White Paper

Business Rules-Based Test Automation: A novel approach for accelerated testing

Traditional ways of test automation are giving ways to newer paradigms

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It is early 2007 and insurers are looking at a year more competitive than ever before. As the market place is changing at a feverish pace, agility and flexibility are the keys to survival. It is essential that insurance technologists look at their insurance systems and ask three key questions:

- *How can we ensure faster products?*
- *How soon can we change the existing systems to meet new requirements?*
- *How can we ensure the quality of our new products?*

A closer look at these imperatives is called for, as the success in the market place is directly linked to the extent to which the insurer can address these challenges.

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The speed imperative: how can we ensure faster products?

In the increasingly competitive market, speed is an imperative. The inability to launch products faster would lead to loss of sales and hence displacement by competitors who are able to achieve shorter product release cycles. The legacy of monolithic systems with embedded decisioning and processing logic would act as deterrents in meeting this imperative. Service Oriented Architecture (SOA), decoupled and modular systems, adoption of "decision services" etc., are some of the directions that insurers are headed towards to achieve the objective of churning out products in shorter time. In a July 2005 report, Karen Pauli, a Senior Analyst at TowerGroup, stated that: "The insurers that will survive this competitive environment are those that leverage technology to advance their business and operations. . . . One of the primary ways insurers are transforming their infrastructure is by supporting the insurance value chain in a modular way, such that applications are not all in one and can decouple and share some core components. . . ." [1].
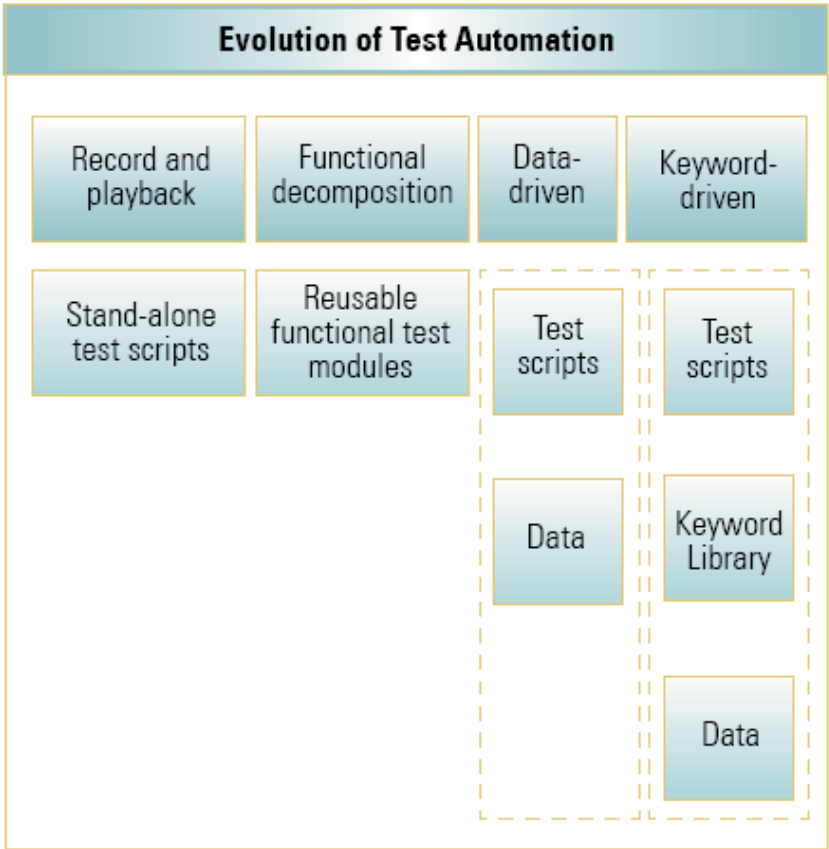

Figure 1: Evolution of Test Automation
Source: Infosys Research

The flexibility imperative: how soon can we change the existing systems to meet new requirements?

