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Evaluating Automated Functional Testing Tools

by Carey Schwaber and Mike Gilpin

TECH CHOICES

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This is the first document in the "Automated Functional Testing Tools" series.

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EXECUTIVE SUMMARY

Forrester evaluated automated functional testing tools to tease out the differences between offerings in this relatively mature market. Our findings? Mercury Interactive's QuickTest Professional is the most capable tool on the market today, with IBM Rational Functional Tester close behind. In the middle of the pack are Compuware and Segue Software, which are both well-established players, as well as Empirix and RadView Software, which are vendors of specialized Web testing tools. Because buying an automated testing tool is necessarily a long-term commitment, users should care not only about a tool's current capabilities, but also about where it's going. And when it comes to strategy, no one outranks IBM Rational, which has big plans for Functional Tester and is well-positioned to execute on those plans.

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Forrester interviewed seven vendor companies — Compuware, Empirix, IBM, Mercury Interactive, RadView Software, Seapine Software, and Segue Software — as well as 14 customer references for these vendors. Forrester also surveyed 34 quality professionals to find out what user companies like — and don't like — about their primary automated functional testing tools.

Related Research Document

"What Hyades Means For IBM, Its Customers, And Its Competitors"

October 8, 2004, Quick Take

HOW CAN AUTOMATED FUNCTIONAL TESTING TOOLS HELP?

Forrester defines functional tests as:

Tests to verify that application functionality conforms to predefined specifications.

We define automated functional testing tools as:

Tools to build and automatically execute suites of functional tests.

The benefits of automation are clear: Automating test script execution enables firms to increase the number of tests they run and the frequency at which they run them by many orders of magnitude.¹ So why not automate every test? From an economic standpoint, it makes sense to automate a given test only when the cost of automation is less than the cost of manually executing the test the same number of times that the automated test script would be executed over its lifetime.² The cost of automation is the cost of the testing tool, the labor associated with creating the test script, and the labor associated with maintaining the script (see Figure 1).

The State Of The Market: Today

Automated functional testing tools help firms build, maintain, and execute tests in the following ways:

- **Script creation and enhancement.** Automated testing tools let users create and enhance test scripts by recording user interactions (record and playback), hand-coding, adding parameters (data-driven), and manipulating low-level script components (keyword-driven). Record and playback is more sophisticated than it once was, but it's nonetheless better as a starting point than as a destination.³ While hand-coding can create the most powerful test scripts, it just isn't an option for users without programming skills. Support for data-driven testing allows nontechnical users to parameterize scripts with data from text files or from databases. And keyword-driven test creation is appealing, but many keyword-driven solutions require significant back-end test component development.
- **Script maintenance.** Today's automated testing tools help users create scripts that are less likely to break when the tested application changes. For example, most tools recognize, record, and manage the properties of individual UI objects, storing them in various ways: with each test script; in frame files associated with one or more scripts; in the tool's repository; or in a database. Competitive tools must have features to record multiple object properties and to let users determine the importance of each property, as well as for automated updating of object properties. One area of tool differentiation is the amount and the nature of the support that tools provide for custom UI objects — particularly for third-party .NET controls.

Figure 1 A Simplified View Of The Economics Of Test Automation

1-1 Determining whether to automate a given test
Automate if:

Cost of automation



Cost of manually executing the test as many times as the automated test would be executed

For example, if a test script will be run every week for the next two years, automate the test if the cost of automation is less than the cost of manually executing the test 104 times.

1-2 Calculating the cost of test automation

$$\text{Cost of test automation} = \text{Cost of tool(s)} + \text{Labor costs of script creation} + \text{Labor costs of script maintenance}$$

Source: Forrester Research, Inc.

