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Analysis of the Problems Existing in Electronic Product Testing and Corresponding Countermeasures

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Abstract: Electronic product testing serves as the core link to guarantee product quality, safe use, and stable performance. However, the traditional testing mode has defects in testing procedures, technical equipment, personnel capabilities, and management systems, which cannot satisfy practical production demands. Enterprises need to carry out optimization measures for every testing link to improve testing accuracy and the detection rate of hidden faults, so as to guarantee product quality better. Based on the practical problems in electronic product testing, this paper puts forward feasible strategies including constructing standardized testing procedures, accelerating the upgrading of technical equipment, strengthening professional talent training, and perfecting closed-loop management and data mechanisms, aiming to provide references for the standardized development of electronic product testing work.

Keywords: Electronic products; Testing; Problems; Countermeasures

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1. Introduction

Product testing runs through the whole chain of electronic products, covering research and development, production and factory delivery, and largely determines product quality and service safety. In the process of pursuing market competitiveness, enterprises must attach great importance to the optimization and upgrading of electronic product testing technologies, make up for deficiencies in all testing links, and fundamentally improve the reliability and accuracy of testing results. Nevertheless, there is a gap between actual electronic product testing and practical demands in real operation, which fails to adapt to the research and production scenarios of high-end electronic products. At present, optimizing electronic product testing strategies guided by practical problems has become an important research topic for enterprises.

2. The important significance of electronic product testing

2.1. Strictly control product quality

Electronic product testing acts as an important checkpoint for factory quality control. From the sales perspective, a complete and scientific electronic product testing system can systematically screen quality defects such as substandard performance, functional failures, insufficient stability, and potential safety hazards before products enter the market, thus preventing unqualified products from flowing to consumers. From the production perspective, accurate and comprehensive testing results can locate process defects and fluctuations in component quality, and guide enterprises to optimize product design and production procedures [1].

2.2. Support iterative product research and development

Relevant testing data can reflect the strengths and weaknesses of existing products in performance, power consumption, compatibility, and other dimensions, and clarify the direction of product iteration and upgrading. For instance, testing results of new product prototypes can intuitively reveal logical loopholes and scenario adaptation problems in research and design [2]. If enterprises discover defects at the prototype stage, they can avoid massive waste of early R&D investment caused by core flaws found after product finalization. Besides, testing results of mass production can reflect unreasonable design schemes, and provide data support for minor revisions and functional upgrades, helping enterprises continuously optimize products and enhance user experience [3].

2.3. Comply with industrial supervision requirements

At present, all industries have issued clear supervision standards for quality, safety, and performance indicators. Manufacturers are required to complete compliance tests on specified items and issue corresponding test reports before products go on sale to obtain market access qualifications. In addition, exported electronic products need to meet special technical specifications and testing requirements formulated by destination countries; otherwise, they cannot pass customs inspection. Therefore, standardized product testing is a necessary prerequisite for electronic products to enter the market. Enterprises must attach importance to electronic product testing to avoid compliance risks and ensure stable production and operation.

3. Main problems in electronic product testing

3.1. Incomplete and non-standard testing procedures

To shorten production cycles and cut costs, some enterprises simplify testing processes by removing or shortening key links such as aging tests and extreme environment long-term stability tests, making it impossible to verify product reliability under extreme conditions fully. Besides, inconsistent implementation of testing standards also leads to non-standard procedures [4]. Some enterprises fail to formulate unified testing processes for different product types, leading to inconsistent operating standards among batches and inspectors. Such randomness in procedures results in undetected hidden faults, and products frequently crash, lag, or suffer battery attenuation after delivery, which seriously damages user experience and brand reputation.

3.2. Backward testing technologies and equipment

With the integration of smart chips, Internet of Things, and artificial intelligence into electronic products, products become increasingly complex with integrated and intelligent functions. While bringing better user experience, this trend raises higher standards for testing precision, efficiency, and comprehensiveness. In fact, many enterprises still rely on manual testing without timely procurement of automatic and intelligent testing equipment. Backward testing technologies and equipment can only complete basic function verification, failing to cover high-precision performance tests, scenario simulation tests, and multi-device compatibility tests. Thus, testing results cannot fully and objectively reflect product quality [5]. Especially for cutting-edge products such as 5G communication modules, AI chips, and flexible screens, hidden performance defects are harder to detect, and traditional testing means can hardly meet practical demands.

3.3. Uneven professional competence of testing teams

Electronic product testing requires inspectors to master circuit principles, software systems, testing technologies, and operation methods of various professional equipment. However, many testing staff in enterprises lack systematic professional training. They only grasp basic operations and have insufficient understanding of testing key points and fault mechanisms of new electronic products [6]. This leads to irregular testing of complex electronic products and failure to identify potential performance defects accurately. Moreover, most enterprises do not attach importance to competency development of testing teams or establish regular training systems, which restricts inspectors' learning of new technologies, equipment, and standards.

3.4. Imperfect testing management system

The defects of the testing management system are reflected in three aspects. First, test data records are non-standard and incomplete, which hinders review and analysis and makes it hard to find omissions in testing links. Second, unclear division of testing responsibilities means specific persons cannot be traced after testing mistakes, so quality control requirements cannot be effectively implemented. Third, there is no full-life-cycle traceability mechanism for testing, resulting in isolated test data from R&D, trial production, and mass production. It hinders data collection and overall analysis, making it difficult to find common quality problems in different production stages and failing to provide sufficient data support for design optimization and process adjustment. Without effective solutions to these problems, a closed-loop mechanism of "testing-feedback-correction-optimization" cannot be formed, resulting in massive waste of data resources.

