XIXLAB
TEST AUTOMATION
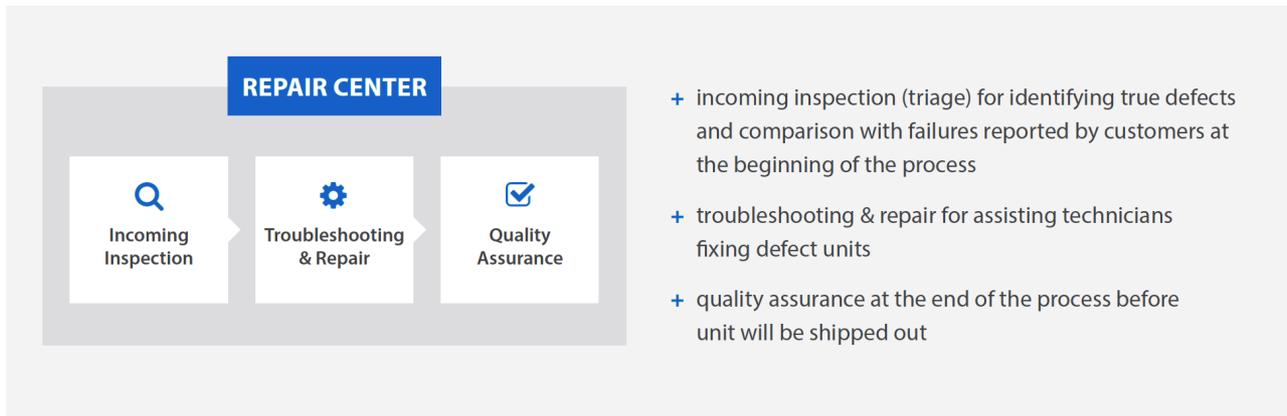
THE MATTER OF TEST SUBJECTIVITY IN MOBILE DEVICES REVERSE LOGISTICS

In mobile devices after-market repair operation, functional testing (also referred to as customer interface testing – CIT) is often done manually. While cellular functionality is tested using measurement equipment for qualified measurements, manual CIT often leaves room for subjectivity and interpretation of test results. Depending on where in the internal process a misinterpretation occurs, different risks with considerable cost impact exists. This whitepaper explains background and solutions.

MOBILE DEVICE TESTING – OVERVIEW

In a typical mobile device repair operation, 3 main use cases for mobile device testing exist:

REPAIR CENTER

Incoming Inspection → Troubleshooting & Repair → Quality Assurance

+ incoming inspection (triage) for identifying true defects and comparison with failures reported by customers at the beginning of the process

+ troubleshooting & repair for assisting technicians fixing defect units

+ quality assurance at the end of the process before unit will be shipped out

Technically, there are 2 different sorts of tests executed: radio frequency (RF) testing for analysis of a unit's cellular performance, as well as functional testing to verify all device features work as expected and can be used through the unit's customer interface.

For RF testing, measurement equipment is used: Qualified results are compared with defined limits to conclude on whether the measured parameter is within specified limits (no defect) or out of spec and thereby needs further repair action. Functional testing is different: Where no automated test equipment is used, functional verification is executed manually and widely depends on operator interaction with the UUT (e. g. touchpad test). Operator judgment is needed in the frequent cases where no determinate fault exists but gradual failure observations e. g. in the case of audio quality. Other defects such as display pixel failures seem to be obvious to detect where indeed, they are not e. g. because of the tiny pixel size.

Same time, cost pressure on repair organizations urges for the reduction of average test times, where due to the reasons outlined, even experienced technicians need to carefully execute specific test-sequences to ensure all potential defects are reliably identified.

Failure to correctly identify defects always impact repair costs. In case where issues are not recognized during incoming inspection / triage, units are probably not channeled into the most effective repair process.

Example: a reported defect of a unit return that cannot be confirmed by incoming inspection might subsequently be channeled through the complete process of content wiping, software update, and refurbishment without actually being repaired. At the end, ultimate quality assurance testing identifies the hardware defect originally reported by the customer. In such case the unit not only needs to be looped back for repair, but channeled through content wiping for a second time to ensure data temporarily required for troubleshooting and testing gets reliably deleted. Consequently, the costs involved are at the expense of the repair center.

Even worse: in cases where issues are not even identified by quality assurance, defect units are getting shipped back to customers (to end customers in case of "direct to customer" repair models, or to business customers in case of bulk repair scenarios). Usually, these defect units will be returned to repair centers as "bounces". Aside the additional repair costs, such failure also leaves

unsatisfied consumers and / or causes poor customer ratings.

