START

Selected Topics in Assurance Related Technologies

Volume 6, Number 2

Performance-Based Requirements (PBRs)

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Introduction
Historically, military procurements were characterized by requirements (in standards and specifications) that not only governed what was being procured, but also provided detailed instructions on how the procured item was to be designed and manufactured. For example, contracts routinely specified what parts could be used, how manufacturing processes were to be performed, what plans were required, and so forth. A key part of Defense Acquisition Reform has been a move from this “how-to” type of contracting to performance-based contracting. Inherent in this approach is the need for and reliance on performance-based requirements (PBRs).

The concept of performance-based service contracting has been a part of government-wide contracting for a long time. In fact, OFPP Policy Letter 91-2 (April 9, 1991) defined performance-based contracting as a means of “structuring all aspects of an acquisition around the purpose of the work to be performed as opposed to either the manner by which the work is to be performed or broad and imprecise statements of work.” Yet, with occasional exception, it was common practice within the Department of Defense (DoD) and the military services to tell contractors what was needed, what to do, and how to do it. Under Defense Acquisition Reform, performance-based contracting and the use of PBRs have become realities within DoD. In large measure, the implementation of performance-based contracting has been supported by the Defense Standardization Program, under which the complete system of military specifications and standards has been changed.

Under the Defense Standardization Program, many specifications and standards have been rescinded, converted to performance-based documents, changed to guidance documents, and so forth. Greater reliance is being placed on the use of commercial standards and specifications. Finally, military procurement agencies cannot impose any military or commercial standards without a waiver. Compare this policy with its predecessor under which the decision not to use many military standards required a waiver.

Concept
It has been stated that performance-based contracting requires the use of PBRs. Just what is a performance-based requirement? As discussed in SD-15 (See “For Further Study,” 2.b), performance-based requirements describe the required results and provide criteria for verifying whether or not these results have been met. Performance-based requirements do not state the methods for achieving the required results. Ideally, they have the following characteristics:

1. Requirements are stated quantitatively
2. Requirements are verifiable
3. Interfaces are stated in sufficient detail to allow interchangeability with parts of a different design
4. Requirements are material and process independent

Table 1 compares performance-based requirements with non-performance-based requirements.
Four types of performance specifications are used by DoD: commercial item descriptions (CIDs), guide specifications (GSs), standard performance specifications (SPSs), and program-unique specifications. Performance specifications are also categorized by the type of item being acquired. There are material specifications, component specifications, and system specifications.

### Developing PBRs

Customers have needs or expectations regarding the products they buy. These needs include the function(s) to be performed and the level of performance (stated quantitatively or qualitatively). Identifying these needs is the first step a contractor must take in developing a product. Often, the customer needs include all factors that influence performance. Some of these factors may be well beyond the ability of the contractor to affect in any meaningful way. Consequently, it makes sense that requirements derived from the customer’s needs reflect only those factors within the control of the contractor.

In the commercial world, the customer’s requirements almost always are stated as needs and any necessary translation is done by the manufacturer. For example, consumers may want (i.e., need) an automobile that “feels comfortable.” Industry must interpret this need and translate it into meaningful design requirements. In the military world, the customer’s needs are explicitly stated in an Operational Requirements Document. The acquisition agency then develops a procurement package that includes system-level requirements derived from these needs.

In general, the process of developing requirements can be described in Figure 1.

As indicated in Figure 1, performance-based requirements are derived from the customer’s needs. This derivation, or translation from needs to requirements, is not an exact science. Various methods and tools are used, as indicated in the figure. Quality Function Deployment (QFD) is one such tool. QFD is a tool for translating defined customer requirements into appropriate design requirements at each stage of design and development. Commercial companies often use benchmarking to determine the level of performance required to remain competitive or expand market share. Comparisons with previous products is also a method used to develop the requirements. Whatever method is used, the goal should be to develop requirements that are quantitative and verifiable.

<table>
<thead>
<tr>
<th>Area of Comparison</th>
<th>Performance-based Requirements</th>
<th>Non-performance-based Requirements</th>
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<tr>
<td>Purpose</td>
<td>Describe functions product is to perform and level of performance</td>
<td>Describe how product is to be designed and manufactured</td>
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<tr>
<td>Key Criteria</td>
<td>Describe means for verifying performance</td>
<td>Describe means of ensuring specified processes are followed</td>
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<td>Design Latitude Given to Contractor</td>
<td>Allow contractor to determine best ways to achieve results</td>
<td>Force the contractor to use prescribed methods and approaches</td>
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<tr>
<td>Responsibility</td>
<td>Responsibility for results clearly belongs to contractor</td>
<td>Responsibility for results shared by customer and contractor</td>
</tr>
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Table 1: Comparing Performance-based Requirements with Non-performance-based Requirements
For Further Study:

1. Web Sites. Additional information on Performance-based Requirements and related topics can be obtained from the following web sites.
   f. http://members.aol.com/drmassoc/QFD.html
   g. http://www-far.npr.gov/BestP/BestPPBSC.html

2. Publications:

Other START Sheets Available:
   94-1 ISO 9000
   95-1 Plastic Encapsulated Microcircuits
   95-2 Parts Management Plan
   96-1 Creating Robust Designs
   96-2 Impacts on Reliability of Recent Changes in DoD Acquisition Reform Policies
   96-3 Reliability on the World Wide Web
   97-1 Quality Function Deployment
   97-2 Reliability Prediction
   97-3 Reliability Design for Affordability
   98-1 Information Analysis Centers
   98-2 Cost as an Independent Variable
   98-3 Applying Software Reliability Engineering (SRE) to Build Reliable Software
   98-4 Commercial Off-the-Shelf Equipment and Non-Development Items
   99-1 Single Process Initiative

To order a free copy of one or all of these START sheets, contact the Reliability Analysis Center (RAC), 201 Mill Street, Rome, NY, 13440-6916. Telephone: (888) RAC-USER (888 722-8737). Fax: (315) 337-9932. E-mail: rac@iitri.org. These START sheets are also available on-line at http://rac.iitri.org/DATA/START in their entirety.
Future Issues:
RAC’s Selected Topics in Assurance Related Technologies (START) are intended to get you started in knowledge of a particular subject of immediate interest in reliability, maintainability and quality. Some of the upcoming topics being considered are:

- Reliability Growth
- Accelerated Testing
- Mechanical Reliability
- Software Reliability

Please let us know if there are subjects you would like covered in future issues of START.

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About the Reliability Analysis Center
The Reliability Analysis Center is a Department of Defense Information Analysis Center (IAC). RAC serves as a government and industry focal point for efforts to improve the reliability, maintainability and quality of manufactured components and systems. To this end, RAC collects, analyzes, archives in computerized databases, and publishes data concerning the quality and reliability of equipments and systems, as well as the microcircuit, discrete semiconductor, and electromechanical and mechanical components that comprise them. RAC also evaluates and publishes information on engineering techniques and methods. Information is distributed through data compilations, application guides, data products and programs on computer media, public and private training courses, and consulting services. Located in Rome, NY, the Reliability Analysis Center is sponsored by the Defense Technical Information Center (DTIC). Since its inception in 1968, the RAC has been operated by IIT Research Institute (IITRI). Technical management of the RAC is provided by the U.S. Air Force’s Research Laboratory Information Directorate (formerly Rome Laboratory).