While meeting the speed imperative ensures newer products at a faster pace, flexibility is required to keep up with the pace of the changes in the market place and customize existing products. Code-based product logic, hard-wired data and system flows inhibit easy modifications to the existing systems. Added to this are the demands for real-time interactions and the need for interfaces for agent use, which necessitates the adoption of technologies such as Business Process Management Systems (BPMS) and Business Rules Management Systems (BRPMS).

The quality imperative: how can we ensure the quality of our new products?

As technology picks up pace and tries to meet the demands of the market place, quality of the delivered products is all the more important. Inability to meet the quality standards can spell doom for not just the product but also for the insurer through loss of reputation and credibility. While extensive testing to ensure quality is called for, the effort demanded by the manual testing methods are so huge that the insurer is left to choose between speed and quality. Several approaches such as risk-based testing would mitigate the risk of not testing the application fully but would not eliminate it. Test Automation is an obvious step to strike a balance between quality and the reduced time-to-market.

The remainder of the article discusses Test Automation in general and the Business rules based approach to test automation that insurers can adopt to meet their speed and flexibility imperatives without sacrificing product quality.

Test Automation: The Story So Far

Automated functional testing has evolved from the early days of so called record and playback to robust data and keyword-driven frameworks, resulting in benefits of scalability, better performance and testing, and increased productivity [Fig. 1]. However, each approach has intrinsic problems and the most common approach has been hybrid models [Fig. 2].

Figure 2: Benefits and Shortcomings of Automated Testing Approaches

Approach	How it works	Benefits	Shortcomings
Record and Playback	Users' actions are captured, then played back on the application	Ease of scripting, not much technical expertise required	Difficult to maintain test scripts, not extendable, limited re-usability, even small changes to the application require updates of scripts
Functional decomposition	Re-useable, repeatable snippets of functions are created	Modular approach provides some flexibility, maintainable, reduces redundancy, larger test cases can be built in a hierarchical fashion	Data exists within scripts, meaning limited reusability, ease of maintenance, depends largely on technical expertise, framework is high dependent on the application
Data-driven	Input/output data is maintained in external files	Size of the test pack is greatly reduced, improved maintainability	Depends on technical expertise of test team, maintenance and perpetuation are issues
Keyword-driven/table driven	Robust, application independent re-usable keyword libraries are built	Ease of maintenance and highly scalable reduced dependence on application availability	Requires great deal of effort and is time consuming, expertise in test tool scripting language required for framework development

Figure 2: Benefits and Shortcomings of Automated Testing
Source: Infosys Research Approaches

Test automation challenges

Despite the impressive evolution of test automation, there are still a lot of challenges that it has to counter. Detailed below are some of those challenges.

- **Cost:** Test automation is never a one off. Test scripts created during the initial automation exercise need to be maintained to keep pace with changes to the relevant application. The cost and effort involved is great for any of the traditional approaches
- **Dependency on automation expert:** Test automation is largely a technical exercise performed by a skilled automation expert
- **Reduced role of business tester:** By contrast, because automation is a technical activity, the users – who typically have a thorough understanding of the application's functions – have little input

- **Framework design:** Designing and building automation framework components is a major project and their effectiveness depends largely on the competency of the creator. Poor design can result in redundancies and high maintenance costs
- **Dependency on application availability:** Scripting usually starts only after the application is ready (except in advanced keyword-driven frameworks, which are expensive)
- **Platform lock-in:** Traditional test automation frameworks typically result in so called platform lock-in, which once built, can be a problem if a change of platform is warranted
- **Documentation:** Requirements must be clearly documented at the start of automation. Any customizing or modifications of the framework once defined is time consuming

Business Rules-Based Test Automation Approach

Business Rules-Based Test Automation (BRTA) follows an approach which responds to the test automation challenges outlined above. The approach prescribes a flexible framework that allows the user to define the Business Rules for the application and the test scenarios in English and then generate automated test scripts from these.

