



Intelligent Use of Testing Service Providers

by Rex Black

This article is excerpted from Chapter 10 of Rex Black's upcoming book Managing the Testing Process, 3e.

Should we outsource our testing? What testing tasks should we outsource, and what tasks should we keep in-house? What are the chief advantages and disadvantages of outsourcing testing? As a consultant, I've been asked questions like these and other outsourcing-related questions a number of times. For a few clients, I've provided the following analysis, which should prove useful to you if you are evaluating outsourcing of testing.

In this article, I analyze the use of outsourcing in testing, based on some twenty years of experience with outsourcing of testing in one form or another. First, I enumerate the key differences between in-house and outsourced test teams. Next, driven by these key differences, I'll analyze which tasks fit better with outsourced testing service providers, followed by a similar analysis for in-house test teams. Then, I'll list some of the technical, managerial, and political challenges that confront a company trying to make effective use of outsourced testing. Finally, I'll address some of the processes needed to use testing service providers effectively and with the least amount of trouble.

Key Differences between Testing Service Providers and In-house Test Teams

A number of important differences exist between testing by an in-house test team and testing by a testing service provider. I want to start by listing these here, because I'll refer to

them later in this analysis (by the labels *KD1*, *KD2*, etc.). The key differences include, most especially, the following:

KD1. Testing service providers already exist. An organization can use them almost immediately for any project. Building an in-house test team can take longer than the duration of a project.

KD2. The cost structure of a testing service provider is variable, while an in-house test team has start-up costs (infrastructure purchase), fixed costs (both labor and infrastructure maintenance), and variable costs (generally project-related contract labor).

KD3. Testing service providers spread the purchase and maintenance costs of particularly expensive infrastructures, such as network test facilities and extensive hardware/software libraries, across a large number of (customer) organizations. An in-house test team must incorporate these costs into the development budget.

KD4. Testing service providers often have existing documented test cases, suites, procedures and processes that have proven efficient (based on the test labs' continued existence). An in-house test team may not have the competitive pressures and sufficient repetition required to hone such tools.

KD5. When the testing service provider is focused entirely on testing, it

will be typically staffed by professional testers, people who choose to work in the test field. (Note that you should carefully scrutinize the test staffs of larger outsourcing firms that include a so-called testing center of excellence or testing practice before concluding that they consist of test professionals.) In-house test teams often attract people who want to move into other areas in the organization.

KD6. In some cases, two or more competitors use the same testing service providers. An in-house test team can provide unique, focused services with no risk of intellectual property leakage.

KD7. Testing service providers tend to run lean. An in-house test team may fully staff a project to avoid temporary stalls in project progress.

KD8. Testing service providers are typically off-site (though some provide the services in part or in whole through on-site staff augmentation). In-house test teams are more likely to be collocated with the engineering and development facilities.

KD9. Testing service providers are most economical when used in a single-pass mode (i.e., once through the planned test suite). They are often uneconomical when used in cyclic activities, in comparison to an in-house test team.

With these differences in mind, let's now analyze how these differences affect outsourced testing.

Test Tasks Appropriate for Testing Service Providers

Now, let's look at how these key differences make certain tasks particularly appropriate for outsourcing to testing service providers. First, due to the ready, willing and able nature of external labs (KD1), test projects which arise suddenly, contain spikes in personnel needs, or exceed the capacity of the current internal test organization are appropriate for outsourcing to a testing service provider. Also, the variable cost structure (KD2) implies that, even in cases where one could staff to meet a spike in test needs, the fixed costs associated with staffing up, plus the variable costs incurred during the testing, might exceed the variable cost incurred by using an external lab instead. So, RBCS recommends the use of testing service providers in most cases of atypical peaks in needed test capacity, rather than staffing to handle the peak, then eliminating staff after the peak.

Diffusing infrastructure costs across multiple customers (KD3) means that, when one needs to test with particularly expensive hardware, or simply a wide range of hardware or software, using a testing service provider makes sense. Network tests are a good example, because, across four or more network topologies (some with three or four protocols), six or seven server types, ten or more client stacks, and almost innumerable client network adapter options, the level of complexity and the fixed and variable costs associated with such a lab are high. Such labs require full-time network administrators who command large salaries. Also, testing service providers maintain extensive libraries of software and hardware, having full-time acquisitions managers who keep the test tools current. Such expenses are impractical for small to mid-sized companies, yet compatibility and configuration testing are essential in many mass-market and Internet products and services. RBCS recommends the use of testing service providers to provide broad test coverage in these areas as a particularly smart reason to hire a testing service provider.

