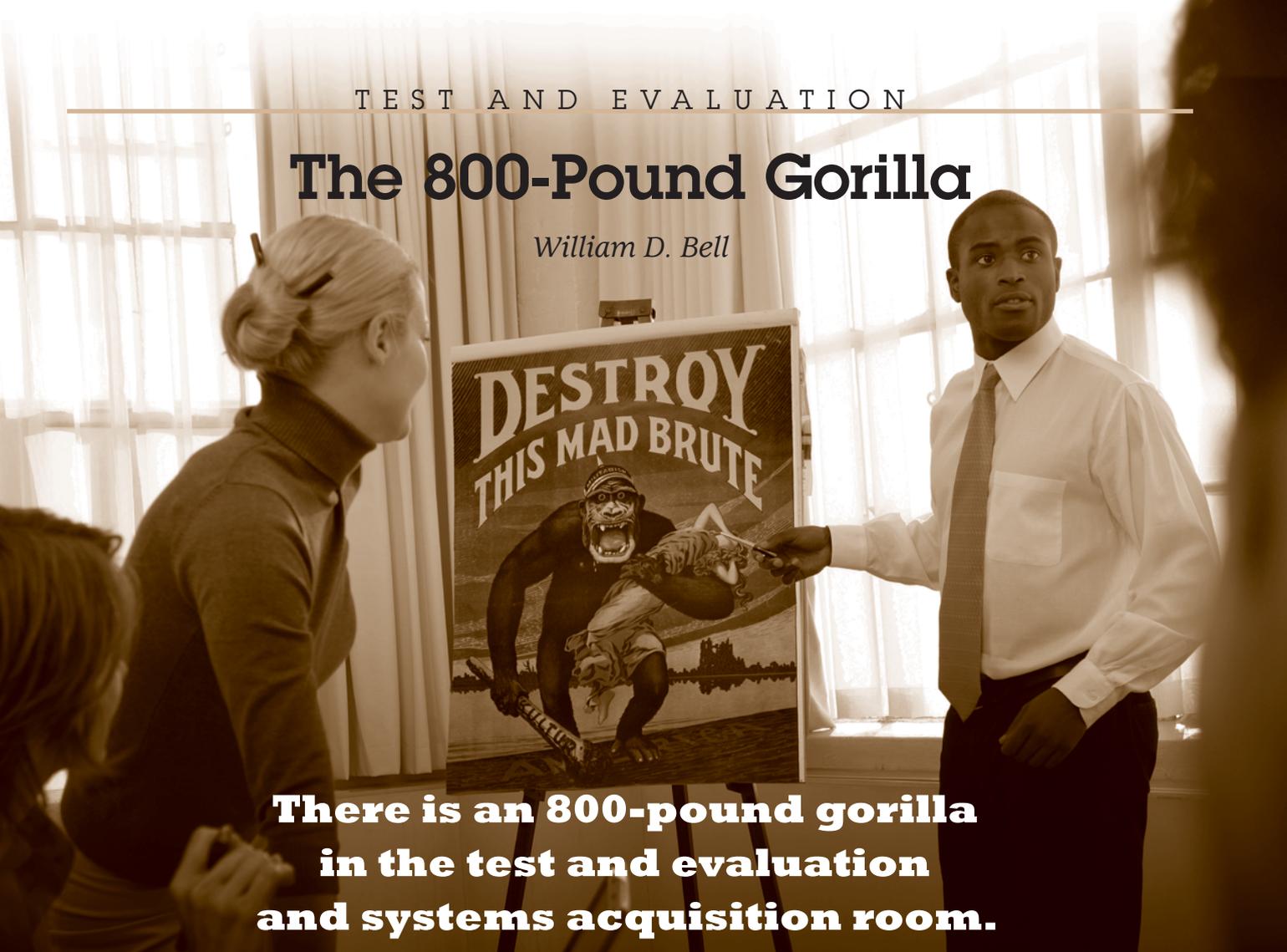


The 800-Pound Gorilla

William D. Bell



There is an 800-pound gorilla in the test and evaluation and systems acquisition room.

