Comparing the eSCM-SP v2 and Software CMM® v1.1

A comparison between the eSourcing Capability Model for Service Providers v2 and the Capability Maturity Model® for Software

Mark C. Paulk, *Carnegie Mellon University*
Subrata Guha, *Satyam Computer Services Ltd*.
William E. Hefley, *Carnegie Mellon University*
Elaine B. Hyder, *Carnegie Mellon University*
Majid Iqbal, *Carnegie Mellon University*

ITSQC Carnegie Mellon

Copyrights

Abstract

The eSourcing Capability Model for Service Providers (eSCM-SP), a best practices model, gives providers of IT-enabled services a reference model and capability determination methods that they can use to develop and improve their capability to consistently deliver high-quality services. The Capability Maturity Model® for Software (Software CMM®) is a framework that guides software organizations toward compliance with the software industry's best practices with respect to the development and maintenance of software systems. While there are similarities and differences in the approach, focus, and scope of the eSCM-SP and Software CMM, they each provide a framework for improving the quality of services while achieving organizational effectiveness and efficiency. This report provides a brief discussion of how the two are conceptually related, and a detailed mapping between the Practices of the eSCM-SP and the Key Practices of the Software CMM.

Contributors

Table of Contents

Preface

This technical report is written for organizations that have already invested in compliance with the Capability Maturity Model® for Software (Software CMM®) and are now considering adoption of the eSourcing Capability Model for Service Providers (eSCM-SP). The report also provides guidance to organizations that have adopted the eSCM-SP and are considering investments in the Software CMM.

When an organization adopts a new framework[1] for capability improvement, it must consider whether the framework requires abandoning or drastically changing existing practices or processes already in place. Specifically, organizations need to know the extent to which existing practices, processes, or systems count toward compliance with the new framework. While, in general, most frameworks have common ideas and principles, there are differences between them with respect to approach, target, and emphasis.

The purpose of this report is to help organizations map their implementation of the Key Practices in the Software CMM to those of the eSCM-SP's Practices. The requirements of the Software CMM and the eSCM-SP are complementary and supplementary to each other. This report highlights areas where there is a significant degree of overlap between the requirements of the two frameworks, and areas where the requirements of one are out of the other's scope.

Section 1 of this report provides an overview of various frameworks for improving quality and process capabilities. Sections 2 and 3 provide brief overviews of the eSCM-SP [Hyder 2004a, Hyder 2004b] and Software CMM [Paulk 1995a], respectively. Section 4 compares the requirements of the eSCM-SP v2 and Software CMM v1.1 at a high level of abstraction. It includes a discussion of the challenges in mapping the requirements across the two frameworks. Section 5 provides the conclusions of this report. Appendices A and B provide more details on the eSCM-SP and Software CMM, respectively. Appendix C provides a mapping of the eSCM-SP to Software CMM, organized by eSCM-SP Practice. Appendix D provides a mapping of the Software CMM to the eSCM-SP, organized by Software CMM Key Process Areas and Key Practices.

1 In this report, the term "framework" refers to models and standards for process improvement and quality management in general. Organizations are usually assessed against standards such as ISO 9001 and BS 15000 on the binary scale of compliant versus not-compliant. Organizations may be assessed against models such as the the eSCM-SP and Software CMM on an ordinal scale such as Capability Levels or Maturity Levels.

1. Introduction

Since the birth of the modern industrial economy at the beginning of the twentieth century, there have been ongoing efforts to systematically improve the productivity of organizations and the quality of the products and services they deliver. From Taylor's work on scientific management to Shewart's statistical process control and, more recently, to the work of quality experts such as Deming, Juran, and Crosby, there has been an evolution in the understanding of how people, process, and technology interact to affect quality, customer satisfaction, productivity, and efficiency in doing work [March 1996]. The appreciation and understanding of the importance of a best-practice approach to process and quality management has widened beyond the initial focus on manufacturing systems and assembly line environments to include service organizations, and systems design and development. The eSourcing Capability Model for Service Providers (eSCM-SP) v2 [Hyder 2004a] is one of the most recent in a long line of frameworks aimed at improving the capability of organizations in developing and delivering products and services.

Information and communication technologies (IT) have been crucial in transforming the value chains of modern industrial organizations by providing access to a larger set of customers, partners, and suppliers than was earlier possible. Several new business models, products, and services have been made viable, from conception to realization, by the facilities and functions provided by IT systems. Such benefits allow IT-led organizations to make large capital investments in the development and extension of their in-house IT capabilities.

However, not all organizations have enjoyed the same returns with respect to their IT assets and investments [Roach 1991], leading them to reconsider the need to develop and maintain their own extensive IT capabilities and resources. In several of these instances, organizations found it advantageous to outsource certain functions and processes, and focus and reallocate their assets on core competencies and business strategies.

This increased reliance on external service providers requires diligence on the part of organizations that outsource their IT and business processes. Service providers, in turn, are required to sufficiently demonstrate that they can be capable and dependable business partners committed to a lasting and beneficial relationship with their customers. The eSCM-SP is specifically targeted at internal and external providers of IT-enabled services, to introduce best practice into the sourcing and delivery of those services.

There are two major strategies for improving performance: framework-based and measurement-based. The eSCM-SP has features of both. A framework-based strategy uses models and standards as frameworks to identify what processes and systems should be implemented in a successful organization. Improvement based on the eSCM-SP is an example of this strategy. Certification in some framework-based strategies, including ISO 9001 [ISO 2000a] and BS 15000 [BSI 2002b], is binary; an organization is either compliant with the standard or not. Models such as the eSCM-SP and Software CMM measure organizations or processes using a form of ordinal scale (e.g., Capability Levels or Maturity Levels). Assessments using a framework identify what to do, but do not usually describe

how to do it. Frameworks typically do not specify performance levels for specific tasks (e.g., 5500 transactions per quarter).

The second strategy is measurement based. The service provider's processes and systems are measured and compared to objectives set by management in order to identify which ones need to be improved. Measurement trends are used to confirm and quantify improvements. Framework-based strategies naturally evolve toward measurement-based strategies tailored to the business needs of the organization as the foundational capabilities described by the framework are successfully put in place. Other frameworks used by the organization may impact the improvement actions based on the eSCM-SP. By focusing on its business objectives, the organization can leverage its existing work on other improvement initiatives, allowing it to develop an integrated improvement strategy. Understanding the relationships between the eSCM-SP and other related models and standards can help the organization to complement or supplement its eSCM-SP implementation strategy.

A number of models and standards exist that are focused on quality or IT-related topics. These frameworks have a variety of issuing bodies, scopes, architectures, and rating methods:

- General Total Quality Management (TQM) philosophies, such as those of Deming [Deming 1986, Deming 1994], Juran [Juran 1992], and Crosby [Crosby 1979].

- Performance excellence strategies such as Six Sigma® [Harry 2000].

- The criteria for quality awards such as the following:

  - the Deming Prize in Japan [Deming]

  - the Malcolm Baldrige National Quality Award in the United States [Baldrige]

  - the European Quality Award [EQA]

  - the Rajiv Gandhi National Quality Award in India [RGNQA]

  - the Brazilian National Quality Award [PNQ]

- Standards such as the following:

  - ISO 9001 (Quality Management Systems—Requirements) [ISO 2000a]

  - Control Objectives for Information and related Technology (COBIT®) [ITGI 2000]

  - ISO/IEC 12207 (Software Life Cycle Processes) [ISO 2002a]

  - ISO/IEC 15288 (System Life Cycle Processes) [ISO 2002b]

  - ISO/IEC 15504 (Software Process Assessment) [ISO 2003]

  - BS 7799-2: 2002 (Information Security Management Systems—Specification with guidance for use) [BSI 2002a]

  - ISO 17799 (Code of Practice for Information Security Management) [ISO 2000b]

  - BS 15000 (IT Service Management) [BSI 2002b]

  - COPC-2000® CSP standards [COPC 2000]

- ‣ Process improvement models such as the following:

  - ‣ the Capability Maturity Model® (CMM®) for Software [Paulk 1995a]

  - ‣ the Systems Engineering CMM® [Bate 1995]

  - ‣ the Software Acquisition CMM® [Cooper 2002]

  - ‣ the People CMM® [Curtis 2001]

  - ‣ CMM Integration℠ (CMMI®) [Chrissis 2003]

This report is part of a series that analyzes the common ground between the requirements of the eSCM-SP and those of some of these frameworks. The reports in this series are intended to help organizations make efficient use of their resources and existing investments in capability improvement. The differences or gaps between the requirements of the eSCM-SP and those of another framework are highlighted as opportunities for improvement or value-addition. This report focuses on the relationship between the eSCM-SP and Software CMM.

Some of the frameworks identified (e.g., Six Sigma, the Baldrige Award, and EQA) are sufficiently abstract that their relationship to the eSCM-SP can be briefly described in the introductory report for this series [Paulk, forthcoming a]. For other frameworks, a fairly detailed mapping is both possible and appropriate. While an overview is contained in the introductory report, separate reports with detailed comparisons are available or under development for ISO 9001 [Guha 2005a], CMMI [Paulk, forthcoming b], the Software CMM (this report), the People CMM [Hefley, forthcoming a], BS 15000 [Iqbal 2004], COBIT [Iqbal forthcoming], COPC-2000 CSP Gold Standard [Guha 2005b], BS 7799/ISO 17799 [Hefley, forthcoming b] and SS 507 [Guha forthcoming].

2. An Overview of the eSCM-SP

Competitive pressure, the need to access world-class capabilities, and a desire to share risks are among the primary drivers for organizations to delegate their IT-intensive business activities to external service providers [Hyder 2004a]. The tremendous growth in the sourcing of IT-enabled services, in particular, has been enabled by the rapid evolution and expansion of the global telecommunications infrastructure [ibid.]. The business processes being outsourced range from routine and non-critical tasks, which are resource intensive and operational, to strategic processes that directly impact revenue growth and profitability. The eSourcing Capability Model for Service Providers (eSCM-SP) v2 has been developed by a consortium led by Carnegie Mellon University's Information Technology Services Qualification Center (ITsqc) with the following purposes [ibid.]:

1. Give service providers guidance that will help them improve their capability across the sourcing life-cycle.

2. Provide clients with an objective means of evaluating the capability of service providers.

3. Offer service providers a standard to use when differentiating themselves from competitors.

Released in April 2004, the eSCM-SP v2 is composed of 84 Practices, which can be thought of as the "best practices" associated with successful sourcing relationships. Each Practice is distributed along three dimensions: Sourcing Life-cycle, Capability Area, and Capability Level.

The first dimension, Sourcing Life-cycle, is divided into Ongoing, Initiation, Delivery, and Completion. Ongoing Practices span the entire Sourcing Life-cycle, while Initiation, Delivery, and Completion occur in specific phases of that Life-cycle. During Initiation the organization negotiates with the client, agrees on requirements, designs the service that will be provided, and deploys (transitions) that service. Initiation may also include transfer of personnel, technology infrastructure, and intellectual property. During Delivery the organization delivers service according to the agreed-upon commitments. During Completion the organization transfers resources, and the responsibility for service delivery, back to the client, or to the client's designee.

The second dimension of the eSCM-SP, Capability Areas, provides logical groupings of Practices to help users better remember and intellectually manage the content of the Model. These groupings allow service providers to build or demonstrate capabilities in each critical sourcing function. The ten Capability Areas are Knowledge Management, People Management, Performance Management, Relationship Management, Technology Management, Threat Management, Contracting, Service Design & Deployment, Service Delivery, and Service Transfer.

The third dimension of the eSCM-SP is Capability Levels. The five Capability Levels of the eSCM-SP describe an improvement path that clients should expect service providers to travel. At Capability Level 1, a service provider is able to provide services but has not implemented all of the Level 2 Practices, and may be at a higher risk of failure.

At Capability Level 2, a service provider is able to consistently meet requirements, and has implemented, at a minimum, all 48 of the Level 2 Practices.

At Capability Level 3, a service provider is able to deliver services according to stated requirements, even if the required services differ significantly from the provider's experience, and has, at a minimum, implemented all 74 of the Level 2 and 3 Practices.

At Capability Level 4, a service provider is able to continuously innovate to add statistically and practically significant value to the services they provide. To achieve Level 4 the service provider has successfully implemented all 84 of the eSCM-SP Practices.

At Capability Level 5, a service provider has demonstrated measurable, sustained, and consistent performance excellence and improvement by effectively implementing all of the Level 2, 3, and 4 Practices for two or more consecutive Certification Evaluations covering a period of at least two years. There are no additional Practices to be implemented at Level 5.

Appendix A provides further detail on the rationale and structure of the eSCM-SP, as well as the Capability Determination Methods associated with it.

3. An Overview of the Software CMM

The Software CMM provides software organizations with guidance on how to gain control of their processes for developing and maintaining software and how to evolve toward a culture of software engineering and management excellence [Paulk 1995a]. The Software CMM was designed to guide software organizations as they select process improvement strategies by determining current process maturity and identifying the most critical issues for software quality and process improvement. By focusing on a limited set of activities and working aggressively to achieve them, an organization can steadily improve its organization-wide software process to enable continuous and lasting gains in software process capability.

A *software process* is a set of activities, methods, practices, and transformations that people use to develop and maintain software, and the associated products (for instance, project plans, design documents, code, test cases, and user manuals). As an organization matures, the software process becomes better defined and more consistently implemented throughout the organization.

Software process maturity is the extent to which a specific process is explicitly defined, managed, measured, controlled, and effective. Maturity implies a potential for growth in capability and indicates both the richness of an organization's software process and the consistency with which it is applied in projects throughout the organization.

As a software organization gains software process maturity, it institutionalizes its software process via policies, standards, and organizational structures. Institutionalization entails building an infrastructure and a corporate culture that supports the methods, practices, and procedures of the business so that they endure after those who originally defined them have gone.

Continual process improvement is based on many small, evolutionary steps, although revolutionary innovations may also occur. The staged structure of the Software CMM provides a framework for organizing these evolutionary steps into five maturity levels that lay successive foundations for continuous process improvement. These five maturity levels define an ordinal scale for measuring the maturity of an organization's software process and for evaluating its software process capability. The Levels also help an organization prioritize its improvement efforts.

Except for Level 1, each maturity level is decomposed into several Key Process Areas that indicate where an organization should focus to improve its software process. Each Key Process Area identifies a cluster of related activities that, when performed collectively, achieve a set of Goals that are considered to be important for enhancing process capability. The path to achieving the Goals of a Key Process Area may differ across projects due to differences in application domains or environments. Nevertheless, all the Goals of a Key Process Area must be achieved for the organization to satisfy that Key Process Area. The Key Process Areas are listed in Table 1.

Table 1
Key Process Areas by Maturity Level in the Software CMM.

Maturity Level	Focus	Key Process Areas
5 Optimizing	Continual process improvement	Defect Prevention
		Technology Change Management
		Process Change Management
4 Managed	Product and process quality	Quantitative Process Management
		Software Quality Management
3 Defined	Engineering processes and organizational support	Organization Process Focus
		Organization Process Definition
		Training Program
		Integrated Software Management
		Software Product Engineering
		Intergroup Coordination
		Peer Reviews
2 Repeatable	Project management processes	Requirements Management
		Software Project Planning
		Software Project Tracking & Oversight
		Software Subcontract Management
		Software Quality Assurance
		Software Configuration Management
1 Initial	Competent people (and heroics)	

Goals summarize the Key Practices of a Key Process Area and can be used to determine whether an organization or project has effectively implemented the Key Process Area. The Goals signify the scope, boundaries, and intent of each Key Process Area. Satisfaction of a Key Process Area is determined by achievement of the Goals.

Key Practices describe the activities and infrastructure that contribute most to the effective implementation and institutionalization of the Key Process Area. The Key Practices describe "what" is to be done, but they should not be interpreted as mandating "how" the Goals should be achieved. Alternative practices may accomplish the Goals of the Key Process Area. The Key Practices should be interpreted rationally to judge whether the Goals of the Key Process Area are effectively, although perhaps differently, achieved. Key Practices are informative; the normative (rating) components of the Software CMM are the Maturity Levels, Key Process Areas, and Goals.

4. Comparing the eSCM-SP and Software CMM

4.1. High-level Comparison

While the quality and process principles in the eSCM-SP and the Software CMM derive from the same roots, the targets are quite different. Organizations that build software can be considered to be a specific kind of service provider, therefore the eSCM-SP has a broader scope of applicability, while the Software CMM provides more detailed guidance. Similarly, the staged representation used within the Software CMM prioritizes the topics for transforming a software organization's capability in a manner demonstrated effective within that domain; the best practices in the eSCM-SP are structured in a manner closer to a continuous representation because of the need for additional research into the improvement priorities within the broader scope targeted by the Model [Chrissis 2003]. Table 2 shows a high-level comparison between the eSCM-SP and the Software CMM.

Table 2
High-level comparison between the eSCM-SP and Software CMM

	eSCM-SP	Software CMM
Audience	Service providers of IT-enabled sourcing services.	Software development and maintenance organizations.
Purpose	Building and improving service providers' capabilities to meet customer needs throughout the sourcing life-cycle.	Building and improving the software organization's capability to develop and/ or maintain software that addresses a customer's requirements.
Size	84 Practices in 10 Capability Areas.	316 Key Practices in 18 Key Process Areas.
Coverage	5 Capability Levels	5 Maturity Levels
	10 Capability Areas	18 Key Process Areas
	84 Practices	52 Goals
	1,234 Required Activities	316 Key Practices
	4-part Sourcing Life-cycle • Ongoing • Initiation • Delivery • Completion	5 Common Features • Commitment to Perform • Ability to Perform • Activities Performed • Measurement and Analysis • Verifying Implementation
Recognition	Certification by Carnegie Mellon University at one of four Capability Levels (Levels 2, 3, 4, and 5). Certification is valid for a period of two years.	Assessment or evaluation results; no formal certification. [SEI 2005]
URL	itsqc.cs.cmu.edu/escm	www.sei.cmu.edu/cmm

An organization can benefit from using both the eSCM-SP and Software CMM. The eSCM-SP helps service providers improve their service delivery capability and customer relationships. The Software CMM provides a framework for process improvement in the engineering service of developing and maintaining software. Both complement each other. While the eSCM-SP has a broader scope, the Software CMM provides focused

implementation guidance for many eSCM-SP Practices, especially for software organizations. For example, Software Configuration Management in the Software CMM provides focused guidance that supplements knw07, "Version & change control."

Table 3 provides a high-level comparison organized by eSCM-SP Capability Area. The first column lists the Capability Area. The second column describes topics that are addressed by both frameworks. The third column describes coverage of the Capability Area by the Software CMM, including any additional requirements in the Software CMM. The fourth column notes unique and additional requirements in the eSCM-SP. The last row contains other requirements that are not addressed in the eSCM-SP.

