



Software Quality Engineering

Assignment 2

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Assignment Question

Q. A system expanded with 1000 users reports student-related problems such as video buffering, login errors, and inconsistent Grading Result.

1. Identify quality risk in the system and rank them on item based on their impact (low, medium, high).
2. Design a testing strategy for functional and non-functional requirement.
3. Purpose performance techniques suitable for this system.
4. Explain about user involvement and how its impact on continuous quality improvement (CMMI).
5. Discuss the role of user experience in software quality.

Assignment Answer

1. Identification of Quality Risks

After the system expanded to 1000 users, several critical issues were reported: video buffering, login errors, and inconsistent grading results. These directly point to underlying quality risks.

Video Buffering – Medium Impact

- Indicates performance bottlenecks
- Server may not handle concurrent streaming load
- Directly affects the learning experience

Login Errors – High Impact

- Points to authentication or session-handling issues
- Students may lose access completely
- Affects system reliability and trust

Inconsistent Grading Results – High Impact

- Indicates data integrity failures
- Possible synchronization errors or incorrect calculations
- Students' academic outcomes are directly affected

Scalability Risk – Medium Impact

- The system may not be optimized for 1000+ concurrent users
- Load balancers and horizontal scaling might be insufficient

Security Risk – Medium Impact

- Login errors may reveal vulnerabilities
- Potential risk of brute-force attacks or unauthorized access

Usability Risk – Low Impact

- Poor UI response during buffering
- User frustration increases

2. Testing Strategy for Functional and Non-Functional Requirements

Functional Testing

Login Functionality Tests

- Valid/invalid login attempts
- Multiple concurrent login sessions
- Session timeout verification
- Password reset flow

Video Playback Functionality

- Play, pause, seek, buffering behavior
- Different video resolutions
- Error messages and fallback handling

Grading System Tests

- Calculation accuracy
- Re-evaluation consistency
- Database CRUD validation
- Boundary testing (minimum and maximum scores)

Role-Based Access Control Tests

- Student/Teacher roles
- Dashboard access validation
- Permission-based restrictions

API Testing

- Response codes
- Latency measurement
- Data validation
- Error handling

Non-Functional Testing

Performance Testing

- **Load Testing:** Evaluate system behavior at 1000–1500 users
- **Stress Testing:** Determine the point of system failure
- **Spike Testing:** Sudden rapid increases in user load

- **Endurance Testing:** Long-duration stability analysis

Security Testing

- SQL Injection attempts
- XSS vulnerability checks
- Authentication token security
- Rate-limiting validation

Usability Testing

- Intuitive navigation
- Clear and meaningful error messages
- Ease of accessing learning modules

Compatibility Testing

- Multi-browser support (Chrome, Firefox, Edge)
- Mobile and desktop responsiveness
- Low-bandwidth performance

3. Performance Techniques Suitable for This System

Caching Techniques

- Using a CDN for video delivery
- Caching frequent metadata for faster response

Load Balancing

- Distributing user traffic across multiple servers
- Reduces single-server overload

Database Optimization

- Adding indexing to grading tables
- Read/write workload separation
- Query optimization

Asynchronous Processing

- Asynchronous video processing
- Event-driven grading operations

Compression

- Transcoding videos to optimized bitrate
- Compressing network payloads for faster API performance

4. User Involvement and Its Role in Continuous Quality Improvement (CMMI)

User involvement plays a significant role in improving software quality and is directly connected to CMMI (Capability Maturity Model Integration).

Importance of User Involvement

- Users provide real-time feedback
- Identifies performance gaps early
- Helps the QA team understand real usage scenarios
- Supports requirement clarification and avoids rework

Impact on CMMI

- At higher maturity levels (Level 3+), structured user feedback loops are essential
- Users help in refining processes and improving product quality
- Continuous feedback contributes to measurable process improvements

In essence, active user participation accelerates continuous improvement and helps organizations achieve higher CMMI maturity levels.

5. The Role of User Experience (UX) in Software Quality

User Experience is a critical dimension of overall software quality. Even if a system is technically functional, poor UX can cause users to perceive it as low quality.

How UX Influences Software Quality

- Enhances user satisfaction and trust
- Reduces frustration and support tickets
- Encourages continued usage and engagement
- Ensures clarity through intuitive design and consistent layouts

Key UX Quality Indicators

- Accessibility
- Interface consistency
- Responsiveness
- Error prevention and helpful guidance messages
- Smooth navigation

A good user experience strengthens the overall perception of system quality and leads to higher adoption and positive feedback.