The BRTA approach is based on the following key concepts:

Empowerment of business experts in test automation

The approach derives its test cases and automates test scripts from the business rules repository created and maintained by the business analysts. Hence the business users (analysts/testers) are able to set the direction for automation without excessive dependence on the test automation expert.

Acceleration through reuse

The keyword library, the business rules elements, the business process elements etc., are designed to be reused multiple times within an application or across a portfolio of applications. This inherent reuse enables acceleration.

A platform independent approach provides flexibility

The approach, by providing an abstract layer on top of the test automation platform obviates the need for significant reinvestment when newer test automation platforms emerge. Also, the approach would provide flexibility by the ability to support multiple application technology platforms.

A Logical Architecture for Business Rules-Based Framework

The framework for test automation of Business Rules-intensive applications consists of a set of technical components that combine to achieve a test case-less approach to test automation. The logical architecture of BRTA framework with its underlying components is depicted in Fig. 3 and the components are briefly explained subsequently.

Rules Modeler: Rules Modeler is the interface provided to the business analyst to define the business and allows the easy entry of the Business Rules into the Business Rules Repository.

Business Rules Repository: This is a single storage for all the business rules relevant to the application. If a BRMS is used, the above two components are provided by the BRMS.

Test Scenario modeler: This web-based, user-friendly interface allows business testers to define test cases easily. It has well-defined modules for test case scripting, test script generation and test data definition.

Scripting engines: These intelligently generate syntax-ready and ready-to-run test scripts for multiple technologies and tools such as Mercury, Rational and Compuware. They allow people who are not automation experts to create scripts. Keyword function library: An exhaustive library supports multiple technologies and tools with inbuilt error handling, nonuser interface functions and user interface functions, making scripting easier, even for complex processes.

Document generator: Documentation is generated for every automated test case, and maintenance of these is easier because all modifications are automatically updated.
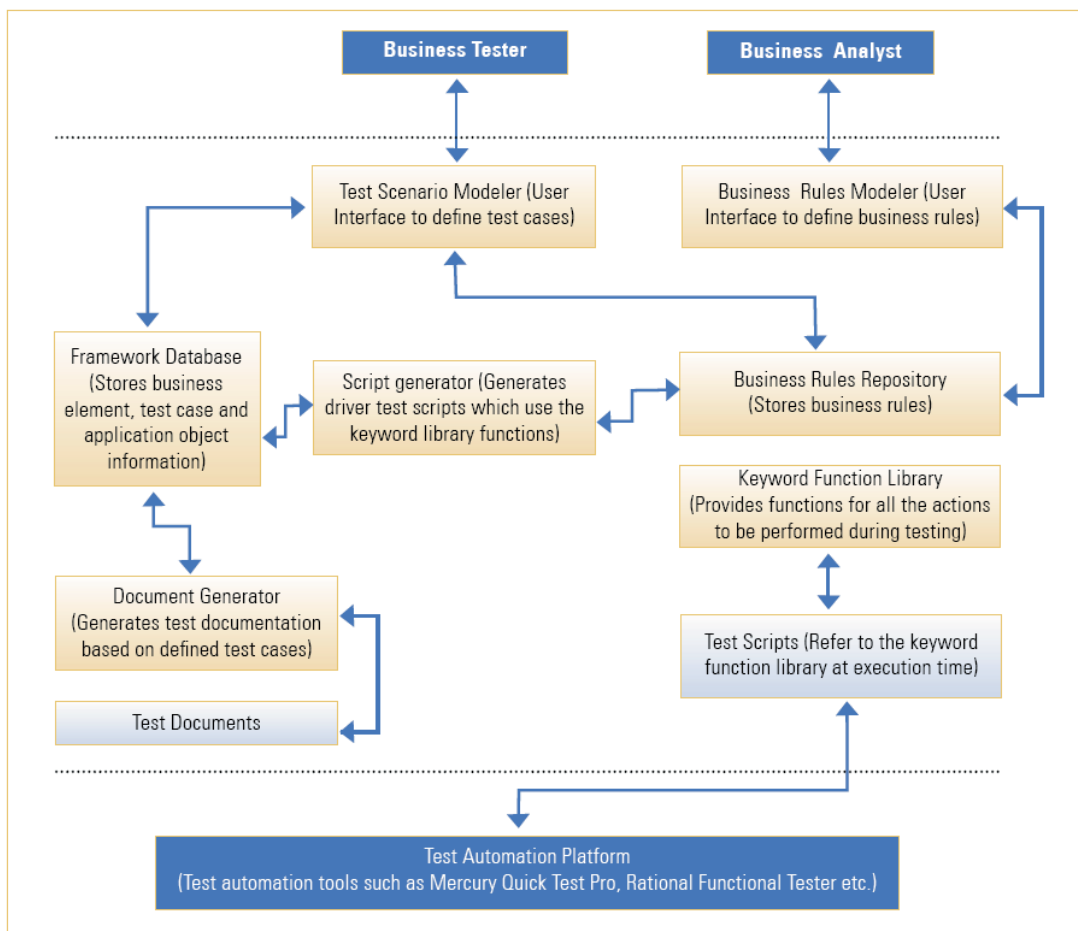
Figure 3: Logical architecture of the BRTA framework
Source: Infosys Research