Table 3
High-level comparison between the eSCM-SP and Software CMM

CA	Overlap	Software CMM v1.1	eSCM-SP v2
knw	Process assets, version and change control, and resource consumption.	This Capability Area is partially covered by Organization Process Focus and Organization Process Definition for process knowledge. The Software CMM has additional requirements for configuration management.	This Capability Area also includes requirements for knowledge system and reuse and has additional requirements for providing information.
ppl	Innovation, participation in decisions, assigning responsibilities, roles, workforce competency, and training.	This Capability Area is partially covered for training in Training Program, roles in Organization Process Definition, work environment in Software Project Planning, and innovation in Technology Change Management and Process Change Management.	This Capability Area also includes requirements for performance feedback, career development, and rewards and recognition.
prf	Objectives, process verification, resources, improvement, capability baselines, preventive action, deploying innovations, benchmarking, organizational performance review, and programs to achieve objectives.	This Capability Area is largely covered by Organization Process Focus and Organization Process Definition. Quantitative control of the project, process, and product are addressed in the Level 4 and higher Key Process Areas.	This Capability Area has additional requirements for benchmarking, organizational performance review, and programs to achieve objectives.
rel	Managing relations and selecting suppliers.	This Capability Area is partially covered by Requirements Management, Software Subcontract Management, and Intergroup Coordination.	This Capability Area also includes requirements for managing relationships and statistical information.
tch	Technology acquisition, and proactively identifying and introducing new technology.	This Capability Area is partially covered by Requirements Management and Technology Change Management.	This Capability Area also includes requirements for licensing, integrating infrastructure, and optimizing technology.
thr	Risk management.	This Capability Area is partially covered by Software Project Planning and Software Project Tracking & Oversight.	This Capability Area also includes requirements for cross-engagement risk management, statutory and regulatory compliance, intellectual property, security, and disaster recovery.
cnt	Gathering and reviewing requirements.	This Capability Area is partially covered by Requirements Management, Software Project Planning, and Software Product Engineering.	This Capability Area also includes requirements for negotiating, pricing, confirming existing conditions, and market information and has additional requirements for responding to requirements and contracts.
sdd	Communicating requirements, planning, designing and deploying services, design feedback, and verifying design.	This Capability Area is largely covered by Requirements Management and Software Product Engineering.	This Capability Area also includes requirements for deploying services.
del	Corrective action, planning service delivery, training clients, verifying service commitments, and service modifications.	This Capability Area is largely covered by Software Project Tracking & Oversight; although there is no exact analog in Software CMM for service delivery, maintenance is covered along with development.	This Capability Area also includes requirements for financial management and service delivery.
tfr		This Capability Area is not covered by the Software CMM.	This Capability Area includes requirements for service transfer (people and other resources).

Each eSCM-SP Practice was compared to the corresponding Key Practices and Key Process Areas in the Software CMM. This Practice-level comparison was then given a label: "addressed," "partially addressed," or "not addressed." Values were assigned to each label (1, 0.67, or 0, respectively), and the average of the Practice values provide a comparison value at the Capability Area level ("largely covered" and "partially covered"). These averages are plotted in the radar charts later in this section.

"Largely covered" means that the greater part of the Capability Area is addressed from the appropriate perspective; the average coverage of all Practices in the Capability Area was greater than 0.67. "Partially covered" means that a significant portion of the Capability Area is addressed, but some requirements may not be explicitly addressed. This corresponds to an average coverage of less than 0.67. Subjective judgment is involved in deciding how well requirements at different levels of abstraction and with different scopes and targets correspond. In addition, specific implementations may go beyond the requirements of either framework.

Figure 1 provides a graphical perspective of Table 3. It shows that organizations using the Software CMM will have a significant advantage in initiating an eSCM-SP-based improvement program. As one might expect, however, there are unique contributions of the eSCM-SP that will add value to an improvement or quality initiative. The score for each Capability Area is the average score for the Practices, as detailed in Appendix C.

Figure 1
Coverage of the eSCM-SP Capability Areas by the Software CMM

Capability Areas	
knw	Knowledge Management
ppl	People Management
prf	Performance Management
rel	Relationship Management
tch	Technology Management
thr	Threat Management
cnt	Contracting
sdd	Service Design & Deployment
del	Service Delivery
tfr	Service Transfer

As shown in Figure 2, organizations using the eSCM-SP that develop or maintain software will have a significant advantage in initiating a Software-CMM-based improvement program. There are unique contributions in the Software CMM that will add value to an eSCM-SP improvement or quality initiative. The eSCM-SP and Software CMM can be viewed as both complementary and supplementary when used within the appropriate, overlapping domains. The score for each Key Process Area is the average score for the Practices, as detailed in Appendix D.

Key Process Areas

RM	Requirements Management
PP	Software Project Planning
PT	Software Project Tracking and Oversight
SM	Software Subcontract Management
QA	Software Quality Assurance
CM	Software Configuration Management
PF	Organization Process Focus
PD	Organization Process Definition
TP	Training Program
IM	Integrated Software Management
PE	Software Product Engineering
IC	Intergroup Coordination
PR	Peer Reviews
QP	Quantitative Process Management
QM	Software Quality Management
DP	Defect Prevention
TM	Technology Change Management
PC	Process Change Management

In addition to the practices in these two models that are specifically comparable, there are also templates that are used to capture generic process management in the eSCM-SP Practices and in the Software CMM key process areas. Those templates are compared in Appendix E.

4.2. Challenges to Mapping

Several challenges arise when comparing the eSCM-SP and the Software CMM. These challenges do not impact the ability of an organization currently using the Software CMM to adopt the eSCM-SP. Instead, the impact is frequently based on the need to broaden the implementation of what is being done in a Software CMM context to a business or technology-specific perspective, as is described in the eSCM-SP.

The challenges arise because of the following differences:

‣ Service providers' operational environment versus software organizations' project environment

‣ Capability models versus maturity models

‣ Capability Areas (in a continuous representation model) versus Key Process Areas (in a staged representation model)

4.2.1. Service Providers versus Software Organizations

One conceptual challenge in relating the eSCM-SP to the Software CMM is related to the difference between operational and project environments. By definition, operations are ongoing, while projects are temporary. The eSCM-SP focuses on service design, deployment, and delivery in an operational environment. Therefore it has, at its core, a somewhat different flavor than the Software CMM, which focuses on software design and development in a project environment. Many practices are analogous without being exact matches. For example, eSCM-SP Practices that address planning for design, deployment, and delivery all map conceptually to Software CMM Key Practices for planning the software project.

Another conceptual challenge is that the eSCM-SP has a much broader scope of application than the Software CMM. The eSCM-SP addresses business and technology issues, and it includes engagement initiation and completion activities that are out of the scope of the Software CMM, which assumes software projects have been initiated in alignment with the organization's strategic objectives.

The eSCM-SP's Practices are written from a business perspective, so they have a different flavor from those of the Software CMM, which are written from a process perspective. For example, the eSCM-SP's organizational objectives include Software CMM's process improvement perspective, but also cover other important business and improvement objectives.

To make a fair comparison between the eSCM-SP and the Software CMM, it is necessary to interpret the eSCM-SP, with its broader scope, from the perspective of providing the engineering service of building software products. While this is only one instance of a service that can be provided, it allows a reasonable comparison of the intent of the practices in the models.

The mappings in Appendices C and D are therefore written from the perspective of a service provider that is designing, deploying, and maintaining applications software

for its clients. In this context, service design is equivalent to software design and coding, deployment is delivery to the customer and/or end user, and service delivery is comparable to ongoing maintenance of a software application and its operational support. The Software CMM does not separate development and maintenance activities (both are considered "software engineering" in different contexts), therefore Software CMM practices map to multiple Capability Areas in the eSCM-SP, with different emphases (interpretations) on the meaning of the Software CMM practice depending on context.

4.2.2. Capability Models versus Maturity Models

The eSCM-SP was developed as a capability model rather than a maturity model. The key difference is that process capability indicates the predictability of the process and outcomes, while process maturity indicates growth in the process capability and involves building on one set of processes to establish a higher-maturity set of processes. This distinction is important in order to understand (1) the expected use of the model, (2) what it means for a Practice to be defined at a specific Capability Level, and (3) what it means for a service provider to be certified at a specific Capability Level.

The following, taken from the Software CMM, helps illustrate the distinction between process capability and process maturity.

> Process capability describes the range of expected results that can be achieved by following a process. The process capability of an organization provides one means of predicting the most likely outcomes to be expected from the next project the organization undertakes. [Paulk 1995a, p. 9]

> A Maturity Level is a well-defined evolutionary plateau toward achieving a mature process. Each Maturity Level provides a layer in the foundation for continuous process improvement. Each level comprises a set of process goals that, when satisfied, stabilize an important component of the process. Achieving each level of the maturity framework establishes a different component in the process, resulting in an increase in the process capability of the organization. [Paulk 1995a, p. 15]

The fact that the eSCM-SP is defined as a capability model means that each Capability Level has Practices that, together, define a predictable set of processes and outcomes. An organization at Capability Level 2, for example, is predictably able to meet client requirements, provided those requirements do not vary significantly from the organization's experience. An organization at Capability Level 3 is predictably able to meet client requirements and measure and control its activities across multiple client engagements. An organization at Capability Level 4 is predictably able to respond to changing business environments and deliver innovative services.

Since maturity models have well-defined plateaus of process maturity, organizations are expected to implement lower-level Practices before beginning to implement higher-level Practices. An organization cannot be expected to gain the full benefit of higher-maturity Practices without the foundation of the lower-maturity Practices.

Capability models, on the other hand, explicitly allow organizations to implement Practices from different levels simultaneously in a manner similar to a continuous representation model [Paulk 1995b]. For instance, an organization using the eSCM-SP may decide to create a capability baseline, a Level 4 capability, for its service delivery processes

before it has implemented all of the Capability Level 2 Practices. The organization may choose to do this for a variety of reasons, including competitive pressures or specific client requirements for demonstrating measurable improvement. The important thing for users of the eSCM-SP to recognize is that, since the eSCM-SP is a capability model and not a maturity model, it is possible in principle to implement Practices in a higher Capability Level and receive a consistent organizational benefit before implementing all Practices in a lower Capability Level.

It is also worth noting that the Capability Levels in the eSCM-SP are not defined using the same principles as the Maturity Levels in the Software CMM. Levels 2 and 3 are quite similar, although there is more of an emphasis on measurement at Level 3 in the eSCM-SP. Level 4 in the eSCM-SP is more similar to Level 5 in the Software CMM in its emphasis on adopting innovations. Level 5 in the eSCM-SP has no equivalent in any of the maturity models since it is based on demonstrable, persistent improvement against business objectives. This emphasis on results is closer to quality awards such as the Baldrige than any of the current maturity models.

4.2.3. Capability Areas versus Key Process Areas

Another important architectural distinction is that the Software CMM is a staged model that identifies the vital few Key Process Areas an organization should focus on for systematic process improvement. Key Process Areas are characterized by a limited number of Goals, typically two to four, which are further described by the Key Practices in the maturity model.

The Capability Areas in eSCM-SP v2 are more similar to the Process Areas in a continuous representation model, where each Process Area is separately rated on a process capability dimension. Templates for Capability Level 2 and 3 Practices evolve in a systematic way. Early versions of the Software CMM were expressed as a maturity framework that used a continuous representation [Paulk 1995c], and Software CMM supports both staged and continuous representation, but the debate over staged versus continuous representations continues [Chrissis 2003].

4.2.4. Required Components versus Informative/Expected Components

Some components in any framework are required; others are informative (or expected). The required Software CMM components used to rate organizations are Goals, Key Process Areas, and Maturity Levels. Key Practices in the Software CMM are informative; they may be expected, but they are not required. Key Practices may have informative subpractices and supplemental information under them. The eSCM-SP Practices are composed of three Major Activities, each of which contains multiple Required Activities, therefore the required eSCM-SP components are Practices, Major Activities, and Required Activities. Required Activities may have Recommended Activities and supplemental information under them. Mapping between the eSCM-SP and the Software CMM may therefore involve mapping required components in one framework to informative components in the other.

While this difference is problematic from a mechanistic perspective, the practical use of comparisons such as this report should always remain at a conceptual level and involve

professional judgment. The adequacy of the implementation of a reference model's "requirements" always has to be judged in the business context. This distinction is not always adequately appreciated by those using the models.

4.2.5. Breadth and Depth Differences

Breadth and depth differences between frameworks may occur simultaneously. The concept of "reviews" may be used in both frameworks yet cover a variety of techniques. A framework that uses technical reviews as a general review of the technical content of work products could include joint reviews with the customer, internal reviews within a project, and peer reviews. Joint reviews and peer reviews lie near opposite ends of the spectrum of reviews, and a framework may, or may not, distinguish between the types. Design reviews are a specific form of technical review, therefore a practice on technical reviews has a broader scope than a practice on design reviews. A practice on design reviews may go into greater detail than a general practice on technical reviews. For example, the design reviews in sdd06 in the eSCM-SP involve the customer and are not, therefore, peer reviews as described in the Software CMM, but they are similar to the formal reviews (at design) described in PT.AC.13.

Judging the relationship between such practices depends on both context and professional judgment. In comparing general and software-specific practices, the general practice only partially addresses the unique concerns of the software-specific practice, and the software-specific practice only partially addresses the breadth of the general. Reviews in the eSCM-SP may be only partially addressed by peer reviews in the Software CMM, while at the same time the peer reviews in the Software CMM are only partially addressed by the requirements for reviews in the eSCM-SP.

5. Conclusions

The eSCM-SP and the Software CMM are similar in many ways. On the surface, both are five-level models developed by Carnegie Mellon University. They are different in that the Software CMM is a capability maturity model aimed at describing and transforming the process capability of software organizations, while the eSCM-SP is a capability model aimed at describing and improving the capability of IT-enabled service providers.

The eSCM-SP and the Software CMM can be complementary for organizations that include software development and maintenance as one of the engineering services provided as part of their professional activities. Many of the Software CMM practices elaborate on items described at a higher level of abstraction in the eSCM-SP. The eSCM-SP supplements the Software CMM by addressing business-related issues that are outside the scope of its software engineering focus but are critical to successful sourcing operations.

References

[Baldrige]   Baldrige National Quality Award. www.quality.nist.gov.

[Bate 1995]   Bate, Roger, Dorothy Kuhn, Curt Wells, et al. 1995. *A Systems Engineering Capability Maturity Model, Version 1.1*. CMU/SEI-95-MM-003. Pittsburgh, PA: Carnegie Mellon University.

[BSI 2002a]   BDD/3 Technical Committee. 2002. *BS 7799-2:2002, Information Security Management Systems—Specification with guidance for use*. British Standards Institution.

[BSI 2002b]   BDD/3 Technical Committee. 2002. *BS 15000-1:2002, IT Service Management, Part 1: Specification for Service Management*. British Standards Institution.

[Chrissis 2003]   Chrissis, Mary Beth, Mike Konrad, and Sandy Shrum. 2003. *CMMI: Guidelines for Process Integration and Product Improvement*. Boston, MA: Addison-Wesley.

[COPC 2000]   Customer Operations Performance Center (COPC-2000). www.copc.com.

[Cooper 2002]   Cooper, Jack, Matt Fisher. 2002. *Software Acquisition Capability Maturity Model (SA-CMM) Version 1.03*. CMU/SEI-2002-TR-010. Pittsburgh, PA: Carnegie Mellon University.

[Crosby 1979]   Crosby, P.B. 1979. *Quality is Free*. New York, NY: McGraw-Hill.

[Curtis 2001]   Curtis, Bill, William E. Hefley, and Sally A. Miller. 2001. *People Capability Maturity Model*. Boston, MA: Addison-Wesley.

[Deming]   Deming Prize. www.deming.org/demingprize/.

[Deming 1986]   Deming, W. Edwards. 1986. *Out of the Crisis*. Cambridge, MA: MIT Center for Advanced Engineering Study.

[Deming 1994]   Deming, W. Edwards. 1994. *The New Economics for Industry, Government, Education, Second Edition*. Cambridge, MA: MIT Center for Advanced Educational Services.

[EQA]   European Quality Award. www.efqm.org/model_awards/eqa/intro.htm.

[Guha 2005a]   Guha, Subrata, William E. Hefley, Elaine Hyder, Majid Iqbal, and Mark C. Paulk. 2005. *Comparing the eSCM-SP v2 and ISO 9001: A comparison between the eSourcing Capability Model for Service Providers v2 and ISO 9001:2000 (Quality Management Systems—Requirements)*. CMU-ITSQC-05-001. Pittsburgh, PA: Carnegie Mellon University.

[Guha 2005b]   Guha, Subrata, William E. Hefley, Elaine B. Hyder, Majid Iqbal, and Mark C. Paulk. 2005. *Comparing the eSCM-SP v2 and COPC-2000®: A comparison between the eSourcing Capability Model for Service Providers v2 and Customer Operations Performance Center (COPC)-2000 CSP Gold Standard, Release 3.4*. CMU-ITSQC-05-003. Pittsburgh, PA: Carnegie Mellon University.

[Guha forthcoming] Guha, Subrata, William E. Hefley, Elaine B. Hyder, Majid Iqbal, and Mark C. Paulk. Forthcoming. *Comparing the eSCM-SP v2 and SS 507: A comparison between the eSourcing Capability Model for Service Providers v2 and SS 507:2004 (Singapore Standard for Business Continuity/Disaster Recovery (BC/DR) Service Providers)*. Pittsburgh, PA: Carnegie Mellon University.

[Harry 2000]   Harry, Mikel, Richard Schroeder. 2000. *Six Sigma: The Breakthrough Management Strategy Revolutionizing the World's Top Corporations*. New York, NY: Doubleday.

[Hefley, forthcoming a]   Hefley, William E., Subrata Guha, Elaine B. Hyder, Majid Iqbal, and Mark C. Paulk. Forthcoming. *Comparing the eSCM-SP v2 and People CMM®: A comparison between the eSourcing Capability Model for Service Providers v2 and People Capability Maturity Model® v2*. Pittsburgh, PA: Carnegie Mellon University.

[Hefley, forthcoming b]   Hefley, William E., et. al. Forthcoming. *Comparing the eSCM-SP v2 and ISO 17799: A comparison between the eSourcing Capability Model for Service Providers v2 and ISO 17799:2000 (E) (Information Technology—Code of Practice for Information Security Management)*. Pittsburgh, PA: Carnegie Mellon University.

[Hyder 2004a]   Hyder, Elaine B., Keith M. Heston, and Mark C. Paulk. 2004. *The eSourcing Capability Model for Service Providers (eSCM-SP) v2, Part 1: Model Overview*. CMU-ISRI-04-113. Pittsburgh, PA: Carnegie Mellon University.

