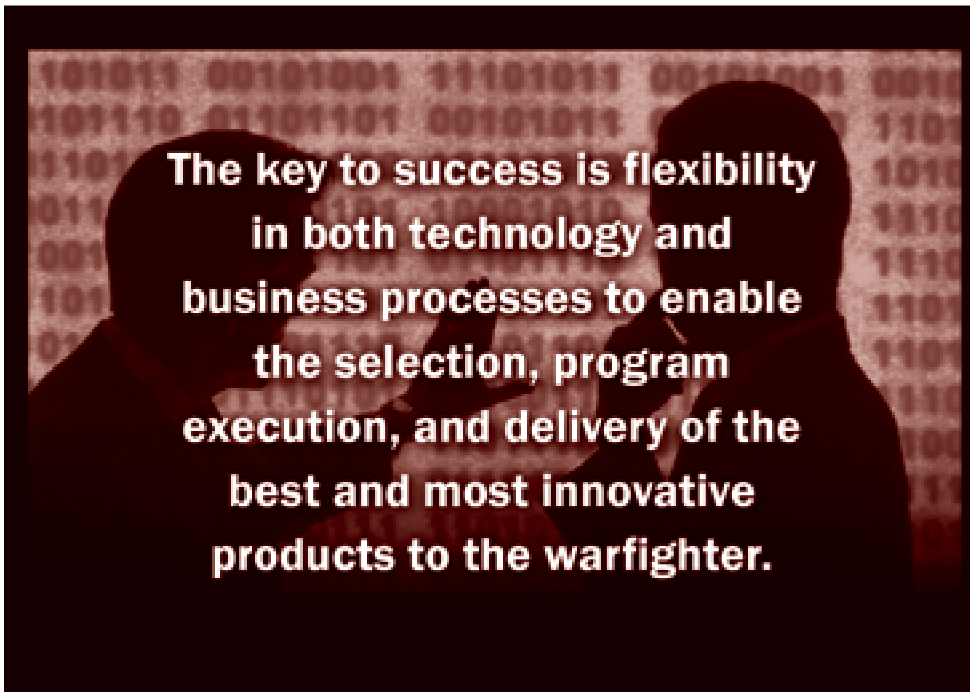
Peer Reviews, Advanced Capability Build Process, and Open Architecture Processes

William M. Johnson

The Naval Open Architecture initiative represents an entrepreneurial approach to acquiring and fielding capabilities to the warfighter that takes advantage of new technologies as they emerge. This approach must be affordable, and it also must allow the Navy to maintain a decisive advantage over the United States' increasingly sophisticated and diverse adversaries. The key to success is flexibility in both technology and business processes to enable the selection, program execution, and delivery of the best and most innovative products to the warfighter. This article provides a practical and proven approach to leveling the playing field when evaluating possible technologies. Although the examples given are from the Navy, the concepts and processes can be made applicable throughout the Department of Defense.



Reviewing Alternate Solutions

In the late 1990s, the submarine community's Acoustic Rapid Commercial Off-The-Shelf Insertion program developed a very successful process to evaluate possible technologies, featuring peer reviews of alternative solutions. In this process, the performance of each alternative is measured using actual system data from operational deployments. Both open data sets (signatures known to the developer prior to user review) and closed data sets (signatures revealed only during testing) are used in the evaluation process. When data from operational deployments are not available, then a simulation must be used. However, it is imperative that this simulation faithfully replicate the real-world environment.

Peer review groups are components of a larger working group—the system working group—whose primary objectives are developing and overseeing the implementation of a coordinated set of plans and processes aimed at resolving specific system performance issues and identifying system shortfalls, selecting the best solutions, and establishing the proper feedback processes and tools to enable a data-driven build-test-build approach to continuous sub-system performance improvement. A notional model of a system working group is shown in the graphic on page 33.

The July 2006 *Naval Open Architecture Contract Guidebook* defines a peer review as "a refereed, open process used to assess technical approaches proposed by or being used by vendors. Reviewers are normally drawn from a cross section of the community of interest with government, academia, and/or private sector entities such that the membership (taken as a whole) is unbiased and impartial.

