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Case Study:

Telecom Giant Uses ATD to Speed Time-to-Market for Mobile and Multi-Platform Applications

Background

Driven by intense time to market demands for releasing new products and services, a multinational telecommunications corporation (one of the largest providers of mobile and fixed telephone services in the United States) investigated options for improving the speed and effectiveness of their software application testing methods. In the highly competitive telecom service provider market, innovation is the key to new customers and expanded profits. New products, combinations, and capabilities drive new business. If a telecom company is not delivering these products and services, their competitors will be, and it stands to lose millions of dollars every month of delay in releasing new products. Therefore, the company took the initiative to identify and remove any bottleneck in the end-to-end product delivery process.

One of the telecom company's new product deliveries included a web and mobile interface for end customers, so that customers could monitor and update their own accounts. The company needed to implement a testing improvement plan, which would allow for faster test case creation without sacrificing test coverage, and indeed, to improve coverage. This was important to support the many enhancements and revisions required each year to quickly add new services. It is simple to speed test creation if comprehensive and known coverage isn't really needed, but thorough, known coverage was critical. Any error in configuring the product combinations selected by the end user, account reporting, or any new product provisioning mistakes could prove to be a nightmare of customer relations.

Conformiq™ presented its Conformiq 360° Test Automation™ approach, which includes an advanced Model-Based Testing (MBT) process, as a testing transformation to greatly improve the current manual test design process, working together with its testing services partner. Conformiq's solution was designed to completely integrate with their existing systems development life cycle (SDLC) environment, including a customized reporting format that they needed to continue using. This program provided extensive proof of the capabilities and flexibility for this transformational process.

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Project Deployment

The multinational telecom company's goals are shown in the following table. The Conformiq 360° Test Automation solution validated all goals during project delivery.

Goals	Validated
Accelerated testing time	✓
Faster testing for frequent application changes	✓
Ability to support aggressive project schedules	✓
Reduced testing effort and resources with improved test design productivity	✓
100% requirement test coverage and requirements traceability	✓
Known test coverage with minimum test cases	✓
Integration with existing SDLC tools	✓
Generation of test reports in current company format	✓

Conformiq Creator™ software (part of the Conformiq 360° Test Automation solution) based on an MBT process, enabled an end-to-end process starting with the creation of a model which is a graphical description of the application being developed, based on the requirements. From this model, all functional test cases, documentation, and executable scripts were automatically generated.

The project work was done over a period of two weeks to match their sprint times with the goal of demonstrating sufficient efficiency gains in test design to justify the transformational change from manual test to automating test design. Accelerated automation of the test execution was a bonus, as current test execution was mostly manual. As the proof, four programs were selected, split between GUI and mobile applications, each with a different set of test design issues, so the full capability of the Conformiq 360° Test Automation approach could be validated. Two medium and two complex applications, as determined by current test management, were chosen.

The seamless end-to-end testing automation process was demonstrated. It started from system requirements through to interfacing with Selenium, Selendroid and Appium automated test execution harnesses, and tested the correct and equivalent operation of the end-user account access application through the GUI user interface as well as on Chrome, Internet Explorer, and Mozilla mobile interfaces.

As previously stated, the primary goal was the ability to speed up testing when application changes were made. The telecom company averaged nine application design enhancements per year, and there just wasn't enough time to write comprehensive test cases for every change, yet high quality was a given

requirement. The initial Conformiq Creator test design times proved to be fast enough that the testing automation process could be used on every change to get comprehensive testing done in time. With everyone's understanding that once modeled, changes to the model would generate tests even faster, it was obvious how quickly test cases could be regenerated after design changes for greater efficiency gains. With Conformiq Creator's update capability, existing test cases can be automatically updated with every model change, including notification on which new ones were added and which were no longer valid, so the invalid test cases would not be carried forward to create a bloated regression suite.

Conformiq Creator modeling software was used to capture the application operation and system flow from the requirements. Mismatches between requirements and the model were automatically flagged. The model was reviewed and because it was graphical, logical process errors were easily and quickly identified. Appropriate data was included for the automatically-generated positive and negative test cases.

Once modeled in part, the Conformiq test generation engine automatically generated an optimal test suite based on the user-selected test design algorithms to achieve 100% coverage of the included requirements. These results were analyzed by reviewing the generated test step reports, message sequence charts, test-to-requirements traceability matrix, and the graphical model coverage diagram. The Conformiq engine automatically split the model across all available computation processors speeding the test generation for real-world model size and complexity. Once validated, the model was extended for additional features, and scripts for Selenium, Selendroid, and Appium were generated for execution.
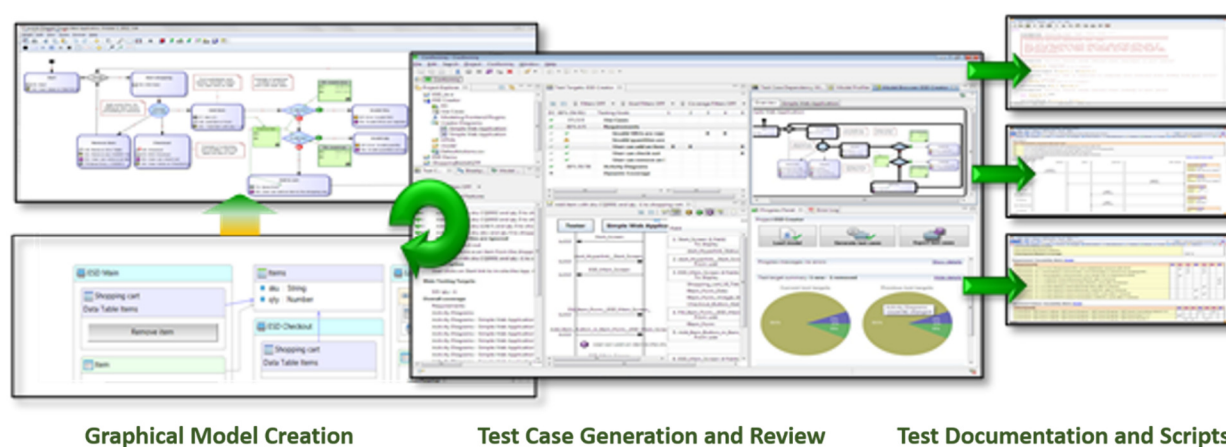