[Hyder 2004b]   Hyder, Elaine B., Keith M. Heston, and Mark C. Paulk. 2004. *The eSourcing Capability Model for Service Providers (eSCM-SP) v2, Part 2: Practice Details*. CMU-ISRI-04-114. Pittsburgh, PA: Carnegie Mellon University.

[Iqbal 2004]   Iqbal, Majid, Jenny Dugmore, Subrata Guha, William E. Hefley, Elaine B. Hyder, and Mark C. Paulk. 2004. *Comparing the eSCM-SP v2 and BS 15000: A comparison between the eSourcing Capability Model for Service Providers v2 and BS 15000-1:2002 (IT Service Management)*. CMU-CS-04-129b. Pittsburgh, PA: Carnegie Mellon University.

[Iqbal forthcoming]   Iqbal, Majid, Subrata Guha, William E. Hefley, Elaine B. Hyder, and Mark C. Paulk. Forthcoming. *Comparing the eSCM-SP v2 and COBIT®: A comparison between the eSourcing Capability Model for Service Providers v2 and Control Objectives for Information and related Technology (COBIT) 3rd Edition*. Pittsburgh, PA: Carnegie Mellon University.

[ISO 2000a]   ISO 9001. 2000. "Quality Management Systems—Requirements." International Organization for Standardization and International Electrotechnical Commission.

[ISO 2000b]   ISO 17799. 2000. "Information Technology—Code of Practice for Information Security Management." International Organization for Standardization and International Electrotechnical Commission.

[ISO 2002a]   ISO/IEC 12207-1995/Amendment 1. 2002. "Information Technology—Software Life Cycle Processes." International Organization for Standardization and International Electrotechnical Commission.

[ISO 2002b]   ISO/IEC 15288. 2002. "Systems Engineering—System Life Cycle Processes." International Organization for Standardization and International Electrotechnical Commission.

[ISO 2003]   ISO/IEC 15504-2. 2003. "Software Engineering Process Assessment—Part 2: Performing an Assessment." International Organization for Standardization and International Electrotechnical Commission.

[ITGI 2000]   The IT Governance Institute. 2000. "COBIT: Control Objectives for Information and related Technology 3rd Edition." www.isaca.org/cobit.htm.

[Juran 1992]   Juran, J.M. 1992. *Juran on Quality By Design*. New York, NY: The Free Press.

[Kumar 2001]   Kumar, B., V. Mahendra, E. Hyder, E. Nawrocki, K. Madhu, and R. Gupta. 2001. *eSCM Annotated Bibliography*. CMU-CS-01-125/CMU-ISRI-01-100. Pittsburgh, PA: Carnegie Mellon University.

[March 1996]   March, Artemis. 1996. "A Note on Quality: The Views of Deming, Juran, and Crosby." *IEEE Engineering Management Review*, vol. 24, no. 1: 6-14.

[Paulk 1995a]   Paulk, Mark C., Charles V. Weber, Bill Curtis, Mary Beth Chrissis. 1995. *The Capability Maturity Model: Guidelines for Improving the Software Process*. Addison-Wesley.

[Paulk 1995b]   Paulk, Mark C., Michael D. Konrad, and Suzanne M. Garcia. 1995. "CMM Versus SPICE Architectures." *IEEE Software Process Newsletter,* No. 3, Spring 1995, pp. 7-11

[Paulk 1995c]   Paulk, Mark C. 1995. "The Evolution of the SEI's Capability Maturity Model for Software." *Software Process: Improvement and Practice,* Vol. 1, No. 1, Spring 1995, pp. 3-15.

[Paulk, forthcoming a]   Paulk, Mark C., Subrata Guha, William E. Hefley, Elaine B. Hyder, and Majid Iqbal. Forthcoming. *Comparing the eSCM-SP v2 and Related Models and Standards: A Comparison Between the eSourcing Capability Model for Service Providers v2 and Related Models and Standards.* Pittsburgh, PA: Carnegie Mellon University.

[Paulk, forthcoming b]   Paulk, Mark C., Subrata Guha, William E. Hefley, Elaine B. Hyder, and Majid Iqbal. Forthcoming. *Comparing the eSCM-SP v2 and CMMI® v1.1: A Comparison Between the eSourcing Capability Model for Service Providers v2 and Capability Maturity Model® Integration v1.1.* Pittsburgh, PA: Carnegie Mellon University.

[PNQ]   Brazilian National Quality Award. www.fpnq.org.br.

[RGNQA]   Rajiv Gandhi National Quality Award. Bureau of Indian Standard, Government of India. www.bis.org.in/rgnqa/rgnqa03.pdf.

[Roach 1991]   Roach, S.S. 1991. "Services Under Siege—The Restructuring Imperative." *Harvard Business Review,* September-October, pp 82-92.

[SEI 2005]   SEI. 2005. "Maturity Profile—Frequently Asked Questions." www.sei.cmu.edu/sema/profile_FAQ.html

Appendix A: Description of the eSCM-SP v2

This section provides a detailed description of the eSourcing Capability Model for Service Providers (eSCM-SP) v2 [Hyder 2004a, Hyder 2004b].

A.1. Rationale Behind Development of the eSCM-SP

IT-enabled sourcing, or eSourcing, uses information technology as a key component of service delivery or as an enabler for delivering services. It is often provided remotely, using telecommunication or data networks. These services currently range from routine and non-critical tasks that are resource intensive and operational in nature to strategic processes that directly impact revenues.

IT-enabled services are being sourced at a rapid rate. The evolution of the Internet and the global telecommunications infrastructure has provided client organizations with a choice of service providers located anywhere in the world. Simultaneously, competitive pressures have driven organizations to find the most cost-effective way to get the IT-enabled services they need while maintaining or improving their quality of service.

Sourcing failures are largely related to a core set of critical issues affecting sourcing relationships. Based on literature review [Kumar 2001] and interviews with eSourcing service providers and clients, issues critical for successful eSourcing have been identified. These include developing and sustaining stakeholder relationships, building and keeping a competent workforce, defining and delivering quality service, assessing and managing threats (e.g., disasters, invasion of networks), remaining competitive through innovation and improvement, and managing transitions of resources and services.

The combination of high growth and significant failures in eSourcing highlights a growing need: clients and service providers both need to be able to address the critical issues in sourcing in order to increase their probability of success. Individually and as a whole, existing frameworks do not address all of the critical issues in eSourcing. Also, many of these frameworks do not readily provide methods to assess the capabilities of IT-enabled service providers to establish, manage, and improve relationships with clients.

A.2. Structure of the eSCM-SP v2

Released in April 2004, the eSCM-SP v2 is composed of 84 Practices, which can be thought of as "best practices" associated with successful sourcing relationships. Each Practice is assigned a value along three dimensions: Sourcing Life-cycle, Capability Area, and Capability Level.

Each of the 84 Practices in the eSCM-SP contains information about a sourcing best practice. This information includes a statement summarizing the best practice, a description of the best practice, a list of activities needing to be performed, and supplemental information that helps clarify those activities. For more information on the structure of the 84 Practices, see *The eSourcing Capability Model for Service Providers (eSCM-SP) v2, Part 2: Practice Details* [Hyder 2004b].

A.2.1. Sourcing Life-cycle

Although most quality models focus only on delivery capabilities, in eSourcing there are also critical issues associated with initiation and completion of engagements. The first dimension of the eSCM-SP highlights where in the Sourcing Life-cycle each Practice is most relevant. The Sourcing Life-cycle is divided into Ongoing, Initiation, Delivery, and Completion. Ongoing Practices span the entire Sourcing Life-cycle, while Initiation, Delivery, and Completion Practices occur in specific phases of that Life-cycle.

Ongoing Practices represent management functions that need to be performed during the entire Sourcing Life-cycle. In order to meet the intent of these Practices, it is important to perform them across the whole life-cycle; an organization that only performs an Ongoing Practice during Delivery is not meeting the intent of the Practice. Initiation Practices focus on the capabilities needed to effectively prepare for service delivery. These Practices are concerned with gathering requirements, negotiating, contracting, and designing and deploying the service, including transferring the necessary resources. Delivery Practices focus on service delivery capabilities, including the ongoing management of service delivery, verification that commitments are being met, and management of the finances associated with the service provision. Completion Practices focus on the capabilities needed to effectively close down an engagement at the end of the Sourcing Life-cycle. They mainly include the transfer of resources to the client, or to a third party, from the service provider.

A.2.2. Capability Areas

Delivery of eSourcing occurs through a series of interdependent functions that enable service providers to effectively deliver service. The second dimension of the eSCM-SP, Capability Areas, provides logical groupings of Practices to help users better remember and intellectually manage the content of the Model. These groupings allow service providers to build or demonstrate capabilities in each critical sourcing function, addressing all of the critical sourcing issues discussed above.

All of the Ongoing Practices are contained within six of the ten Capability Areas: Knowledge Management, People Management, Performance Management, Relationship Management, Technology Management, and Threat Management. The other four Capability Areas are temporal and are typically associated with a single phase of the Sourcing Life-cycle: Initiation, Delivery, or Completion. The exception is Service Transfer, which includes both Initiation and Completion Practices. In addition to Service Transfer, these temporal Capability Areas are Contracting, Service Design & Deployment, and Service Delivery.

The Knowledge Management Practices focus on managing information and knowledge systems so that personnel have easy access to the knowledge they need to effectively perform their work. This Capability Area addresses the critical issues of capturing and using knowledge, and measuring and analyzing reasons for termination.

The People Management Practices focus on managing and motivating personnel to effectively deliver services. They address understanding the organization's needs for personnel and skills, filling those needs, and encouraging the appropriate behaviors to effectively deliver service. This Capability Area addresses the critical issues of establishing

and maintaining an effective work environment, building and maintaining competencies, and managing employee satisfaction, motivation, and retention.

The Performance Management Practices focus on managing the organization's performance to ensure that the client's requirements are being met, that the organization is continually learning from its experience, and that the organization is continually improving across engagements. These Practices address the effective capture, analysis, and use of data, including data on the organization's capabilities relative to its competitors. This Capability Area primarily addresses the critical issues of maintaining competitive advantage, innovating, building flexibility, and increasing responsiveness. It also addresses monitoring and controlling activities to consistently meet service delivery commitments.

The Relationship Management Practices focus on actively managing relationships with stakeholders, including the client, as well as suppliers and partners who are integral to the delivery of services to the client. Relationship Management primarily addresses the critical issues of managing stakeholder expectations, establishing and maintaining trust and ensuring the effectiveness of interactions with stakeholders, managing supplier and partner relationships, managing the cultural differences between stakeholders, and monitoring and managing the client's and end-users' satisfaction. This Capability Area also addresses innovating, building flexibility, increasing responsiveness, establishing well-defined contracts with stakeholders, and maintaining a competitive advantage.

The Technology Management Practices focus on managing the availability and adequacy of the technology infrastructure used to support the delivery of the services. Their focus covers controlling the existing technology, managing changes to that technology, and appropriately integrating the technology infrastructure with the client, suppliers, and partners to effectively deliver service. This Capability Area addresses the critical issue of managing rapid technological shifts and maintaining technology availability, reliability, accessibility, and security. It also addresses innovating, building flexibility, and increasing responsiveness.

The Threat Management Practices focus on identifying and actively managing threats to the organization's ability to meet its objectives and the requirements of the client. They focus on active risk management, paying particular attention to the risks associated with security, confidentiality, infrastructure, and disasters that may disrupt service or fail to meet the requirements of the client. This Capability Area addresses the critical issues of managing clients' security, and ensuring compliance with statutory and regulatory requirements. It also addresses maintaining the continuity of service delivery, managing rapid technological shifts, and maintaining the availability, reliability, accessibility, and security of the technology.

The Contracting Practices focus on effectively managing the process of gathering client requirements, analyzing them, and negotiating a formal agreement that describes how the service provider will meet those requirements. A critical component of contracting is understanding the client's expectations and needs, and agreeing with the client on how the organization will meet those requirements. All Contracting Practices are in Initiation. This

Capability Area addresses the critical issues of translating implicit and explicit needs into the defined requirements, and establishing well-defined contracts with stakeholders.

The Service Design & Deployment Practices focus on translating the client's requirements and the contract language of what will be provided into a detailed design for how it will be provided, and on effectively deploying that design. This Capability Area is closely related to the Contracting Capability Area. All Service Design & Deployment Practices are in Initiation. This Capability Area addresses the critical issue of reviewing service design and deployment to ensure adequate coverage of the requirements. It also addresses developing procedures for monitoring and controlling activities to consistently meet service delivery commitments.

The Service Delivery Practices focus on the continued delivery of services according to commitments made to clients and based on service designs. They include planning and tracking of the service delivery activities. The Service Delivery Practices are the only ones in Delivery. This Capability Area addresses the critical issues of monitoring and controlling activities to consistently meet service delivery commitments, and maintaining continuity of service delivery. It also addresses establishing well-defined contracts with stakeholders, and maintaining a competitive advantage.

The Service Transfer Practices focus on transferring resources between service providers and clients or other service providers. In Initiation the resources are transferred to the organization as it takes responsibility for service delivery. This transfer may include people, processes, technology, and knowledge needed to effectively perform that service delivery. In Completion the organization transfers resources to the new service provider (either the client or an external service provider) in a manner that ensures continued service to the client during the transfer period. This Capability Area addresses the critical issues of smoothly transferring services and resources, and capturing and transferring the knowledge gained during the engagement to the client during contract completion. It also addresses maintaining continuity of service delivery.

A.2.3. Capability Levels

The third dimension in the eSCM-SP is Capability Levels. The five Capability Levels of the eSCM-SP describe an improvement path that clients should expect service providers to travel. This path starts from a desire to provide eSourcing services, and continues to the highest level, demonstrating an ability to sustain excellence.

The capabilities of Level 1 service providers vary widely. Some may have almost none of the eSCM-SP Practices implemented. These providers are very likely to be a high risk to work with because they often promise more than they deliver. Other service providers may have many of the eSCM-SP Practices implemented, including some Practices at Capability Levels 3 and 4. Because these service providers have not fully implemented all of the Capability Level 2 Practices, they may meet many of the client's needs successfully, but there will still be a risk of failure in areas where they have not implemented the necessary eSCM-SP Practices.

Service providers at Capability Level 2 have formalized procedures for capturing requirements and delivering the services according to commitments made to clients and

other stakeholders. These providers are able to deliver specific services according to stated client expectations, given that the services do not significantly vary from the provider's experiences. At Capability Level 2 the service provider is able to systematically capture and understand requirements, design and deploy services to meet the requirements, and successfully deliver the services according to agreed-upon service levels.

The infrastructure (e.g., work environment, training, technology, and information) is in place to support consistent performance of work that meets the service provider's commitments. Level 2 service providers have implemented all of the Capability Level 2 Practices and can demonstrate their effective usage.

Service providers at Capability Level 3 are able to deliver services according to stated requirements, even if the required services differ significantly from the providers' experience. At Level 3 the service provider is able to manage its performance across the organization, understand targeted market services and their varying requirements (including specific cultural attributes), identify and manage risks across engagements, and design and deliver services based on established procedures. The service provider supports this capability through sharing and using knowledge gained from previous engagements, objectively measuring and rewarding personnel performance, and monitoring and controlling technology infrastructure. Having established systems for forming and managing client relationships, providers at Capability Level 3 continuously aim to improve the services delivered. Improvements are reactive and are typically generated from the defined measurement and verification activities. The Level 3 service provider demonstrates measurable improvement with respect to organizational objectives. Organizational learning improves performance across engagements. Level 3 providers have effectively implemented all of the Level 2 and 3 Practices.

Service providers at Capability Level 4 are able to continuously innovate to add statistically and practically significant value to the services they provide to their clients and other stakeholders. At Capability Level 4 the service provider is able to customize its approach and service for clients and prospective clients, understand client perceptions, and predict its performance based on previous experiences. The service provider supports this capability through systematically evaluating and incorporating technology advances and setting performance goals from a comparative analysis of its current performance as well as from internal and external benchmarks. Level 4 providers systematically plan, implement, and control their own improvement, typically generating these plans from their own performance benchmarks. They have effectively implemented all of the Capability Level 2, 3, and 4 Practices.

Service providers at Capability Level 5 have demonstrated measurable, sustained, and consistent performance excellence and improvement by effectively implementing all of the Capability Level 2, 3, and 4 practices for two or more consecutive Certification Evaluations covering a period of at least two years. There are no additional Practices required to reach Capability Level 5; effective, continued, implementation of all 84 of the eSCM-SP Practices in a rapidly changing environment shows an ability to sustain excellence throughout the organization over time.

A.3. Capability Determination Methods

ITsqc provides four methods that can be used to assess the capabilities of service providers relative to the eSCM-SP Capability Levels. The four Capability Determination Methods systematically analyze evidence of the provider's implementation of the eSCM-SP v2 Practices to determine what Capability Level their organization has achieved [Hyder 2004a]. The Capability Determination may be of interest to, or required by, current or prospective clients of the service provider within a sourcing selection process. In this context, the Methods provide a consistent way for clients to evaluate their existing service providers or to compare two or more prospective providers. The knowledge from such an eSCM-SP Capability Determination may be used by clients to assess the risks and benefits of selecting a given service provider. Capability Determination may also be sponsored by service providers with the objective of evaluating their current capabilities and defining targets for self-improvement. In this context, the organization may or may not seek formal certification at an eSCM-SP Capability Level.

The four Capability Determination Methods that are available from ITsqc are (1) Full Evaluation, (2) Full Self-appraisal, (3) Mini Evaluation, and (4) Mini Self-appraisal. The five major differences among these methods are (1) their purpose and outcome, (2) who does them, (3) who leads them, (4) who sponsors them, and (5) the number of eSCM-SP Practices that are analyzed (i.e., the model scope). Table 4 summarizes the four Methods.

