
WHAT DOES "INSTITUTIONALIZATION" MEAN?

BY MARK C. PAULK

One of the “magic words” in software process improvement is institutionalization. Anyone doing improvement based on the Capability Maturity Model for Software (CMM) has to both implement and institutionalize their processes to fully satisfy a key process area. The definition in the CMM is that institutionalization is “the building of infrastructure and culture that support methods, practices, and procedures so that they are the ongoing way of doing business, even after those who originally defined them are gone.” This definition captures the concept but is not operationally satisfactory.

In the early days, some organizations “defined their process” the week before an SCE team arrived and expected to get credit for having a process in place. How much more than one week (or how many executions of the process) is needed to show “this is the way we do things around here”?

Appraisal teams need better guidance to make consistent judgments. The CBA IPI Lead Assessor’s Guide, v1.2 (CMU/SEI-2001-HB-002, December 2001) states on p. 2-41:

“Processes are not to be considered fully institutionalized unless they have been in place for a sufficient amount of time so that the organization has had the opportunity to fine-tune them and determine their effectiveness. The intent of institutionalization is for a process to be stable and repeatable. Some heuristics can be applied:

- *Is the process performed and trained? Is training available?*
- *Has the process been performed more than three times following this procedure?*
- *If the process is performed ‘frequently,’ e.g., weekly or monthly, has it been in place for the last six months?”*

While this is much more helpful, this elaboration does not provide an absolute rule. You will not find anything in the CMM that states how many months are required for institutionalization. Assessors have to make judgments on whether a process is really in place or not. Fundamentally, a process is what you do. It is not a document. Process improvement is a lifestyle change. Behavior change takes time, and it requires a supporting infrastructure (in some senses similar to Weight Watchers or AA).

Other SEI materials, such as the “High Maturity With Statistics” course, suggest that a reasonable heuristic for judging institutionalization is 6-12 months. Many of my colleagues feel more comfortable observing a year’s worth of behavioral evidence. But the answer depends on management support, frequency of execution, training, and other infrastructure issues. This “rule of thumb” is not an “official rule”—it’s a heuristic, to apply with judgment and common sense.

To add to the complexity, institutionalization occurs at the same time as continual improvement. The process you are implementing today is probably at least incrementally improved over the one you used a year ago. It may be radically different if you’ve adopted a whole new technology or methodology.

Does adoption of a new technology or method mean a drop in organizational maturity? If it did, we’d never get beyond Level 1! Does adoption of a new technology mean (at least potentially) a drop of process capability for the projects going through the learning curve? Probably. Even Level 5 organizations are continu-

ally changing (improving) their processes. The practical answer is that a change in the flavor of a process that does not affect the fundamental discipline of the process does not require “re-institutionalizing.”

What kind of change affects the “fundamental discipline”? Which I have carefully not defined....That’s the judgment part. It’s a matter of “degree” becoming great enough to become “kind” sometimes. If there’s a wholesale process change, as might happen after a buyout or merger, then institutionalization is likely to be a significant risk to manage.

To make it operational in project terms, if you have one big process change in a project, that’s piloting. If you have several, that’s chaos, and the project is going to have some significant challenges to deal with. If most projects are in that boat, the organizational capability is unpredictable.

So what does institutionalization really mean? It means setting expectations for the process while, as Collins and Porras put it in *Built to Last*, applying the “genius of the AND” rather than falling prey to the “tyranny of the OR”—maintaining process stability AND supporting continual improvement. It means establishing a culture of following a disciplined process (with different attributes as one moves up the maturity levels) even though that process (or set of processes) will be systematically changed in a controlled fashion over time. Maturity “regression” occurs when the “disciplined culture” falls apart.

So what we’re really looking for when we examine institutionalization is whether a disciplined process is being systematically followed, even though the implementation details change over time (and maturity adds in attributes associated with the levels). Six months or so is the minimum time for demonstrating behavioral change associated with the “clusters

(cont. on p. 14)

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of process attributes” that characterize each level, and if you’ve ever been on a diet, a year is probably a much better indicator, but the possibility of regression exists even after five years.