4. Optimization countermeasures for problems in electronic product testing

4.1. Construct standardized testing procedures

Standardized testing procedures serve as the foundation for resolving electronic product testing challenges, improving the production quality of electronic goods, and consolidating enterprises' high-quality development. Enterprises must face up to deficiencies in their existing testing workflows and establish standardized testing procedures covering the entire product lifecycle. For instance, during the product research and development phase, specific operational steps and judgment criteria for functional verification, performance benchmarking, and compatibility testing shall be defined in line with product functional designs and performance parameter requirements, so as to accurately identify product defects at the design

stage and offer guidance for product design optimization [7]. Upon entering the pilot and mass production phases, enterprises shall adopt a hierarchical testing control model, specifying requirements for basic functional inspections, sampling aging tests, and extreme environment simulation tests for each batch of products to guarantee consistent testing procedures and standards across all batches. In accordance with the characteristics of each product category, testing contents and operational specifications shall be stipulated to compile standardized technical manuals, mandating all testing personnel to conduct tests strictly in compliance with the manuals. Quality control requirements for each testing phase shall be clarified, and testing review mechanisms shall be implemented at every node to prevent issues such as shortened testing durations and omission of critical testing steps. This set of testing procedures defines key testing points and operational standards for distinct production stages, minimizes testing oversights from a procedural perspective, and further enhances the reliability of test results [8].

4.2. Accelerate the upgrading of testing technologies and equipment

Enterprises should increase investment in electronic product testing, timely introduce new testing technologies and equipment, and advance the intelligent transformation of testing methods. First of all, enterprises need to introduce high-precision testing instruments and intelligent testing systems tailored to their product testing requirements, and promptly replace outdated equipment that has exceeded its service life and fails to meet precision standards, so as to ensure testing facilities are compatible with integrated and intelligent electronic products. For example, enterprises can deploy scenario-based simulation testing systems, leveraging their technical strengths to improve the comprehensiveness and accuracy of test results for high-end electronic products and guarantee production quality. Such systems can simulate a wide range of complex application scenarios for electronic products and conduct special testing items including multi-device linkage compatibility tests and extreme environmental adaptability tests, enabling more accurate identification of latent performance defects in products. Secondly, enterprises shall accelerate the application and promotion of automated testing technologies, and develop automated testing scripts for routine basic testing procedures to realize automated batch testing of products [9,10]. On one hand, this eliminates errors caused by manual operation and improves the consistency and precision of test results; on the other hand, it boosts testing efficiency, shortens testing cycles, and aligns product testing technologies with the demands of mass production. Finally, enterprises shall attach importance to independent innovation of testing technologies, encourage technical staff to develop customized testing schemes based on the testing demands of core products, and strengthen the compatibility between testing technologies and their own product systems [11].

4.3. Promote training and team building for testing talents

To ensure the smooth progress of all electronic product testing work, enterprises should attach great importance to the training of testing personnel and team building, and continuously increase efforts in training and recruiting testing staff. For enterprises, training testing personnel constitutes internal self-sustained talent development. Enterprises shall establish regular training mechanisms based on the capability deficiencies of existing testing staff. The training content mainly covers testing standards for new electronic products, fault analysis methods, and operating specifications for new testing equipment; training methods include offline centralized lectures, online special courses, and on-the-job practical training. In practice, enterprises may select customized training content and approaches for testing personnel at different

competency levels to help them timely update their knowledge systems, master cutting-edge testing skills, and build a competency framework matching current product testing requirements. Meanwhile, enterprises shall actively recruit high-level testing technical professionals to form specialized testing teams and elevate the overall technical capacity of testing teams. Such external talent introduction can help enterprises rapidly recruit professional specialists for high-end electronic product testing [12]. By hiring high-level testing technical talents, enterprises can directly upgrade the team's technical capabilities, and these professionals can drive the competency improvement of internal testing staff through knowledge sharing and mentoring.

4.4. Improve testing management and data closed-loop mechanisms

Perfect testing management and data closed-loop mechanisms lay the foundation for traceable test data and locatable problems. Enterprises shall formulate complete testing management systems, clarify powers and responsibilities of all testing links, and require staff to standardize testing and record data and abnormal conditions [13]. The analyzed data can identify defects in testing and production processes and provide a reliable basis for optimizing testing procedures and product design. On this basis, build a full-life-cycle test data management platform to break data barriers among R&D, trial production, and mass production, and realize real-time sharing and centralized storage of test data [14]. The platform forms a complete chain of "data collection-data summary and analysis-problem positioning-feedback-implementation of optimization-verification", supporting continuous iteration of testing technologies. Enterprises can improve closed-loop management of testing to guarantee reliable and comprehensive test results, feed data back to R&D departments, and realize a circulation of "testing-analysis-improvement-verification", thus lifting testing efficiency and product quality [15].

5. Conclusion

Product testing is a vital link to guarantee electronic product quality, and its technical level and working efficiency determine enterprise competitiveness and consumer rights. Enterprises shall address defects including non-standard procedures, backward technologies, insufficient talent development and weak management, and perfect testing systems from four dimensions: institutional construction, technical upgrading, talent cultivation and management optimization. Coordinated progress of these dimensions can standardize and intellectualize testing work, solve various problems in testing links, and bring important benefits to enterprises and the whole industry. Enterprises shall keep track of technical trends in electronic testing, and dynamically optimize testing management systems according to product iteration directions, so as to guarantee product quality and sustain the lifeline of corporate and industrial development.

Disclosure statement

The author declares no conflict of interest.

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