This white paper is the third in a five-part series dedicated to examining problems organizations encounter when operating in multimodel environments and the current process improvement approaches such organizations need to consider.

Improvement Technology Classification and Composition in Multimodel Environments

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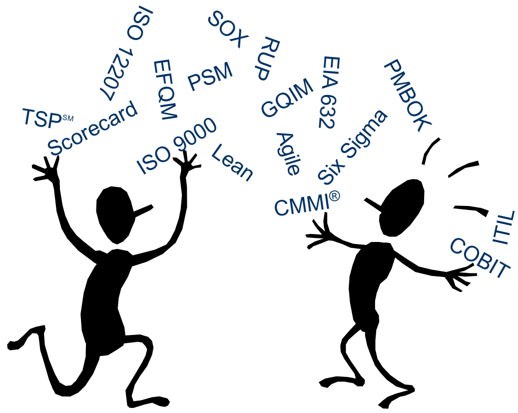
About this series



This white paper is the third in a five-part series dedicated to examining problems organizations encounter when operating in multimodel environments and the current process improvement approaches such organizations need to consider. It examines technology composition in relation to the concepts introduced in the previous white papers; a proposed element classification taxonomy to make technology integration effective in practice; and the role of technology structures, granularity and mappings in technology composition.

The rest of this series addresses, in more detail, each phase of the reasoning framework for technology harmonization in a multimodel environment:

- The 1st white paper addresses the benefits of a harmonized approach when implementing more than one improvement model, standard, or other technology and provides a high-level description and underlying paradigms of a reasoning framework for technology harmonization.
- The 2nd white paper examines the approaches needed in technology selection including a strategic taxonomy, the decision authorities associated with that selection at all levels in the organization, and considerations for thoughtful sequencing of implementation in alignment with the organization's mission, goals, and objectives.
- The 4th white paper examines the current state of the practice for defining process architecture in a multimodel environment, methods, and techniques used for architecture development, and underlying questions for a research agenda that examines the relationship of technology strategy and composition to process architecture as well as the interoperability and architectural features of different process technologies.
- The 5th white paper addresses the implementation challenges faced by process improvement professionals in multimodel environments, where it becomes necessary to coordinate roles and responsibilities of the champions for different technologies, to integrate and coordinate training, to optimize audits and appraisals, and develop an integrated approach to project portfolio management.

It is an unavoidable fact-of-life for many organizations that they have to use an ever-increasing set of improvement technologies[1] in their effort to achieve competence in the processes used to manage their business and enable competitive advantage. The effort and cost associated with defining and implementing processes in these multimodel environments can be prohibitive in terms of effort, cost, and the degree of process-fatigue exhibited by those on the front-lines, subject to a never-ending series of uncoordinated process improvement initiatives. The most commonly observed barriers to success in multimodel environments include the differences in structure and terminology across relevant improvement technologies, difficulty in recognizing similarities between technologies, and, as mentioned in the earlier white papers in this series, conflict between competing improvement initiatives within the organization. The approaches outlined in the first two white papers in this series provide guidance for organizations in the selection of appropriate technologies and in the alignment of these and the associated improvement initiatives with the organization's mission. The technology composition concepts discussed in this white paper support the organization in the practical integration of the technologies selected to support achieving missions and goals.

ELEMENT CLASSIFICATION: A TAXONOMY FOR TECHNOLOGY COMPOSITION

The previously examined concepts of value propositions and strategy aid organizations in the selection of relevant technologies to support the business mission and goals. For the practical integration of the selected technologies, we need to understand:

- The relationships of the selected technologies to each other
- The types of elements the selected technologies contain
- Technology mapping and process implementation

From experience with industry in relation to concrete problems associated with process improvement in multimodel environments, we have developed a three-category classification of technology elements. This classification arose from a need to understand how individual technologies may relate to one another. In an attempt to achieve this understanding for technologies that may be widely different in style and scope we examined the elements of technologies commonly used in systems and software product development. From this examination, we were able to classify elements of process improvement technologies into three categories, as detailed in Figure 1.

[1] In this series of white papers, we use the terms *improvement technologies*, *technologies*, or *models* somewhat interchangeably as shorthand when we are referring in general to the long list of reference models, standards, best practices, regulatory policies, and other types of practice-based improvement technologies that an organization may use simultaneously.

Good Practice Elements	Improvement Method Elements	Institutionalization Elements
CMMI PAs, P-CMM, TSP, PSP, PLA, and others ISO 15504, ISO 12207, and others COBIT, ITIL, SOX, and others EFQM and others ISO 9001, ISO 61508, ISO 16949, and others	Change management techniques: IDEAL, Six Sigma, Lean Six Sigma, TQM, selected CMMI PAs, Assessment and Audit Methods, and others	CMMI Generic Goals and Practices: GG5 GG4 GG3 GG2 GG1

Figure 1: Technology Element Classification

Good Practice Elements

Good Practice Elements are the technology elements that define what or how an organization needs to improve. These represent the principal domain-specific content of technologies. Examples of Good Practice Elements include the Engineering, Support and Project Management process area categories from the CMMI®. Similarly, the PMBOK, ITIL, and COBIT also have elements that provide discipline and domain-specific technology content that serves as "good practices." .

