

## BEST PRACTICE Testing Constraints

Anything that inhibited the tester's ability to fulfill their responsibilities is a constraint. Constraints include limited schedule and budget, an incomplete statement of work, changes in technology, and limited tester skills. Each of these four constraints will be discussed individually.

### Budget and Schedule Constraints

Budget and schedule constraints may limit the ability of a tester to complete their test plan. Understanding why the lack of life cycle testing can cause budget and schedule problems can help relieve the constraint.

The cost of defect identification and correction increases exponentially as the project progresses. Figure 10 illustrates the accepted industry standard for estimating costs, and shows how costs dramatically increase the later you find a defect. A defect encountered during requirement and design is the cheapest to fix. So let's say it costs  $x$ ; based on this a defect corrected during the system test phase costs  $10x$  to fix. A defect corrected after the system goes into production costs  $100x$ . Clearly, identifying and correcting defects early is the most cost-effective way to develop an error-free system.

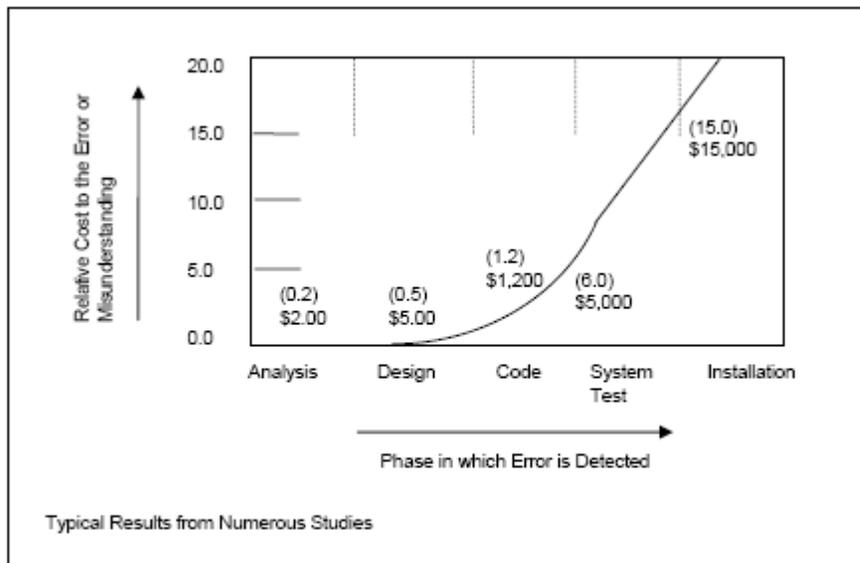


Figure 10. Relative Cost versus the Project Phase

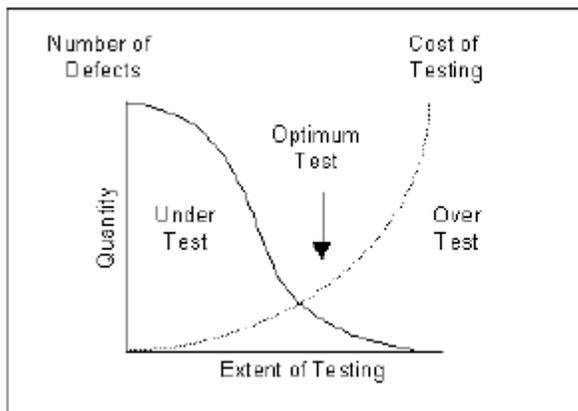
Testing should begin during the first phase of the life cycle and continue throughout the life cycle. It's important to recognize that life cycle testing is essential to reducing the cost of testing. The sidebar provides a brief outline of life cycle testing.

Let's look at the economics of testing. One information services manager described testing in the following manner. "Too little testing is a crime – too much testing is a sin." When control is viewed as a risk situation, this can result in over-and-under testing. The risk of under testing is directly translated into system defects present in the production environment. The risk of overtesting is the unnecessary use of valuable resources in testing computer systems that have no flaws, or so few flaws that the cost of testing far exceeds the value of detecting the system defects.

