The Israel ESPINODE

Software Process Improvement Series

Part V

Software Process Improvement, ISO-9000 and CMM [1]

---

[1] Adapted from the book by Kenett and Baker: **SOFTWARE PROCESS QUALITY: Management and control**, M. Dekker Inc., 1999

There are a number of ISO Standards which are applicable to software development, acquisition, maintenance, and quality. These are ISO 9001, ISO 9000-3, and the emerging ISO 12207 and SPICE standards. Many organizations implement these standards in order to be registered with ISO as being compliant with one or more of their various standards. There are good business reasons for doing so. In many parts of the world, registration as being compliant with one or a number of ISO standards is essential in order to conduct business in these countries. Duly authorized representatives of ISO conduct audits of organizations to determine their compliance.

ISO 9001 is a quality system standard which is applicable to the design, manufacturing, installation, test, and maintenance of systems, typically under a 2-party agreement. The text of the requirements of ISO 9001 are very much hardware system oriented. As a consequence, they are sometimes considered to be somewhat difficult to apply to software. Consequently, the need arose to develop a guide on the application of these requirements to software. The guide is ISO 9000-3. Nonetheless, some organizations will utilize 9001 as the basis for developing their software quality system, rather than 9000-3.

ISO 9000-3 is a guidebook on applying the requirements of ISO 9001 to software development and maintenance organizations, and not a software quality system standard. It describes a number of elements that should be included in an organization's quality system for software. These are organized into three major areas: framework, life-cycle activities, and supporting activities. Examples of these elements include:

- Establishment of a Quality Program (framework)
- Corrective Action (framework)
- Contract Review (life-cycle activities)
- Development Planning (life-cycle activities)
- Design and Implementation (life-cycle activities)
- Maintenance (life-cycle activities)
- Configuration Management (supporting activities)
- Quality Records (supporting activities)
- Measurement (supporting activities)

For the most part, ISO 9000-3 and ISO 9001 specify only minimal requirements for the elements covered in these standards. Effectively, they require that the organization have a quality system and a quality plan that addresses these elements, and the organization specifies what practices they will apply in implementing these elements. Furthermore, there is a requirement that an organization be audited as part of the registration process. Periodic follow-up audits are conducted every 6 months subsequent to the initial registration to maintain the registration. Registered organizations must, therefore, demonstrate continuous compliance with their quality system documentation. Through the corrective action element of the standards, process improvement is addressed, although somewhat indirectly.

In essence, establishing compliance to the ISO standards plays a role in strategic quality planning. Registration is a lengthy process, involving the establishment of quality plans, procedures, etc. Preliminary audits may be used as a means of determining the readiness for registration. The process of registration can take from one to two years from the date of inception to accomplish.

Another ISO standard, called SPICE (Software Process Improvement Capability dEtermination), is nearing completion. It is similar, in some respects, to the CMM in that it has an organization of maturity levels with defined key processes. It also has an assessment methodology associated with it, which will be in the public domain. In its current form, the key process areas are selectable. Each software development organization is free to define which key processes they wish to be evaluated against.

The CMM, by contrast, when compared to the most of the ISO standards, is fairly prescriptive. As we will see in the next section, for each Key Process Area (KPA), the Key Practices define *what* practices the organization must be performing in order to have that KPA under control. The Key Practices don't define *how* things should be done -- only *what*. That leaves the organization free to choose whatever methodologies makes sense for the particular types of applications they produce. For example, for the Level 2 Software Project Planning KPA, one of the Key Practices requires the development organization to establish a software life cycle with predefined stages of manageable size for each project. There is nothing that mandates a waterfall model or a spiral model or incremental development, etc. In fact, at Level 2, each project is free to utilize a different development cycle model, just as long as one is specified.

When compared to the requirements of ISO 9000-3, the CMM is definitely more prescriptive. The same is true if we compare it to the degree of rigor specified in ISO 12207. ISO 12207 is a software life cycle standard. It tends to be somewhere between ISO 9001 (or ISO 9000-3) and the CMM in its extent of specificity. ISO 12207 tends to cover many of the same kinds of items included in the CMM. Like the comparison to 9000-3, the CMM has many areas of overlap with 12207, but there are also many areas that are unique to both standards. For instance, because 12207 is a life cycle standard, it covers maintenance more effectively than does the CMM. But the CMM does a more thorough job in covering specific software development practices (the "*whats*") that organizations should implement.

Implementing software process improvement involves the development of an overall strategy. Process improvement does not occur overnight, and can not be implemented on a "fad of the week" basis. If it is, it is doomed to failure. Process improvement requires patience on the part of all parties involved: management, the developers, and the stakeholders. Many small steps are involved in process improvement. The first, and most crucial step, is committing to process change. There has to be an acknowledgment by all parties that process improvement is required in order to remain competitive. Accompanying that acknowledgment must be willingness on the part of management to commit the necessary resources to accomplish rational process change.

Part VI will present specific planning actions for software process improvement.