Table 4
eSCM-SP Capability Determination Methods

<table>
<thead>
<tr><th></th><th></th><th>Evaluation</th><th>Self-appraisal</th></tr>
</thead>
<tbody>
<tr><td rowspan="5">FULL</td><td>Purpose</td><td>For certification</td><td>To prepare for a Full Evaluation or launch or validate an improvement effort. No certification.</td></tr>
<tr><td>Team</td><td>External, trained & authorized by Carnegie Mellon University</td><td>Internal, external, or combination</td></tr>
<tr><td>Lead evaluator</td><td>Required</td><td>Strongly Recommended</td></tr>
<tr><td>Sponsor</td><td>Client or service provider</td><td>Service provider</td></tr>
<tr><td>Model scope</td><td>All eSCM-SP Practices</td><td>All eSCM-SP Practices</td></tr>
<tr><td rowspan="5">MINI</td><td>Purpose</td><td>To prepare for a Full Evaluation or as part of a provider selection process. No certification.</td><td>To launch or validate an improvement effort. No certification.</td></tr>
<tr><td>Team</td><td>External, trained & authorized by Carnegie Mellon University</td><td>Internal, external, or combination</td></tr>
<tr><td>Lead evaluator</td><td>Required</td><td>Recommended</td></tr>
<tr><td>Sponsor</td><td>Client or service provider</td><td>Service provider</td></tr>
<tr><td>Model scope</td><td>Subset of eSCM-SP Practices</td><td>Subset of eSCM-SP Practices</td></tr>
</tbody>
</table>

Only the Full Evaluation leads to an ITsqc certification. It is a third-party external evaluation of a service provider's capability. It is based on evidence of the provider's implementation of all the Practices in the eSCM-SP, and is sponsored by the service provider or by its client(s). Members of the evaluation team must be trained by Carnegie Mellon University and must be authorized to perform external evaluations of service providers. An authorized Lead Evaluator must head the evaluation effort. The evaluation data is rigorously reviewed by a certification board at Carnegie Mellon University and, when warranted, results in certification by Carnegie Mellon of the provider's capability. Organizations can be Certified eSCM-SP-compliant at Capability Levels 2, 3, 4, or 5.

Appendix B: Description of the Software CMM

The Software CMM provides software organizations with guidance on how to gain control of their processes for developing and maintaining software and how to evolve toward a culture of software engineering and management excellence [Paulk 1995a]. The Software CMM was designed to guide software organizations in selecting process improvement strategies by determining current process maturity and identifying the most critical issues for software quality and process improvement. By focusing on a limited set of activities and working aggressively to achieve them, an organization can steadily improve its organization-wide software process to enable continuous and lasting gains in software process capability.

A *software process* is a set of activities, methods, practices, and transformations that people use to develop and maintain software and the associated products (for instance, project plans, design documents, code, test cases, and user manuals). As an organization matures, its software process becomes better defined and more consistently implemented throughout the organization.

Software process capability describes the range of expected results that can be achieved by following a software process. An organization's software process capability is one way of predicting the most likely outcome to expect from the next software project the organization undertakes.

Software process performance represents the actual results achieved by following a software process. Thus, software process performance focuses on the results achieved, while software process capability focuses on the results expected.

Software process maturity is the extent to which a specific process is explicitly defined, managed, measured, controlled, and effective. Maturity implies a potential for growth in capability and indicates both the richness of an organization's software process and the consistency with which it is applied in projects throughout the organization.

As a software organization gains in software process maturity, it institutionalizes its software process via policies, standards, and organizational structures. Institutionalization entails building an infrastructure and a corporate culture that supports the methods, practices, and procedures of the business so that they endure after those who originally defined them have gone.

B.1. The Five Levels of Software Process Maturity

Continuous process improvement is based on many small, evolutionary steps, although revolutionary innovations may also occur. The staged structure of the Software CMM provides a framework for organizing these evolutionary steps into five Maturity Levels that lay successive foundations for continuous process improvement. These five Maturity Levels define an ordinal scale for measuring the maturity of an organization's software process and for evaluating its software process capability. The levels also help an organization prioritize its improvement efforts.

A *Maturity Level* is a well-defined evolutionary plateau on the path to a mature software process. Each Maturity Level comprises a set of process goals that, when satisfied, stabilize an important component of the software process. Achieving each level of the maturity framework establishes a higher level of process capability for the organization. Organizing the Software CMM into these five levels prioritizes improvement actions for increasing software process maturity.

The five levels can be briefly described as follows:

Table 5
Five levels of process maturity

	Maturity Level	Description
1	Initial	The software process is characterized as ad hoc, and occasionally even chaotic. Few processes are defined, and success depends on individual effort and heroics.
2	Repeatable	Basic project management processes are established to track cost, schedule, and functionality. The necessary process discipline is in place to repeat earlier successes on projects with similar applications.
3	Defined	The software process for both management and engineering activities is documented, standardized, and integrated into a standard software process for the organization. Projects use an approved, tailored version of the organization's standard software process for developing and maintaining software.
4	Managed	Detailed measures of the software process and product quality are collected. Both the software process and products are quantitatively understood and controlled.
5	Optimizing	Continuous process improvement is enabled by quantitative feedback from the process and from piloting innovative ideas and technologies.

These five levels reflect the fact that the Software CMM is a model for improving the capability of software organizations. The priorities in the Software CMM, as expressed by these levels, are not directed at individual projects. A project that is in trouble might well prioritize its problems differently from the taxonomy given by the Software CMM. The troubled project's solutions might be of limited value to the rest of the organization, because other projects might have different problems or because other projects could not take advantage of its solutions if they lack the necessary foundation to implement them. The Software CMM focuses on processes that are of value across the organization.

B.2. Key Process Areas

Except for Maturity Level 1, each Maturity Level is composed of several Key Process Areas that indicate where an organization should focus to improve its software process. Key Process Areas identify the issues that must be addressed to achieve a Maturity Level, as summarized in Table 6.

Table 6
Key Process Areas of the Software CMM.

	Maturity Level	Focus	Key Process Areas
1	Initial	Competent people (and heroics)	N/A
2	Repeatable	Project management processes	Requirements Management Software Project Planning Software Project Tracking & Oversight Software Subcontract Management Software Quality Assurance Software Configuration Management
3	Defined	Engineering processes and organizational support	Organization Process Focus Organization Process Definition Training Program Integrated Software Management Software Product Engineering Intergroup Coordination Peer Reviews
4	Managed	Product and process quality	Quantitative Process Management Software Quality Management
5	Optimizing	Continual process improvement	Defect Prevention Technology Change Management Process Change Management

Each Key Process Area identifies a cluster of related activities that, when performed collectively, achieve a set of Goals considered to be important for enhancing process capability. The path to achieving the Goals of a Key Process Area may differ across projects based on differences in application domains or environments. Nevertheless, all the Goals of a Key Process Area must be achieved for the organization to satisfy that Key Process Area.

The Key Process Areas at Maturity Level 2 focus on the software project's concerns related to establishing basic project management controls.

Requirements Management (RM)
Establish between the customer and the software project a common understanding of the customer's requirements that will be addressed by the software project.

Software Project Planning (PP)
Establish reasonable plans for performing the software engineering and for managing the software project.

Software Project Tracking & Oversight (PT)
Establish adequate visibility into actual progress so that management can take effective actions when the software project's performance deviates significantly from the software plans.

Software Subcontract Management (SM)
Select qualified software subcontractors and manage them effectively.

Software Quality Assurance (QA)
Provide management with appropriate visibility into the process being used by the software project and of the products being built.

Software Configuration Management (CM)
Establish and maintain the integrity of the products of the software project throughout the project's software life cycle.

The Key Process Areas at Maturity Level 3 address both project and organizational issues, as the organization establishes an infrastructure that institutionalizes effective software engineering and management processes across all projects.

Organization Process Focus (PF)
Establish the organizational responsibility for software process activities that improve the organization's overall software process capability.

Organization Process Definition (PD)
Develop and maintain a usable set of software process assets that improve process performance across the projects and provides a basis for defining meaningful data for quantitative process management.

Training Program (TP)
Develop the skills and knowledge of individuals so they can perform their roles effectively and efficiently.

Integrated Software Management (IM)
Integrate the software engineering and management activities into a coherent, defined software process that is tailored from the organization's standard software process and related process assets.

Software Product Engineering (PE)
Consistently perform a well-defined engineering process that integrates all the software engineering activities to produce correct, consistent software products effectively and efficiently.

Intergroup Coordination (IC)
Establish a means for the software engineering group to actively participate with the other engineering groups so the project is better able to satisfy the customer's needs effectively and efficiently.

Peer Reviews (PR)
Remove defects from the software work products early and efficiently. An important corollary effect is to develop a better understanding of the software work products and of the defects that can be prevented.

The Key Process Areas at Maturity Level 4 focus on establishing a quantitative understanding of both the software process and the software work products being built.

Quantitative Process Management (QP)
Quantitatively control process performance of the software project.

Software Quality Management (QM)
Develop a quantitative understanding of the quality of the project's software products and achieve the specific quality goals.

The Key Process Areas at Maturity Level 5 cover the issues that both the organization and the projects must address to implement continuous and measurable software process improvement.

Defect Prevention (DP)
Identify the causes of defects and prevent them from recurring.

Technology Change Management (TM)
Identify beneficial new technologies (such as tools, methods, and processes) and transfer them into the organization in an orderly manner.

Process Change Management (PM)
Continually improve the software processes used in the organization with the intent of improving software quality, increasing productivity, and decreasing the cycle time for product development.

B.3. Key Practices, Common Features, and Goals

Key Practices describe the activities and infrastructure that contribute most to the effective implementation and institutionalization of the Key Process Area. The Key Practices describe "what" is to be done, but they should not be interpreted as mandating "how" the Goals should be achieved. Alternative practices may accomplish the Goals of the Key Process Area. The Key Practices should be interpreted rationally to judge whether the Goals of the Key Process Area are effectively, although perhaps differently, achieved. Key Practices are informative; the normative (rating) components of the Software CMM are the Maturity Levels, Key Process Areas, and Goals.

For convenience, the Key Practices that describe the Key Process Areas are organized by Common Features. The common features are attributes that indicate whether the implementation and institutionalization of a Key Process Area is effective, repeatable, and lasting. The five common features are listed below:

Commitment to Perform (CO)
Describes the actions the organization must take to ensure that the process is established and will endure; typically involves establishing organizational policies and senior management sponsorship.

Ability to Perform (AB)
Describes the preconditions that must exist in the project or organization in order to implement the software process competently; typically involves resources, organizational structures, and training.

Activities Performed (AC)
Describes the roles and procedures necessary to implement a Key Process Area; typically involve establishing plans and procedures, performing the work, tracking it, and taking corrective actions as necessary.

Measurement and Analysis (ME)
Describes the need to measure the process and analyze the measurements; typically includes examples of the measurements that could be taken to determine the status and effectiveness of the activities performed for the Key Process Area.

Verifying Implementation (VE)
Describes the steps to ensure that the activities are performed in compliance with the process that has been established; typically encompasses reviews and audits by management and software quality assurance.

The practices in the common feature Activities Performed describe what must be implemented to establish a process capability. The other practices, taken as a whole, form the basis by which an organization can institutionalize the practices described in the Activities Performed common feature.

Goals summarize the Key Practices of a Key Process Area and can be used to determine whether an organization or project has effectively implemented the Key Process Area. The Goals signify the scope, boundaries, and intent of each Key Process Area. Satisfaction of a Key Process Area is determined by achievement of the Goals.

Appendix C: Coverage of the eSCM-SP by the Software CMM

In support of the high-level comparison provided in section 4.1 and illustrated in Figure 3, this section provides a detailed mapping of eSCM-SP Practices to the Key Practices of the Software CMM. The objective of this comparison is to demonstrate the extent of coverage of eSCM-SP requirements by the Software CMM. This is only an indicative comparison based on the requirements of the two frameworks. This comparison should be used as a guideline, not as a rule.

Figure 3
(For reference; identical to Figure 1)
Coverage of eSCM-SP v2 Capability Areas by Software CMM

Capability Areas

knw	Knowledge Management
ppl	People Management
prf	Performance Management
rel	Relationship Management
tch	Technology Management
thr	Threat Management
cnt	Contracting
sdd	Service Design & Deployment
del	Service Delivery
tfr	Service Transfer
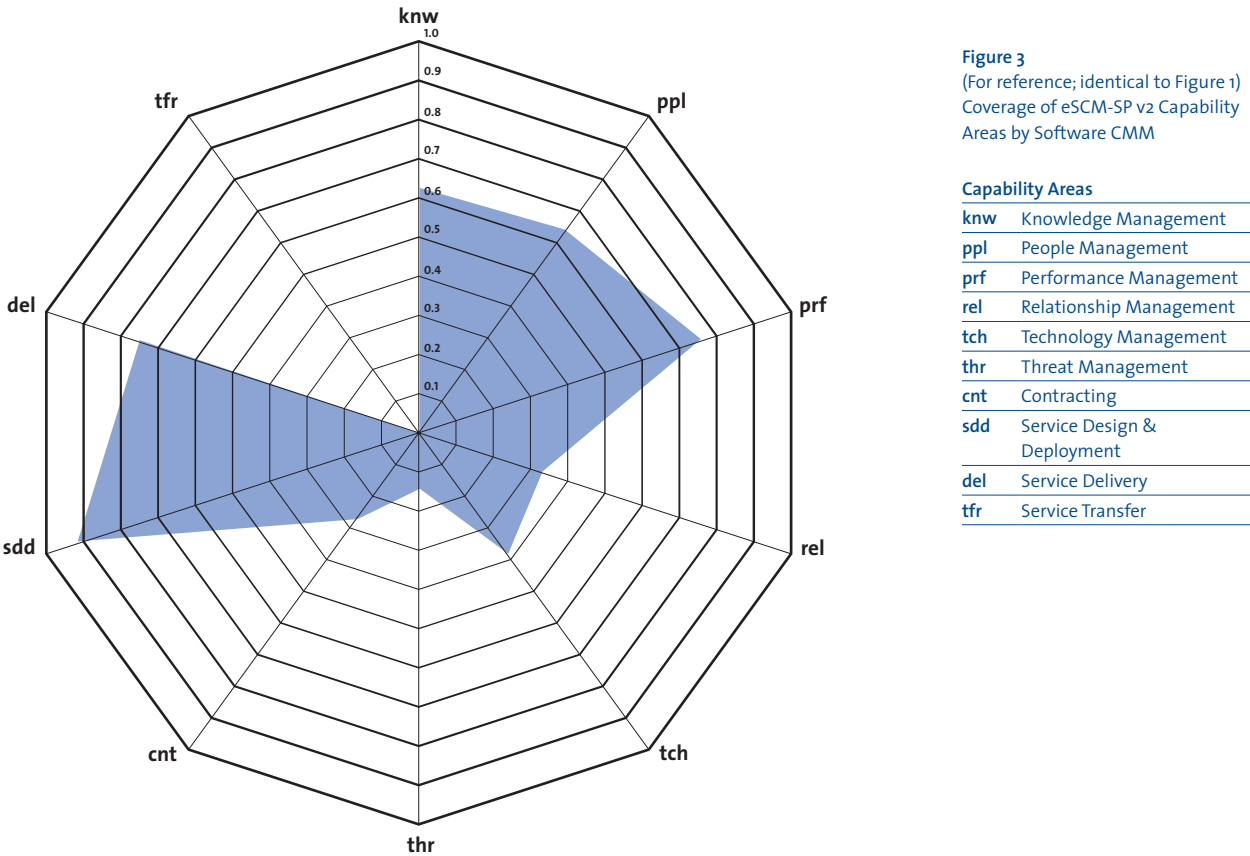
Table 7 is organized according to the Capability Areas of the eSCM-SP. Note that in some cases, a Practice in the eSCM-SP may map to multiple Key Practices, Goals, and/or Key Process Areas in the Software CMM. A summary mapping precedes such instances.

The following symbols are used to show coverage of eSCM-SP requirements by Software CMM:

Symbol	Interpretation
●	The eSCM-SP Practice is addressed in the Software CMM.
○	The eSCM-SP Practice is only partially addressed in the Software CMM.
Ø	The eSCM-SP Practice is not addressed in the Software CMM (to any significant degree).

Table 7
Coverage of the eSCM-SP by Software CMM

Knowledge Management (knw)

eSCM-SP Practice	Relation	Software CMM Key Practice	Comments
knw01: Share knowledge	O	IC: Intergroup Coordination	Although the process aspect of "Share knowledge" is addressed in the Software CMM, the details of this Level 4 policy are not explicitly addressed or addressed in the same breadth in the Software CMM. Intergroup Coordination addresses communication and coordination between different project groups and the customer.
knw02: Provide required information	Ø		Providing the information required to perform the work is not explicitly addressed in the Software CMM. The process aspect is captured in the process assets in Organization Process Definition and the skills-building aspect in the training materials in Training Program, but those topics are separately addressed in knw04 and ppl06.
knw03: Knowledge system	Ø		"Knowledge system" is partially covered by the development of process assets in Organization Process Definition, but that aspect of the knowledge system is already addressed in knw04.
knw04: Process assets	●	PD: Organization Process Definition	"Process assets" is essentially equivalent to the organization's standard software process, software process database, and tailoring guidelines.
knw05: Engagement knowledge	O		Lessons learned and process assets correspond to "Engagement knowledge." That knowledge is used to both manage and improve the process in Integrated Software Management. It is done at the subpractice level. Thus it does not have the same visibility in the Software CMM as in the eSCM-SP.
	O	PD.AC.6: library of software process-related documentation	Software CMM-based process improvement includes lessons learned during a project, but "Engagement knowledge" covers a much broader set of topics than process information (e.g., reuse of work products and process usage/efficiency).
	O	IM.AC.2.1	Lessons learned from other projects are used in defining the project's processes at the subpractice level.
	O	IM.AC.4.6	Lessons learned from other projects are used in (re)planning and managing the project at the subpractice level.
knw06: Reuse	Ø	IM.AC.6.3 PE.AC.3.4 PE.AC.4.2	While reusable software components are identified at the subpractice level, it is far less detailed than the "Reuse" Practice in the eSCM-SP.
knw07: Version & change control	●	CM: Software Configuration Management	"Version & change control" is essentially equivalent to Software Configuration Management.
knw08: Resource consumption	●		"Resource consumption" is an instance of the issues tracked and managed in Software Project Tracking & Oversight.
	O	PT.AC.6: track effort and costs	The number of personnel utilized and the duration of tasks are examples of resources tracked in knw08 (b1).
	O	PT.AC.7: track critical computer resources	Technologies used, network utilization, and transaction rates are examples of critical computer resources tracked in knw08 (b1).
	O	PT.AC.8: track schedule	Duration of tasks is an example of resources tracked in knw08 (b1).