Graphical Model Creation   **Test Case Generation and Review**   **Test Documentation and Scripts**

Figure 1: Three Step Process for Test Design

The process of 1. modeling, 2. test case generation and review, and 3. test documentation, plus test scripts for automated execution, including the expected correct test execution results (test oracle), is shown in three steps above. Incremental modeling and test generation supports Agile processes and continuous integration with tools such as Jenkins.

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Since the company's key goal for this project was test design speed, the previous manual times and efforts to complete the test case designs were known and matched against the Conformiq generated results. The telecom's key target of test design speed was easily demonstrated with Conformiq Creator.

Additionally, Creator automatically generated the test execution stimuli and expected correct test execution results, plus an Excel mapping file with pre-defined library mappings, which easily linked the executable scripts with the harness. This allowed the telecomm company to achieve an automated end-to-end testing process and further efficiency gains. Because Creator automatically provides impact analysis after each model change, maintenance was improved, as the no-longer-valid test cases were not carried further for execution. As for many clients and projects, the telecom company wanted documentation in their own reporting format, so the Conformiq scripter was quickly modified to generate documentation in their specified format.

Project Results

Specific results for each of these four projects were as follows:

Application Module	User Stories	Number of Test Cases		Test Case Planning and Design (in hours)	
		Manual	Conformiq	Manual	Conformiq
Billing	7	25	25	14	7
MPS	2	50	50	100	18
Profile	35	150	108	70	13
Payment	4	28	32	25	8
Total	**48**	**253**	**214**	**209**	**46**

The overall results for the testing work done for these four projects combined were as follows:

Test Case Design and Script Generation	Project Results
Requirements coverage	100%
Regression suite optimization (reduced Test Cases from automatic test design)	18%
Test case design and generation efficiency gain	454%

Note: Reusability was not considered during initial modeling, but would have resulted in higher efficiency gains when subsequently used in part on additional modules. Also, as initial modeling typically takes longer, nine (9) revisions made per year accelerated just by making model changes would further increase the efficiency and reduce the time needed for test design.

Furthermore, test automation was achieved by generating executable scripts linked to harness library functions.

Automation of Test Script Generation	Project Results
Speed up of test execution	75%

The efficiency gains demonstrated and validated by the current testing team were more than sufficient to move ahead with Conformiq deployment.

Next Steps

Based on the results from this project Conformiq Creator was immediately widely deployed. Conformiq trained the initial deployment team and provided model reviews until the team demonstrated proficiency. Within the first two weeks, they had proven to be nearly independent, although local Conformiq support remained available if requested.

Summary

This multinational telecom company and their testing partner more than achieved their initial goal of speeding up test design. They achieved a dramatic test design efficiency gain and an end-to-end SDLC integrated process that enables them to fully test nine (9) or more revisions each year at a much lower cost.

MBT is an umbrella term that can mean many different approaches or processes built on the concept of using a model. The differences between MBT tools are very large; and even though they may seem similar in their high-level abstract concept, results from projects such as this one prove that the innovative Conformiq 360° Test Automation provides great transformational improvement – benefits much greater than just faster test design.

Conformiq 360° Test Automation represents the most advanced and highest level of overall capability, using MBT technology and an integrated yet open end-to-end automated testing process supporting both third-party SDLC tools and proprietary tooling.

The gains achieved from deploying Conformiq, even if only considering software test design, are significant, yet even larger gains come from the accelerated commercial deployment of the developed application, along with the benefits of validated software quality. Any company looking to improve its current software testing methodology would do well to look in depth at the transformational power of Conformiq solutions.

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Conformiq is transforming software testing with Conformiq 360° Test Automation™, providing the most sophisticated and comprehensive automated test design solution in the industry. The unique Conformiq 360° Test Automation technology enables the next generation of testing: transforming, streamlining and automating even the most complex system-level testing environments. Conformiq 360° Test Automation has proven it improves efficiency with a 40% faster test case development cycle; enables delivery of higher quality code with 50% more defects found; increases manageability with 50% better collaboration: and reduces costs with a 400% return on investment. Conformiq serves enterprise IT, communications and embedded software markets worldwide. Privately-held Conformiq is headquartered in San Jose, California, with a worldwide delivery and support organization including offices in Finland, Germany, Sweden, and India.

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