Revision History

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| Date | Version | Description | Author |
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K.A.E Experience Centre Management System

Phase 1 Documentation

V1.08

19/03/2012

Contents

[1 Test Plan 1](#_Toc323010249)

[1.1 Introduction 1](#_Toc323010250)

[1.1.1 Purpose 1](#_Toc323010251)

[1.1.2 Scope 1](#_Toc323010252)

[1.1.3 Definitions 1](#_Toc323010253)

[1.1.4 Applicable Documents 1](#_Toc323010254)

[1.2 Tests 2](#_Toc323010255)

[1.2.1 Logged in as ‘Admin’ 2](#_Toc323010256)

[1.2.2 Logged in as ‘Instructor’ 2](#_Toc323010257)

[1.2.3 Logged in as ‘Counter Staff’ 3](#_Toc323010258)

[1.2.4 Logged in as ‘Owner’ 3](#_Toc323010259)

[2 Testing 4](#_Toc323010260)

[3 Software Quality Plan 5](#_Toc323010261)

[3.1 Introduction 5](#_Toc323010262)

[3.1.1 Purpose 5](#_Toc323010263)

[3.1.2 Scope 5](#_Toc323010264)

[3.1.3 Applicability 5](#_Toc323010265)

[3.1.4 Applicable Documents 5](#_Toc323010266)

[3.1.5 Dictionary of Terms 5](#_Toc323010267)

[3.2 Document Structure 6](#_Toc323010268)

[3.3 Documentation 7](#_Toc323010269)

[3.4 Development 7](#_Toc323010270)

[3.5 Implementation 8](#_Toc323010271)

[4 Software Quality Assurance Plan 11](#_Toc323010272)

[4.1 Introduction 11](#_Toc323010273)

[4.1.1 Purpose 11](#_Toc323010274)

[4.1.2 Scope 11](#_Toc323010275)

[4.1.3 Definitions 11](#_Toc323010276)

[4.2 Applicability 11](#_Toc323010277)

[4.3 Applicable Documents 11](#_Toc323010278)

[4.4 Project Management and Planning 12](#_Toc323010279)

[4.4.1 Organisation 12](#_Toc323010280)

[4.4.2 Tasks 12](#_Toc323010281)

[4.4.3 SQA Personnel 12](#_Toc323010282)

[4.5 Program Requirements 13](#_Toc323010283)

[4.5.1 Program Performance and Resource Allocation Monitoring 13](#_Toc323010284)

[4.5.2 SQA Program Audits 13](#_Toc323010285)

[4.5.3 SQA Records 13](#_Toc323010286)

[4.5.4 SQA Status Reports 13](#_Toc323010287)

[4.5.5 Software Documentation 14](#_Toc323010288)

[4.5.6 Requirements Traceability 14](#_Toc323010289)

[4.5.7 Software Development Process 14](#_Toc323010290)

[4.5.8 Project Reviews 14](#_Toc323010291)

[4.5.9 Tools and Techniques 15](#_Toc323010292)

[4.5.10 Software Configuration Management 15](#_Toc323010293)

[4.5.11 Release Procedures 15](#_Toc323010294)

[4.5.12 Change Control 15](#_Toc323010295)

[4.5.13 Problem Reporting 16](#_Toc323010296)

[4.5.14 Software Testing 16](#_Toc323010297)

[5 Phase 1 Quality Audit 17](#_Toc323010298)

[5.1 Documentation 17](#_Toc323010299)

[5.2 Development 17](#_Toc323010300)

[5.3 Implementation 18](#_Toc323010301)

[6 Phase 2 Quality Audit 19](#_Toc323010302)

[6.1 Documentation 19](#_Toc323010303)

[6.2 Development 19](#_Toc323010304)

[6.3 Implementation 20](#_Toc323010305)

[7 Phase 3 Quality Audit 21](#_Toc323010306)

[7.1 Documentation 21](#_Toc323010307)

[7.2 Development 21](#_Toc323010308)

[7.3 Implementation 22](#_Toc323010309)

# Test Plan

## Introduction

### Purpose

This Test Plan details all the tests that will ensure that the Experience Centre Management System program is fully functional. It will detail all the things that the program must do and all the things it must not do along with the schedule and projected cost of the project.

### Scope

The tests will cover all parts of the program that SegFault Software has developed but will not include any third party code, the client’s computer or internet connectivity.