People Management (ppl)

eSCM-SP Practice	Relation	Software CMM Key Practice	Comments
ppl01: Encourage innovation	○		Encouraging innovation is not explicitly addressed in the Software CMM, but it is implied in Technology Change Management.
	○	TM.CO.1	The policy on technical change management includes innovation.
	○	TM.CO.2	Senior management sponsorship of technical change management includes innovation.
	○	TM.CO.3	Senior management oversight of technical change management includes innovation.
	○	PC.CO.1	The policy on process improvement management includes innovation.
	○	PC.CO.2	Senior management oversight of process improvement management includes innovation.
ppl02: Participation in decisions	●		Although not as explicitly brought out in the Software CMM as in eSCM-SP, the clear intent of this Practice is to have software professionals participating in the major decisions on the software work as an integral part of the internal commitment process.
	○	RM.AC.1: review allocated requirements	The software engineering group reviews the client's requirements in Requirements Management, which is one aspect of participating in decisions that affect work commitments.
	○	PP.AC.1: participate on proposal	The software engineering group participates on the proposal team in Software Project Planning, which is one aspect of participating in decisions that affect work commitments.
	○	PP.AC.3: participate in project planning	The software engineering group participates in overall project planning in Software Project Planning, which is one aspect of participating in decisions that affect work commitments.
	○	PT.GO.3: agree to changes	The software engineering group agrees to changes in commitments.
	○	PC.AC.6: participate in improvements	The software staff are expected and encouraged to participate in software process improvement. Although this Key Practice is at Maturity Level 5 in the Software CMM, it is foreshadowed by the commitment practices in PT.GO.3.
ppl03: Work environment	○		While facilities and tools are mentioned in this KPA, the "work environment" in the eSCM-SP encompasses physical, social, cultural, and regulatory issues that are not explicitly addressed in the Software CMM.
	○	PP.AC.14: identify facilities and support tools	Planning for the acquisition of the facilities and support tools needed to do the work is performed at Maturity Level 2.
	○	PE.AC.1: integrate methods and tools	Methods and tools, which are part of the "work environment," are integrated into the project's defined software process at Maturity Level 3.
	○	*.AB.resources and funding	The template for Adequate resources addresses many aspects of the work environment.
ppl04: Assign responsibilities	●		The assignment of responsibilities is addressed at the project level in the Software CMM and at the engagement level in the eSCM-SP.
	○	*.AB.training	Qualifying personnel is addressed in the Software CMM via training, which is one of the templates for Ability to Perform. Personnel competencies are assumed to result primarily from training.
	○	PT.AB.2: responsibility assigned for work	The software project manager assigns the responsibility for software work products and activities in Ability to Perform in Software Project Tracking & Oversight.
	○	TP.AC.1: develop project training plan	The software project has a training plan that specifies its training needs at Maturity Level 3, while the eSCM-SP describes assigning people with the requisite competencies.
	○	IM.AC.4.7-8	Identifying training needs for the software project is done at Maturity Level 3 at the subpractice level.

eSCM-SP Practice	Relation	Software CMM Key Practice	Comments
ppl05: Define roles	●		Although somewhat diffusely spread throughout the Software CMM, defining roles is fully covered in multiple Key Practices, typically in Ability to Perform as part of the "resources" and "groups" templates.
	O	*.AB.resources and funding	"Resources" includes managers (various management roles are specifically identified) and staff.
	O	*.AB.groups	"Groups" are responsible for specific functions, such as quality assurance and configuration management. Key Practices that define the roles of specific groups include RM.AB.1, PP.CO.1, PP.AB.2, PT.CO.1, SM.CO.2, and PF.AB.1.
	O	PD.AC.2.2	The responsibilities for implementing the process are described in each process element of the organization's standard software process at Maturity Level 3 at the subpractice level.
	O	TP.AC.2.2	Training is provided to provide the skills needed by the organization (i.e., to qualify personnel to fulfill the roles identified in the organization's standard software process at the subpractice level).
ppl06: Workforce competencies	O		"Workforce competencies" is addressed at Maturity Level 3 via required training, although alternate mechanisms for skills-building are suggested in TP.AC.1.2. The eSCM-SP has a somewhat broader scope since ppl06 (b5) includes transferring, hiring, or outsourcing to address competency needs.
	O	*.AB.required training	"Required training" at Maturity Level 3 addresses the Capability Level 3 Practice, "Workforce competencies."
	O	TP: Training Program	"Workforce competencies" is addressed by providing training in the Maturity Level 3 Training Program KPA, although alternate mechanisms for skills-building are suggested in TP.AC.1.2 (e.g., seminars and on-the-job training).
ppl07: Plan & deliver training	●	TP: Training Program	"Plan & deliver training" at Capability Level 3 is equivalent to Training Program at Maturity Level 3.
ppl08: Personnel competencies	●		This Practice addresses "personnel competencies" via training, which is part of every Key Process Area in the Software CMM, as well as being addressed at the project and organizational levels.
	●	*.AB.training	"Personnel competencies" are generally addressed by the "training" template.
	O	TP.AC.1: develop project training plan	The software project has a training plan that specifies its training needs at Maturity Level 3, corresponding to building competency via training in this Practice.
	O	IM.AC.4.7/8	Identifying training needs for the software project is done at Maturity Level 3 at the subpractice level.
ppl09: Performance feedback	Ø		"Performance feedback" is not explicitly addressed in the Software CMM.
ppl10: Career development	Ø		"Career development" is not explicitly addressed in the Software CMM.
ppl11: Rewards	Ø		"Rewards" are not explicitly addressed in the Software CMM.

Performance Management (prf)

eSCM-SP Practice	Relation	Software CMM Key Practice	Comments
prf01: Engagement objectives	O		"Engagement objectives" is diffusely addressed in the Software CMM. Both the eSCM-SP and Software CMM strongly emphasize communication with the customer in establishing engagement objectives and project commitments. The eSCM-SP includes business objectives that extend beyond the customer requirements, so the eSCM-SP is broader in scope, but the inclusion of the software engineering group in the proposal and overall project planning implies that business objectives are considered in the Software CMM.
	O	RM: Requirements Management	Communication with the customer and within the project is the focus of the Requirements Management KPA.
	O	PP.AC.1: participate on proposal	The definition and communication of engagement objectives can be partially inferred by the participation of the software engineering group on the proposal team.
	O	PP.AC.3: participate in project planning	The definition and communication of engagement objectives can be partially inferred by the participation of the software engineering group in project planning.
	O	IC.AC.1: participate with customer and end users	Communication and coordination with the customer and within the project is the focus of Intergroup Coordination at Maturity Level 3.
prf02: Verify processes	●		Verifying that processes are consistently performed as defined is equivalent to process assurance in Software Quality Assurance, although measurement is explicitly identified as a critical part of the verification in this Practice.
	●	QA.AC.4: review activities	Process assurance is covered by Software Quality Assurance. Product assurance corresponds to verifying that service level agreements are met, which is addressed in del04, "Verify service commitments."
	O	*.ME.measurement	Determining measures (b1) and collecting data (b3) are Activities in this Practice that correspond to the "measurement" template used in the Key Process Areas in the Software CMM.
	O	*.VE.QA	Process assurance is an integral part of the "QA" template used in the Key Process Areas.
prf03: Adequate resources	●		Resources are addressed in every Key Process Area. The adequacy of resources for projects is first determined as part of the estimating process; adequacy is then confirmed (or revised) as part of tracking performance.
	●	*.AB.resources and funding	The "resources" template is part of Ability to Perform in every Key Process Area.
	O	PP.GO.1: estimate	Resource needs are estimated as part of planning a software project.
	O	PT.GO.1: track	Adequacy of resources such as cost (budget), effort, schedule, and critical computer resources are tracked, and corrective action is taken in PT.GO.2 when there are significant differences.
prf04: Organizational objectives	O	PF.CO.3: senior management oversight of OPF QP.AC.1: develop QPM plan	"Organizational objectives" has no direct analog in the Software CMM because the eSCM-SP focus is on business issues from a client and market perspective, although improvement objectives are part of the organizational objectives. Organizational objectives in a business sense are outside the scope of the Software CMM. Alignment of the process improvement initiative with strategic goals is mentioned in Organization Process Focus, and quantitative management is partially based on the organization's strategic goals in Quality Process Management.
prf05: Review organizational performance	O		This Practice is only partially covered in the Software CMM because this Practice considers senior management oversight of organizational performance to be broader and business oriented. The Software CMM's focus on organizational performance is in a process management and improvement context.
	O	*.VE.senior management	Senior management reviews in the various Key Process Areas are an aspect of organizational performance reviews.
	O	PF.AC.1: assess process	Assessments are one aspect of reviewing organizational performance.

eSCM-SP Practice	Relation	Software CMM Key Practice	Comments
prf06: Make improvements	●	PF: Organization Process Focus	"Make improvements" is equivalent to Organization Process Focus; both are process focused, although the drivers for improvement may span a variety of organizational and project/engagement factors.
prf07: Achieve organizational objectives	○		"Achieve organizational objectives" corresponds to a combination of the program aspects of Organization Process Focus and the business objectives of Process Change Management, plus other business and improvement objectives, but the business case aspects are missing.
	○	PF: Organization Process Focus	"Achieve organizational objectives" corresponds partially to Organization Process Focus. The emphasis of the Practice is on improving the capability and effectiveness of the organization, which includes business objectives as well as process improvement objectives, but the business case aspects are missing from Organization Process Focus.
	○	PC: Process Change Management	"Achieve organizational objectives" at Capability Level 4 corresponds partially to Process Change Management at Maturity Level 5. The KPA emphasizes continual improvement in achieving business objectives. Although the Software CMM focuses on quality, productivity, and cycle time, these are business objectives. The element lacking in Process Change Management is the "program" aspect of this Practice, which is addressed in Organization Process Focus at Level 3.
prf08: Capability baselines	●	QP.GO.3: determine process capability	"Capability baselines" are equivalent to the project's process performance baselines and organization's process capability baselines in the Software CMM.
prf09: Benchmark	○	PF.GO.2: assess strengths and weaknesses	"Benchmark" covers a potentially broader set of benchmarking issues (e.g., quantitative benchmark or benchmarks against competitors or industry leaders) than the assessments in the Software CMM.
prf10: Prevent potential problems	○		Although there is no direct equivalent to the Level 4 Practice, "Prevent potential problems" in the Software CMM, its focus on quality, systemic adoption of new technologies, and organizational learning addresses many aspects of this Practice. "Prevent known problems," del06, is complementary to prf10 and is explicitly addressed in the Software CMM at Maturity Level 5.
	○	IM.AC.2.1	Lessons learned from other projects are used in defining the project's processes at the subpractice level.
	○	IM.AC.4.6	Lessons learned from other projects are used in (re)planning and managing the project at the subpractice level.
	○	QM.AC.3: define quality goals	Preventing potential problems is a proactive way of addressing quality goals. Correcting problems (del05) or preventing known problems (del06) are more reactive.
	○	TM.AC.4: analyze need for technology change	Proactively identifying new technologies that can benefit the organization is an aspect of preventing potential problems.
prf11: Deploy innovations	○		This Level 4 Practice is equivalent to the Maturity Level 5 KPA, Process Change Management, except it bases the change management on a business case.
	○	PC: Process Change Management	Process Change Management includes deploying process innovations.
	○	TM: Technology Change Management	Technology Change Management includes deploying technology innovations.

Relationship Management (rel)

eSCM-SP Practice	Relation	Software CMM Key Practice	Comments
rel01: Client interactions	O		The Software CMM focuses on the requirements aspect of client interaction and does not address broader issues, such as dispute handling and escalation (b6 and b11).
	O	RM: Requirements Management	Requirements flow from the customer, and changes to those requirements are managed in Requirements Management at Maturity Level 2.
	O	IC.AC.1: participate with customer and end users	Working with the client (b4, b8, and b13 in this Practice) to establish the requirements is part of client relationship management at Maturity Level 3.
rel02: Select suppliers & partners	O	SM.GO.1: select qualified subcontractors	Selecting qualified suppliers (subcontractors) is only part of rel02. Selecting and initiating partnerships and alliances are outside the scope of the Software CMM, although it can be extended to address those topics by appropriate interpretation.
rel03: Manage suppliers & partners	O	SM.GO.4: track performance of subcontractors	Managing suppliers (subcontractors) is only part of rel03. Managing partnerships and alliances are outside the scope of the Software CMM, although it can be extended to address those topics by appropriate interpretation.
rel04: Cultural fit	Ø		"Cultural fit" is not explicitly addressed in the Software CMM.
rel05: Stakeholder information	O		Stakeholders outside the organization, other than the client, are not explicitly addressed in the Software CMM.
	O	RM: Requirements Management	Client information is primarily addressed in the customer requirements allocated in the Software CMM. Interactions that do not affect the requirements are not explicitly addressed in the Software CMM. Since in the eSCM-SP the purpose of analyzing stakeholder information is to capture an understanding of the client's needs, there is overlap, but the Software CMM leaves the system (customer) requirements to be specified by the systems engineering group, so the Software CMM is less comprehensive.
	O	IC.AC.1: participate with customer and end users	The Software CMM encourages customer feedback primarily on the system/allocated requirements. Acceptance testing (PE.AC.7) provides closure to the delivery of the system. The eSCM-SP's use of feedback throughout the sourcing process is much broader than the Software CMM's, although the Software CMM does specify significant customer interactions.
rel06: Client relationships	Ø		The Software CMM addresses establishing an understanding of the customer requirements and regular channels of communication (e.g., project reviews), but the fostering of long-term relationships is not a focus of the Software CMM, although it is implied by many of the practices in the model.
rel07: Supplier & partner relationships	Ø	SM: Software Subcontract Management	The Software CMM addresses managing the suppliers of software components and functionality (e.g., compilers) that are critical to the development of the software product. The Software CMM does not address partner relationships or the broader scope of acquisition issues that may be important for a successful software project.
rel08: Value creation	Ø	QM.AC.3: define quality goals	Proactively identifying opportunities for value creation is a strategic planning issue. Software Quality Management covers only the proactive aspects of building a product that satisfies the customer's requirements (and needs), where rel08, "Value creation," proactively addresses the business needs associated with new products and services.

Technology Management (tch)

eSCM-SP Practice	Relation	Software CMM Key Practice	Comments
tch01: Acquire technology	O		Acquiring and deploying technology is a Level 2 issue in the eSCM-SP, but it is addressed at Maturity Level 3 in the Software CMM (although the "adequate resources" practices in the Level 2 Key Process Areas imply technology as a resource to be acquired). The Software CMM does not explicitly address the role of suppliers and partners, licensing, contingency plans, deployment, and verification of deployed technologies.
	O	AB.resources and funding	One of the resources addressed in the "adequate resources" institutionalization practice in every Software CMM Key Process Area is technology and tools.
	O	PF.AC.5: evaluate new processes, methods, and tools	Evaluation is part of acquiring technology.
	O	PE.AB.1.2	Tools to support the various software engineering tasks are explicitly identified at the sub-practice level in the Software CMM as resources to be provided.
	O	PE.AC.1: integrate methods and tools	Although the Software CMM does not explicitly call out service levels, security issues, or regulatory requirements, appropriate tools (and integration of those tools in the engineering environment) are covered.
tch02: Technology licenses	Ø		Technology licenses are not explicitly addressed in the Software CMM.
tch03: Control technology	O	PE.AC.1.4	The tools used by the project are placed under configuration management in the Software CMM. Because this is explicitly addressed as a subpractice rather than a Key Practice, it is judged as only partially covering the eSCM-SP Practice, but in the field, configuration management (or inventory control) of software tools would usually be considered a critical practice.
tch04: Technology integration	Ø		Integration of the organization's technology infrastructure with the client's is not explicitly addressed in the Software CMM, although integrating the tools within the engineering environment of the software organization is addressed in PE.AC.1. While extending this Software CMM practice to integration with clients, suppliers, and partners may be a logical extension that is addressed by many software organizations, it is not explicitly addressed in the Software CMM.
tch05: Optimize technology	Ø		Although PE.AC.1 discusses integrating the appropriate tools into the project's process, and Technology Change Management describes adopting new technologies, the Software CMM does not address the overall performance of the technology infrastructure in the sense of this Practice. The eSCM-SP focuses on the effective use of technology across engagements. Optimizing the infrastructure in this context means using the organization's technology efficiently across engagements.
tch06: Proactively introduce technology	●	TM: Technology Change Management	Technology Change Management describes adopting new technologies in an orderly way. Note that Technology Change Management is a Maturity Level 5 Key Process Area, and tch06 is a Capability Level 4 Practice.

Threat Management (thr)

eSCM-SP Practice	Relation	Software CMM Key Practice	Comments
thr01: Risk management	Ø		This policy Practice in the eSCM-SP has no direct analog in the Software CMM. It is implied by the practices on risk management, particularly at Maturity Level 3 where organizational learning and institutionalization are Software CMM principles. It should be implied by the policy practices in Software Project Planning and Software Project Trading & Oversight.
thr02: Engagement risk	●		Risk management is addressed by risk identification, tracking, and management at Maturity Levels 2 and 3 in the Software CMM.
	○	PP.AC.13: identify risks	Risk identification is addressed in planning.
	○	PT.AC.10: track risks	Risk tracking is addressed in tracking.
	●	IM.AC.10: manage risks	Risk management is addressed at Level 3 in the Software CMM as a more sophisticated, proactive implementation of the risk identification and tracking at Level 2.
thr03: Risk across engagements	Ø		In the Software CMM risk management is within a project, not across projects (or engagements) as described here in the eSCM-SP.
thr04: Security	Ø		Security is an "ility" that is addressed by inference in the Software CMM. See PE.ME.1, where measurement of "ilities" such as security is mentioned.
thr05: Intellectual property	Ø		Protection of intellectual property is not explicitly addressed in the Software CMM.
thr06: Statutory & regulatory compliance	Ø		Statutory and regulatory compliance is not explicitly addressed in the Software CMM.
thr07: Disaster recovery	Ø		Disaster recovery is not specifically addressed in the Software CMM, although this could be one of the risks managed.