- **Test management and integration of testing with the rest of the life cycle.** Because testing is a process — not just an activity — the best testing tool vendors tightly integrate functional testing and test management tools to facilitate test planning, scheduling, execution, and results reporting.⁴ Integration of testing tools with other application life-cycle tools — including development, source control, requirements management, test management, and performance testing tools — is also crucial, as it helps firms ensure that quality is top of mind from analysis to deployment and beyond.⁵

We evaluated the leading automated functional testing tools against 84 criteria in a Forrester Wave™ to see how well each tool helps users build, maintain, and manage automated test scripts (see Figure 2). We looked at seven commercial tools that test traditional client/server applications and Web applications, including Compuware TestPartner (as part of the QACenter Enterprise Edition+); Empirix e-Tester (as part of the e-TEST suite); IBM Rational Functional Tester (in conjunction with Rational Manual Tester and Rational TestManager); Mercury QuickTest Professional (in conjunction with Business Process Testing and TestDirector); RadView WebFT (as part of the TestView Suite); Seapine QA Wizard (in conjunction with TestTrack Pro); and Segue SilkTest (in conjunction with SilkCentral Test Manager and Issue Manager).

Figure 2 High-Level Evaluation Criteria

2-1 Current offering

Attribute	Attribute explanation	Weighting
Supported technologies	What kind of applications can the tool test?	10%
Object recognition	How well does the tool recognize and test objects (that is, inspect the internal state of an application program)?	20%
Script creation	How powerful and easy to use are the tool's script creation capabilities?	25%
Script execution	How sophisticated are the tool's script execution, error capture and recovery, and script debugging?	10%
Data testing	What support does the tool offer for scripts that execute function calls against data files, datapools, and databases?	15%
Life-cycle integration	How well does the tool integrate testing with other life-cycle tools?	10%
Access to functionality	What functionality is available to different kinds of users?	10%

2-2 Strategy

Attribute	Attribute explanation	Weighting
Corporate strategy	How much investment is the vendor putting into its testing tools?	30%
Product strategy	Does the product road map indicate that its tool will score better on the current offering axis in the future? How broad is the tool's target audience?	35%
Cost	What is the license cost as evaluated? What kind of licenses are available?	25%
Sales strategy	How strong is the vendor's global presence and how does it support global customers? What kind of partnerships does the vendor have?	10%

2-3 Market presence

Attribute	Attribute explanation	Weighting
Installed base	How many users are there for this product? How many customers does the vendor have overall?	50%
Services	What relevant services are available in the areas of training, implementation, and support?	10%
Employees	How many employees does the vendor have?	15%
Financials	What are the vendor's most recent annual revenues? How have the vendor's annual revenues changed in the past year?	25%

Source: Forrester Research, Inc.

The State Of The Market: Tomorrow

The automated functional testing tool is relatively mature; we found few areas in which many vendors were especially weak. Still, there are important developments ahead. In the next few years, Forrester expects vendors to:

- **Adopt open standards.** The emergence of open and de facto standards like UML, Eclipse, and Visual Studio Team System stands to benefit both users and vendors.⁶ Tools built on a common infrastructure are considerably easier to integrate with other life-cycle tools. The result? Streamlined defect discovery and repair processes from design to development, through testing, and into production. Plus, vendors that build their tools on these common foundations will be able to dedicate more of their R&D resources to innovation — rather than to the replication and maintenance of basic tool features. Four of the seven vendors included in this evaluation have adopted or are considering adopting such standards.
- **Better integrate functional testing tools with other life-cycle tools.** Many of the vendors that we evaluated could stand to improve their tools' integration with other life-cycle tools — both their own and those of other vendors. Some vendors plan to improve their integration with partners' tools, but savvy vendors are building open interfaces for integration, including support for XML import/export and powerful service and extension APIs. Open interfaces are far superior to proprietary interfaces — it's better for users to be able to integrate with any tool than to be able to integrate with only their vendor's partners' tools.⁷
- **Reach out to new user populations.** Vendors are working to improve the appeal that their tools hold for users with stronger and weaker technical skills. Many, for example, accommodate developers by offering standard, powerful, and extensible scripting languages, strong integration with IDEs, and inexpensive runtime editions. And other vendors are working to make more of their functionality accessible to users who don't have programming skills. For example, Mercury is wooing business analysts with its Business Process Testing and keyword-driven testing, and IBM will reach out to those new to automated testing by integrating Rational Functional Tester with Rational Manual Tester.
- **Improve support for distributed teams and organizations.** The application life cycle is increasingly distributed across functional teams, organizations, and geographies. Distributed teams have unique needs, and some of the vendors Forrester evaluated — notably Mercury and Empirix — plan to rise to the challenge by helping these teams share test plans and test assets. The development of more full-featured, Web-based interfaces that provide a single point of access to multiple testing tools will be key to this effort.

