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QA as a predictive system: Modern methods of ensuring stability, compliance, and resilience of digital products

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Abstract

The article examines modern QA methods as a tool for predictive analysis and increasing the resilience of digital systems.

Approaches to risk-oriented testing, defect prediction, multiplatform analysis, and compliance control of medical and high-load products with industry standards are analyzed. It is shown that QA engineering is developing as an analytical discipline and is becoming a key element of digital product management at the stages of design, development, and operation.

Keywords: Software Quality; Predictive Testing; Risk Analysis; Regression Automation; HIPAA; FDA; Defectology; Platform Variability

1. Introduction

The digital economy imposes new requirements for the predictability, reliability, and scalability of IT systems.

Software quality is no longer the result of isolated testing activities but becomes the outcome of systemic predictive analysis.

Modern products mobile services, telemedicine solutions, e-commerce platforms require comprehensive quality control that includes data analysis, defect prediction, verification of compliance with security standards, and adaptation to a multiplatform environment. This leads to the formation of a new paradigm: QA as a scientific-analytical discipline and a tool for risk management.

2. Predictive analysis as the foundation of QA engineering

The use of machine learning and statistical models makes it possible to identify areas of probable defect occurrence, predict error types, and determine points of maximum risk.

Studies show that the implementation of predictive models reduces the number of critical defects after release by 30–45% and also increases release stability.

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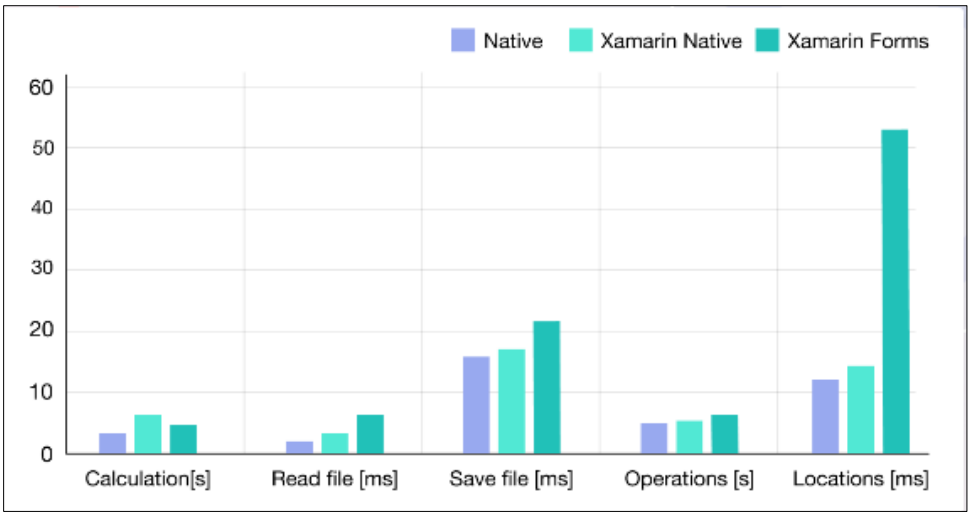

Figure 1 Comparative performance metrics for Native, Xamarin Native, and Xamarin Forms implementations across typical operational tasks.

3. Multiplatform Variability and Its Impact on Quality

Modern digital products operate simultaneously in several environments: iOS, Android, Web, and smart devices.

Differences between platforms become one of the main causes of defects, including

- API incompatibility,
- Differences in UI rendering,
- Network latency,
- Hardware limitations,
- Differences in libraries and SDKs.

According to reports, up to 58% of failures are related to cross-platform incompatibility, which confirms the need for a hybrid approach: automation + manual testing on real devices.

4. Testing Medical Software: HIPAA and FDA Requirements

Medical products are among the most demanding categories.

4.1. Quality control must ensure

- Data protection (HIPAA Privacy Rule),
- Access management and auditing,
- Cryptographic security,
- Functional validation according to FDA standards,
- Reproducibility of test scenarios.
- For companies, working with medical products turns QA into a tool for minimizing legal and operational risks.

5. Automation of Regression Testing and Its Importance for Scalable Products

Frequent updates and a fast release pace require the automation of regression testing.

IBM statistics show that the cost of fixing defects after release can exceed the cost of fixing them during the testing stage by 6–8 times.

