

## Case Study:

### *Global Banking Company Transforms Testing to Overcome Challenges of Shortening Development Cycles*

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#### Background

One of the world's largest global banking companies, a bank with over 200 million customer accounts and banking operations in over 160 countries and jurisdictions, is continuously looking to leverage new technology and processes wherever possible. With rapid technological changes in the banking industry, there is a need to keep up with the competition by shortening the time to market for new products and creating additional functionality. The bank aspired to increase automation levels in its testing process. While execution automation was an established concept, the ability to automate script generation and reduce product release timelines was a much more indefinite concept.

Working with a testing services partner, Conformiq presented its Creator Automated Test Design (ATD) approach based on Model Based Testing (MBT) as a way to transform testing in order to greatly improve the bank's current manual test design process. The bank management was skeptical, saying that MBT had previously been seen and tried, but it did not prove itself to be valuable and was no longer of interest to them. Conformiq and our partner explained that not all MBT tools and processes are equal and convinced the bank to allow us to demonstrate end-to-end automation, leveraging automated test design and integration with their SDLC tool chain. Because the bank was under pressure to decide how to move forward and find the best approach to improve its functional testing, the bank agreed to have this project delivered using Conformiq MBT as a transformation demonstration by their service provider.

#### MBT Project Deployment

Conformiq Creator™ software enables an end-to-end automation process that starts with the creation of a model which is a graphical description of the application being developed using the requirements. Directly from the model, all functional test cases, documentation, and executable scripts are automatically generated without user involvement except to select the test design algorithms used.

The project work was done over a period of several weeks with the goal of validating the required target capabilities through automating the design of test cases for execution and integration with the bank's existing SDLC tools infrastructure. The base loan booking operation for a personal loan was selected as being representative of many applications. ACH functionality for 10 user stories was graphically modeled using Conformiq Creator. A seamless end-to-end automated testing process was demonstrated, starting with system requirements, all the way to interfacing with the bank's hybrid HP QTP™ automated test execution harness.

One of the bank's testing challenges was the need to speed up testing when application changes were made. There was not enough time to write comprehensive test cases, but high quality was a requirement. So to demonstrate even greater efficiency gains using the ATD process and to satisfy one of the bank's goals, changes to the loan processes were made, showing how quickly test cases can be regenerated after design changes are made. The model was adapted as needed, all test cases were automatically updated, and notifications alerted which cases were new and which were no longer valid.

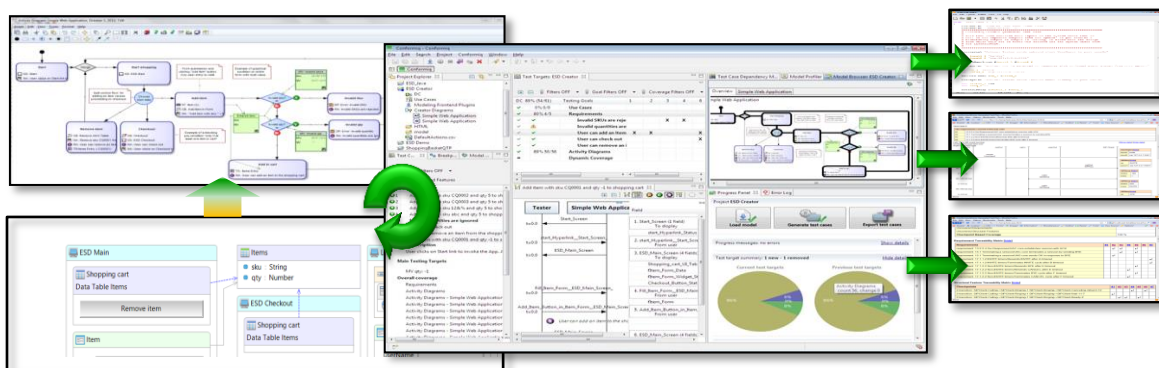
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The bank's goals are shown in the following table. Conformiq Creator with its Automated Test Design process validated all goals during project delivery.

Goals	Validated
Improve project delivery time & effort	✓
Achieve 100% updated test documentation	✓
Achieve 100% requirement test coverage	✓
Faster test creation & testing when design changes	✓
Automated requirement traceability information	✓
Integration with test management system (HP-QC/ALM)	✓
Reduced maintenance effort	✓
Test report customization	✓
Improve test design productivity by 30-40%	✓
Model & process re-usability	✓

The Conformiq Creator modeling software was used to capture the application's operation and system flow from requirements. Inconstisencies between requirements and the model were automatically flagged, so when the graphical model was reviewed, logical process errors were easily and quickly identified. 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 in order to achieve 100% coverage of 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, which speeds up the process of test generation for real world model size and complexity. Once validated, the model was extended for additional features and new VB scripts were generated.



Graphical model creation

Test case review and generation

Test documentation and scripts

The three step process shown above shows modeling, generated test case review, and fully automatic test documentation plus test scripts for automated execution, including the expected correct test execution results (test oracle).

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The process of incrementally creating models and adding to existing models to test as development progresses supports the incremental creation process in agile development and allows for continuous integration, which is ideal for use with tools like Jenkins. This was not an immediate focus area for the bank during this project, but it did demonstrate an additional benefit of Conformiq's MBT process.