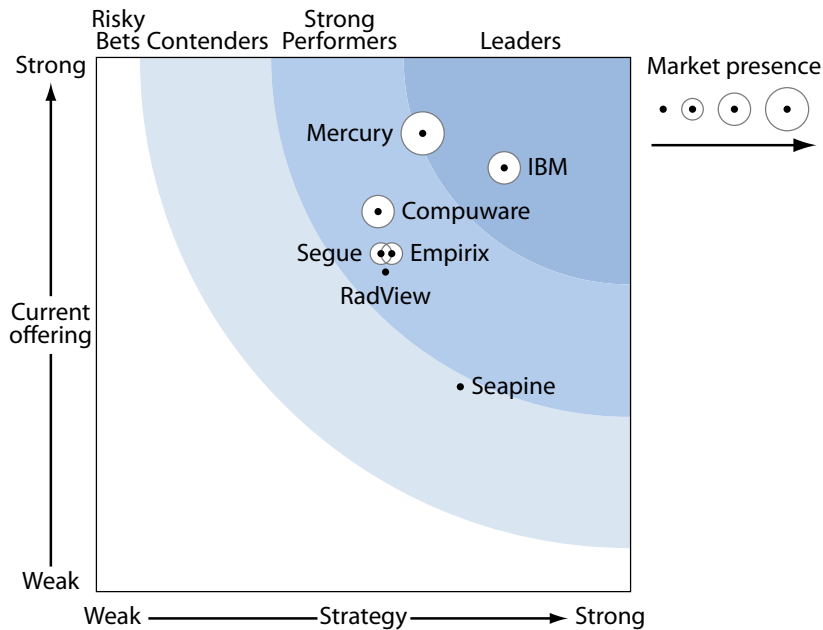
HOW THE MOST POPULAR TOOLS STACK UP

Forrester’s evaluation of these seven automated functional testing tools identified two Leaders, four Strong Performers, and a single Contender (see Figure 3). Forrester’s take:

- **Mercury sits at the top of the heap.** Mercury is the market share leader by a landslide, although its dominance of this space is primarily due to the popularity of WinRunner, its legacy testing tool. In combination with Mercury’s TestDirector and Business Process Testing, QuickTest Pro includes enough functionality to satisfy the vast majority of users. However, Mercury’s immoderate pricing continues to push customers into the arms of its competitors. In addition, the most capable tool will of course be the tool that is the hardest to improve upon; as other vendors play catch-up, Mercury will have to innovate to maintain its edge.
- **But IBM is regaining lost ground.** The recently re-engineered IBM Rational Functional Tester is proof of IBM’s renewed commitment to software quality. Although it isn’t currently the most capable product on the market, Functional Tester is beginning to emerge as a threat to Mercury’s market dominance. Rational’s greatest strengths are its use of open standards, its Java and Visual Basic .NET scripting, its integration with Eclipse and Visual Studio .NET, and its upcoming linkage of automated and manual testing.

Figure 3 Forrester Wave™: Automated Functional Testing Tools, Q1 '05

 The spreadsheet detailing this Forrester Wave™ is available online.



Source: Forrester Research, Inc.

