CSO’s Experiences testing a complex CAPI Instrument
Background

• CSO has been using Blaise since 1997 for CAPI household surveys
• In 2011 the European Central Bank commissioned the Household Finance and Consumption survey (HFCS)
• A Blaise Questionnaire was required to query household and personal assets, liabilities, wealth, income and indicators of consumption
Why a new testing approach?

- HFCS was a very complex survey instrument.
- Survey instruments have been difficult and time-consuming to test.
- A new approach was needed to prioritize questionnaire testing and also to ensure greater test coverage of the instrument.
Testing in the Instrument Development lifecycle

- Requirements testing
- Component testing
- Independent Component testing
- System [& Integration] testing
- User Acceptance testing
Requirements Testing
Requirements Testing

Who?

- Performed by the Development manager in collaboration with:
  - Specification authors
  - Programmers
Types of Tests:

• Functional or Black Box testing
• Static analysis – reviews of documentation
  • Informal reviews
  • Walkthroughs
  • Technical reviews
Component Testing

Who?

- Component [block] programmer
Component testing

Types of Tests:

• Structural or white Box testing
• Static analysis – reviews of code
  • Informal reviews
  • Walkthroughs
Independent Component Testing

Who?

- Anyone but the component author
Independent Component testing

Types of Tests:

• Black box functional testing
• Test log template for each test approach:
  • Routing
  • Variable Ranges
  • Fill/Inserts & text
  • Error/Signals
  • Computations/Don’t knows & refusals
Creating test Logs

- Test Logs created from specifications
- Time consuming – worth the effort in Quality terms
- Encouraged authors to use test design techniques to create test cases
<table>
<thead>
<tr>
<th>Household Level</th>
<th>Test Log Template</th>
<th>Completed Test Log</th>
<th>Error Log</th>
<th>Specification Document Page Number(s)</th>
<th>Tester</th>
<th>Changes Made?</th>
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<tbody>
<tr>
<td>Household Data</td>
<td>☑</td>
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<td>1 &gt; 8</td>
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<td>Denis</td>
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<td>Denis</td>
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<td>20 &gt; 70</td>
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<td>Denis</td>
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<td>John</td>
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<td>Higher Level Condition</td>
<td>Variable Name</td>
<td>Page Ref</td>
<td>Test Performed</td>
<td>Expected Result</td>
<td>Actual Result</td>
<td>Fail / Pass</td>
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<td>Oth_Veh</td>
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<td>Cars_No</td>
<td>124</td>
<td>Cars_No = 0</td>
<td>Error message</td>
<td>Cars_Val</td>
<td>Fail</td>
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<td>Cars_No = 1 to 4</td>
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<td>Cars_No &gt; 4</td>
<td>CarsVal</td>
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<td>Cars_Val &lt;&gt; EMPTY</td>
<td>Oth_Veh</td>
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<td>Oth_Veh = 1</td>
<td>Oth_VehT</td>
<td>Oth_VehT</td>
<td>P</td>
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<td>Oth_Veh = 2 AND Cars = 1</td>
<td>Veh_Buy</td>
<td>Veh_Buy</td>
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<td>Oth_Veh = 2 AND Cars = 2</td>
<td>Valuables</td>
<td>Valuables</td>
<td>P</td>
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<td></td>
<td>Oth_VehT</td>
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<td>Oth_VehT = 1</td>
<td>HowMany (MotBk)</td>
<td>HowMany(MotBk)</td>
<td>P</td>
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<tr>
<td>Variable Name</td>
<td>Spec Page Ref</td>
<td>Scenario</td>
<td>Possible Error / Problem</td>
<td>Comment</td>
<td>To be resolved by</td>
<td></td>
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<td>---------------</td>
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<tr>
<td>Cars_No</td>
<td>124</td>
<td>Cars_No = 0</td>
<td>Test plan says it should go to Oth_Veh but error message is generated saying range 1-99</td>
<td>Limits not stated in spec. Gerry said he intended to allow 0. Now says leave as is.</td>
<td>Denis</td>
<td></td>
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<tr>
<td></td>
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<td>Cars_No 1-4</td>
<td>Test plan says it should go to Oth_Veh but routes to Cars_Val.</td>
<td>Check Expected Result. O.K. as per spec 6/11</td>
<td>Denis</td>
<td></td>
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<tr>
<td>Business</td>
<td>125 - 132</td>
<td>Business = 1 AND HowMany &lt;&gt; 1</td>
<td>Test plan says HowMany &lt;&gt; 1.</td>
<td>0 not allowed in coding but Gerry may have wanted it. Check with Gerry. Gerry said leave as is.</td>
<td>Denis</td>
<td></td>
</tr>
<tr>
<td>Other_V</td>
<td>133</td>
<td>Other_V = 0 AND Cars = 1</td>
<td>Test plan says route to Veh_Spnd but form routes to Veh_Buy.</td>
<td>Check Expected Result as Veh_Buy should be asked before Veh_Spnd. Error in Test Plan.</td>
<td>Denis</td>
<td></td>
</tr>
<tr>
<td>OthVehVal</td>
<td>133 - 136</td>
<td>Other_V = 2 AND Cars = 1</td>
<td>Test plan says route to Veh_Spnd but form routes to Veh_Buy.</td>
<td>Check Expected Result as Veh_Buy should be asked before Veh_Spnd. Error in Test Plan.</td>
<td>Denis</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Other_V = 1 etc. AND Cars = 2</td>
<td>Test plan says route to Jewels or Valuables but form routing to Veh_Buy</td>
<td>Recheck spec. and check Expected Result. O.K. as per spec 6/11</td>
<td>Denis</td>
<td></td>
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<tr>
<td>Filter</td>
<td></td>
<td>Cars = 1 AND Oth_Veh = 1</td>
<td>Test plan says ask Veh_Buy if Cars = 1 AND Oth_Veh = 1. Spec says as Veh_Buy if Cars = 1 OR Oth_Veh = 1.</td>
<td>Check Expected Result. Spec 6/11 states: Ask if Cars=1 or Oth_veh=1</td>
<td>Denis</td>
<td></td>
</tr>
</tbody>
</table>
Test case design techniques for Blaise Code

