Test Faces The Knowledge Gap

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Chances are your company has continuous training programs for various engineering disciplines, such as hardware design and software engineering. But do you have formal training for test engineering? Basic principles of test engineering aren't taught in engineering schools, and increased layoffs and early retirements among experienced engineers are adding to the knowledge gap.

Young engineers lack both mentors and training on basic principles of test engineering. Yet test engineering remains a critical part of your development cycle, gating product releases and ensuring the quality of the products you produce. How can you fill this looming gap?

Test engineering has become an increasingly complex discipline. As products grow in complexity, design cycles shrink, and the demand for quality continues to grow, test engineering can become a bottleneck for achieving your company's goals. When viewed more strategically, however, test is an integral part of the design process—adding value through the feedback it provides into the process and the quality it "adds" to the product by screening failures in manufacturing.

Test engineering is also inherently multidisciplinary, combining software development, electrical and mechanical design, and sometimes even a little finance. It takes a skilled engineer to test products both efficiently and effectively.

Training Programs

But when it comes to its study and training, test engineering lacks the rigor of other disciplines. Rigorous principles certainly exist in subjects such as measurement theory, metrology, test coverage, and repeatability/reproducibility. Yet this information is rarely taught formally, but rather learned on the job, often under the tutelage of a more experienced test engineer.

National Instruments recently surveyed our advisory council of test managers on test engineering training programs. This group responded that nearly 80% of their employees are trained only through mentorship or have no formal training at all. Only 15% have formal, instructor-led training programs. And this group represents many of the most advanced organizations with respect to test strategy, so I would expect them to be well above the industry average in terms of their view of the strategic importance of test.

At the same time, many organizations are seeing an experience gap develop as older test engineers are laid off or retire. Mentorship is clearly important. But if we are relying only on mentorship, and the mentors are leaving, then we will ultimately face a knowledge crisis. Also, for many engineers, test engineering is a part-time endeavor. Many design engineers are additionally responsible for building the test plans for their products. So, it is critical to find ways

to retain best practices that have been learned over so many years and pass them on to everyone who shares responsibility for testing.

Some organizations have recognized this crisis and are working to fill the gap. Lexmark, for example, has a well-developed training program and has even developed a sophisticated model of the return on investment of training programs, helping to alleviate the constant budget pressure training faces because its effect on the bottom line can be difficult to quantify.

The U.S. Department of Defense also views test more strategically. The DoD's test systems are critical to the safety and effectiveness of our armed forces and must be reliably maintained for many decades. For instance, David Carey, who works at the Tobyhanna Army depot and holds the title of "Chief of the Test Program Development Branch," is passionate about test engineering and works on internal curricula, even teaching an instrumentation automation course at Wilkes University.

Steps To Take

All of us who work on teams responsible for test engineering can do a few things to close the gap. As a start, we can evaluate our test capability against industry best practices. My own experience would suggest that most organizations under-appreciate the role of test and thus operate sub-optimally. I have seen many organizations implement changes in test strategy that have added millions of dollars each year to their bottom line.

Next, implement a formal training program on test engineering, if you haven't already. Engage your senior engineers in the development and delivery of training material and make time for them to do so. This will augment the on-the-job training they are already conducting for the younger members of the team and create lasting training materials.

Many vendors have training courses on their tools, as well as material on measurement fundamentals, cost of test, and other principles that also can be incorporated into your training. For example, my team at National Instruments has been working with many of our lead customers to develop a training guide titled "Designing Automated Test Systems—a Practical Guide to Software-Defined Test Engineering," which is available at www.ni.com/automatedtest/guides.htm. The reception has been overwhelming and is further evidence that the need exists for this type of practical training material.

Finally, work with your local colleges and universities to incorporate test engineering principles into their curriculum. Our engineering students need more experiential learning to be successful in the industry, and design labs should incorporate measurement fundamentals and testing methods to more accurately reflect real-world product development.

Recognizing the strategic importance of test engineering and the rigor required to employ proper testing procedures will elevate the role of the test engineer in your organization. Implementing a formal training program that engages your senior engineers as teachers will help close the knowledge gap and ensure that you will be able to keep pace with the testing challenges you'll continue to face.