These elements should be viewed as requirements on the organization's process for its implementation, description, and evaluation in the organization. They are transitioned to the organization's process through the execution of the Improvement-Method Elements. The long-term integrity of the Good Practice Elements once implemented in the organization's process is supported by application of the Institutionalization Elements. Placing the organization's focus on its own process rather than the technologies from which the process was derived is considered a critical success factor for process improvement in multimodel environments.

Improvement Method Elements

Improvement Method Elements are the technology elements that drive the change and facilitate the technology transition processes in the organization. Common examples include IDEAL®, Total Quality Management methods, Six Sigma, Lean, the Organizational Process Focus and Organizational Process Definition process areas from CMMI and any number of assessments and audits approaches. We recommend that organizations select from improvement approaches that will best suit their organizational culture. (Refer to the first two white papers in this series for methods to support this selection.) It is important for success that the application of the chosen Improvement Method Elements is in the form of a single, integrated approach that encompasses all improvement technologies and their elements.

That is, organizations need to avoid using different transition methods for different technologies, especially when the practitioners on the receiving end are the same people.

The establishment of an integrated improvement infrastructure to support consistent long-term implementation of the Improvement Method Elements is also critical to success. This infrastructure typically includes roles such as sponsors and change agents and a communication system to support the improvement initiative and counteract resistance to change. In addition the rewards and recognition system will need to be aligned with the desired change, supported by an effective training organization, and risk management and measurement system to enable effective change management in the organization.

Refer to the fifth white paper in this series, which addresses these concepts in more detail.

Institutionalization Elements

Institutionalization elements help an organization in sustaining achieved improvements. The best examples we know of Institutionalization Elements are the Generic Goals and Practices that are detailed in the CMMI. In fact, few other models or other improvement technologies contain this type of element and none are as well conceptualized or described as those in the CMMI. The CMMI defines institutionalization in the glossary as “The ingrained way of doing business that an organization follows routinely as part of its corporate culture.” The Generic Goals and Generic Practices guide an organization in what it must do to ensure that the characteristics necessary to achieve different levels of institutionalization are established. These include, for example, that

- management guides the organization by establishing process-related policies
- responsibility and authority for the process is defined
- process users and others receive appropriate training in the process
- the work products of the process are controlled
- objective evaluation of process adherence is performed
- management at various levels in the organization has appropriate insight into how the process is performing

Note: This list is not exhaustive in terms of the characteristics necessary. Reference to the CMMI should be made by those interested in a comprehensive treatment of this subject.

The use of a unified, common set of goals and practices across all technologies addressed within the organization supports general process institutionalization. The Generic Goals and Practices of the CMMI are just what the name implies—goals and practices that are applicable to any process and are, therefore, generic. The use of these to ensure institutionalization of other technologies requires little more than the extension of the standard description by what are termed “elaborations.”

STRUCTURES, MAPPINGS, AND OTHER CONSIDERATIONS FOR TECHNOLOGY COMPOSITION

In order to create a successful multimodel solution for your organization, it is necessary to understand how much overlap there is between the subject areas of selected technologies and how the granularity of the description of the technologies relate to one another. Granularity refers to the level of detail to which individual technologies are described. A model like the CMMI for Development extends to several hundred pages. In contrast, an ISO standard covering similar subject matter may only extend to tens of pages. The granularity of these two technologies is obviously very different, although they address similar subject matter. We can thus refer to the CMMI model as fine-grained and to the ISO standard as coarse-grained.

Why is technology granularity important? In practice, process professionals in organizations typically attempt to understand the relationship between two technologies by referring to mappings between the relevant pairs. Many such mappings are readily available.

These mappings detail where technologies address the same subject matter and highlight where there are gaps. You need to be aware of granularity differences between technologies when making decisions about compliance based on mappings. For example, an ISO 9001:2000 compliant practice that has been implemented in the organization's process and verified by an audit against the relevant ISO standard may not fulfill the finer grained requirements of the CMMI, although the mapping designates them as equivalent. This does not devalue the technology mappings—they have value, but you should be aware of differences in technology granularity, where present.

Furthermore, we need to realize that the structure of two technologies may prohibit effective comparison unless we are prepared to invest a lot of time and effort. These structural differences may occur between technologies where one is described largely through checklists while the other has a prose style with flowing text. In addition, two technologies may address similar subject areas but one may only inform the organization about what it should be doing, while another defines exactly how it should be done. For example, an IT organization uses CMMI for Services to learn what it should do in pursuit of excellence in terms of the services it delivers; the same IT organization uses ITIL to learn how to do that in detail.