There is an 800-pound gorilla in the test and evaluation and systems acquisition room. This gorilla is rarely acknowledged, sometimes fed and patted, but most often ignored. He has been on the prowl for decades, and it is well past time to lock him up in the zoo. What is this so-called gorilla? It will be revealed in a moment, but first, a little background and perspective.

The Problem of Declining Success Rates

At the annual International Test and Evaluation Association Symposium in November 2007, numerous speakers alluded to the fact that in recent years, about half of all systems undergoing initial operational test and evaluation are at least partially not suitable or not effective, or both. A successful IOT&E is necessary for approval of full-rate production of a new system. In prior years, the IOT&E success rate certainly has varied, but overall has hovered at the 20-percent level of either partially or totally not suitable or not effective. At the symposium, Dr. Dave Castellano, deputy director for assessments and support,

Office of the Deputy Under Secretary of Defense for Acquisition and Technology, reported that over the past 10 years, Department of Defense systems have experienced a 33 percent cost growth as a result of research, development, test, and evaluation mistakes.

With all the modern day emphasis on systems engineering, why is DoD experiencing a downturn in IOT&E success? Is it due to the testers; the acquisition program management offices; or that darn gorilla, which is the typically poor or strained relationship between PMOs and testers.

The Gorilla—The PM/Tester Tussle

Have you ever been a part of a systems acquisition program office? If so, you know it involves high stress and a fast tempo. Often, a new capability is needed especially quickly. After all, we are under wartime pressures. Further exacerbating the situation, DoD acts as though it believes that it requires state-of-the-art technology to win a war—not always stated, but usually assumed. Add to this

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a program manager whose promotions or other career-enhancing changes depend on his or her program—or baby, if you will—successfully being developed or at least being relatively problem-free during the next two or three years. Then into the middle of this stress-soup comes a test and evaluation professional (a tester) who says the program did not have a successful test—the equivalent of saying a PM's baby is ugly. Furthermore, the PM likely perceives that the tester is wasting precious time and money performing tests to show that the baby is or may be ugly!

Know any testers? They have for too long been the Rodney Dangerfields—the comedian known for his “I don't get no respect” phrase—of the engineering community. Why? There are at least two reasons. First, in the 1960s, 1970s, and 1980s, the test group was where engineers were sent to await their retirement. Now those folks were not usually the majority of the group, but the perception that some testers were biding their time rather than being seriously engaged tainted the image of all testers.

The second reason is bullying by program offices. Testers need system requirements and specifications to use to build their test plans. The PMs, who are the keepers of those documents and keepers of the money, did not want the testers involved until the very last moment—ever—thus diminishing the modicum of respect testers might have otherwise received. Knowing that the PM did not think they were worth their cost, testers were—by golly!—going to show that darn PM that they could find lots of problems that needed fixing. Those are problems they would have found anyway, but when using those problems as a get-even ploy, the tester becomes an unhelpful pain until the problem is fixed.

So given this history—which is actually even more contentious, but you are being spared the gore—it is no surprise that the relationship between PMOs and testers is strained. Yet these two communities have been dueling for decades, and this strained relationship does not explain the recently degenerating IOT&E situation. In fact, there are many contributors to the recent decline in IOT&E results, and the PMOs and testers are uniquely qualified to turn this tide—but this can only happen if there is an end to the distrust and the beginning of trust and mutual respect.

Complex Systems Need Good Relationships

In a nutshell, system complexity, not the gorilla, is the ultimate culprit behind the decline in IOT&E results. Folks tout budget constraints, schedule pressures, incompetent engineers, slippery contractors, and so forth, but the root cause is the complexity of new and proposed systems; not just the systems themselves, but the environment in which they must perform. This is especially true as we try to benefit by applying new communication, computing,

and Internet technologies to our new systems. Network-centricity provides unparalleled capabilities to warfighters, but at the cost of added complexity.