The bank's goals were to create check points to validate the MBT work. Previous manual efforts to complete the tasks in the goals were known by the bank and were matched against the results generated by Conformiq. The bank's main goal of automating test design was easily demonstrated by Conformiq's fully automatic generation of the stimuli and the correct test execution results, along with an Excel mapping file with pre-defined mappings to easily link the executable scripts with the QTP libraries. When test data generated from the model was changed, the mapping remained unchanged. Because Creator automatically provides impact analysis after each model change, maintenance was improved by restricting no longer valid test cases from uploading to HP QC for HP QTP execution.

The bank also wanted documentation in its own reporting format, so the Conformiq scripser was easily modified to document what was generated in the bank's format.

## Project Results

Results for the testing work done for the ACH project were as follows:

Test Case Design and Script Generation	Project Results
Requirements coverage	100%
Regression suite optimization (reduced TCs by ATD design)	40%
Test design cycle time reduction	40%
Test case design & generation efficiency gain	28%
Total design optimization gain (new + revisions)	48%
Total e2e process effort gain (new + revisions)	55%
Efficiency from gains from model reusability	32%

- Test Cases and Traceability Matrix were exported to Excel sheets
- 126 Test Cases were generated
- Reusability was not considered during initial modeling, but would have resulted in higher efficiency gains if it had

Change Management – Model Enhancement	Project Results
Maintenance test suite optimization	>50%
Maintenance effort reduction	>80%

- Conformiq model was easily updated to incorporate design changes
- Updated test suite was automatically regenerated with Automatic Impact Analysis

Automation of Test Script Generation	Project Results
Effort reduction from scripts & Excel mapping file generation	70%

- Test automation achieved using existing QTP library functions
- VB test scripts were generated for QTP automated execution, with successful execution

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The Creator Automated Test Design results were compared with the bank's manual test design methods, as shown below. Check marks indicate the testing process that better solves each key attribute.

Comparative Attributes	MBT	Manual	Comments
Comprehensive test design & test coverage	✓		Will take longer with manual
Reuse & quick test changes	✓		Major difference
Executable test script creation	✓		Generated automatically with MBT
Test design efficiency & optimized test design	✓		Major difference, typically creates fewer test cases for same coverage
Updated documentation, test design & reporting consistency	✓		Manual documentation is seldom kept up-to-date, manual varies by each tester
User knowledge needed		✓	Less knowledge needed for manual test designers
Understand spec completeness & knowledge transfer	✓		Good visualization and documentation with modeling
User cost basis		✓	Lower cost of testers
Tool cost		✓	No tool cost for manual design
Test design head count needed	✓		Assuming customer's view that fewer is better
Ability to reduce overall testing time & costs	✓		Time to product delivery and reduced cost is a huge customer benefit
Using technology to help customer	✓		Showing leadership and innovation to customers

Exact overall gains depend on the selected Conformiq licenses, project team size, program duration, tester costs, and especially the frequency of application revisions. The expected Return on Investment (ROI) for use across this program was calculated to be 3.2X annual ROI. The breakeven point will occur in the fourth month of use. The ROI would have been greater if the users had more Conformiq experience and all the interfaces with the bank's tool chain and QTP libraries had been previously created, thus saving a one-time interface effort that was included in the above results. Beyond testing cost savings alone, the demonstrated efficiency gains enable faster application deployment, which has much greater worth. Further, savings to the testing provider improve their EBITA even at lower customer prices.

## Next Steps

Based on the results from this project, Creator licenses have been deployed. Some of the bank's application is being modeled to create reusable testing assets to ensure that model reusability and fast changes for software needing testing for multiple locations will deliver even greater efficiency gains.

Beyond the initial ACH application, Conformiq products have expanded to a second project. Five other banking groups in multiple locations are now interested in even broader deployment. The results have proven that not all MBT products and processes are equal and Conformiq delivers major improvements.

## Summary

The bank more than achieved its initial goal of automating test design. It achieved an end-to-end SDLC integrated process and a reusable testing asset plan that will deliver faster time to commercial deployment for their software and lower testing costs, all with known quality and full documentation.

MBT is an umbrella term that can signify many different processes built on the concept of using a model. The differences between MBT tools are very large and, even though they are similar in their high level abstract concept, the details from projects such as the one for this bank, prove that there are major differences in the overall benefits achieved – benefits much greater than just test design. To deliver the highest level of capability through the MBT process, Conformiq delivers an integrated, yet open end-to-end automated testing process, with third-party SDLC tools and/or the customer's own tooling. Although the gains achieved from deploying the Conformiq MBT based Automated Test Design process are significant, the even larger gains come from earlier commercial deployment of the developed application.

Automated Test Design is the most advanced MBT process. Any company looking to improve its current functional testing should consider the benefits that this transformational process will deliver. Conformiq and its testing service partners can help achieve a successful transformation and aid in the faster release of products and applications.

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Conformiq is the industry leader in Model Based Testing and delivers software and supporting services to successfully transition customers from manual test writing to automated test design which helps enable the full end to end automation of the testing process. Privately held Conformiq is headquartered in San Jose, California with offices in Finland, Germany, Sweden, and India plus additional partner support operations in India. Visit [www.conformiq.com](http://www.conformiq.com).

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