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An 'independent peer review' is one where the membership includes individuals from outside the program being reviewed. Membership is structured to achieve a balanced perspective in which no one organization is numerically dominant. Consensus is a goal, but the peer review group's findings or recommendations to the decision maker normally consist of a majority opinion and a documented dissenting opinion if the minority chooses to formalize its concerns. This assessment process normally results in findings or recommendations presented to the decision maker with the authority and responsibility to select or make the final course of action or decision." The final decision maker is ultimately a Navy program executive officer.

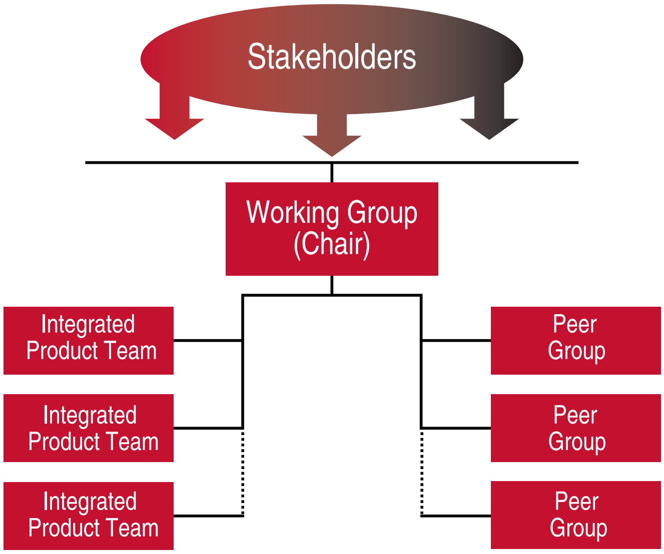
How Peer Reviews Work

Peer review groups address the functional and technical issues leading to recommendations for improvements based on the Navy fleet's inputs. The peer review groups provide recommendations to the system working group on research and development priorities, including tasking requests for each funded organization, and also provide independent test and evaluation of alternatives. Peer review groups collectively survey, develop, and test the alternatives and monitor progress through completion of the evaluation process. The program office lead of the system working group determines what peer review groups are needed and then identifies the chairperson and membership for each group.

Peer Review Membership

Selecting the leadership and the membership of a peer review organization is critically important. Membership selection criteria are based on the talents, experience, and capabilities of the individuals rather than on their organizational ties. Peer review teams should be formed of experts from government, industry (including competing solution providers), and academia.

System Working Group



Typically, a peer review group is composed of 10 to 12 members. These experts are drawn from a pool of resources that are funded through existing contractual relationships with the government—thus their participation doesn't represent a new cost. It is the responsibility of the program office, working with the peer review group chair, to ensure that the composition of the group is appropriate and effective. Membership changes can and should be made to address group performance issues.

