

# Evaluating Artifact Quality from an Appraisal Perspective

Emanuel R. Baker  
Matthew J. Fisher  
Charlene C. Gross  
Gerald W. Miller, Editor

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## Abstract

A question currently being argued throughout the appraisal community concerns evaluation of artifact quality during Standard CMMI<sup>®</sup> Appraisal Method for Process Improvement (SCAMPI<sup>SM</sup>) appraisals. Different, conflicting opinions on whether evaluation of artifact quality during a SCAMPI is appropriate run from an extremely vigorous “no” to an equally vigorous “yes!” In other words, some lead appraisers and teams believe artifact quality is totally outside the scope of a SCAMPI appraisal. Other appraisers and teams believe that evaluating artifact quality is an integral part of the SCAMPI.

This technical note examines the various opinions in an attempt to resolve the confusion.

The main issue appears to be linked to word definitions—specifically, a lack of agreement among SCAMPI lead appraisers about what “quality” means in the SCAMPI context. This report notes that earlier writings on the subject focus on the problem of defining the attributes of artifact quality in appraisals. Three attributes—appropriate, adequate, and reasonable—are recognized throughout the community as applicable to the quality of artifacts. However, these attributes are not defined, creating the opportunity to apply subjective rules where objectivity is critical. With this information in hand, we can initiate an effort to provide more clear-cut, succinct guidance on the application of quality attributes to appraisal artifacts. This effort will enable Lead Appraisers and team members to inject greater objectivity into appraisals.

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# 1 Introduction

A question currently being argued throughout the appraisal community concerns evaluation of artifact quality during Standard CMMI Appraisal Method for Process Improvement (SCAMPI<sup>SM</sup>) appraisals. Different, conflicting opinions on whether evaluation of artifact quality during a SCAMPI is appropriate run from an extremely vigorous “no” to an equally vigorous “yes!” In other words, some SCAMPI Lead Appraisers<sup>SM</sup> and teams believe artifact quality is totally outside the scope of a SCAMPI appraisal. Other appraisers and teams believe that artifact quality is an integral part of the SCAMPI.

This technical note examines the various opinions in an attempt to resolve the confusion. We seek an answer to the following question:

*Following the current SCAMPI methodology, can and should the Lead Appraiser and appraisal teams judge the quality of artifacts examined during the appraisal?*

To explore the question, we have to understand several aspects surrounding quality and associated terminology:

- What do we mean by quality with respect to artifacts examined during an appraisal?
- What quality attributes does the SCAMPI Method allow to be applied to artifacts, if any?
- What would be the effect of applying the quality attributes to artifacts during a SCAMPI?

We postulate that the issues noted above stem from the lack of precise definitions of terms in appraisal documentation related to the word “quality.” To correct this, we introduce, in Section 2, terms that establish a context for the subsequent discussions of quality. In Section 3 we note assertions made by the appraisal community that reflect some differences in that community’s thinking about what appraisals can accomplish in determining process quality. Section 4 examines these opinions in light of the current appraisal methodology in a SCAMPI.

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## 2 Terminology

In this section, we introduce and define terminology related to the issue of artifact evaluation, specifically the term *quality*.

### 2.1 Entities—Quality of What

The first question to answer: What entity are we seeking to evaluate for quality during an appraisal? Baker identifies several, such as product, process, artifact, activity, and service, to which we can apply quality evaluations [Baker 2007]. Certainly other entities exist for this application; the concept of quality is generally applicable to almost anything, tangible or intangible. Each entity may have very different quality attributes being evaluated depending on one's perspective. An appraiser must first identify the entity or entities for which the quality is to be evaluated—and, critically, the associated quality attributes to examine to establish an evaluation approach.

From Baker and the question at hand, the following is the focus of our discussions:

- Artifacts that make up the direct or indirect objective evidence are the entities whose quality we wish to attempt to judge.
- The SCAMPI Method Definition Document (MDD) can provide a list of the needed quality attributes that can be applied to the artifacts for a more objective quality evaluation than can be obtained through the consensus of individual teams.
- This evaluation approach can result in support for reporting on the quality of the artifacts as part of the appraisal. (How to use this information is a decision left to the organization being appraised.)