After examining the relationship of the different improvement technologies to one another, using mappings to support the task, an organization must address the final and most critical relationship type—that of selected technologies to the organization's own process. This understanding is essential to enable the effective transition of the Good Practice Elements from the selected technologies to the processes implemented in the organization. The organization needs to implement the requirements placed by these technologies on the organization's processes. This hopefully starts by translating the requirements to the organization's own terminology and then inserting (or creating completely from scratch in some cases) the relevant changes to the organization's process.

In a multimodel environment, however, many technologies place simultaneous requirements on the organization's process. The focus of the organization must therefore be on its own process. The organization's process management capability must ensure a complete overview of all requirements fulfilled in the organization's process, from all the improvement technologies (which, as a reminder, span regulations, models, standards, practices, and so forth) the organization selected to support mission achievement (see Figure 2).

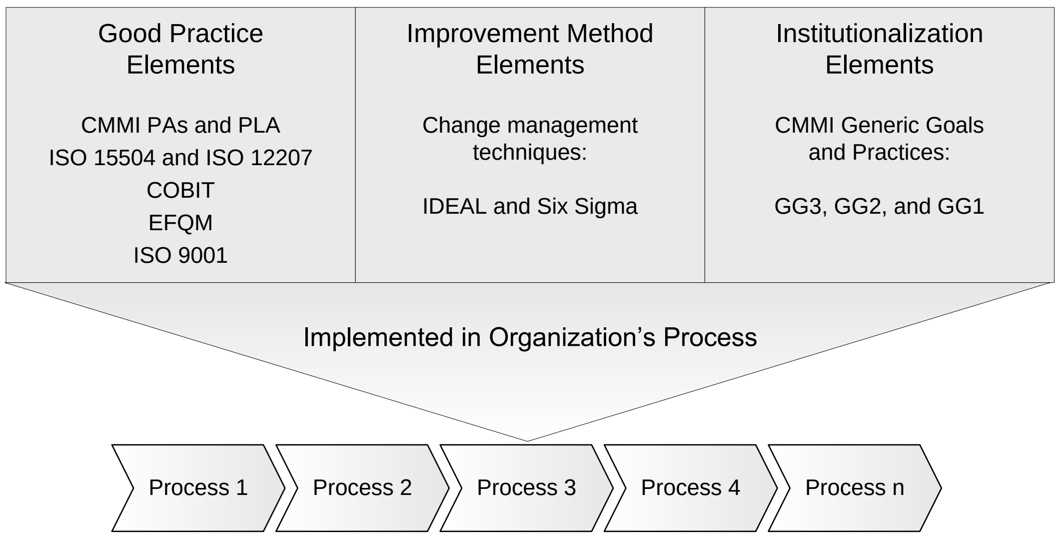


Figure 2: The relationships of selected technologies to the organizations own process should be transparent to those responsible for the process

The achievement of the required overview may necessitate an instrumentation of the process descriptions used in the organization. This allows the extraction of data related to the source technology specific requirements, in relation to how these are fulfilled by each element of the organization's process. This instrumentation supports traceability of process requirement sources, allowing the organization to satisfy demands on traceability to the source technologies placed on all staff within an organization by audits, assessments and benchmarking of all kinds. The investment the organization previously made in technology-to-technology mappings pays dividends in the verification that the organization's process really implements all the source technology requirements. This is performed using two different approaches:

- the process professional can verify that the instrumentation in the organization's process tracks back to all desired source technology requirements
- technology-to-technology mappings can be cross-checked to ensure that related portions are reflected in the same locations in the organization's process descriptions

This overview also informs the technology selection process described in the first two white papers in this series. In general, the activities described here have a close relationship to the value proposition and strategy considerations the organization must undertake. An organization can and should inform its multimodel process improvement strategy with a composite and coordinated view of the improvement technologies considered or already implemented—the view held by the organization's process improvement professionals about the totality of process requirements set forth by these improvement technologies.

By focusing on the organization's own process, rather than on the source technologies, the organization derives benefits beyond the ability to demonstrate compliance in audits and to inform the strategic direction of process management. Changes to individual process steps are now made with the knowledge of the other technologies implemented in each particular process step. This ensures that no process is altered by a change request, without all relevant source technologies being considered for impact. The traceability to source technology enables this degree of control when considering proposed changes. In addition, training for the majority of staff can now be focused on the organization's own process, rather than on a set of obscure technologies. This has the added benefit that resistance to process change is less as staff members often identify with the organization's process, but rarely with the underlying technologies. In practice, process professionals are now the only staff who need an intimate knowledge of the various technologies underlying the organization's own process.