Therefore, regression automation becomes not just desirable, but critically important for product teams striving to reduce costs and increase the speed of bringing a product to market.

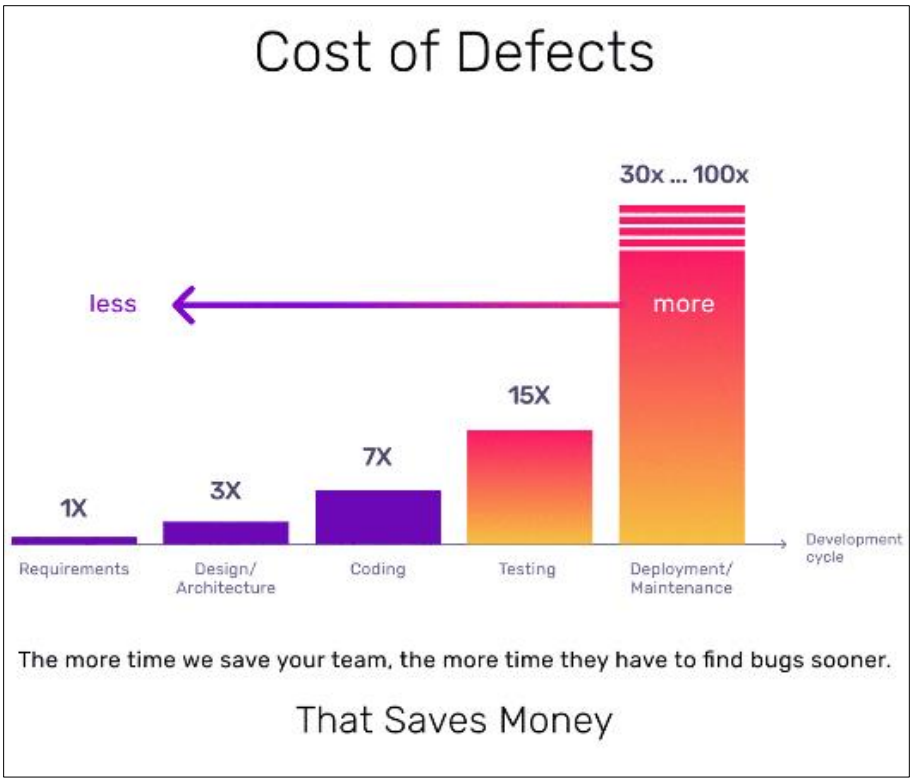

Figure 2 Cost of Defects at different stages of the development cycle

6. The Role of QA in Architectural and Product Management

6.1. QA engineering today participates in key stages of the product life cycle

- Prioritization of features,
- Risk analysis,
- Formation of stability requirements,
- Participation in roadmap development,
- Ensuring compliance with industry standards.

6.2. The integration of QA into the product cycle increases

- Release stability,
- User satisfaction,
- Customer retention,
- Incident response speed (MTTR).

7. Educational Ecosystems and the Global Demand for QA Specialists

The global market is experiencing a shortage of QA specialists.

The strengthening of educational platforms, communities, and practice-oriented courses is becoming the foundation for forming a new generation of engineers capable of working in international teams and ensuring software compliance with global standards.

8. Conclusion

QA engineering is evolving into a predictive and analytical discipline that encompasses defect forecasting, risk analysis, compliance verification, and architectural oversight.

The integration of modern QA approaches into the product cycle makes it possible to create resilient digital solutions that meet high requirements for security, reliability, and user experience.

Software quality becomes a strategic asset of a company, and QA becomes the foundation of digital maturity.

Compliance with ethical standards

Disclosure of conflict of interest

The author declares that there are no conflicts of interest related to this article.

References

[1] ResearchGate. (2024). Predictive Defect Models.

[2] Mobile App Failure Review. (2023). Annual Report on Application Stability and Failure Rates.

[3] HIPAA Journal. (2024). HIPAA Compliance Map and Regulatory Overview.

[4] IBM Systems Institute. (2024). Cost of Software Defects Across the Development Lifecycle.

[5] Simform Research. (2022). Software Quality and Testing Efficiency Report.

[6] Grand View Research. (2025). Global Education Technology Market Analysis.