### 2.2 Quality (What Do We Mean by Quality?)

Cooper provides an operational definition of quality:

*Quality is the degree to which an object (entity) [e.g., process, product, or service] satisfies a specified set of attributes or requirements [Cooper 2002].*

This identifies “specified requirements” as the quality attributes to be used. The attributes or requirements are to be specified and must adhere to the normal rules for requirements description such as being consistent, clearly stated, testable, or measurable (quantitative in some way).

Significant here is the concept of completely defining the quality attributes being sought. In order to understand the quality of an entity, the context<sup>1</sup> for the quality attributes must be defined and specified. This concept is embedded in the following statement:

*Just as beauty is in the eye of the beholder, so is quality [Baker 2007].*

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<sup>1</sup> Context includes criteria to define quality in quantitative terms and the associated measurements of quality.

Consequently, a set of attributes that one community deems important as a measure of quality may not be deemed important by another community. Rather, each community is likely to have its own set of attributes and attribute values with which to measure quality. This point becomes critical when organizations are asked to establish baselines and prediction models used to help manage statistically the product's quality and process performance during development.

Overall we must describe the entire context of the quality we are looking for to be able to measure or otherwise judge the quality of an entity.

We explore these quality concepts next in the context of appraisals.

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### 3 A Review of Appraisers' Opinions

The following statements summarize opinions of the appraisal community on the subject of whether an appraisal evaluates artifact quality.

Some Lead Appraisers and teams assert the following:

*An appraisal team does indeed evaluate the quality of an artifact. Since the CMMI practices describe the characteristics of effective processes, artifacts that address implementation of these practices are, by definition, effective. Since effectiveness is a quality attribute, the artifact is subject to an evaluation of quality.*

Other Lead Appraisers and teams profess the following approach:

*Quality attributes such as effectiveness are reserved for practice execution. If quality attributes apply to process and practice execution, and the artifact is entirely separate from practice execution, then there are no quality attributes that can be applied to the artifacts.*

Still other Lead Appraisers and teams assert the following view:

*Sooner or later the appraisal team must establish a consensus view on what is reasonable to expect, since it is only the presence of that consensus view that permits a determination of practice implementation to be made. Artifacts are typically judged for “adequacy” as an indication of their quality, where “adequacy” depends on the experience of the team.*

These statements illustrate some of the confusion surrounding evaluation of artifact quality.

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## 4 Judging Artifact Quality during an Appraisal

### 4.1 Artifacts

Appraisals require examination of artifacts because artifacts are considered evidence of model practice implementation of a process. Three terms are part of the appraisal community's perception of how to characterize these artifacts: *appropriate*, *adequate*, and *reasonable*. As such, they may be considered the quality attributes of the artifacts the appraisal examines.

An artifact is typically considered “appropriate” if it is applicable to the practice it represents. Thus, a requirements specification would not be appropriate to represent the output of the practice “develop a project plan.”

Of the three terms, only “adequacy” is further elaborated in the SCAMPI MDD as “adequate to substantiate the implementation of a practice” [MDD 2007].

However, there does not seem to be any further definition of each of these terms in the MDD. The presumption by many is that the appraisal team would apply their experience to help determine the definition and be able to judge the quality of the artifact.

Thus, evaluation of an artifact's “adequacy” depends on the experience of the team, and as asserted, “Beauty is in the eye of the beholder.”

Lastly, the team might be able to define “*reasonableness*” of the artifact. But that takes us again into subjective evaluation of artifacts. This is similar to the above evaluation of artifact adequacy being dependent on the experience of the appraisal team.

Definitions of quality attributes in the CMMI<sup>®</sup>-DEV glossary do not provide relief or additional insight. For “adequate” the glossary states the following:

*This word is used so that you can interpret goals and practices in light of your organization's business objectives. When using any CMMI model, you must interpret the practices so that they work for your organization. This term is used in the goals and practices where certain activities may not be done all the time. (See also “appropriate” and “as needed.”)*

The terms “appropriate” and “as needed” in the CMMI glossary simply repeat the above statement and are therefore treated as synonyms for adequate. The statement itself is not a definition in the usual sense, but it does illustrate that an organization can or should use the terms relative to the practices it implements. For example, if an organization defines an artifact as being adequate relative to its business goals, can the appraisal team judge the artifact otherwise? (Since “appropriate” and “as needed” are used synonymously, this fact could also be a confusion factor.)

