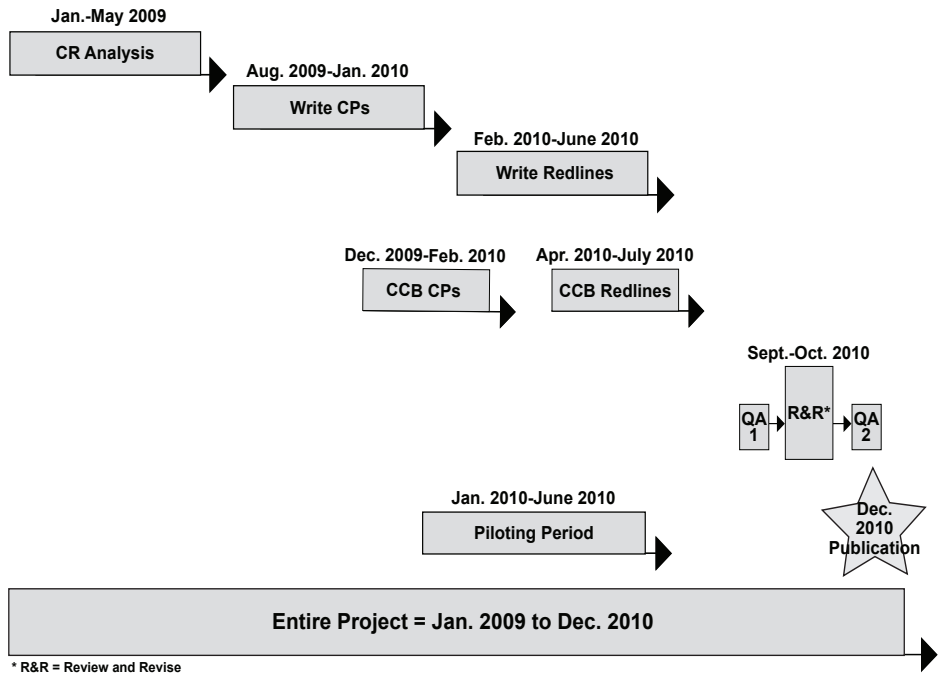


Figure 2: *CMMI V1.3 Model Schedule*

Figure 3: *CMMI V 1.3 SCAMPI Upgrade Schedule*



Software Defense Application

Since many DoD and defense contractor organizations within the software community are currently utilizing CMMI Product Suite V1.2, this article is an extremely valuable primer for the approaching upgrade to V1.3. The value of this article is to alert the software defense community to the specific improvements to the three models (CMMI-DEV, CMMI-ACQ, and CMMI-SVC), the SCAMPI appraisal, and CMMI training methods. Time and money may be saved by knowing what's coming, and perhaps by participating in the SEI's pilot program of the draft models (discussed in the Development Schedule for V1.3 section).

Summary

The improvements included in CMMI V1.3 include high maturity improvements and clarifications, improved appraisal efficiency, and models that have consistent architectures and shared content. At this point in the development life cycle, the improvements have not required major changes to the existing V1.2 product suite. Therefore, CMMI users should continue with their process improvement programs without regard to the release date for V1.3.◆

Reference

1. Phillips, Mike. "CMMI Version 1.3—Plans for the Next Version." *News at SEI*. 7 Aug. 2009 <www.sei.cmu.edu/library/abstracts/news-at-sei/cmmiinfocus200904.cfm>.

Notes

1. The components that comprise CMMI models are grouped into three categories: required, expected, and informative. Unlike the required and expected model components, the informative model material is not considered normative.
2. These two approaches are variations in how appraisals are conducted. However, the idea of high maturity is essentially the same in both.
3. Learn more about ATLAS at <www.pactcmmi.com/pages/atlas>.

About the Authors

Mike Phillips is the program manager for CMMI at the SEI, a position created to lead the CMMI Product Suite evolution. He has authored technical reports, technical notes, CMMI columns, and various articles in addition to presenting CMMI material at conferences around the world. Prior to his retirement as a colonel from the Air Force, he was the program manager of the $36 billion development program for the B-2 stealth bomber at Wright-Patterson AFB. His bachelor's degree in astronautical engineering is from the Air Force Academy, and he holds four master's degrees: nuclear engineering (from Georgia Tech), systems management (from the University of Southern California), international affairs (from Salve Regina College), and national security and strategic studies (from the Naval War College).

SEI
4500 Fifth AVE
Pittsburgh, PA 15213-2612
Phone: (412) 268-5884
Fax: (412) 268-5758
E-mail: dmp@sei.cmu.edu

Sandy Shrum is a senior writer at the SEI. She has been a member of the CMMI development team since its inception in 1998 and has coauthored three CMMI books. Shrum co-published "CMMI-ACQ: Guidelines for Improving the Acquisition of Products and Services" in 2009. Her experience as a writer in the software industry dates back to 1988, when she earned her master's degree in professional writing from Carnegie Mellon University, and her bachelor's degree in business administration from Gannon University.

SEI
4500 Fifth AVE
Pittsburgh, PA 15213-2612
Phone: (412) 268-6503
E-mail: sshrum@sei.cmu.edu

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