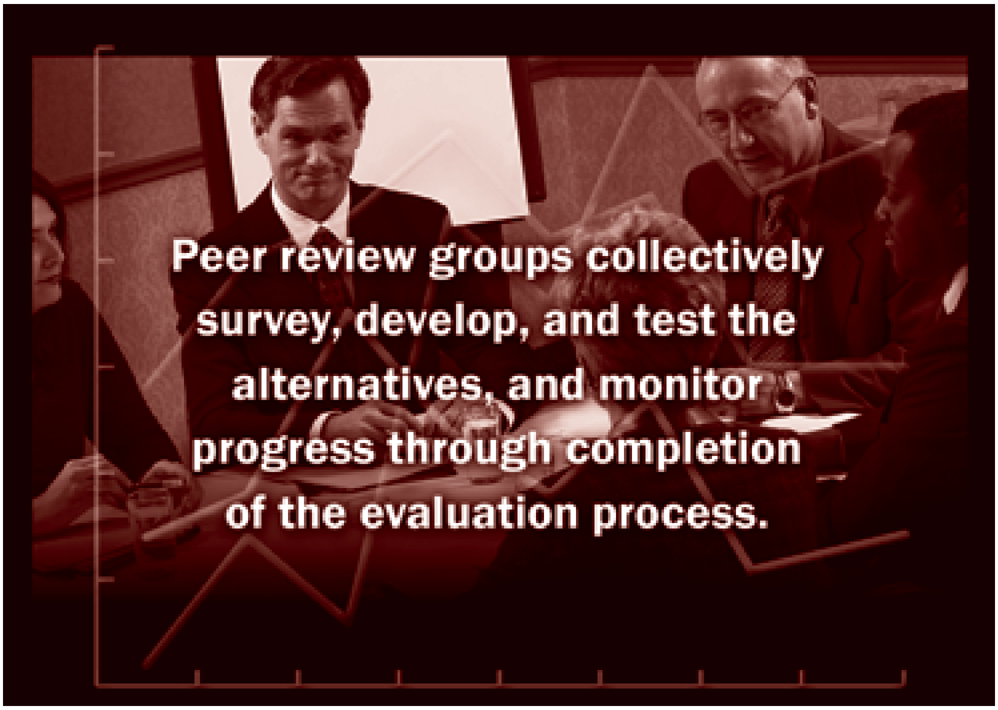
The Successful Peer Review Group

Well-run peer review groups build early and interactive bridges between the operational fleet, acquisition communities, and technology providers by making transition recommendations based on performance, with oversight from the system working group. When properly implemented, peer review groups solicit the best ideas available from a broad knowledge base. Membership in peer review groups is based on technical credentials, and their chairpersons are chosen typically by the Navy program sponsor or their designated representative for their objectivity and leadership ability. Members have equal status within the group and generally are drawn from a diverse set of organizations. Because of this diversity, the peer group must develop and use common metrics for performance evaluations. Usually, significant up-front time is spent defining relevant metrics and ensuring that the definitions are specific enough to enable all organizations to compute the metrics in the same manner.

The peer review process works best as a performance meritocracy in which candidate technologies are evaluated with common metrics and common data (open and closed). A peer review process should foster spirited debate between participants presenting their own views based on their organizations. Peer group members should solicit information from other organizations that are brought in via an open process.

It often becomes apparent that the best solution is the result of aggregating many inputs. This collaborative development may be difficult to manage due to the pride of ownership of the parties involved, but in the end, results in a better product.

Incorporating peer reviews into system acquisition life cycles entails a significant change in culture—one that recognizes that no one organization has all the answers and that collaborative and competitive processes with free-flowing information are efficient for realizing improvements cost effectively. Provisions for conducting peer reviews should be built into a program's acquisition strategy, request for proposals, and the associated contractual documents. However, peer reviews are not intended to be a bureaucratic exercise. Rather, peer reviews are put together only when the program reaches a juncture at which decisions or recommendations must



be made among technology or business approaches to solve emerging warfighter issues.

The ACB Process

Peer reviews are an essential part of the overall advanced capability build (ACB) process, which ensures adequate requirements definition and testing at the advanced development stage. This process represents a fundamental change in Navy acquisition strategy by seamlessly coupling advanced development to engineering development, leading to significant savings through early technology testing, software re-use, and a reduction in lead time from concept to fleet introduction. What follows is a summary of the four basic steps required for ACB development.

Technology Evaluation

The first ACB step involves a survey of promising technologies from the research and development community. The goal here is to consider technology developed by the Navy, other DoD agencies, and industry to determine their tactical importance, maturity, expected performance, and computational resource requirement.

Technology Assessment

The next step is a test of relatively mature technologies that promise to provide performance improvements to the fleet. Using real-world data sets collected from U.S. Naval exercises and provided by the Office of Naval Intelligence, this testing provides a projection of technology performance under real-world conditions. Experience has shown that testing on synthetic, or developed, data is insufficient for uncovering the problems of many technologies in actual fleet use.

This step is unique in that the developers submit technology for testing with the expectation of useful feedback from the testing process. This step helps reduce risk, affording time to work technology and concept-of-operations issues asynchronously at the technology level before testing in an integrated system under more significant time constraints. Technology promotion to the next ACB step is based on successful performance as determined by the peer review group. In some cases, hardware technologies that are based primarily on commercial off-the-shelf components without extensive modification may satisfy this step's requirements through benchmark testing. At the discretion of the peer review group and with concurrence of the system working group, these technologies may be deemed suitable for integration into the system baseline without going through the third ACB step.