### Definitions

* ECMS - Experience Centre Management System, the program which has been developed
* Validation – A test on input data to check whether the data is logical according to a set of predefined rules

### Applicable Documents

This document is IEEE 830 compliant: <http://standards.ieee.org/findstds/standard/829-2008.html>

## Tests

|  |  |  |
| --- | --- | --- |
| **Test number** | **Test Description** | **Expected result** |
|  | Login with no username or password specified | Login fails, displays login failed message box |
|  | Login with valid username and unspecified password | Login fails, displays login failed message box |
|  | Login with unspecified username and valid password | Login fails, displays login failed message box |
|  | Login with valid username and incorrect password | Login fails, displays login failed message box |
|  | Login with valid username and password | Login successful |

### Logged in as ‘Admin’

|  |  |  |
| --- | --- | --- |
| **Test number** | **Test Description** | **Expected result** |
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### Logged in as ‘Instructor’

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| --- | --- | --- |
| **Test number** | **Test Description** | **Expected result** |
|  | Attempt to add a new Rental for a Member | Failure due to incorrect permission set. |
|  | Change any Member information and attempt to submit | Failure due to incorrect permission set. |
|  | Add new Member to System | Failure due to incorrect permission set. |
|  | Search/Filter Members in System Test Data: “Martin Pierce” | Correct Member shows based on filter. |
|  | Search/Filter for non-existing Member  Test Data: “Tony Franklin” | No Members shown in Member listing. |
|  | Cancel any staged changes to a Member’s data | Resets the data to that in the DB. |
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### Logged in as ‘Counter Staff’

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| **Test number** | **Test Description** | **Expected result** |
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### Logged in as ‘Owner’

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| **Test number** | **Test Description** | **Expected result** |
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# Testing

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| --- | --- | --- |
| **Test number** | **Passed?** | **Actual result** |
|  | ✓ | Login fails, displays login failed message box |
|  | ✓ | Login fails, displays login failed message box |
|  | ✓ | Login fails, displays login failed message box |
|  | ✓ | Login fails, displays login failed message box |
|  | ✓ | Login successful |
|  |  |  |
|  |  |  |

|  |  |  |
| --- | --- | --- |
| **Test number** | **Passed?** | **Actual result** |
| 18. | ✓ | Failure as expected, shows “Incorrect Permissions” messagebox. |
| 19. | ✓ | Failure as expected, shows “Incorrect Permissions” messagebox. |
| 20. | ✓ | Failure as expected, shows “Incorrect Permissions” messagebox. |
| 21. | ✓ | Correct member filtered from the listing. |
| 22. | ✓ | No members shown in the member listing. |
| 23. | ✓ | Data correctly resets, all changes dropped. |
| 24. |  |  |

# Software Quality Plan

## Introduction

### Purpose

The purpose of this software quality plan is to define the standards to which the language and roles project will be developed which will enable SegFault Software to make Experience Centre Management System a high quality project.

### Scope

This document will assure that: (1) Experience Centre Management System is a fully functioning and robust application; (2) the program suits the client’s needs; (3) documentation is of a high standard; (4) the development process cycle itself is high quality with all components acting in a professional manner.

### Applicability

This document will be used throughout the: analysis, design, implementation, testing and evaluation of Experience Centre Management System. This SQP is in effect until all deliverables including the ECMS program, documentation, installation, presentation and 2 years of phone support have been delivered to the client in their entirety.

This plan applies only to software developed by SegFault Software. Products and services provided by third parties may not abide by the same quality standards.

### Applicable Documents

Microsoft UI Guidelines: <http://www.microsoft.com/download/en/details.aspx?displaylang=en&id=2695>

### Dictionary of Terms

|  |  |
| --- | --- |
| Term | Definition |
| Code | An instruction that tells a computer how to perform a computation |
| Debugging | The process of identifying and removing errors from code |
| Open source | Computer software that is available in source code form |
| Source code | Text written using the format and syntax of a programming language |
| Bug | An error in programming code |
| Operating system | Software that supports a computer’s basic functions e.g. communicating with hardware and peripherals |
| Object oriented | A type of programming philosophy based around objects |

## Document Structure



Quality can be broken down into several categories; this plan is structured according to this breakdown.

* Documentation – These apply just to the documentation used to support the program
* Development – These standards apply to the development process itself
* Implementation – These standards apply to the ECMS program
  + Operation – Refers to the way the program functions
  + Transition – Refers to the ability to move parts of the program and interface it with other programs
  + Revision – Refers to the ease of supporting and modifying the program

## Documentation

|  |  |  |  |
| --- | --- | --- | --- |
| Standard Number | Category | Definition | Time of Implementation |
| DO1 | Consistency | All documents must show consistent facts and figures | Throughout |
| DO2 | Legibility | All documents must be written in British English | Throughout |
| DO3 | Legibility | All documentation must use proper grammar and spelling | Throughout |
| DO4 | Consistency | All documents must use Segoe UI font | Throughout |
| DO5 | Consistency | The default font size for all documentation is 11 | Throughout |
| DO6 | Comprehensiveness | All documents must include all sections used by reputable established companies | Throughout |
| DO7 | Explicit | All documents should contain a list of definitions for any terms not in common use | Throughout |
| DO8 | Explicit | Unnecessary technical terminology should be avoided in client documentation | Throughout |