That complexity is challenging the cognitive capabilities of many U.S. military operators. Such systems may be able to pass specification verification, but when operators try to use them effectively in harsh environments—both physically harsh environments and those induced by the fog of war or the fog of competition—the systems are not effective or suitable. So while complexity of systems has increased, the relationship between PMOs and testers has not changed.

Why Relationships Matter

It is hard to imagine the specifics of the requirements in a complex system. It is difficult to get the requirements stated in a succinct and understandable way. It is impossible to develop appropriate specifications from poorly written requirements. The more complex a system, the greater are the opportunities for human error. From the definition of the need; to the requirements decomposition; to the building, coding, and integration, the difficulty skyrockets. The increased complexity causes more requirements, more applications, more environments, more failure modes, and increased sustainability challenges. In this environment, there is no time for Hatfield-McCoy feud-like behavior (meaning the famous 19th century U.S. family feud). Testers and PMs have to pull together.

Before the late 1990s, when government-staffed PMOs had significant roles in the design and development of systems, PMOs could tell the end users that their requirements were unreasonable. Now contractors, who are the system developers or lead system integrators, would never do that because there is another contractor right around the corner who will say that he can do it and will thus win the contract. Therefore, almost every user requirement gets placed on a developing system without a good reality check. Engineers, scientists, and managers are guessing on feasibility, methods, and resources until well into the development effort, when it is often too late and too expensive for significant changes. If you've ever underestimated your needs in a home project, you'll agree with me that it is human nature to underestimate, so developments almost always overrun resources. However, guessing can also cause designs and developed systems to be cumbersome, inadequate, or even wrong for the requirements. Such systems will fail to be effective or suitable in IOT&E.

When Teamwork Happens

Here is what can and often does happen when testers and PMs work as one group from the very beginning of the acquisition process:

- Requirements that are beyond the state of the art for field deployable systems are questioned and elimi-



nated. PMs often hear from their potential prime contractors that something can be done. The contractor is afraid of losing business if he says otherwise. Naturally, PMs are hoping for the positive answer, but testers are accustomed to challenging and questioning things. Working together, the PM and tester can sort out truth from fiction.

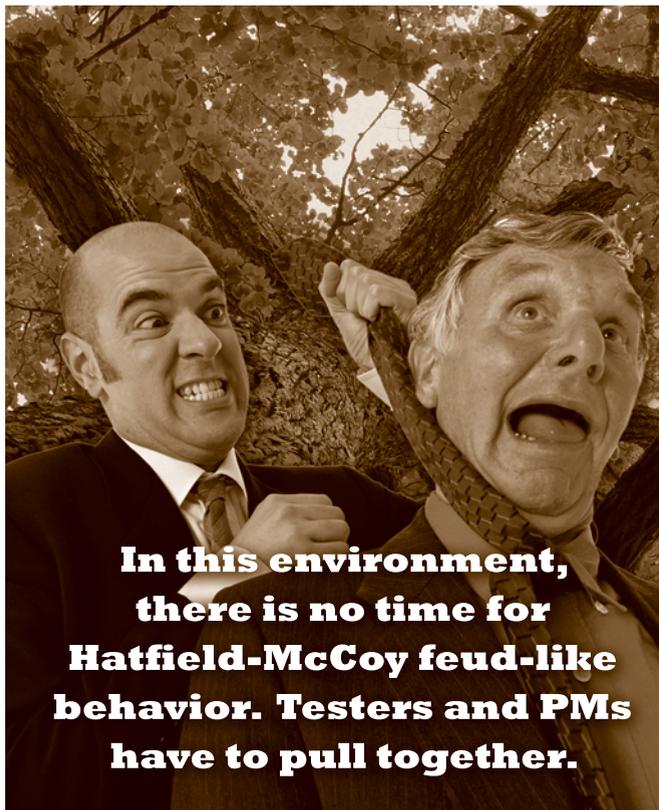
- The requirements are stated in a way that will ultimately be verifiable. The tester will make sure of this because he has to provide the test to support this verification.
- A verifiable requirement is also one from which a verifiable specification can be written.
- Verifiable requirements and specifications are readily understood—i.e., are not susceptible to misinterpretation during the requirements flow-down process.
- Appropriate testing-related schedule, budget, infrastructure, other resources, and personnel are planned early and become a part of such documents as the test and evaluation master plan (TEMP), the request for proposal (RFP), the initial capabilities document (ICD), and the systems engineering master plan (SEMP).
- Contractors can be prevented from under- or over-bidding the test and evaluation part of their proposal because testers, as a respected part of the proposal evaluation team, can assure test realism in the proposal, or at least in the negotiations.
- Testers can help make the system integration lab a useful preparatory time and place for systems testing.
- Testers can encourage and double check that proper reliability growth testing is planned and executed—which is a big contributor to successful IOT&E.