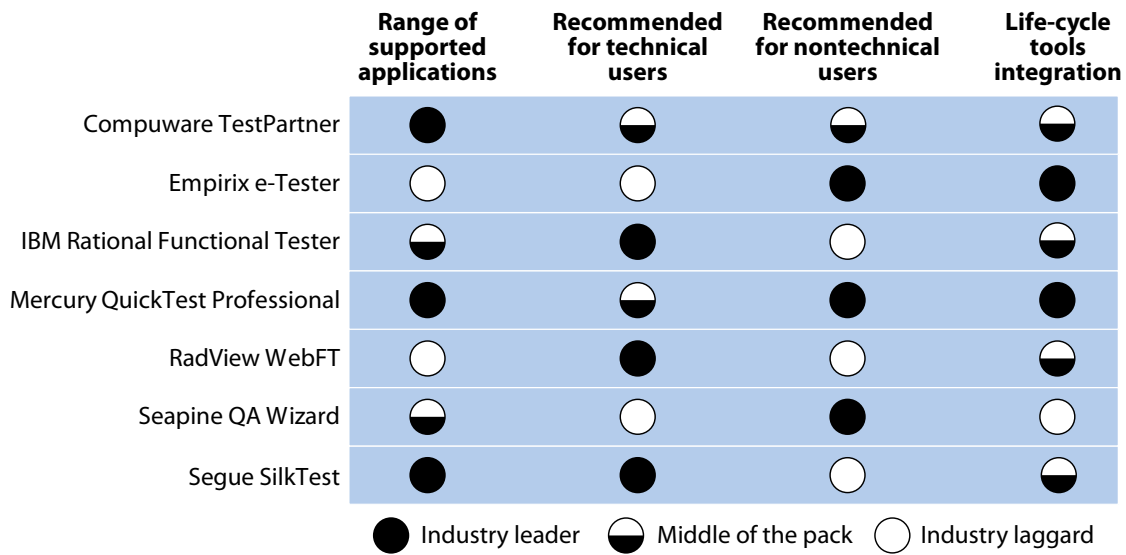
- **The middle of the pack is crowded.** Here, two very established mainstream testing tools vendors, Compuware and Segue — each of which has been in the business for more than a decade — find themselves in the company of Empirix and RadView, two smaller vendors of highly specialized tools for testing Web applications. These four tools are all very capable; they simply aren't quite as capable as QuickTest Pro and Rational Functional Tester. RadView's financial instability makes its WebFT much less appealing, however.
- **Seapine brings up the rear.** Seapine's QA Wizard is easy to use, but its functionality is limited. Some companies that perform only basic testing of less complicated apps will find QA Wizard satisfactory — and they won't have to pay for features they don't need.

PICKING THE RIGHT TOOL FOR THE JOB

Three primary factors make a testing tool implementation successful (see Figure 4). Firms should shortlist tools that:

1. **Offer strong support for the kinds of applications that are under test.** Bells and whistles just don't matter if a tool can't test .NET when that's all that needs to be tested. Also important are the extensibility of the tool's technology support and the speed at which the vendor introduces support for new technologies. Centralized testing teams will require support for a wider variety of application types, while dedicated testing teams will require deeper support for fewer technologies.
2. **Suit the skill level of the intended end users.** Almost all of the tools we evaluated are suitable for both technical and nontechnical users, but each is nonetheless more appropriate for one of these two groups. It's highly unlikely that any single tool will be the best choice for both an experienced test automation group staffed by testers with programming experience and a team of manual testers who want to automate a few of their most common tests.
3. **Integrate with other in-house, software development life-cycle (SDLC) tools.** Integration with tools that are already on hand isn't the most important factor to consider, but it can tip the scale. Firms that purchase tools that don't integrate with their source control systems, for example, spend an extra minute each time they check scripts in and out. This extra minute might not matter much on a day-to-day basis, but it does matter in the grand scheme of things. When it comes to the integration of functional testing tools with other SDLC tools, IBM has the edge.
4. **Integrate with other in-house, application life-cycle management (ALM) tools.** Application quality continues to be an issue after applications are put into production, and Mercury does the best job of integrating its functional testing tools with post-deployment ALM tools. The combination of Rational and Tivoli under the IBM umbrella has potential, but that potential hasn't yet been realized.

Figure 4 How The Tools Stack Up On Supported Apps, Skill Levels, And Integration



Source: Forrester Research, Inc.

Another important consideration is whether to go with a tightly integrated suite of tools from a single vendor or to patch together a selection of best-of-breed tools. Firms should determine which route they would prefer to take for testing tools, SDLC tools, and ALM tools.⁸

RECOMMENDATIONS

DIFFERENT TOOLS FOR DIFFERENT APPS, USERS, TEAMS, AND COMPANIES

The automated functional testing tools that Forrester evaluated are right for different applications, users, teams, and organizations. Different tools are appropriate in different circumstances:

- Compuware TestPartner is appropriate for teams with both nontechnical and semi-technical users and a relatively diverse portfolio of apps to test.
- Empirix e-Tester is suitable for teams of nontechnical users testing Web applications and services and for organizations testing Web apps that are integrated with contact center and voice apps.
- IBM Rational Functional Tester is the right choice for users who have strong programming skills and for users who work closely with development teams.
- Mercury QuickTest Professional is best for centralized testing teams that work on a wide range of apps and include team members with varying levels of programming skill.