## Development

|  |  |  |  |
| --- | --- | --- | --- |
| Standard Number | Category | Definition | Time of Implementation |
| DE1 | Punctuality | All team members should attend all meetings | Throughout |
| DE2 | Punctuality / Communicativeness | Emails should be read and responded to if necessary within 24 hours | Throughout |
| DE3 | Planning | A plan that covers the entire project must be made to schedule tasks | Beginning of project |
| DE4 | Planning | The plan must be adjusted throughout the development cycle so that it consistently reflects reality | Throughout |
| DE5 | Delegating | Skills matrices must be completed by all team members to allow tasks to be delegated properly | Beginning of project |

|  |  |  |  |
| --- | --- | --- | --- |
| Standard Number | Category | Definition | Time of Implementation |
| DE6 | Responsibility | Each team member is responsible for making sure their work is compliant with all quality standards | Throughout |
| DE7 | Communication | Each member must communicate that they have started a piece of work to prevent duplication | Throughout |

## Implementation

|  |  |  |  |
| --- | --- | --- | --- |
| Standard Number | Category | Definition | Time of Implementation |
| I1 | Correctness | The program must match the: specification that the client provided, the software requirements specification and the conceptual and technical designs | Implementation |
| I2 | Correctness | Each test in the test plan must correspond with a point in the technical design | Testing |
| I3 | Reliability | Data must be transmitted over the network accurately | Implementation |
| I4 | Integrity | It must be impossible to use the software without logging in | Design | |
| I5 | Integrity | Suitable permissions will work as described in the software specification | Design | |
| I6 | Efficiency | The program, not including the stored data, must not use more than 100mb of backing store space | Implementation | |
| I7 | Correctness | The program must run on the client’s systems | Implementation | |
| I8 | Usability | The GUI must meet the Windows User Interface Guidelines (29/09/2010) | Design | |
| I9 | Integrity | The program must not introduce security flaws into the company’s IT system | Design / Implementation | |

|  |  |  |  |
| --- | --- | --- | --- |
| Standard Number | Category | Definition | Time of Implementation |
| I10 | Portability | The software must not require any configuration to install on the client’s computer | Implementation |
| I11 | Portability / Integrity | It must be possible to fully remove the program including all files from the client’s system | Implementation |
| I12 | Maintainability | GUI objects will use a suitable standardised prefix for the object type followed by an underscore and then an appropriate variable name | Design |
| I13 | Maintainability | All code blocks will be indented by exactly one tab | Implementation |
| I14 | Maintainability | Only one statement will occur per line | Implementation |
| I15 | Maintainability | Left hand comparisons shall be used i.e. 42==a not a==42 | Implementation |
| I16 | Testability / Flexibility / Maintainability /  Interoperability | Data will be stored in a separate file(s) from the executable | Design |
| I17 | Flexibility / Reusability | Class names will be named with semantic names in upper camel case ie FileInputOutput | Implementation |
| I18 | Flexibility / Reusability | Class names will not use acronyms unless it is more commonly used than its unabbreviated counterpart | Implementation |
| I19 | Flexibility / Reusability | Variable names will be semantic and in lower camel case with the first word written in lower case and subsequent words beginning with a capital letter i.e. numberOfCars | Implementation |

|  |  |  |  |
| --- | --- | --- | --- |
| Standard Number | Category | Definition | Time of Implementation |
| I20 | Maintainability / Flexibility | Variables with single character names should not be used unless scope is confined to a single code block i.e. I, j, k | Implementation |
| I21 | Flexibility / Reusability | Method names will have semantic lower camel case names similar to variable names with the first word written in lower case and subsequent words beginning with a capital letter i.e. getNumberOfCars | Implementation |
| I22 | Flexibility / Reusability | All names used within the code will fully follow standard British English language including all grammar and punctuation | Implementation |
| I23 | Maintainability / Testability | Version control will use the .NET convention of: major version, minor version, revision number and build number i.e. 1.0.5.20042 | Implementation |
| I24 | Reliability | The program must be fully tested in compliance with IEEE 829-2008 | Testing |
| I25 | Correctness | Review of user requirements | Throughout |
| I26 | Usability | A user manual will be included with the program | Evaluation |
| I27 | Portability | The system will be usable on machines using both Windows and Linux operating systems. | Implementation |
| I28 | Reusability / Flexibility | The system will be developed using object oriented programming techniques. | Implementation |

# Software Quality Assurance Plan

## Introduction

### Purpose

The purpose of this software quality assurance plan is to define the techniques and methodologies which will enable SegFault Software to enforce the standards required to make ECMS a high quality product. The format of this document follows the requirements of ECMS’s Software Quality Plan.