Most problems associated with testing occur from one of the following causes:

- Failing to define testing objectives
- Testing at the wrong phase in the life cycle
- Using ineffective test techniques

The cost-effectiveness of testing is illustrated in Figure 11. As the cost of testing increases, the number of undetected defects decreases. The left side of the illustration represents an under test situation in which the cost of testing is less than the resultant loss from undetected defects.



At some point, the two lines cross and an over test condition begins. In this situation, the cost of testing to uncover defects exceeds the losses from those defects. A cost-effective perspective means testing until the optimum point is



reached, which is the point where the cost of testing no longer exceeds the value received from the defects uncovered.

Few organizations have established a basis to measure the effectiveness of testing. This makes it difficult for the individual systems analyst/programmer to determine the cost effectiveness of testing. Without testing standards, the effectiveness of the process cannot be evaluated in sufficient detail to enable the process to be measured and improved.

The use of standardized testing methodology provides the opportunity for a cause and effect relationship to be determined. In other words, the effect of a change in the methodology can be evaluated to determine whether that effect resulted in a smaller or larger number of defects. The establishment of this relationship is an essential step in improving the test process.

The cost-effectiveness of a testing process can only be determined when the effect of that process can be measured. When the process can be measured, it can be adjusted to improve the cost effectiveness of the test process for the organization.

### **Incomplete Statement of Work**

A test objective is simply a testing “goal.” It is a statement of what the test team or tester is expected to accomplish or validate during a specific testing activity. Test objectives, usually defined by the test manager or test team leader during requirements analysis, guide the development of test cases, test scripts, and test data.

Test objectives enable the test manager and project manager to gauge testing progress and success, and enhance communication both within and outside the project team by defining the scope of the testing effort.

Each test objective should contain a statement of the objective, and a high-level description of the expected results stated in measurable terms. The users and project team must prioritize the test objectives. Usually the highest priority is assigned to objectives that validate high priority or high risk requirements defined for the project. In cases where test time is cut short, test cases supporting the highest priority objectives would be executed first.

Test objectives can be easily derived from using the system requirements documentation, the test strategy, the outcome of the risk assessment, and the test team assignments. If requirements are lacking or poorly written, then the test team must have a defined method for uncovering and defining test objectives. A few techniques include brainstorming and relating test objectives to the system



inputs, events, or system outputs. Ideally, there should be less than 100 test objectives for all but the very largest systems. Test objectives are not simply a restatement of the system's requirements, but the actual way the system will be tested to assure that the system objective has been met. Completion criteria define the success measure for the tests.

As a final step, the test team should perform quality control. This activity entails using a checklist or worksheet to ensure that the process to set test objectives was followed, or reviewing them with the system users.

### **Changes in Technology**

Effective testing must be done by a team comprised of information services professionals and users. In corporations where the users are not readily available, i.e., they are in a remote location, a professional test group can represent the users. Also vendors of software may not be able, or may not want to have users testing their systems during the developmental process. Again, in these instances, a professional test group can represent the users. The test group is known by different names, including IT testing, quality control, quality assurance, and inspectors.

The following technological developments are causing organizations to revise their approach to testing:

- **Integration**  
Technology is being more closely integrated into day-to-day business resulting in business being unable to operate without computer technology. For example, the airlines can only take reservations when their computer systems are operational.
- **System Chains**  
Computer systems are interconnected into cycles of chains such that problems in one can cascade into and affect others.
- **The Domino Effect**  
One problem condition, such as a wrong price or a program defect, can cause hundreds or even thousands of similar errors within a few minutes. Reliance on Electronic Evidence With hard-copy documents being removed from processing, the validity of the transactions is dependent upon the adequacy of controls, and thus a control error may result in extensive losses.
- **Multiple Users**



Systems no longer belong to single users, but rather to multiple users, making it difficult to identify a single organizational unit responsible for a system.

The organizational approach to testing commences with a policy on testing computer systems. The policy should be developed under the direction of the IT department, but should represent the philosophy of the entire organization. Once the policy has been established, then the procedures and the methods of testing can be developed based upon the desires of management as expressed in the testing policy.

### ***Limited Tester Skills***

Testers should be competent in all ten knowledge categories to be effective. Lack of the skills needed for a specific test assignment constrains the ability of the testers to effectively complete that assignment.

### **References**

Guide – CSTE Common Body Of Knowledge, V6.1