Contracting (cnt)

eSCM-SP Practice	Relation	Software CMM Key Practice	Comments
cnt01: Negotiations	Ø		Negotiation guidelines are not explicitly addressed in the Software CMM, although the project software manager is responsible for negotiating commitments (PP.CO.1).
cnt02: Pricing	Ø		Pricing guidelines are not explicitly addressed in the Software CMM, although cost estimating is addressed in PP.AC.10, and cost is a crucial component of pricing.
cnt03: Confirm existing conditions	Ø		"Due diligence," as confirming existing conditions, is not explicitly addressed in the Software CMM, although it may be partially implied by requirements elicitation and analysis.
cnt04: Market information	Ø		Market information (and similar strategic business planning topics) is not explicitly addressed in the Software CMM.
cnt05: Plan negotiations	Ø		Changes to the requirements are discussed with the affected groups in the Software CMM, which implies negotiating with the client, but the timeliness of identifying the issues important to the client or establishing negotiating positions is not explicitly addressed in the Software CMM.
cnt06: Gather requirements	●		For software-only systems, requirements elicitation is the appropriate analog to cnt06. If the client is building a hardware-software system, then the client's requirements are out of scope for the Software CMM since gathering its requirements would then be a systems engineering task.
	●	RM.AB.2: document allocated requirements	In the Software CMM, requirements elicitation is assumed to be the responsibility of the systems engineering group, although for software-only projects, the software engineering group must address requirements elicitation.
	O	RM.AC.3: change allocated requirements	Changes to requirements should also be gathered.
	O	PE.AC.2: analyze software requirements	Software requirements analysis is the initial requirements stage considered within the scope of the Software CMM.
cnt07: Review requirements	●		Feedback from the software engineering group is made available to those making commitments.
	O	RM.AC.1: review allocated requirements	The custom requirements allocated to the software project are reviewed by the software engineering group to verify that they are complete, feasible, clear, consistent, and testable. Note that the allocated requirements may be from the systems engineering group rather than directly from the client and that this review may not precede making commitments to the client.
	O	RM.AC.3: change allocated requirements	Changes to the custom requirements allocated to the software project are reviewed by the software engineering group.
	O	PP.AC.1: participate on proposal	Custom requirements allocated to the software project are reviewed to determine feasibility.
	O	PP.AC.4: senior management reviews commitments	External commitments for the software project are reviewed with senior management in the Software CMM.
cnt08: Respond to the requirements	O	PP.AC.1: participate on proposal	The Software CMM specifies that the software engineering group participates in the proposal effort, but that the systems engineering group has the responsibility of responding to requirements.
cnt09: Contract roles	O		The full set of roles and responsibilities for interacting with the client, and the client's responsibilities, are out of scope for the Software CMM.
	O	RM.AB.1: requirements allocation	The specific responsibility for analyzing the requirements is captured in the Software CMM (and is assumed to belong to the systems engineering group).
	●	PP.AB.1: statement of work	The Statement of Work includes documentation of the assigned responsibilities and the identification of customers and end users.
cnt10: Create contracts	Ø		While the software engineering group is involved in reviewing requirements, participating in the proposal effort, planning, and reviewing commitments, the Software CMM does not address creating contracts.
cnt11: Amend contracts	Ø		While the software engineering group is involved in reviewing requirements, participating in the proposal effort, planning, and reviewing commitments, the Software CMM does not address amending contracts.

Service Design & Deployment (sdd)

eSCM-SP Practice	Relation	Software CMM Key Practice	Comments
sdd01: Communicate requirements	●		In the Software CMM context, the equivalent of the client interaction team is the systems engineering group. Although systems engineering is outside the scope of the Software CMM, the Requirements Management KPA is the bridge between the customer and the software team that ensures communication of requirements.
	●	RM: Requirements Management	Requirements Management is the bridge between the customer and the software team that ensures communication of requirements.
	○	IC.AC.7: conduct technical interchanges	Technical interchanges are a mechanism for communicating requirements.
sdd02: Design & deploy services	○		Conceptually, service design in the eSCM-SP and software design and coding in the Software CMM are similar. Deployment (i.e., delivering the software product to the customer and/or end user) is not explicitly addressed in the Software CMM. Procedures at Capability Level 3 in the eSCM-SP are similar to the defined processes at Maturity Level 3 in the Software CMM.
	○	RM.AC.2: use allocated requirements	The custom requirements allocated to the software project are the basis for designing the service.
	○	CM.AC.7: release products	Deployment (i.e., delivery to the customer and/or end user) is not directly addressed in the Software CMM. The closest practice is CM.AC.7 on creating and releasing products, which does not include delivery to the customer.
	○	PE.AC.3: develop software design	Procedures for designing the software are part of service design.
	○	PE.AC.4: develop software code	Procedures for coding the software are part of service design.
sdd03: Plan design & deployment	○		Planning and tracking the service delivery in the eSCM-SP is conceptually equivalent to planning and tracking the software (development) project in the Software CMM. Although Software Project Planning and Software Project Tracking & Oversight have more detailed guidance, the eSCM-SP Practice addresses the same concepts as these Key Process Areas and includes their Key Practices by implication. Deployment is covered by inference.
	○	PP: Software Project Planning	Planning of the engineering service of software design and development occurs in Software Project Planning.
	○	PT: Software Project Tracking & Oversight	Tracking of the engineering service of software design and development occurs in Software Project Tracking & Oversight.
	○	CM.AC.2: use CM plan	Deployment (i.e., delivery to the customer and/or end user) is not directly addressed in the Software CMM. The closest practice is CM.AC.7 on creating and releasing products, which does not include delivery to the customer.
sdd04: Service specification	●		The service specification in the eSCM-SP corresponds to either the system requirements or the software requirements in the Software CMM, depending on the business context of the software project. The mapping here is specifically to the software requirements because for the Software CMM the development of system requirements is "out of scope" (a systems engineering concern), although the allocated requirements (for software) are controlled in Requirements Management. For software-only projects, Requirements Management deals with controlling the customer requirements, and the software requirements remain the analog to the service specification.
	●	PE.AC.2: analyze software requirements	The service specification in the eSCM-SP is equivalent to the software requirements specification.
	○	PE.AC.10: maintain consistency across work products	The service specification in the eSCM-SP is based on (and consistent with) the client requirements.

eSCM-SP Practice	Relation	Software CMM Key Practice	Comments
sdd05: Service design	●		Service design in the eSCM-SP corresponds to software design and coding in the Software CMM. Note that "service" design may include non-technological design issues, such as training.
	○	RM.AC.2: use allocated requirements	The custom requirements allocated to the software project are the basis for designing the service.
	○	PE.AC.3: develop software design	Developing the design is explicitly included in this Key Practice.
	○	PE.AC.4: develop software code	Developing the code is explicitly included in this Key Practice.
	○	PE.AC.10: maintain consistency across work products	In the eSCM-SP, service design is based on (and consistent with) the service specification.
sdd06: Design feedback	●		Although communication with the customer is covered more broadly in the eSCM-SP in general, design reviews are part of the Software CMM's customer relationship management.
	●	PT.AC.13: conduct formal reviews	Customer feedback occurs as part of formal reviews in Software Project Tracking & Oversight, although feedback on the design is only part of the customer feedback solicited.
	●	IM.AC.11: project reviews	Customer feedback occurs as part of alignment with current and project needs in Integrated Software Management, although feedback on the design is only part of the customer feedback solicited.
sdd07: Verify design	●		Review and verification of the service design in the eSCM-SP is equivalent to the peer reviews and testing of the software design/product in the Software CMM.
	○	PE.AC.5: perform testing	Testing is a mechanism for verifying the design.
	○	PE.AC.6: perform integration testing	Testing is a mechanism for verifying the design.
	○	PE.AC.7: perform system and acceptance testing	System and acceptance testing are associated with requirements more than design, which makes this Software CMM practice somewhat broader in scope than the eSCM-SP Practice.
	●	PR: Peer Reviews	Peer reviews, as applied to software design, are equivalent to verification of service design.
sdd08: Deploy service	○	CM.AC.7: release products	Deployment (i.e., delivery to the customer and/or end user) is not directly addressed in the Software CMM. The closest practice is CM.AC.7 on creating and releasing products, which does not include delivery to the customer.

Service Delivery (del)

eSCM-SP Practice	Relation	Software CMM Key Practice	Comments
del01: Plan service delivery	●		Planning and tracking the service delivery in the eSCM-SP is conceptually equivalent to planning and tracking the software (or maintenance) project in the Software CMM. Delivery is in many ways analogous to application maintenance and operational support. The Software CMM tends to focus on development and include maintenance activities by implication. The delivery is performed (i.e., the maintenance and support are done) according to the plan, which is distributed throughout other parts of the Software CMM, such as Software Product Engineering. Although Software Project Planning and Software Project Tracking & Oversight have more detailed guidance, the eSCM-SP Practice addresses the same concepts as these Key Process Areas and includes their Key Practices by implication.
	○	PP: Software Project Planning	Planning maintenance activities is included in this Key Process Area.
	○	PT: Software Project Tracking & Oversight	Tracking maintenance activities is included in this Key Process Area.
	○	PE.AC.10: maintain consistency across work products	The service delivered is based on, and consistent with, the service design.
del02: Train clients	○	PE.AC.8: develop documentation	Training end users is not explicitly addressed in the Software CMM. The closest practice is PE.AC.8, which deals with user documentation. In some business environments, the user manual may be an adequate implementation of del02, although this interpretation depends on the service being delivered.
del03: Deliver service	○		Conceptually, service delivery is equivalent to maintaining the software product and providing operational support. Operational support is not covered in the Software CMM, but maintenance of the design and code is addressed.
	○	PE.AC.3: develop software design	Maintenance of the design is explicitly included in this Key Practice.
	○	PE.AC.4: develop software code	Maintenance of the code is explicitly included in this Key Practice.
del04: Verify service commitments	●		Verifying that service commitments are being met maps fairly directly to validating that the customer requirements have been satisfied.
	○	QA.AC.5: audit designated work products	Auditing work products against the relevant standards and requirements serves as an objective verification that requirements have been met. The audit may verify that testing has been done or it may be a performance of the testing.
	○	PE.AC.7: perform system and acceptance testing	Measuring that commitments are being satisfied as described in del04 is more than system and acceptance testing.
	○	QM.AC.4: measure product quality	Measuring product quality and comparing it to quality objectives is more than tracking service commitments, but the basic capability described in del04 is the foundation for this Key Practice.
del05: Correct problems	○	CM.AC.5: address change requests and problem reports	The obvious analog to "correct problems" in the Software CMM is the problem tracking system used in fixing defects. A full analog to "correcting problems," however, would include concepts of workarounds and fault tolerance that are not explicitly addressed in the Software CMM.
del06: Prevent known problems	●	DP: Defect Prevention	Defect Prevention in the Software CMM is a systemic process for preventing the recurrence of identified problems. Although Defect Prevention has more detailed guidance, the eSCM-SP practice addresses the same concept as the Key Process Area and includes its Key Practices by implication.
del07: Service modifications	●		Although this Practice covers services rather than software, the maintenance subpractices in the Software CMM conceptually address its intent.
	○	CM.AC.5: address change requests and problem reports	Change requests address enhancements to the software as well as corrections.
	○	PE.AC.3: develop software design	Maintenance of the design is explicitly included in this Key Practice.
	○	PE.AC.4: develop software code	Maintenance of the code is explicitly included in this Key Practice.
del08: Financial management	∅		Financial management is not explicitly addressed in the Software CMM, although effort and costs are estimated (PP.AC.10) and tracked (PT.AC.6).

Service Transfer (tfr)

eSCM-SP Practice	Relation	Software CMM Key Practice	Comments
tfr01: Resources transferred in	Ø		Resource transferal is not explicitly addressed in the Software CMM.
tfr02: Personnel transferred in	Ø		Transferring people from the client to the organization is not explicitly addressed in the Software CMM.
tfr03: Service continuity	Ø		Neither contract completion nor transition are addressed in the Software CMM.
tfr04: Resources transferred out	Ø		Resource transfer is not explicitly addressed in the Software CMM.
tfr05: Personnel transferred out	Ø		Transferring people from the organization to the client is not explicitly addressed in the Software CMM.
tfr06: Knowledge transferred out	Ø		Knowledge transfer between the client and the organization is not explicitly addressed in the Software CMM.

Appendix D: Coverage of Software CMM by the eSCM-SP

In support of the high-level comparison provided in section 4.1 and illustrated in Figure 4, this section provides a detailed mapping of the Key Practices of the Software CMM with the Practices of the eSCM-SP. The objective of this comparison is to demonstrate the extent of coverage of Software CMM requirements by the eSCM-SP. This is only an indicative comparison based on the requirements of the two frameworks. This comparison should be used as a guideline, not as a rule.

Many of the 316 Key Practices in the Software CMM map to a lower level of detail than the 84 Practices in the eSCM-SP. Where Key Practices map to Required Activities, the comments for the Key Process Area are typically sufficient. No additional comment is made unless there is a specific reason, and multiple Required Activities may be mapped on a single row. Note that the institutionalization Practices are discussed in Appendix E.
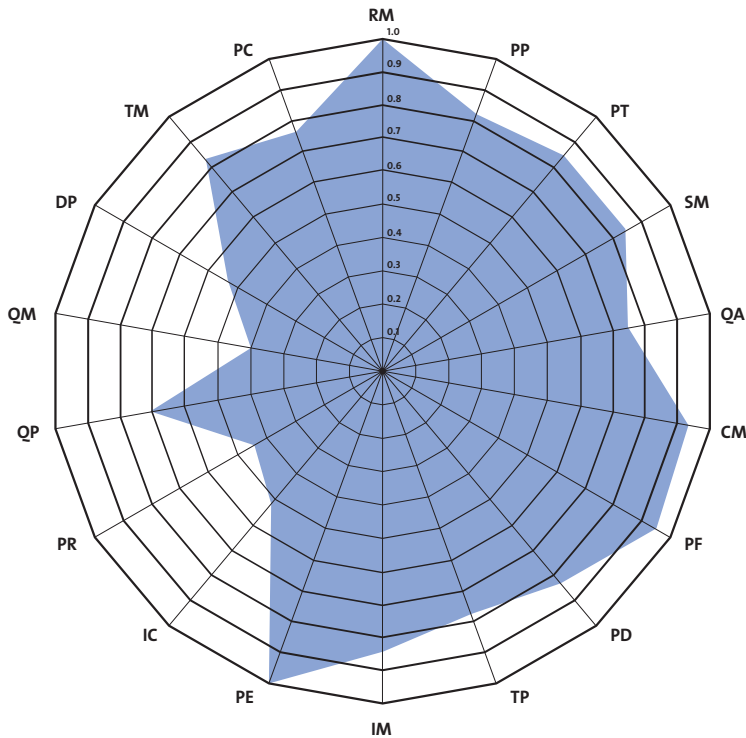

Figure 4
(For reference; identical to Figure 2.)
Coverage of the Software CMM Key Process Areas by the eSCM-SP.

Key Process Areas

RM	Requirements Management
PP	Software Project Planning
PT	Software Project Tracking and Oversight
SM	Software Subcontract Management
QA	Software Quality Assurance
CM	Software Configuration Management
PF	Organization Process Focus
PD	Organization Process Definition
TP	Training Program
IM	Integrated Software Management
PE	Software Product Engineering
IC	Intergroup Coordination
PR	Peer Reviews
QP	Quantitative Process Management
QM	Software Quality Management
DP	Defect Prevention
TM	Technology Change Management
PC	Process Change Management

Table 8 is organized according to the Key Practices of the Software CMM. Note that in some cases, a Key Practice in the Software CMM may map to multiple Practices and/or Capability Areas in the eSCM-SP. A "summary mapping" precedes such instances where appropriate.

The following symbols are used to show coverage of Software CMM requirements by the eSCM-SP:

Symbol	Interpretation
●	The Software CMM Key Practice is addressed in the eSCM-SP.
O	The Software CMM Key Practice is only partially addressed in the eSCM-SP.
Ø	The Software CMM Key Practice is not addressed in the eSCM-SP (to any significant degree).

Table 8
Coverage of the Software CMM by the eSCM-SP

RM: Requirements Management

Software CMM Key Practice	Relation	eSCM-SP Practice	Comments
RM: Requirements Management			Requirements Management depends on managing the customer relationship effectively (rel01 and rel06), as well as ensuring that the service provider understands the client's requirements (cnt07).
RM.AC.1: review allocated requirements	●	cnt07: Review requirements	The requirements review in cnt07 is an internal review. For the Software CMM, the customer requirements allocated to the software project are reviewed by the software engineering group to verify that they are complete, feasible, clear, consistent, and testable. Note that the allocated requirements may be from the systems engineering group rather than directly from the client and that this review may not precede making commitments to the client, which is part of the cnt07 requirements review.
RM.AC.2: use allocated requirements	●		The client requirements are used to create the service specification, which is then used to design the service to be deployed (sdd08).
	○	sdd04 (b1): Service specification	The service specification is based on the client requirements.
	○	sdd05: Service design	The service design is based on the service specification.
RM.AC.3: change allocated requirements	●	cnt07: Review requirements	Changes to the customer requirements allocated to the software project are reviewed by the software engineering group.

PP: Software Project Planning

Software CMM Key Practice	Relation	eSCM-SP Practice	Comments
PP: Software Project Planning			Planning development and maintenance activities is addressed in sdd03 and del01.
PP.AC.1: participate on proposal	●	cnt07: Review requirements	Customer requirements allocated to the software project are reviewed to determine feasibility.
PP.AC.2: initiate planning early	○	cnt08: Respond to the requirements	The software engineering group in the Software CMM participates in the proposal effort, but responding to requirements is primarily the responsibility of the systems engineering group in the Software CMM.
PP.AC.3: participate in project planning	●	ppl02: Participation in decisions	The software engineering group participates in overall project planning in Software Project Planning, which is one aspect of participating in decisions that affect work commitments.
PP.AC.4: senior management reviews commitments	●	cnt07: Review requirements	External commitments for the software project are reviewed with senior management in the Software CMM.
PP.AC.5: software life cycle	Ø		Life cycles are not explicitly addressed in the eSCM-SP.
PP.AC.6: develop software development plan	●	sdd03 (b2): Plan design & deployment del01 (b2): Plan service delivery	
PP.AC.7: document software development plan	●	sdd03 (b2): Plan design & deployment del01 (b2): Plan service delivery	
PP.AC.8: identify work products for control	●	knw07 (b2): Version & change control	
PP.AC.9: estimate size	Ø		Size estimation not explicitly addressed in the eSCM-SP.
PP.AC.10: estimate effort and costs	●	sdd03 (b1): Plan design & deployment del01 (b1): Plan service delivery	
PP.AC.11: estimate critical computer resources	●	tch01 (b1): Acquire technology tch05 (b1): Optimize technology sdd03 (b2): Plan design & deployment del01 (b2): Plan service delivery	
PP.AC.12: develop schedule	●	sdd03 (b2): Plan design & deployment del01 (b2): Plan service delivery	
PP.AC.13: identify risks	●	thr02 (b1): Engagement risk	Risk identification is addressed in planning.
PP.AC.14: identify facilities and support tools	●	ppl03: Work environment	Facilities and support tools needed to do the work are planned for at Maturity Level 2.
PP.AC.15: record planning data	○	sdd03 (b2): Plan design & deployment del01 (b1c, b2): Plan service delivery	Recording planning data is not explicitly addressed in the eSCM-SP, but it is strongly implied in the definition of plan in the planning and tracking Activities.