Efficient test processes and expert test professionals (KD4 and KD5) are especially useful in areas of testing considered unglamorous. Testing service providers generally hire and retain a greater proportion of professional testers than do hardware, software, and systems companies staffing in-house test teams, and certainly more than the average non-computer-related company hiring testers for their IT operation. In-house test team candidates often have long-term goals in other fields within the company, viewing testing as a stepping stone to advancement. In-house test team staff members usually enjoy testing cutting-edge technologies, and developing test plans for products that use these technologies. When it comes to more mundane but equally important tasks, testing service providers will usually have an edge.

The remote location of the testing service provider (KD8), while sometimes perceived as a disadvantage, can provide benefits. First, it offers an environment where the test effort can stay focused on the overall test plan, rather than getting bogged down in the crisis of the moment. Second, in conjunction with a dedicated liaison, a single contact window provides a way of channeling information from the test staff to the project team without non-test team members interrupting testers with what they think will be (but often are not) quick questions, a significant time drain for in-house test teams. This means that one can hand off the bulk of the test tasks to a testing service provider, knowing they will proceed towards the agreed-upon goals for completion in a deliberate fashion, regardless of the tempests raging around the project on-site.

Test Tasks Appropriate for In-house Test Teams

Now, let's look at how the key differences make certain tasks particularly appropriate to retain for an in-house test team. First, a two-edged sword, the variable cost structure of external labs (KD2) implies that you need to use testing service providers carefully, and with forethought. Though the cost for a single test may be relatively low, the cost per test cycle (one complete run through all planned tests) might not be. Therefore, you need to keep the number of cycles executed at an external lab to a minimum in many cases. Handling crisis situations, especially those sparked by last-minute changes in requirements, is better suited to an in-house test team, at least at first, testing service provider responsiveness (KD1) and leveraged infrastructure (KD3) notwithstanding. In some cases, of course, the infrastructure available at the testing service provider is necessary (e.g., a complex network or a range of supported browsers). If testing service provider participation in a crisis is needed, the test manager must take time to plan carefully their role. Otherwise, you might incur excessive cycles at the testing service provider, and you'll typically pay for these services on a time-and-materials basis.

While documented, standard test processes (KD4) would suggest that testing service providers will more outperform than in-house test teams, this often is most true for tasks which must be done efficiently (i.e., with the minimum cost and effort). Sometimes the most important consideration is completeness of coverage and meticulousness of testing, especially for those features and functions judged by business stakeholders as critical. Also, the broad client base and cross-platform service offering of testing service providers (KD6) means solid testing and technology expertise, they tend to be weak in highly specialized application domains, since they often cannot afford to specialize in the features, advanced functions, and peculiarities applicable to a single client's system. These two facts have a number of implications. First, some level of in-house test expertise is needed to make the decision on whether bugs reported by testing

service providers have the appropriate severity and priority assigned, and, indeed, whether they are bugs at all, given the unique elements of the system. Second, in-house test staff will need to cover the unusual features in the system, or be prepared to provide direct support to the testing service provider in terms of what testing should occur. Third, in-house test staff will need to test the most critical features, even though you might also have the external labs provide double coverage for added security.

In a mass-market, e-commerce, or software-as-a-service situation, where many of your competitors often substantially similar products and services, the openness of the external labs (KD6) means that you can't obtain a significant competitive edge in terms of testing and quality by using testing service providers exclusively. While using a dedicated testing service provider liaison allows for a great degree of specialization and more-complete coverage, to achieve truly distinctive levels of quality, an organization must add testing in an in-house test team. Furthermore, some of the testing done by this team must utilize the information available from business stakeholders and others with direct interaction with customers and users to emulate the real customers and users in terms of infrastructure environments, test scenarios and usage profiles. In other words, while in-house test teams have the potential to provide a competitive edge in testing, that edge does not come free, but rather requires considerable forethought, cooperation and hard work.

The lean staffing of testing service providers (KD7) affects handling of the critical test tasks, those in which speed of completion, accuracy of results, and thoroughness are all of crucial importance. A good example is performance testing. In most testing service providers, specialized personnel are not always available to work on your particular crisis task at the exact moment you require the service, and you or others in your organization might find it unacceptable to have the testing service provider place such crisis tasks in a queue for service based on specialist availability. (Of course, the distinction here may well be one of appearance – the perception of a uniform sense of urgency – as any actual difference in the time required to complete the task. A testing service provider might, through efficiency and expertise, hold an edge in handling such tasks, but the politics of the crisis might require someone present on-site, visibly sweating the details and working long hours.) Note that location (KD8) comes into play here as well, particularly when the priorities tend to change a few times a day, with the latency of communication to an off-site testing service provider making it difficult for them to keep up with rapidly evolving conditions.