- Systematic approach for developing test cases
- Generate test cases that have better chance of finding faults
- An objective method of developing test cases

- Decision tables
- Equivalence partitioning
- Boundary Analysis
- Use Case
- Flowcharts
- State transition
Test case design techniques used for Routing test logs

- Decision tables proved a very useful tool for blaise testing
- Programmers encouraged to draw specifications in flow charts and state transition diagrams
Test case design techniques used for Ranges/computations test logs:

- Mapping test cases using Equivalence partitioning helps to define representative values of valid and invalid ranges.
- Boundary Analysis used to define and test minimum and maximum values of a range.

Equivalence partitioning

Boundary Analysis
Test case design techniques used for Inserts & Question text Logs

- Use case or Scenario testing used for testing inserts and fills in Question text
- Incorporate into these tests were visual and Question text tests
System & Integration testing

Who?

• Developers
Types of tests:

- Black box testing
- Use Case scenario testing
System & Integration testing

Non functional requirements tested:

- Installability
- Maintainability
- Performance
- Load & Stress handling
- Recovery
- Usability
User Acceptance testing

Who?

- Business Users
- Independent of Blaise and IT teams
Types of tests:

- Use Case testing [scenarios]
- Pilot
Performance & Results

- Over 80 test log templates were prepared
- Test logs prioritized by complexity
- 3.5 independent testers took 15 -20 days to complete the logs
- Testing and re-testing continued until Questionnaire sign-off [1 week before release for pilot]
Performance & Results

• Testing documentation was reviewed and updated throughout development
• Extra testers if needed
• All incidents corrected, retested and signed off or waived
Results
Results

- No critical problems in live environment
- Helpdesks calls related to the Questionnaire were Interviewer training issues
- Positive feedback from Business area on the Quality of the Questionnaire
Conclusion

• 25% of development time assigned to testing
• Creating and maintaining the large volume of test logs was time consuming but definitely worth the effort
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Conclusion

Thank You