Thinking About “Peer Reviews”

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When the SEI’s software process maturity framework was first published back in 1987, one of the important concepts contained was that of the peer review. In the initial framework and preliminary questionnaire, however, the term used was “technical review.” This was actually a misstatement of Humphrey’s experience at IBM prior to joining the SEI. The IBM practice was inspections, as developed by Michael Fagan. The term “technical reviews” is usually meant more in the sense of an end-of-phase review, typically including both managers and customer representatives. In those days, one of the necessary clarifications when filling out the questionnaire was what “technical review” really meant.

When Humphrey’s book Managing the Software Process was published in 1989, it included a chapter on “inspections,” stating the intent of the maturity framework more precisely. As we worked on formalizing the framework in what became the Capability Maturity Model® for Software, we considered a number of ways of expressing this concept in a general way. Inspections are a powerful review technique, but including a specific technique in a general-use model such as the CMM was feared to be too prescriptive.

At one time in building the CMM, we considered using a continuous architecture similar to that used in ISO/IEC 15504 (Software Process Assessment). When prototyping that approach, we considered having the review technique evolve from technical reviews to walkthroughs to inspections. In the end, we rejected this approach in favor of the staged architecture used in Software CMM v1.0, with key process areas at different maturity levels that capture the vital few issues from an organizational intervention perspective.

When defining the level 3 key process area, we chose a generic term – peer reviews – that covers a broad range of collegial reviews, from walkthroughs to inspections. The implementation is selected by the organization. The decision as to what peer review technique is appropriate for what work product in what life cycle phase should be determined by the organization in light of its business objectives. Since the published data from many surveys suggests that inspections are both the most formal and most effective form of peer review (walkthroughs typically have a return-on-investment of 3:1 and inspections 5:1), we would expect most organizations to add inspections as one of the tools in their kit as they mature.

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The definition of “peer” has been somewhat confusing to some. Designers, coders, testers, and other software professionals can be considered peers of one another. Some associated engineering disciplines who have adopted CMM concepts have rejected the term “peer review” in favor of “defect review” because of the connotation of a review of peers (performance evaluation) rather than a review by peers.

Managers, who have hiring, firing, promotion, and raise-granting authority, are not peers. Their participation in “peer reviews” can have a chilling effect on the performance of the review. Use of inspection data by managers in performance evaluations has even led to the use of “pre-reviews” – reviews held before the inspection to remove defects that could reflect badly on the producer of the work product. The combination of pre-reviews and inspections, when poorly thought out, is an inefficient way of removing defects or building knowledge within the software team. Some teams have included customers in their peer reviews, which can have a similar counter-productive effect.

An organization should choose the peer review technique(s) and terminology that are best suited to achieving its business objectives and compatible with its culture. From a CMM perspective, the best decision is one driven by data. In one instance, an organization wanted to use 1-on-1 reviews by managers for peer reviews. When told that this was an unacceptable definition of a “peer review,” they objected to the extent that they ran a pilot of peer reviews as defined in the CMM... and found that real peer reviews are not only more effective, but they also find more substantive kinds of defect, i.e., content as opposed to format. Peer reviews is meant to be a broad concept, but it does not have its bounds.

Based on data from surveys and workshops, high maturity organizations typically perform peer reviews, as is required to be a level 3 organization. Much of the data used at level 4 comes from peer reviews. Most high maturity organizations perform inspections, the most formal variant of peer reviews, because of their emphasis on collecting data and the associated process rigor, but many use both informal peer reviews (e.g., walkthroughs) and inspections. There are many different forms of peer review and several variants of the inspection process. As research into peer reviews continues in the empirical software engineering community, new variants will undoubtedly be proposed.