- PMO testers—when they exist—make the best interface to the independent operational testers in terms of communication between the IOT&E executors and the program office.
- Testers can plan and execute developmental test and evaluation thoroughly enough so as to virtually assure success in IOT&E. This is especially valuable in suitability and interoperability issues. The PMO testers learn what the independent IOT&E testers are planning and dry-run those tests to see how the system performs. Thus, the PM has an excellent idea that his or her system will pass IOT&E before turning over the system for IOT&E.
- PMOs—after a small initial investment—save huge sums of money and significant schedule reductions compared to the status quo.

These items explain why Charles McQueary, director of operational test and evaluation, and John Young, under secretary of defense for acquisition, technology and logistics, signed a joint memo Dec. 22, 2007. The memo states that test and evaluation “expertise must be brought to bear at the beginning of the system life cycle to provide earlier learning about the strengths and weaknesses of the system under development.”

Locking Up the Gorilla

We need to put the 800-pound gorilla of bad PM and tester relations into the zoo at the start of a program. The gorilla has been a problem way too long.



The solution to this problem starts with mutual respect. For example, testers must acknowledge the pressure and constraints under which PMs work. Testers must be timely, helpful, and truthful. Instead of believing that a test is not successful if they cannot find a wart on the baby, testers must be the bearer of good news whenever it is appropriate. Testers should be willing to suggest workable solutions to found problems.

On the other hand, PMs and their PMOs have to start taking the long-term or enterprise view. That is, it is not OK for a PM to delay the discovery of technical, schedule, or budget problems until the office has no choice but to acknowledge such problems. PMs need to be rewarded for solving problems, not for postponing the discovery of problems. An enterprise view will look for the best solution for the warfighter, not just the cost and schedule concerns of the PMO. Also, PMs must recognize that testers are just as savvy and just as concerned about a program’s success as they are, and PMs must treat them as partners in that success. Therefore, PMs must value testers’ input and perspectives—and should not shoot the messenger! After all, the messenger may have good or at least useful news! Testers provide knowledge, and a recent Government Accountability Office report on weapon system acquisition cites lack of knowledge as a major problem with defense acquisition programs.

Some of you may recognize that the solution to the problem of unsuccessful IOT&E, in this age of complex systems, could be described as the implementation of an integrated product team as envisioned when IPTs were first invented and not as they exist today. When IPTs were first invented, they contained valued members from the specialty and testing engineering communities. These folks had both the responsibility and authority to make sure the disciplines they represented were considered and included in the design process. Today’s IPTs often downplay and marginalize these disciplines. This construct—again as originally created—would institutionalize (that is make it the norm) the respected and valued involvement of testers and many other minimalized engineering specialists.

The United States is at war, and the warfighters have immediate needs that include new and complex systems to accomplish their mission while staying safe. The aim of this article is for folks to see a solution to a serious problem that hampers the successful creation of such systems. With an attitude change from disdain to mutual respect, the talented combined teams of PMOs with testers can meet the challenge of defining and developing complex systems.

The author welcomes comments and questions and can be contacted at wbell@mitre.org.