PT: Software Project Tracking & Oversight

Software CMM Key Practice	Relation	eSCM-SP Practice	Comments
PT: Software Project Tracking & Oversight			Tracking development and maintenance activities is addressed in sdd03 and del01.
PT.AC.1: use software development plan	●	sdd03 (b5): Plan design & deployment del01 (b4): Plan service delivery	
PT.AC.2: revise software development plan	●	sdd03 (a3): Plan design & deployment del01 (a3): Plan service delivery	
PT.AC.3: review commitments with senior management	●	sdd03 (b4): Plan design & deployment del01 (b3): Plan service delivery	
PT.AC.4: communicate changes to commitments	●	sdd03 (c4): Plan design & deployment del01 (c4): Plan service delivery	
PT.AC.5: track size	∅		
PT.AC.6: track effort and costs	●		Effort and costs are among the resources tracked in knw08, sdd03, and del01.
	●	sdd03 (b5): Plan design & deployment del01 (b4): Plan service delivery	
	●	knw08: Resource consumption	The number of personnel utilized and the duration of tasks are examples of resources tracked in knw08 (b1).
PT.AC.7: track critical computer resources	●		Critical computer resources are among the resources tracked in knw08, sdd03, and del01.
	●	sdd03 (b5): Plan design & deployment del01 (b4): Plan service delivery	
	●	knw08: Resource consumption	Technology used, network utilization, and transaction rates are examples of critical computer resources tracked in knw08 (b1).
PT.AC.8: track schedule	●		The schedule is among the resources tracked in knw08, sdd03, and del01.
	●	sdd03 (b5): Plan design & deployment del01 (b4): Plan service delivery	
	●	knw08: Resource consumption	The duration of tasks is an example of resources tracked in knw08 (b1).
PT.AC.9: track technical activities	●	sdd03 (b5): Plan design & deployment del01 (b4): Plan service delivery	
PT.AC.10: track risks	●	thr02 (b6): Engagement risk	Risk tracking is part of engagement risk management.
PT.AC.11: record measurement and replanning data	O	sdd03 (b5): Plan design & deployment del01 (b4): Plan service delivery	Measurement and replanning data are not explicitly addressed in the eSCM-SP, but they are strongly implied in the definition of plan in the planning and tracking Activities.
PT.AC.12: conduct internal technical reviews	O	sdd03 (b4, b5): Plan design & deployment del01 (b3, b4): Plan service delivery	
PT.AC.13: conduct formal reviews	O	sdd06: Design feedback	Customer feedback occurs as part of formal reviews in Software Project Tracking & Oversight, although feedback on the design is only part of the customer feedback solicited in sdd06.

SM: Software Subcontract Management

Software CMM Key Practice	Relation	eSCM-SP Practice	Comments
SM: Software Subcontract Management			Selecting and managing suppliers (subcontractors) is described in rel02, rel03, and rel07. The scope of suppliers and partners addressed by the eSCM-SP is larger than the Software CMM on this point.
SM.AC.1: define work to be subcontracted	●	rel02 (b1b): Select suppliers & partners	
SM.AC.2: select subcontractor	●		Selecting subcontractors is addressed in rel02.
	●	rel02: Select suppliers & partners	Selecting qualified suppliers (subcontractors) is only part of rel02.
	●	cnt10 (b4): Create contracts	
SM.AC.3: establish contractual agreement	●	rel02 (b3): Select suppliers & partners	
SM.AC.4: approve subcontractor's plan	○	rel02 (b2): Select suppliers & partners	
SM.AC.5: use subcontractor's plan	○	rel03 (b6, b7): Manage suppliers & partners	Verifying that the subcontractor's software development plan is used is implied by tracking methods.
SM.AC.6: deploy changes to work	●	cnt11 (b6): Amend contracts	
SM.AC.7: conduct status/coordination reviews	●	rel03 (b8): Manage suppliers & partners	
SM.AC.8: conduct technical interchanges	●	rel03 (b2, b4, b9, b11): Manage suppliers & partners	
SM.AC.9: conduct formal reviews	●	rel03 (b12): Manage suppliers & partners	
SM.AC.10: QA monitoring of subcontractor	●	rel03 (c5): Manage suppliers & partners	
SM.AC.11: CM monitoring of subcontractor	Ø		
SM.AC.12: acceptance testing of subcontracted product	○	rel03 (b8): Manage suppliers & partners	
SM.AC.13: evaluate subcontractor performance	●	rel03 (b12): Manage suppliers & partners	

QA: Software Quality Assurance

Software CMM Key Practice	Relation	eSCM-SP Practice	Comments
QA: Software Quality Assurance			Software Quality Assurance addresses both process and product assurance, which are addressed by prf02 and del04, respectively.
QA.AC.1: develop QA plan	●	prf02 (b2): Verify processes	
QA.AC.2: use QA plan	●	prf02 (c): Verify processes	
QA.AC.3: participate in plans, standards, and procedures	Ø		
QA.AC.5: audit designated work products	●		Product assurance in a Software CMM context is conceptually equivalent to verifying service commitments in the eSCM-SP. Auditing work products is explicitly addressed in prf02 as part of verifying processes.
	○	del04: Verify service commitments	Auditing work products against the relevant standards and requirements objectively verifies that requirements have been met, which is conceptually equivalent to verifying service commitments.
	○	prf02 (b5): Verify processes	
QA.AC.5: audit designated work products	●	del04: Verify service commitments	Auditing work products against the relevant standards and requirements objectively verifies that requirements have been met, which is conceptually equivalent to verifying service commitments.
QA.AC.6: report results to software engineering	●	prf02 (b7, c4): Verify processes / del04 (c4): Verify service commitments	
QA.AC.7: handle deviations	●	prf02 (b9): Verify processes / del04 (b5): Verify service commitments	
QA.AC.8: interact with customer QA	Ø		

CM: Software Configuration Management

Software CMM Key Practice	Relation	eSCM-SP Practice	Comments
CM: Software Configuration Management			knw07, "Version & change control," is essentially equivalent to Software Configuration Management.
CM.AC.1: develop CM plan	○	knw07 (c4): Version & change control	
CM.AC.2: use CM plan	●	knw07 (c4): Version & change control	
CM.AC.3: establish configuration management library system	●	knw07 (b1): Version & change control	
CM.AC.4: identify configuration	●	knw07 (b2): Version & change control	
CM.AC.5: address change requests and problem reports	●		Change requests and problem reports are separately addressed in the eSCM-SP.
	○	del05: Correct problems	Addressing ptoblem reports is equivalent to correcting problems.
	○	knw07 (b3): Version & change control	
	○	del07: Service modifications	Change requests address enhancements to the software, i.e, service modification and corrections.
CM.AC.6: control changes	●	knw07 (b4, b5): Version & change control	
CM.AC.7: release products	●	sdd08: Deploy service	Deployment (i.e., delivery to the customer and/or end user) is not directly addressed in the Software CMM. The closest practice is CM.AC.7 on creating and releasing products.
CM.AC.8: record configuration status	●	knw07 (b5): Version & change control	
CM.AC.9: report configuration status	●	knw07 (c4): Version & change control	
CM.AC.10: audit configuration (baseline)	○	knw07 (c5): Version & change control	

PF: Organization Process Focus

Software CMM Key Practice	Relation	eSCM-SP Practice	Comments
PF: Organization Process Focus			Organization Process Focus addresses defining and improving processes at the organizational level, similar to prf06, "Make improvements." Since improvement objectives are part of the organizational objectives, prf07 is included by implication. The process assets created in knw04 are tightly coupled with this Key Process Area.
PF.AC.1: assess process	●		Assessments are primarily addressed by reviewing organizational performance (prf05) at Capability Level 3, although assessments are not the primary intent of that Practice. They also correspond to aspects of benchmarking (prf09) at Capability Level 4.
	●	prf05: Review organizational performance	Assessments are one aspect of reviewing organizational performance at Capability Level 3.
	●	prf09: Benchmark	"Benchmarking" at Capability Level 4 covers a broader set of benchmarking issues (e.g., quantitative benchmark or benchmarks against competitors or industry leaders) than is covered by the assessments in the Software CMM.
PF.AC.2: develop PF plan	●	prf06 (b3): Make improvements prf07 (b7): Achieve organizational objectives	
PF.AC.3: coordinate improvement	○	prf06 (a2, c1, c4): Make improvements	One of the important concepts in the Software CMM's approach to process improvement is that improvement is performed in collaboration with the people doing the work, which is implicit in the choice of the word "coordinate" here and in prf. Its organizational focus on improvement addresses coordinating the development and improvement efforts of empowered process owners.
PF.AC.4: organization's software process database	●	knw04 (b2): Process assets	
PF.AC.5: evaluate new processes, methods, and tools	●		Evaluation is addressed at Level 2 for technology, and Level 4 for innovations in general.
	○	tch01: Acquire technology	Evaluation is part of acquiring technology. The broader scope of PF.AC.5, however, includes processes and methods, as well as technology.
	○	prf11 (b2): Deploy innovations rel08 (b4): Value creation	Processes, methods, and tools are instances of innovations analyzed at Capability Level 4 in the eSCM-SP.
PF.AC.6: coordinate process training	●	ppl07 (b2): Plan & deliver training	While training is described in some detail in the eSCM-SP Practices, and process training is implied by "qualified personnel" in c3 of every Practice, "process training" is specifically implied by organizational training.
PF.AC.7: inform implementers	●	Every Practice (c1): Sub-activities knw04 (c4): Process assets	The Sub-activity c1 generically and knw04 (c4) specifically describe informing stakeholders of process development and improvement activities and status.

PD: Organization Process Definition

Software CMM Key Practice	Relation	eSCM-SP Practice	Comments
PD: Organization Process Definition			Practice knw04, "Process assets," is essentially equivalent to this Key Process Area's standard software process, software process database, and tailoring guidelines.
PD.AC.1: develop organization's standard software process	●	knw04 (a): Process assets	
PD.AC.2: document organization's standard software process	●	knw04 (b1): Process assets	
PD.AC.3: software life cycles	Ø		Life cycles are not explicitly addressed in the eSCM-SP.
PD.AC.4: tailoring guidelines	●	knw04 (b4): Process assets	
PD.AC.5: organization's software process database	●	knw04 (b2): Process assets	
PD.AC.6: library of software process-related documentation	●	knw03: Knowledge system	Software CMM-based process assets include examples, templates, training materials, lessons learned during a project, etc., which are specific kinds of knowledge.

TP: Training Program

Software CMM Key Practice	Relation	eSCM-SP Practice	Comments
TP: Training Program			The organization's Training Program primarily addresses workforce competencies (ppl06), but it also includes training as the specific mechanism for skills building (ppl07) and personnel competencies (ppl08).
TP.AC.1: develop project training plan	●		Project- (or engagement-) specific training is addressed in the eSCM-SP primarily through assigning qualified personnel (ppl04), where the training builds competencies (ppl08).
	●	ppl04: Assign responsibilities	At Maturity Level 3, the software project has a training plan that specifies its training needs, where the eSCM-SP describes assigning people with the requisite competencies.
	●	ppl08: Personnel competencies	At Maturity Level 3, the software project has a training plan that specifies its training needs, corresponding to building competency via training in this Practice.
TP.AC.2: develop organization training plan	●	ppl06 (b5): Workforce competencies ppl07 (b2): Plan & deliver training	
TP.AC.3: use TP plan	●	ppl06 (c4): Workforce competencies	
TP.AC.4: develop organizational training	●	ppl07 (b3): Plan & deliver training ppl08 (b3): Personnel competencies	Note that the training in ppl08 is engagement-focused rather than organization-focused.
TP.AC.5: establish training waivers	Ø		
TP.AC.6: maintain training records	●	ppl07 (b6): Plan & deliver training	

IM: Integrated Software Management

Software CMM Key Practice	Relation	eSCM-SP Practice	Comments
IM: Integrated Software Management			This Key Process Area primarily deals with tailoring organizational assets to the needs of the project (the project's defined process). This is addressed by implication in the (a) Sub-activities in every Practice "across the organization" and the (c) Sub-activities for using the (tailored) process. Practice sdd02, Design & deploy services, captures planning and trading knowledge in procedures for design and deployment, and implies the Level 3 tailoring concepts in knw04 (b4).
IM.AC.1: develop defined process	●	Every Practice (a): Sub-activities	
IM.AC.2: revise defined process	●	Every Practice (a3): Sub-activities	
IM.AC.3: plan defined process	○	sdd02 (b1, b2): Design & deploy services	
IM.AC.4: use defined process	●	Every Practice (c): Sub-activities	
IM.AC.5: use organization's software process database	●	knw04 (b2): Process assets	Resource consumption data is collected in knw08, stored in the measurement repository for the organization, and used in sdd03 (according to sdd02 (b1)) and del01 as the basis for planning.
IM.AC.6: manage size	∅		Size is not explicitly addressed in the eSCM-SP.
IM.AC.7: manage effort and costs	●	sdd02 (b4, b6): Design & deploy services sdd03 (b1): Plan design & deployment del01 (b1): Plan service delivery	
IM.AC.8: manage critical computer resources	●	sdd02 (b4, b6): Design & deploy services tch01 (b1): Acquire technology tch05 (b1): Optimize technology sdd03 (b2): Plan design & deployment del01 (b2): Plan service delivery	
IM.AC.9: manage critical dependencies	○	sdd02 (b4, b6): Design & deploy services	
IM.AC.10: manage risks	●	thr02: Engagement risk	Risk management is addressed at Level 3 in the Software CMM and in the eSCM-SP at Level 2.
IM.AC.11: project reviews	●		Managing the relationship with the client involves regular communication; project reviews are one form of communication.
	○	knw04: Process assets	Version and change control should provide consistency across work products.
	●	rel06 (b5): Client relationships	
	○	sdd06: Design feedback	Customer feedback occurs as part of alignment with current and project needs in the Integrated Software Management KPA, although feedback on the design is only part of the customer feedback solicited.

PE: Software Product Engineering

Software CMM Key Practice	Relation	eSCM-SP Practice	Comments
PE: Software Product Engineering			The development and maintenance activities in the Software CMM correspond to service design in the eSCM-SP (sdd corresponds to development) and delivery (del corresponds to maintenance).
PE.AC.1: integrate methods and tools	●		Methods and tools, which are part of the "work environment" in PE.AC.1, are integrated into the project's defined software process at Maturity Level 3.
	●	ppl03: Work environment	The "work environment" in this Practice includes methods and tools.
	○	tch01: Acquire technology	Although the Software CMM does not explicitly call out service levels, security issues, or regulatory requirements, the appropriate tools (and integration of those tools in the engineering environment) are covered.
PE.AC.2: analyze software requirements	●		From a Software CMM perspective, requirements analysis does not include requirements elicitation. Understanding the customer needs is assumed to be a systems engineering responsibility, which may be assumed by the software group for a software-only system. Requirements analysis specifically involves analyzing the custom customer requirements allocated to the software project to build a software requirements specification.
	○	cnt06: Gather requirements	If the client is building a hardware-software system, then the client's requirements are out of scope for the Software CMM since gathering client requirements would then be a systems engineering task.
	●	sdd04: Service specification	The service specification in sdd04 is equivalent to the software requirements specification in PE.AC.2.
PE.AC.3: develop software design	●		Conceptually service design in the eSCM-SP and software design and coding in the Software CMM are similar.
	○	sdd02: Design & deploy services	Conceptually service design procedures at Capability Level 3 in the eSCM-SP and software design and coding in the Software CMM are similar.
	○	sdd05: Service design	Developing the design is explicitly included in this Key Practice.
	○	del03: Deliver service	Maintenance of the design is explicitly included in this Key Practice.
	○	del07: Service modifications	Maintenance of the design is explicitly included in this Key Practice.

Software CMM Key Practice	Relation	eSCM-SP Practice	Comments
PE.AC.4: develop software code	●		Conceptually service design in the eSCM-SP and software design and coding in the Software CMM are similar.
	○	sdd02: Design & deploy services	Conceptually service design procedures at Capability Level 3 in the eSCM-SP and software design and coding in the Software CMM are similar.
	○	sdd05: Service design	Developing the code is explicitly included in this Key Practice.
	○	del03: Deliver service	Maintenance of the code is explicitly included in this Key Practice.
	○	del07: Service modifications	Maintenance of the code is explicitly included in this Key Practice.
PE.AC.5: perform testing	●	sdd07: Verify design	Testing is a mechanism for verifying the design.
PE.AC.6: perform integration testing	●	sdd07: Verify design	Testing is a mechanism for verifying the design.
PE.AC.7: perform system and acceptance testing	●	del04: Verify service commitments	Measuring that commitments are being satisfied is more than system and acceptance testing.
PE.AC.8: develop documentation	●	del02: Train clients	Training end users is not explicitly addressed in the Software CMM. The closest practice is PE.AC.8, which deals with user documentation. In some business environments, the user manual may be an adequate implementation of del02, although this interpretation depends on the service being delivered.
PE.AC.9: collect defect data	●	del05 (b1): Correct problems del06 (b1): Prevent known problems	
PE.AC.10: maintain consistency across work products	●		The client requirements, service specification, and service design, and service delivery are intended to be internally consistent.
	○	knw04: Process assets	Version and change control should provide consistency across work products.
	○	sdd04: Service specification	The service specification is based on (and consistent with) the client requirements.
	○	sdd05: Service design	The service design is based on (and consistent with) the service specification.
	○	del01: Plan service delivery	The service delivered is based on (and consistent with) the service design.

IC: Intergroup Coordination

Software CMM Key Practice	Relation	eSCM-SP Practice	Comments
IC: Intergroup Coordination			The (c1) and (c4) Sub-activities generically emphasize communication and coordination.
IC.AC.1: participate with customer and end users	●		Communication, particularly with the customer, is well addressed in both the Software CMM and the eSCM-SP.
	○	rel01: Client interactions	Working with the client (b4, b8, and b13 of rel01) to establish the requirements is part of client relationship management at Maturity Level 3.
	○	rel05: Stakeholder information	The Software CMM encourages customer feedback primarily on the system/allocated requirements. Acceptance testing (PE.AC.7) provides closure to the delivery of the system. The eSCM-SP's use of feedback throughout the outsourcing process is much broader than the Software CMM's, although the Software CMM does imply significant customer interaction.
	○	rel06: Client relationships	At Level 3, the Software CMM describes participating with the customer and end users to establish the requirements; this communication is another aspect of managing client relationships.
IC.AC.2: work with other engineering groups	○	knw01: Share knowledge	The Intergroup Coordination KPA addresses communication and coordination between different project groups and the customer.
IC.AC.3: commitments plan	∅		
IC.AC.4: manage critical dependencies	○	ppl03 (b4): Work environment	
IC.AC.5: accept internal work products	○	sdd04 (b3): Service specification sdd05 (b9): Service design	
IC.AC.6: handle intergroup issues	∅		
IC.AC.7: conduct technical interchanges	○	sdd01: Communicate requirements	Technical interchanges are a mechanism for communicating requirements.