The rapidly mounting costs of external labs in a cyclic mode (KD9) affects test tasks such as regression testing. While using a testing service provider to provide a final check on the product makes sense, delivering highly buggy products for testing can result in multiple passes through the test suite at considerable

expense. An in-house test team should ensure sufficient quality prior to engagement of a testing service provider, using written entry criteria.

Organizational Challenges

Using a testing service provider can involve resolving a number of technical, managerial and political challenges in many organizations. Many of these challenges apply to distributed testing in general; e.g., leveraging a vendor's test organization. Let's take a look at these challenges so that you can resolve them before they become obstacles.

First, since there is no widely-accepted definition of a test case, each test organization involved will have cases consisting of a different number of conditions (granularity) and requiring a different amount of time. Also, some tests naturally break down into different sized tasks. The test manager must ensure that they have a way to integrate tests and test information across disparate testing teams in a way that makes sense.

In addition to test case definitions, a continuum also exists in terms of where debugging tasks end and where testing tasks begin. This is multidimensional, applying to the responsibilities of developers versus testers, when testers have performed sufficient isolation to characterize a bug in a report sufficient for delivery to the development team, and when developers have performed sufficient testing to return a fix to the test team. Each organization will have a different answer. This is an issue for testing service providers in that you need an agreement in advance on the level of isolation performed for each bug report. Failure to get sufficient isolation information in the bug reports from the testing service providers will result in a lot of questions and complaints by developers about bugs reported by the testing service provider.

In development projects that have international teams, language will be an issue. You cannot assume that all testers will know the project language, nor can you assume that a project team member from another country who is conversant in the project language will read and write it as effortlessly as a native speaker. The organization must make allowances for varying levels of language proficiency, and plans must exist for translating critical documents into the project language.

Influenced by the three issues above but distinct from them is the matter of test result reporting. While there is a certain minimal set of data one expects to find in a bug report, standards and formats vary widely. In addition, the ways in which organizations track the status (pass, fail, blocked, etc.) of test cases vary both in method and in quality. The overall test results dashboard is likely to vary from one organization to another. While converting everyone to a single format is unlikely, crucial milestones prior to starting test execution include agreeing on a minimal set of data, a frequency of reporting, standards for failure reproduction procedures, and standards for updating changing status. In

addition, the test manager will need to create a single, unified test results dashboard for reporting to project and outside managers, with quick, meaningful data feeds across all the test teams, both internal and external.

Testing should be pervasive, in the sense that there are a series of levels of testing and quality assurance activities embedded in the project. Each level should have established entry and exit criteria. This allows each activity to act as a bug-filter, leading to the highest cumulative level of bug removal in the most efficient fashion. In contrast, a single-level approach with no formal entry or exit criteria tends to rush products into testing before they are ready, to squander a lot of time in testing trying to test unready, unstable products, and to release systems with low and inconsistent levels of quality. However, while this multi-filter approach is well-established in mature organizations, and general guidelines for test levels are available, organizations apply them differently. This means that a vendor might use A-Test, B-Test, and C-Test, your company might use Component Test, Integration Test, and System Test, and the testing service provider might use a whole different standard. Alternatively, they might all use the same names for the levels but have different objectives, entry criteria, and exit criteria for them. The manager responsible for the master test plan on a given project must understand how all these levels fit together; otherwise, the benefits of the test levels will be defeated.

On systems projects that involve hardware prototypes, prototype allocation will usually create a headache or two. You should pay attention to this issue both during test planning and during test control. Because more organizations are involved, you'll need more prototypes. Before test execution starts, you should make sure that an agreed-upon allocation plan exists. This plan should, to the extent possible, meet the needs of all test participants. The compromises made – and you will make compromises – due to system scarcity should be understood and clearly communicated. During test execution, you must set and monitor milestones to ensure that allocated quantities are delivered on time. You should proactively anticipate and handle any delays and shortages that might occur.

With downsizing always a possibility, and leading a large department sometimes seen as part of climbing the management ladder, the use of testing service providers for reasons other than pure staffing necessity tends to meet with some resistance from the in-house test team. This is less of a challenge for an organization planning to use testing service providers from the beginning, than for organizations with large, existing in-house test teams that are starting to use test outsourcing. However, the political pressures exist to some degree regardless, and the organization must deal with these pressures effectively to prevent dysfunctional behavior.

