FUNCTIONAL AND PERFORMANCE TESTING PHASE

UNESCO Heritage Sites Analysis Project

Date: 26-27 June 2025

Team ID: LTVIP2025TMID51713

Project Name: UNESCO Heritage Sites Analysis Project

Testing Duration: 2 Days (Sprint-4)

TESTING OVERVIEW

Testing is the process of evaluating and verifying that your project works correctly and meets the specified requirements. For your UNESCO project, we need to test both functionality (does it work?) and performance (does it work well?).

FUNCTIONAL TESTING (USN-15) - 3 Story Points

What is Functional Testing? Functional testing verifies that each feature of your application works according to the requirements. It focuses on checking if the system does what it's supposed to do.

Test Cases for UNESCO Project:

TC-001: Dataset Loading and Cleaning

- **Test Objective:** Verify that UNESCO dataset loads correctly and data cleaning works
- **Test Steps:**
    1. Load the UNESCO dataset file
    2. Check for missing values handling
    3. Verify data types are correct
    4. Confirm duplicate records are removed
- **Expected Result:** Dataset loads without errors, missing values handled, clean data ready for analysis
- **Priority:** High

TC-002: Data Analysis Functionality

- **Test Objective:** Verify data analysis features work correctly
- **Test Steps:**
    1. Test region-wise distribution analysis
    2. Check category-wise site classification
    3. Verify pattern identification in data
    4. Test statistical calculations
- **Expected Result:** Analysis generates correct insights, patterns identified accurately
- **Priority:** High

TC-003: Visualization Dashboard

- **Test Objective:** Verify visual dashboards display correctly
- **Test Steps:**
    1. Test chart generation (bar charts, pie charts, maps)
    2. Check dashboard responsiveness
    3. Verify data accuracy in visualizations
    4. Test interactive features (if any)
- **Expected Result:** All visualizations display correctly with accurate data
- **Priority:** High

TC-004: Endangered Sites Filter

- **Test Objective:** Verify filtering of endangered sites works
- **Test Steps:**
    1. Apply endangered sites filter
    2. Check if correct sites are displayed
    3. Verify site details are accurate
    4. Test filter reset functionality
- **Expected Result:** Only endangered sites shown, details are correct
- **Priority:** Medium

TC-005: UNESCO Criteria Analysis

- **Test Objective:** Verify criteria-based analysis (1-10) works
- **Test Steps:**
    1. Test each UNESCO criteria filter (1-10)
    2. Check sites matching specific criteria
    3. Verify criteria combinations work
    4. Test multiple criteria selection
- **Expected Result:** Sites correctly filtered based on UNESCO criteria
- **Priority:** Medium

TC-006: Report Generation

- **Test Objective:** Verify final report generation works
- **Test Steps:**
    1. Generate project summary report
    2. Check all sections are included
    3. Verify data accuracy in report
    4. Test report export/save functionality
- **Expected Result:** Complete report generated with accurate findings
- **Priority:** High

TC-007: Recommendation System

- **Test Objective:** Verify protection recommendations are generated
- **Test Steps:**
    1. Generate recommendations for endangered sites
    2. Check recommendation relevance
    3. Verify recommendations are actionable
    4. Test recommendation formatting

- **Expected Result:** Relevant protection recommendations provided
- **Priority:** Medium

PERFORMANCE TESTING (USN-16) - 3 Story Points

What is Performance Testing? Performance testing checks how well your application performs under various conditions. It measures speed, responsiveness, and stability.

Performance Test Cases:

PT-001: Data Loading Performance

- **Test Objective:** Measure time taken to load UNESCO dataset
- **Test Method:** Record loading time for dataset
- **Acceptance Criteria:** Dataset should load within 10 seconds
- **Test Data:** Full UNESCO dataset file
- **Expected Result:** Loading time ≤ 10 seconds

PT-002: Analysis Processing Speed

- **Test Objective:** Measure time for data analysis operations
- **Test Method:** Time each analysis function
- **Acceptance Criteria:**
  - Region-wise analysis: ≤ 5 seconds
  - Category analysis: ≤ 3 seconds
  - Pattern identification: ≤ 8 seconds
- **Expected Result:** All analysis operations within time limits

PT-003: Visualization Rendering Performance

- **Test Objective:** Measure dashboard rendering speed
- **Test Method:** Time chart and graph generation
- **Acceptance Criteria:**
  - Charts load within 3 seconds
  - Dashboard fully rendered within 10 seconds
- **Expected Result:** Fast visualization rendering

PT-004: Filter Response Time

- **Test Objective:** Measure filter application speed
- **Test Method:** Time filter operations
- **Acceptance Criteria:**
  - Endangered sites filter: ≤ 2 seconds
  - Criteria filters: ≤ 3 seconds
- **Expected Result:** Quick filter responses

PT-005: Memory Usage Testing

- **Test Objective:** Monitor memory consumption
- **Test Method:** Check RAM usage during operations

- **Acceptance Criteria:** Memory usage should not exceed 1GB
- **Expected Result:** Efficient memory utilization

PT-006: Concurrent User Simulation (if applicable)

- **Test Objective:** Test multiple users accessing system
- **Test Method:** Simulate 5-10 concurrent users
- **Acceptance Criteria:** System remains responsive
- **Expected Result:** No performance degradation

BUG FIXES AND OPTIMIZATION (USN-17) - 5 Story Points

Bug Identification Process:

1. **Critical Bugs:** System crashes, data corruption, major feature failures
2. **High Priority Bugs:** Important features not working, incorrect results
3. **Medium Priority Bugs:** Minor feature issues, cosmetic problems
4. **Low Priority Bugs:** Enhancement requests, minor UI issues

Common Bug Categories to Check:

Data-Related Bugs:

- Incorrect data processing
- Missing value handling errors
- Wrong calculations in analysis
- Data visualization showing wrong information

User Interface Bugs:

- Dashboard not displaying properly
- Charts not rendering correctly
- Filter buttons not working
- Report generation failing

Performance Issues:

- Slow loading times
- Memory leaks
- Inefficient algorithms
- Large file handling problems

Integration Bugs:

- Components not working together
- Data flow issues between modules
- Export/import functionality problems

TESTING DELIVERABLES:

1. **Test Case Execution Report**
    - List of all test cases executed
    - Pass/Fail status for each test
    - Screenshots of test results
2. **Bug Report Document**
    - Bug ID, description, severity, status
    - Steps to reproduce bugs
    - Screenshots of bugs
3. **Performance Test Results**
    - Loading times for different operations
    - Memory usage statistics
    - Performance optimization recommendations
4. **Final Test Summary Report**
    - Overall testing results
    - System readiness assessment
    - Recommendations for production deployment

SUCCESS CRITERIA:

✅ All High Priority test cases pass ✅ Performance meets acceptance criteria ✅ Critical bugs fixed ✅ System ready for demo ✅ Documentation complete

TESTING TOOLS SUGGESTED:

- **Manual Testing:** For functional verification
- **Browser Developer Tools:** For performance monitoring
- **Screenshots:** For bug documentation
- **Excel/Google Sheets:** For test case tracking
- **Timer/Stopwatch:** For performance measurement