To return to the LA Handbook guidance, an institutionalized process is “in place for a sufficient amount of time so that the organization has had the opportunity to fine-tune [it] and determine [its] effectiveness.” This implies both consistent execution over time and that the organization has learned how to do the process better. One implication of an institutionalized process is, therefore, that it has been improved!

This alleviates the problem of institutionalization becoming an “iron cage” that constrains creativity via bureaucracy. Of the three forms of isomorphism associated with institutionalization in the sociological literature (see Paul J. DiMaggio and Walter W. Powell, “The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields,” *American Sociological Review*, April 1983), we would prefer normative rather than coercive or mimetic. Normative isomorphism is associated with professionalization—making software development and maintenance a legitimate engineering discipline.

The bottom line is that the appraisal team has to come to consensus that the documented process is “the way we do things in this organization.” The consensus of a team of knowledgeable professionals is one of the keystones of consistent appraisals—it’s not black-and-white, but when properly done, it works well.

Mark Paulk is a senior member of the technical staff at the Software Engineering Institute. He has been with SEI since 1987. He was the “book boss” for Version 1.0 of the Capability Maturity Model for Software and was the project leader during the development of Software CMM Version 1.1. He is also involved with software engineering standards, including ISO 15504, ISO 12207, and ISO 15288. His current interests center on high maturity practices and statistical control for software processes. He is also working on an eCommerce Capability Model (eCCM) in collaboration with the IT Services Qualification Center at Carnegie Mellon University.

ANSWERS TO THE SOFTWARE QUALITY ENGINEERING QUIZ

1. **Answer C is correct.** One of the responsibilities of the team’s sponsor is to ensure that the team has required resources to adequately perform their function. The team’s facilitator is the expert on the use of quality improvement tools and techniques and would make recommendations to the team on their use. The team’s leader would typically direct the team, including making assignments, and would also arrange for meeting rooms and other logistics. **CSQE Body of Knowledge Area: I.C.3**
2. **Answer D is correct.** Changes to a defined process should be done formally through a change request process that involves the process owners. This allows the improvement to be appropriately analyzed as to its impact on the entire quality system. A single individual should not personally deviate from the defined process or change the process documentation without formal approval. Simply doing a lessons learned posting on the intranet will not insure that the improvement

idea is considered and implemented if appropriate. **CSQE Body of Knowledge Area: II.B.5**

3. **Answer A is correct.** A data flow diagram is a graphical representation of how data flow through and are transformed by the processes of a system. Data flow diagrams are not one of the elements of UML. **CSQE Body of Knowledge Area: III.D.1**
4. **Answer C is correct.** The senior management project review meeting would not review the details of individual tasks and inter-task dependencies. This would typically be dealt with at the lower level project team status meetings. **CSQE Body of Knowledge Area: IV.B.4**
5. **Answer C is correct.** A checklist can be used to ensure that all of the important items have been included in their discussion. An affinity diagram can be used to organize the ideas into categories. Affinity diagrams can also be used with defect data, customer quality requirements, audit observations, or any other set of data that need to be organized into categories. A cause and effect diagram, also called a fishbone diagram, would be a good tool to help the team analyze and organize the root causes of a particular problem. The force field analysis tool can be useful when trying to identify driving forces that help move toward reaching their goal and restraining forces inhibiting movement toward their goal. **CSQE Body of Knowledge Area: V.C.2**
6. **Answer B is correct.** Inspections focus exclusively on defect detection while walk-throughs include both defect detection and engineering analysis aspects. Both inspections and walk-throughs are peer reviews that are used to evaluate software work products. The work product author plays a critical role in both inspections and walk-throughs. **CSQE Body of Knowledge Area: VI.B.1**
7. **Answer A is correct.** The allocation of system-level requirements to each software component is done as part of defining the system and software architecture, and is therefore a role of software development or systems engineering, not configuration management. **CSQE Body of Knowledge Area: VII.A.1**