The accelerated process

A business-driven framework simplifies and speeds up test automation, by removing some steps and allowing the business tester and automation expert to work in parallel.

The above described framework calls for a new lifecycle process for test automation which is driven by the business analyst in place of the test automation engineer. This process focuses on the business rules of the application and leverages the framework elements to enable accelerated generation and deployment of automated test scripts. The technical complexity of the process is abstracted from the Business Analyst who makes decisions on the test automation components.

Benefits of the approach

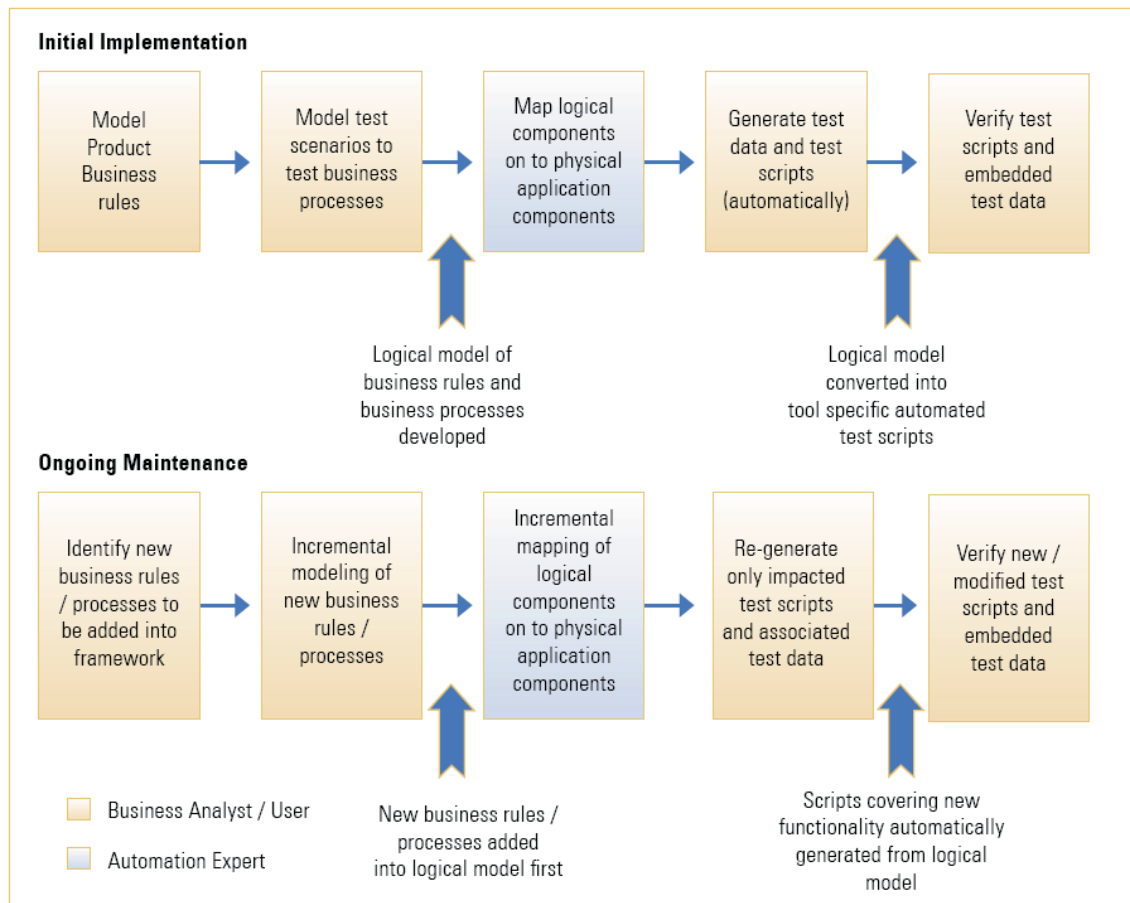BRTA approach provides multifold significant benefits to organizations over the traditional approach, for e.g.,