System Real-Time Implementation

In the third ACB step, technology is passed to an integration agent for incorporation into the target system. In order for this to occur, the system must meet the open architecture technical principles. The tests in this step are conducted by a test, evaluation, and assessment support group (TEASG) that is organizationally located within the system working group. This provides an opportunity to independently test for compliance with performance requirements as well as to verify the second ACB step results. It also serves to introduce fleet representatives to new features in an end-to-end context and provides for fleet feedback. Similar to the second ACB step, real-world data are used for this testing. Any identified issues resulting from the testing are forwarded to the integration agent for resolution prior to at-sea testing. Independent testing of the ACB product is a critical step in the build-test-build process. It ensures readiness for at-sea testing and provides confidence for the community contributors that their ideas have been implemented properly.

At-Sea Testing

The final ACB step involves an at-sea test, and it is conducted by the TEASG. This is the most important phase of testing prior to inclusion of the technology in the

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the metrics will likely be manipulated before they are reported, creating a false status.

The metrics for contractors should be developed jointly between the project staff and the contractor, although this can be very difficult and time consuming. It is essential, though, because the metrics must be acceptable to both, and the metrics have to show the status of the project using measurements that the contractor can control. If the metric is affected by something that the project staff does (such as the speed at which deliverables are approved/accepted), then the contractor is not going to accept the metric as a measure of his performance.

The metrics should be scaled to fit the project. A small project doesn't need several metrics, while a complex ship or aircraft design project would need many. Pick the ones that you need—and need is the operative word. Don't collect data just because you can. It's a waste of time and energy if it is something that you are not going to use.

Finally, choose the right metrics, even if it's hard to do. The wrong metrics are a waste of resources and may not be useful at all. They may even be misleading. If poor metrics are forced on you by someone higher in the chain, make the effort to show them a better alternative.

Metrics Software

There are plenty software products out there to assist you in tracking metrics for project management and portfolio management, including Artemis, Changepoint, CA Clarity™ PPM, DOORS, Primavera®, Planview®, and Microsoft® Office. Project managers must remember that these are only tools and need to be used wisely to get the data that's needed and not just to get data. A good metrics program should provide reliable, useful information for good decision making.

You may find that you need only a few metrics to measure the project's status. Don't be concerned if there are only a few. A large number doesn't necessarily make for better understanding or for good decision making. Too many metrics can make life confusing for the project team and cause people to manage the metrics rather than the product.

If you aren't using metrics, start. If you are, take a look at the ones that you are using. Are they worthwhile? Do they tell you what you need to know? If not, you had better take the time to determine the metrics that you really need. Otherwise you could find yourself and your project in deep trouble.

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system baseline. This test provides the opportunity to verify performance and collect calibrated data for future use. The TEASG is also responsible for the evaluation and assessment of the test results as well as the interpretation of the component level and the sub-system or system level results.

The at-sea tests conducted by the TEASG are not intended to serve as the system certification. System certification is accomplished by the program office via a separate testing effort following full integration of the ACB into the baseline system. However, this step is designed with certification in mind so that the program office can ascertain the level of certification testing required. In addition, representatives of the Navy's Operational Test and Evaluation Force participate in testing as independent observers, facilitating decisions regarding future certification testing. At completion of the testing, the system is delivered to the program office for incorporation into the system baseline.

Following the fielding of a system, the performance of system baselines is analyzed based on data collected during deployments in actual operational environments as part of an engineering measurement program (EMP). The EMP is designed to provide data to support future ACB spirals, to establish a new baseline capability to compare to future improvements, and to address real-world fleet issues in operational environments.

The keys to ACB success are

- Sharing of information across organizations to create the full story
- Data-driven testing (build-test-build)
- Significant fleet involvement
- Peer review of new developments
- Verification of technology prior to implementation
- Continuing assessments and measurements.

Well-constructed peer group reviews of candidate technologies and applications allow independent and unbiased decision recommendations that provide the best options to the program manager to meet the urgent needs of the fleet. Ensuring strong, independent leadership and a balanced group membership is a crucial part of an effective peer review process, as is the use of real threat data for the ACB process and performance evaluation. The four-step process has been demonstrated by the submarine domain to be both effective and efficient in achieving the desired goals and to be extensible.

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