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## 4.2 Simple Example

A simple analogy is to apply the three terms to the following scenario. We will use the following practice as an example:

*Have a substantial breakfast before 9 a.m.*

During the appraisal, the team identified an artifact that shows that the organization has a substantial dinner after 4 p.m. This artifact is not considered appropriate because it does not relate to the practice. Further it does not substantiate implementation of the practice, so it is not adequate. The quality of this artifact's attributes is considered substandard.

Therefore, we may conclude that the artifact is neither appropriate nor adequate.

Being a conscientious group, the appraisal team continues to look for and finds another artifact to address the breakfast requirement. It turns out to be an empty glass that once held milk, and the organization confirms that its employee breakfast consists only of milk. The artifact is appropriate because it addresses breakfast; and it is adequate to substantiate the implementation of the practice. But is it reasonable to accept a glass of milk as the sole ingredient for a substantial breakfast? Who will determine this?

Using the team's collective experience and knowledge of the ingredients of a substantial breakfast, the decision is likely to be that this artifact cannot be considered reasonable as proof of a substantial breakfast.

Note that our practice example can be translated any number of ways depending on culture and common practice. Likewise, organizations can implement practices any number of ways, based on business objectives. If the organization states that a glass of milk is its definition of a substantial breakfast, what will the appraisal team decide? Without a quantitative basis to explain this and any other term, there is no way to provide objective basis for team judgment and defense of team judgment. There is an argument that if the organization uses the artifact, then it is deemed reasonable. However, appraisal teams must be careful that the "use" is then reasonable to ensure the organization doesn't just state that the artifact is used.

Of course, even for this example there are other scenarios surrounding the artifacts that we could pursue.

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## 5 Conclusions

Let's consider the original question: Can and should an appraisal team evaluate the quality of artifacts discovered during SCAMPI appraisals? We believe the answer is a qualified yes. There are three attributes—appropriate, adequate, and reasonable—that are recognized throughout the community as appropriate to apply to artifact quality. These three attributes are repeated throughout the documentation for conducting the SCAMPI family of appraisals (A, B, and C), as well as throughout the CMMI model itself.

However, a close review of documents that guide appraisal teams shows that these quality attributes have been designated but never clearly defined. The CMMI-DEV glossary uses the same definition to define the terms adequate, appropriate and a third term—"as needed." This glossary does not include the term reasonable, so the Webster Dictionary definition of the term takes precedence, according to CMMI rules for definitions. That definition of "reasonable" is (a) "being in accordance with reason (a *reasonable* theory) and (b) not extreme or excessive."<sup>2</sup> Applying this definition to our earlier breakfast example, we can say that it is not reasonable to define a glass of milk as a *substantial* breakfast; and therefore, the artifact does not support the quality attribute of being reasonable.

Unfortunately, we are still left without a definitive explanation for the terms "adequate" and "appropriate." There have been indications in some of the literature that this lack of explanation was a conscious decision to allow the terms to apply to a variety of environments and a variety of approaches. However, the lack of definition creates the opportunity to apply subjective rules where objectivity is critical.

We recommend that further research be conducted to determine the requirements used by the community to define artifact quality attributes. We also suggest that a review of the literature may also provide material on commonly held definitions for these terms in the context of a SCAMPI appraisal. With this information in hand, we can initiate an effort to provide more clear-cut and succinct guidance on the application of quality attributes to appraisal artifacts. The results of this effort will enable Lead Appraisers and team members to inject greater objectivity into the appraisal process and to build a firmer foundation for evaluating the quality of artifacts that they must review.

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<sup>2</sup> Definition from Merriam-Webster's Online Dictionary (<http://www.merriam-webster.com/dictionary/reasonable>)

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