- RadView WebFT is appropriate for relatively technical teams working exclusively on Web apps — but only at organizations that have high risk tolerance.
- Seapine QA Wizard is suitable for teams of nontechnical users with very basic testing needs and a low budget for testing tools.
- Segue SilkTest is a good bet for very technical teams — or teams with a few very sophisticated automation architects — that are testing complicated apps.

SUPPLEMENTAL MATERIAL

Online Resource

The online version of Figure 3 has an interactive spreadsheet that includes seven scorecards, one for each automated functional testing tool. Readers can use the spreadsheet in their own decision process by: 1) customizing the weightings for personal results; 2) trimming the vendors down to a shortlist; 3) sharing the results with other team members; and 4) using the criteria set in RFPs.

Methodology

In preparation for this Forrester Wave evaluation of automated functional testing tools, we fielded an anonymous online survey about automated functional testing tools to 34 IT decision-makers. Respondents told Forrester about the strengths and weaknesses of the tools they use and rated them against seven criteria.

Companies Interviewed For This Document

Agile Practices Workshop	Patni Computer Systems
Compuware	RadView Software
Empirix	Royal Neighbors of America
Genilogix	SAS Institute
GiftCertificates.com	Schwab Performance Technologies
IBM	Seapine Software
Mercury Interactive	Segue Software
NDCHealth	SupportSoft
Oceanwide.com	ThoughtWorks
Olenick & Associates	

ENDNOTES

- ¹ Many of the users that Forrester interviewed have suites of thousands of tests that they run every night — as well as additional suites of tests that they run on a weekly or monthly basis.
- ² Test scripts that are good candidates for automation verify important functionality and are relatively easy to automate, unlikely to require much maintenance, and are likely to be run frequently or for a long period of time. Source: Brian Marick, “When Should A Test Be Automated?” www.testing.com/writings/automate.pdf.
- ³ Early tools recorded user mouse and keyboard interactions and produced scripts that broke at the drop of a pin, whereas newer tools somewhat improve script resilience by recording interactions at the object and API levels.
- ⁴ Because functional testing and test management tools are so tightly integrated, Forrester chose to consider the capabilities of separate test management tools — even when these tools are available only at an extra cost. The license prices that we used represent the cost of bundles that include a functional testing tool and a test management tool (if one is available). In some cases, that bundle happened to also include load testing and source control tools. More details are available in the Forrester Wave spreadsheet.
- ⁵ Users tell Forrester that the integration they most desire, but can’t seem to achieve, is integration with their source control systems.
- ⁶ The Hyades project — more formally known as the Eclipse Test and Performance Tools Platform project — is the wheel that testing tools vendors have historically had to reinvent, each in its own unique way. Hyades is an open source testing framework with facilities for tools that manage and execute functional and load testing and analyze application usage. As more vendors standardize on Hyades, the result will be better tool integration, easier tool customization, increased tool choice, and less vendor lock-in. This will be a boon for users and a force for change in the industry. See the October 8, 2004, Quick Take “What Hyades Means For IBM, Its Customers, And Its Competitors.”
- ⁷ With open interfaces and common metadata, plug-in authors are free to create the integrations that make sense for them and their customers. Integration is not controlled by proprietary APIs or partnership agreements. See the October 7, 2004, Quick Take “Eclipse Changes The Game For Development Tools.”
- ⁸ Firms must choose between tools that are fully integrated in a comprehensive suite that hides complexity and tools that function as lightweight plug-ins to an open, flexible, and configurable environment like Eclipse. This dichotomy applies to testing tools, as well as to other life-cycle tools. Forrester has defined four key ways to resolve this tension, and each of these approaches is taken by one of the following user segments: Standardizers, Customizers, Optimizers, and Simplifiers. See the December 7, 2004, Trends “How Developers Can Conquer Complexity.”

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