Figure 4: The New Process for Test Automation
Source: Infosys Research

Independence from Manual Test Cases: The new approach does not require manual test cases to be developed. Development of scripts can begin immediately after the requirement phase instead of manual test case preparation phase.

Business Analyst Empowerment: Business rules are defined by the business analyst and the automated test scripts are based on the Business Analyst-defined rules. Hence the analyst has the power to drive the changes to the rules as well as their testing.

Separation of concerns: The framework separates the business rules validation from the application navigational flow. It looks at each screen of the application and the associated rules and automates it as an independent component. The navigational aspect is addressed by allowing for the sequencing of these individual components into the different flows that need to be tested.

Single point changes: The framework allows for maintaining a single Business Rules repository which reflects the latest business rules. Test scripts are driven by the rules in the single repository that serves as the application rules repository as well. This helps in ensuring that the rules that test scripts refer to and the application rules are synchronized.

Easy Rules Management: The Rules Modeler module of the framework allows for easy changes to the business rules. The modeler provides an easy-to-use interface which is intuitive to use and hides the technical complexity from the Business Analyst.

Framework Extensibility: The framework provides the tester with the flexibility to create any end-to-end test scenario flows by combining individual test scenario components even after the script development phase. This enables the extension of the framework to cover scenarios that may not have been envisioned during the time of initial development of the framework.

Easy Maintenance: This is achieved by means of minimum number of test scripts thereby decreasing maintenance cost.

Table 1 illustrates the benefits of test automation as compared to manual testing. Table 2 lists the benefits of the Business Rules-based approach as compared to the traditional approach to automation. These benefits have been realized for a reinsurance company which adopted the approach for test automation [5].

Activity	Effort (person hours)
Manual based approach – Project A	40
Claims-Based on new framework	16
Reduction in effort	24
Percentage reduction	60

Table 1: Effort comparison manual vs. Automation (Illustrative)

Activity	Effort (In man months)
Under writing-Test case based approach	60
Under writing-Based on new framework	31
Reduction in effort	29
Percentage reduction	48.33

Table 2: Effort comparison Traditional automation approach vs. Business Rules-based approach (Illustrative)

Conclusion

Faster products and easy customization to meet the demands of the fast-changing insurance industry would enable insurers to gain competitive advantage. Test Automation would ensure product quality within the shorter product release cycle. However, insurance technologists will have to think beyond the traditional ways of test automation to achieve quality, speed and flexibility. BRTA approach would enable organizations to reap the benefits of test automation fully and effectively and thereby achieve the objectives of the business.

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