REQUIREMENTS

The list of requirements to be fulfilled by a process able to master the difficulties outlined shall include the following major aspects:

+ NO SUBJECTIVE TESTING Manual tests shall be eliminated and replaced by qualified measurements with predefined test limits. This often requires test equipment to be used, which need to be selected having the specific requirements of after-market service in mind.

+ NO VARYING TEST EXECUTION Test results shall not be impacted by varying manual interaction with the UUT. Automated interaction with the units ensures exact test duplication, so that repeatable results can be expected. An approach for automated tests is a robotized test hardware.

+ TEST COMMONALITY ACROSS DIFFERENT USE CASES Methods used for testing a specific functionality or parameter shall always be the same, regardless of the use case. This ensures that tests executed earlier can be duplicated with identical test results, to a later point in time, by other test operators or even by other organizations. Where 100 % commonality is not realistic due to use-case specific test environment limitations (e. g. no test hardware available for repair deflection), the different test solutions need to be designed in a way to avoid differences in test results.

+ MODEL SPECIFIC TEST RECIPES Individual tests performed shall be specific to the product, its configuration and version. For use cases such as incoming inspection and quality assurance, these tests shall be grouped and executed as recipes which are verified, approved and provided to users. For use-cases, such as repair deflection and repair trouble shooting, no recipes shall be used but individual tests shall be selected by users for verification of single functionality or parameters.

+ EASE OF USE Operating the functional test tools shall be simplified to the outmost. Therefore, user interfaces are to be optimized for the individual application in terms of user interaction and the customer-specific process supported.

+ TEST RESULTS LOGGED AND AVAILABLE FOR LATER REFERENCE All tests executed shall be logged and details stored in a data base accessible for relevant members of the service supply chain. Details logged shall include unit ID, configuration and model as well as test time, test system and test version along with test limits and results. Such data logs support various use cases such as performance monitoring, technical support, preemptive maintenance as well as different managerial business processes and support quality system requirements.

+ MINIMIZED MAINTENANCE EFFORTS All functional test hardware and software systems shall require only a minimum of maintenance efforts. Automated hardware needs a robust design for extended durability in daily operation. System vendors need to provide quick and effective spare parts policy and technical support for global customers.

+ AFTER MARKET SERVICE REQUIREMENTS ADDRESSED Test systems fulfilling the technical requirements outlined shall support business needs of the mobile devices after-market service. This specifically means that the total cost of test gets significantly reduced compared to manual function tests applied. Same time, initial investments for test systems shall allow a quick and risk-free Return On Investment.

xixLab GmbH
phone: +49 461 40308075
info@xixlab.de

Lise-Meitner-Strasse 2
24941 Flensburg
Germany

SOLUTION

With revoox, xixLab GmbH offers a full suite of automated test solutions for the use cases in after-market service. For repair centers, revoox provides a robotized test chamber, capable of executing product-specific test sequences always identical for guarantied duplicity of test results. xixLab delivers pre-defined test recipes for new mobile devices at or shortly after their market launch. Different recipes are provided, supporting the specifics of the diverse use cases such as incoming inspection / triage, grading and quality assurance. The system identifies connected products automatically and reads relevant unit configuration information. Unit data and test results are logged in files and an online data base.
All solutions are tethered: a cloud server architecture leverages unit test history information throughout the end-to-end process.

Throughout the system's design and implement-tation, xixLab always considered not only the technical requirements of after-market service but also specific business cases, ensuring excellent ROI through cost savings.

ABOUT xixLab

xixLab GmbH is a leading supplier of mobile devices test-automation products and engineering services.

We are a passionate, interdisciplinary team of specialists, eager to work on world-class test solutions for mobile devices. We formerly worked for mobile device manufacturers, audio/video broadcasting equipment producers, mobile app design houses, fine electronic R&D companies and others. As a team, we now uniquely blend all our long-year professional experience from senior-positions in engineering and management to provide world-class mobile devices test solutions.

We know that every customer, every operation's process is different for good reasons. While our solutions are available off-the-shelf, their design and architecture has carefully be engineered around great flexibility for supporting each customer's specific needs. For us, this means first and foremost to listen to our customers, for getting a detailed understanding of their processes, requirements and environment. With this knowledge as a starting point we offer solutions to customers, perfectly fitting their needs.

We have 2 goals:
1 – Customers choose our products because they are best for them on the market.
2 – Customers choose us as long-term partner because we are reliable, fair and always (always!) care for their needs.

What we get out of this:
Working this way, we get a happy xixLab-team with people who love what they do, motivated to stretch themselves for providing better and better products to our customers.

Find further information at www.xixLab.org