PR: Peer Reviews

Software CMM Key Practice	Relation	eSCM-SP Practice	Comments
PR: Peer Reviews			Peer reviews as a general verification technique are broader in scope than verifying the service design (sdd07).
PR.AC.1: develop PR plan	○	sdd07 (b3, b4): Verify design	
PR.AC.2: perform peer reviews	○	sdd07 (b10): Verify design	
PR.AC.3: record peer review data	○	sdd07 (b12): Verify design	

QP: Quantitative Process Management

Software CMM Key Practice	Relation	eSCM-SP Practice	Comments
QP: Quantitative Process Management			The eSCM-SP does not emphasize quantitative management, or statistical process control, to the same extent as the Software CMM does, although statistical control of services is better understood than it is in software engineering. Much of the quantitative management encouraged by the Software CMM is therefore implied in the measurement Activities of the eSCM-SP. In all cases, the form of appropriate "quantitative management" should be driven by business objectives.
QP.AC.1: develop QP plan	○	prf02 (b2): Verify processes prf09 (b8): Benchmark del01 (b2e): Plan service delivery	
QP.AC.2: use QP plan	○	del01 (b4): Plan service delivery	
QP.AC.3: determine data analysis strategy	○	prf02 (b1): Verify processes del01 (b2g, b2h): Plan service delivery	
QP.AC.4: collect measurement data	○	prf02 (b3): Verify processes prf08 (b3): Capability baselines del01 (b4): Plan service delivery	
QP.AC.5: control defined software process	○	prf02 (b10): Verify processes	
QP.AC.6: report results of QP	○	prf02 (c4): Verify processes del01 (c4): Plan service delivery	
QP.AC.7: establish organizational process capability baseline	●	prf08: Capability baselines	"Capability baselines" are equivalent to the project's process performance baselines and organization's process capability baselines in the Software CMM.

QM: Software Quality Management

Software CMM Key Practice	Relation	eSCM-SP Practice	Comments
QM: Software Quality Management			The closest equivalent of Software Quality Management in the eSCM-SP is value creation (rel08), but value creation in the eSCM-SP has a broader scope than the Software CMM.
QM.AC.1: develop QM plan	∅		
QM.AC.2: use QM plan	∅		
QM.AC.3: define quality goals	○		Proactively identifying value creation opportunities is a strategic planning issue. Software Quality Management covers only the proactive aspects of building a product that satisfies the customer's requirements and needs, where value creation (rel08) proactively addresses the business needs associated with new products and services.
	○	rel08: Value creation	Establish quality goals that satisfy the customer's requirements (and needs); value creation proactively addresses the business needs associated with new products and services.
	○	prf10: Prevent potential problems	Preventing potential problems is a proactive way of addressing quality goals. Correcting problems (del05) or preventing known problems (del06) are more reactive.
QM.AC.4: measure product quality	○	del04: Verify service commitments	Measuring product quality and comparing it to quality objectives is more than tracking service commitments, but the basic capability described in del04 is the foundation for this Key Practice.
QM.AC.5: allocate subcontractor quality goals	○	rel07 (b4): Supplier & partner relationships	

DP: Defect Prevention

Software CMM Key Practice	Relation	eSCM-SP Practice	Comments
DP: Defect Prevention			Defect Prevention in the Software CMM is a systemic process for preventing the recurrence of known problems (del06). Although Defect Prevention has more detailed guidance, conceptually the eSCM-SP Practice addresses the same concept as the Key Process Area and includes its Key Practices by implication. Preventing potential problems (prf10) is related but more proactive.
DP.AC.1: develop DP plan	○	del06 (b5): Prevent known problems	
DP.AC.2: conduct DP kick-off meeting	∅		
DP.AC.3: conduct causal analysis	●	del06 (b2): Prevent known problems	
DP.AC.4: coordinate DP activities	●	del06 (c1, c4): Prevent known problems	
DP.AC.5: document DP data	●	del06 (b4): Prevent known problems	
DP.AC.6: revise organization's standard software process	○	prf06: Make improvements	Defect prevention is one of the forms of improvements included in improving organizational performance.
DP.AC.7: revise defined software process	∅		
DP.AC.8: receive feedback on DP	∅		

TM: Technology Change Management

Software CMM Key Practice	Relation	eSCM-SP Practice	Comments
TM: Technology Change Management			Technology Change Management describes adopting new technologies in an orderly way similar to the proactive introduction of technology in tch06.
TM.AC.1: develop TM plan	●	tch06 (b1, b3): Proactively introduce technology	
TM.AC.2: work with projects	○	tch06 (b4): Proactively introduce technology	
TM.AC.3: inform of TM	●	tch06 (c1, c4): Proactively introduce technology	
TM.AC.4: analyze need for technology change	●		Identifying and analyzing innovative technologies and the opportunities for improvement within the organization is also the point of this Key Practice.
	●	tch06 (b1, b2, b3): Proactively introduce technology	
	○	prf10: Prevent potential problems	Proactively identifying new technologies that can benefit the organization is an aspect of preventing potential problems.
TM.AC.5: select technologies	●	tch06 (b4): Proactively introduce technology	
TM.AC.6: pilot new technology	∅		
TM.AC.7: incorporate new organizational technologies	●	tch06 (b5): Proactively introduce technology	
TM.AC.8: incorporate new project technologies	●	tch06 (b6): Proactively introduce technology	

PC: Process Change Management

Software CMM Key Practice	Relation	eSCM-SP Practice	Comments
PC: Process Change Management			Deploying innovations (prf11) is equivalent to the Maturity Level 5 Process Change Management Key Process Area. Achieving organizational objectives (prf07) is also covered by the PC KPA since Process Change Management emphasizes continual improvement in achieving business objectives. Although the Software CMM focuses on quality, productivity, and cycle time, these are business objectives. The element lacking in Process Change Management is the "program" aspect of prf07, which is addressed in Organization Process Focus at Maturity Level 3.
PC.AC.1: establish empowered improvement	O	ppl02: Participation in decisions	"Empowerment" is a stronger concept than "participation."
PC.AC.2: coordinate improvement	●	prf11 (a2, c1, c4): Deploy innovations	
PC.AC.3: develop PC plan	●	prf11 (b3): Deploy innovations	
PC.AC.4: use PC plan	●	prf11 (b4): Deploy innovations	
PC.AC.5: handle improvement proposals	●	prf06 (b1, b2): Make improvements prf11 (b1): Deploy innovations	Improvement proposals are one mechanism for identifying candidate improvements and innovations.
PC.AC.6: participate in improvements	●	ppl02: Participation in decisions	The software staff are expected and encouraged to participate in software process improvement. Although this Key Practice is at Maturity Level 5 in the Software CMM, it is foreshadowed by the commitment practices in PT.GO.3.
PC.AC.7: pilot improvements	Ø		
PC.AC.8: transfer improvements	●	prf11: Deploy innovations	Deployment of improvements is a subset of the innovations that may be deployed.
PC.AC.9: maintain improvement records	●	prf11 (b5): Deploy innovations	
PC.AC.10: receive feedback on improvement	Ø		

Appendix E: Support Practices of the eSCM-SP versus Software CMM Institutionalization

Major Activities a and c in every Practice of the eSCM-SP, and their Sub-activities, are, in essence, the same. These Activities refer to a set of Practices, called Support Practices since they support the implementation of all Practices. Support Practices, sometimes called generic practices, are applied to each Practice in the eSCM-SP in the Practice templates. Unlike continuous models like ISO 15504-2 [ISO 2003] and CMMI [Chrissis 2003], the templates in the eSCM-SP are applied to Practices rather than Capability Areas; eSCM-SP Practices are frequently more analogous to Goals or Key Process Areas in the Software CMM than they are to Key Practices.

Table 9 shows the general structure of an eSCM-SP Practice. Note that this table displays only the beginning of each Activity and Sub-activity. The remainder of each depends on the Practice. These are referred to as the Activity Templates.

Table 9
Templates and Support Practices in the eSCM-SP v2

Activity Templates	Related Support Practices Level 2	Level 3&4
a. Provide support for creating and maintaining the [work products and tasks required] for X _across the organization_.		
1. Provide sponsorship and resources for creating the [work products and tasks].	prfo3	knwo4 prfo3
2. Involve relevant stakeholders in creating, improving, reviewing, and approving the [work products and tasks] as appropriate.	knwo2	knwo2 relo5
3. Maintain and improve the [work products and tasks] as appropriate.	knwo7	knwo4 knwo7
b. Document the [work products and tasks required] for X. Documentation includes the following Activities:		
c. Implement X, according to the [documented work products and tasks].		
1. Communicate the availability and location of the [work products and tasks] to relevant stakeholders.	knwo2	knwo2 knwo3
2. Provide resources to effectively perform the work.	knwo2 pplo3 prfo3 tcho1	knwo2 knwo3 pplo3 prfo3 tcho1
3. Assign qualified personnel the responsibility, authority, and accountability to perform the work.	pplo4 pplo8	pplo4 pplo5 pplo7 pplo8
4. Communicate planned actions and their outcomes to relevant stakeholders.	knwo2	knwo2 knwo3
5. Verify that the work is consistently and effectively performed according to the [work products and tasks] _across the organization_.	prfo2	knwo4 prfo2

The templates used in Software CMM v1.1 are applied to the structure of the Key Process Areas [Paulk 1995a, pp. 46-58]. They are primarily used in the four institutionalization Common Features: Commitment to Perform, Ability to Perform, Measurement and Analysis, and Verifying Implementation. The implementation Common Feature, Activities Performed,

also includes institutionalization sub-practices addressing the software work products that should undergo configuration management and peer reviews. Plans, which are usually considered an institutionalization practice, are also addressed in Activities Performed.

The templates and the relevant Key Process Areas in the Software CMM are listed in Table 10, although as a staged model, the Software CMM does not address the relationship between Key Process Areas and institutionalization as explicitly as continuous representation models do. In some cases, Key Process Areas at Maturity Level 3 are mapped to templates used at Level 2; in such cases, the Key Process Areas are in parentheses to indicate that a project-specific or less mature capability may be used to address the template than is implied by the Key Process Area. This ambiguity has been clarified in CMMI [Chrissis 2003], and the relationships are discussed in the mappings between eSCM-SP and CMMI [Paulk, forthcoming b].

Table 10
Institutionalization Templates in Software CMM v1.1

Key Practice and Subpractice Templates	Relevant Key Process Areas
Commitment to Perform—policy	(Organization Process Definition)
Commitment to Perform—leadership	Organization Process Focus
Ability to Perform—groups	
Ability to Perform—resources and funding	Software Project Planning
Ability to Perform—training (Level 2)	(Training Program)
Ability to Perform—required training (Level 3+)	Training Program
Ability to Perform—orientation	(Training Program)
Ability to Perform—prerequisites	
Activities Performed—plans	Software Project Planning
Activities Performed—documented procedures	(Organization Process Definition)
Activities Performed—configuration management	Software Configuration Management
Activities Performed—peer reviews	Peer Reviews
Measurement and Analysis—status measures	Software Project Tracking & Oversight
Verifying Implementation—senior management reviews	Software Project Tracking & Oversight
Verifying Implementation—project management reviews	Software Project Tracking & Oversight
Verifying Implementation—software quality assurance	Software Quality Assurance

Note that some templates, such as the "groups" template, are only occasionally used in Software CMM v1.1. As an example of how to provide resources, the "group" Key Practices were to be removed in Software CMM v2 and used only as examples of how a project or organization might be structured. Similarly, "prerequisites" were to be moved under "planning" as a new Ability to Perform template in Software CMM v2. (Version 2 of the Software CMM was not released because of the shift to CMM Integration [Chrissis 2003] directed by the SEI's Department of Defense sponsor.)

Table 11
Mapping eSCM-SP Templates to Software CMM Templates

eSCM-SP v2	Relation	SW-CMM v1.1	Rationale
a1. Provide sponsorship and resources for creating the [work products and tasks].	●	CO.policy	The policy practices in the Software CMM have the same intent in principle as the sponsorship and resources Major Activities in the eSCM-SP.
	○	CO.leadership	The leadership practices in the Software CMM are specific to a few management and organizational Key Process Areas where leadership is particularly critical. They are not generally used templates, but their intent is generically subsumed into the sponsorship template in the eSCM-SP.
	○	PF.AB.2 resources	The resources referenced in the (a1) template are targeted toward process definition and improvement.
	○	PD.AB.1 resources	The resources referenced in the (a1) template are targeted toward process definition and improvement.
	∅	AB.prerequisites	Prerequisites are not templated in the eSCM-SP, and this template is sporadically used in the Key Process Areas in the Software CMM. Its content is addressed in the planning Practices in the eSCM-SP as appropriate.
a2. Involve relevant stakeholders in creating, improving, reviewing, and approving the [work products and tasks] as appropriate.	○	PF.GO.1	Involving stakeholders in process definition is not generically addressed in the Software CMM, but the "coordination" of improvement activities in PF.GO.1 implies the involvement of relevant stakeholders at Level 3.
a3. Maintain and improve the [work products and tasks] as appropriate.	○	PF: Organization Process Focus	A focus on improvement is explicitly addressed in this Key Process Area, which is located at Maturity Level 3.
	○	PD: Organization Process Definition	The work products that are maintained under configuration management are described in broad detail in this Key Process Area, which is located at Maturity Level 3.
	○	IM: Integrated Software Management	Tailoring the guidance documents for a specific context using the tailoring guidelines in knw04 is implied.
	○	AC.documented procedures	Defining the process, via procedures where appropriate, is systematically addressed in the Software CMM, although templates in the Activities Performed (AC) are not as uniformly applied as those in the other Common Features.
	○	AC.configuration management	Placing process descriptions under configuration management is one example of the work products being controlled, although the templates in Activities Performed are not as uniformly applied as those in the other Common Features.

eSCM-SP v2	Relation	SW-CMM v1.1	Rationale
c1. Communicate the availability and location of the [work products and tasks] to relevant stakeholders.	●	PF.AC.7 inform implementers	Communicating the availability of process assets is addressed by this Key Practice at Maturity Level 3.
c2. Provide resources to effectively perform the work.	●	AB.resources and funding	The resources templates in the Software CMM and eSCM-SP are essentially equivalent.
	○	AB.groups	The "groups" that are specified in some Key Process Areas are examples of specific resources—and assumed organizational structures—for performing the work.
c3. Assign qualified personnel the responsibility, authority, and accountability to perform the work.	○	AB.training	Training is a mechanism for building qualified personnel, but (c3) is broader in scope than training.
	○	AB.required training	Required training, called out at Maturity Level 3 and higher in the Software CMM, is a mechanism for building qualified personnel, but (c3) is broader in scope than training.
	○	AB.orientation	Orientation is a form of training and is a mechanism for building qualified personnel, but (c3) is broader in scope than training.
c4. Communicate planned actions and their outcomes to relevant stakeholders.	○	AC.plans	This Activities Performed template is not uniformly applied across the Key Process Areas, but it is the nearest analog to the eSCM-SP template.
c5. Verify that the work is consistently and effectively performed according to the [work products and tasks] *across the organization.*	●	VE.software quality assurance	Quality assurance in the Software CMM addresses both process and product assurance activities.
	○	ME.status measures	Measurement is part of process and service verification.
	○	AC.peer reviews	This Activities Performed template is only applied at Maturity Levels 3 and higher in the Software CMM.
	○	VE.senior management reviews	Senior management reviews are one form of management verification.
	○	VE.project management reviews	Project manager reviews are one form of management verification.

Key

●	Addressed
○	Partially addressed
Ø	Not addressed *(to any significant degree)*

Appendix F: Acronyms List

AB	ability to perform (Software CMM KPA common feature)
AC	activities performed (Software CMM KPA common feature)
CBA	CMM-Based Appraisals (SEI project; merger of SCE and SPA)
CM	Software Configuration Management (Software CMM ML2 KPA)
CM	configuration management
CMM	capability maturity model
CMU	Carnegie Mellon University
cnt	Contracting (eSCM-SP Capability Area)
CO	commitment to perform (Software CMM KPA common feature)
del	Service Delivery (eSCM-SP Capability Area)
DP	Defect Prevention (Software CMM ML5 KPA)
eSCM	eSourcing Capability Model
eSCM-SP	eSourcing Capability Model for Service Providers
IC	Intergroup Coordination (Software CMM ML3 KPA)
IM	Integrated Software Management (Software CMM ML3 KPA)
ISM	Integrated Software Management (Software CMM ML3 KPA)
ISRI	Institute for Software Research International
IT	information technology
ITsqc	IT Services Qualification Center
knw	Knowledge Management (eSCM-SP Capability Area)
KP	key practice
KPA	key process area
ML	maturity level
OPD	Organization Process Definition (Software CMM ML3 KPA)
OPF	Organization Process Focus (Software CMM ML3 KPA)
PCM	Process Change Management (Software CMM ML5 KPA)
PD	Organization Process Definition (Software CMM ML3 KPA)
PE	Software Product Engineering (Software CMM ML3 KPA)
PF	Organization Process Focus (Software CMM ML3 KPA)
PM	Process Change Management (Software CMM ML5 KPA)
PP	Software Project Planning (Software CMM ML2 KPA)
ppl	People Management (eSCM-SP Capability Area)
PR	Peer Reviews (Software CMM ML3 KPA)
prf	Performance Management (eSCM-SP Capability Area)
PT	Software Project Tracking and Oversight (Software CMM ML2 KPA)
PTO	Software Project Tracking and Oversight (Software CMM ML2 KPA)
QA	Software Quality Assurance (Software CMM ML2 KPA)
QA	quality assurance
QM	Software Quality Management (Software CMM ML4 KPA)
QP	Quantitative Process Management (Software CMM ML4 KPA)
QPM	Quantitative Process Management (Software CMM ML4 KPA)
rel	Relationship Management (eSCM-SP Capability Area)
RM	Requirements Management (Software CMM ML2 KPA)
SCE	software capability evaluation (method)

SCM	Software Configuration Management (Software CMM ML2 KPA)
SCM	software configuration management
sdd	Service Design & Deployment (eSCM-SP Capability Area)
SEI	Software Engineering Institute
SEPG	Software Engineering Process Group
SM	Software Subcontract Management (Software CMM ML2 KPA)
SP	Service Provider
SPA	software process assessment (method)
SPE	Software Product Engineering (Software CMM ML3 KPA)
SPP	Software Project Planning (Software CMM ML2 KPA)
SQA	Software Quality Assurance (Software CMM ML2 KPA)
SQA	software quality assurance
SQM	Software Quality Management (Software CMM ML4 KPA)
SSM	Software Subcontract Management (Software CMM ML2 KPA)
tch	Technology Management (eSCM-SP Capability Area)
TCM	Technology Change Management (Software CMM ML5 KPA)
tfr	Service Transfer (eSCM-SP Capability Area)
thr	Threat Management (eSCM-SP Capability Area)
TM	Technology Change Management (Software CMM ML5 KPA)
TP	Training Program (Software CMM ML3 KPA)
TQM	Total Quality Management
VE	verifying implementation (Software CMM KPA common feature)