The first five challenges, by the way, come under a general area called mapping. They

involve taking the test processes of different teams and mapping them functionally into a single virtual test team. This is, of course, less efficient than having a single set of standards to which all test teams adhere from the start, but, in the case of outside testing service providers and vendors, there is no real alternative.

Processes for Effective Use of Testing Service Providers

Related to the issue of mapping is alignment of processes. While you cannot – and need not – resolve all such process alignment issues to the point where everyone involved in testing works the same as your in-house test team does, you need to ensure good process alignment in the following areas to support effective use of testing service providers.

- Someone must own the role of test coordinator or liaison to ensure integration of the test results into the test management and reporting processes.
- Processes must exist to deal with the mapping issues that arise.
- During the planning phases for the overall test project, a global plan should identify all the test work that will occur, regardless of location. The test manager should consider the testing service providers as available testing resources, and plan accordingly.
- Since no testing service provider works for free, a way of getting them paid must exist.
- Though e-mail and phone calls can handle much of the coordinating of external testing, nothing maximizes communication effectiveness like physical presence, especially in international situations where project language issues exist. Therefore, the coordinator or liaison role must involve travel to the testing service provider's location as required. In addition, this liaison should make sure that developers address the bugs found and reported by the testing service providers.
- Whenever hardware prototypes will remain on-site at a testing service provider for any length of time, a process must exist for refreshing the prototypes as needed. Allowing the prototypes to get out of date in terms of firmware and hardware versions in comparison to the final hardware will cause test escapes.

All these processes must include active follow-up elements for the coordinator, liaison, and/or test manager. In any distributed project, especially one that spans time zones, multiple opportunities exist for confusion, miscommunication, lost communication and ostrich-like reactions to bad news or undesirable requests. While distributed testing creates a matrix-like test organization, the ultimate responsibility for test task completion must remain with one person.

Conclusion

Properly used, testing service providers can make a valuable and economical contribution to system and software projects. Categories of tests that make sense to outsource include:

- Tests that would cause a short-term spike in test manpower requirements, followed by downtime or layoffs.
- Tests that cover a board range of hardware and software, or otherwise use expensive infrastructures.
- Tests that are routine and unglamorous, but important to shipping a quality product.
- Large blocks of tests that might not get done in-house due to changing priorities.

Some tests require in-house attention. Categories of tests that make sense to run using in-house test teams include:

- Tests that result from last-minute changes in requirements.
- Tests and test result evaluations that require sophisticated domain knowledge.
- Tests that provide a competitive advantage in terms of evaluating and improving product quality.
- Tests that are time-critical and vital to project success, or which are subject to rapidly evolving requirements.
- Tests that establish system stability prior to release to an testing service provider for final testing.

In addition to dividing the test workload intelligently, the effective test manager must handle the technical, managerial and political issues associated with using external and distributed test resources. Many of these problems have to do with mapping and integrating the disparate test organizations into a single virtual test team. In addition, the test manager must allocate test units effectively and make intelligent allocation compromises as needed. Finally, once the test manager has the work divided and the virtual organization mapped, the test manager must ensure that appropriate processes exist to support the execution of the project. These processes must support a single point of contact for gathering test results into a consistent test dashboard and to ensure completion of critical tasks.



Biography

With a quarter-century of software and systems engineering experience, Rex Black is President of RBCS (www.rbcs-us.com), a leader in software, hardware, and systems testing. For over a dozen years, RBCS has delivered services in consulting, outsourcing and training for software and hardware testing. Employing the industry's most experienced and recognized consultants, RBCS conducts product testing, builds and improves testing groups and hires testing staff for hundreds of clients worldwide. Ranging from Fortune 20 companies to start-ups, RBCS clients save time and money through improved product development, decreased tech support calls, improved corporate reputation and more. As the leader of RBCS, Rex is the most prolific author practicing in the field of software testing today. His popular first book, *Managing the Testing Process*, has sold over 35,000 copies around the world, including Japanese, Chinese, and Indian releases. His five other books on testing, *Advanced Software Testing: Volume I*, *Advanced Software Testing: Volume II*, *Critical Testing Processes*, *Foundations of Software Testing*, and *Pragmatic Software Testing*, have also sold tens of thousands of copies, including Hebrew, Indian, Chinese, Japanese and Russian editions. He has written over twenty-five articles, presented hundreds of papers, workshops, and seminars, and given about thirty keynote speeches at conferences and events around the world. Rex is the President of the International Software Testing Qualifications Board and a Director of the American Software Testing Qualifications Board.