### Scope

This document will assure that: (1) Experience Centre Management System is a fully functioning and robust application; (2) the program suits the client’s needs; (3) documentation is of a high standard; (4) the development process cycle itself is high quality with all components acting in a professional manner.

### Definitions

* L&RPT – Experience Centre Management System Project Team – The team responsible for the development of the software and documentation for this project
* Project Team – The team responsible for the production of the project including all software development and non-software development staff
* QSD Certification – Quality Software Developer Certification – A certification that all software developers at SegFault Software must attain to become developers. It covers good programming and project development practices. All developers must repeat the assessment annually to keep their certification and therefore job title.
* SQP – Software Quality Plan – Describes the standards which the project will adhere to make L&R a high quality product
* Resolution – The smallest level of detail that can be defined

## Applicability

This document will be used throughout the: analysis, design, implementation, testing and evaluation of Experience Centre Management System. This SQA is in effect until all deliverables including the ECMS program, documentation, installation, presentation and 2 years of phone support have been delivered to the client in their entirety.

This plan applies only to software developed by SegFault Software. Products and services provided by third parties may not abide by the same quality standards.

## Applicable Documents

Template used: <http://acis.mit.edu/acis/sqap/>

## Project Management and Planning

### Organisation



The ECMS Project Team consists of 4 team members, 3 software developers and 1 technical author. All these members have been put under the direct management of Mark Robinson, a Java development team leader, for the development of this project. Mark acts as the point of contact for the client and reports directly to the Erin Anttila, Executive Director of European Software Development. Mark is acting software producer for this project and so is responsible for the overall project and managing contact with any other departments as required.

### Tasks

All tasks related to the development of the software including all documentation will be managed and completed by the ECMSPT. Administration tasks such as accounting and payment processing will be handled by the appropriate departments. Interfacing with these other departments will be the responsibility of Mark Robinson.

### SQA Personnel

#### SQA Training

No additional training is expected to be required as all staff members are already sufficiently trained to deliver a quality product. In the case of new staff being recruited or contractors hired it will be ensured that they have the necessary qualifications and that they become familiar with this SQA.

#### Quality Software Developer - Training Certification

Every developer in the project team has already been assessed and provided QSD Certification by SegFault Software prior to joining the project team. This assessment is repeated annually to ensure compliance.

## Program Requirements

### Program Performance and Resource Allocation Monitoring

This will be included in the usability testing as exceeding latency limits may not make the program a technical failure however will make it difficult to use in practice.

### **SQA Program** Audits

SQA will review and approve all design documents prior to development to ensure that the proposed system fits the client’s needs and SegFault Software’s quality standards. This will include ECMS but not any third part dependencies, though dependencies shall be checked for adequate compatibility with the client’s computer systems.

#### Sched***uled*** Audits

Audits will occur at the end of each development phase before delivery and at each stage of testing the software.

#### Uns***ched***uled Audits

Unscheduled SQA audits will occur both at random and when issues arise to ensure constant compliance.

#### Audi***ts*** of the SQA Organisation

Audits of those responsible for the SQA will be completed by SegFault Software’s Internal Audit department at random and on completion of each phase before delivery. This will ensure that the project team’s SQA has been effective; results shall be delivered to the Executive Director of European Software Development and archived by the Internal Audit department.

#### Audit Reports

Audit reports contain the current status of the project, its quality level and recommended corrective actions. These reports shall be delivered to the project team and the corrective actions will be brought to the attention of the member of the team responsible for that section of the project.

### SQA Records

Audit reports will be held by both the project team and the Internal Audit department. Change and meeting logs shall be kept by just the project team and will be transferred to Internal Audit on the date of delivery of the software deliverables.

### SQA Status Reports

SQA status reports will include the current quality of the project, the current progress of the project and a summary of any SQA audits accomplished since the last status report. These reports will be delivered directly to the Executive Director of European Software Development and archived by the Internal Audit department.

### Software Documentation

SQA will review all documentation including those about ECMS and those about the development process itself.

The essential documentation includes:

* Software Requirements Specification
* Costing Analysis
* Risk Analysis
* Quality Assurance Standards and Plan
* Conceptual Design
* Technical Design (UML, data storage,)
* Test Plan
* Testing
* Project Evaluation
* Client Presentation

Software documentation must be based on well-established standards or templates.

Documents will be audited to ensure they comply with the standards and templates used. Corrective recommendations will be issued if they do not comply which will be routed to the team member responsible. Documentation audits will be held by the project team and then transferred to Internal Audit for archiving.

### Requirements Traceability

SQA will audit requirements traceability via a spread sheet matrix to ensure all requirements are met at each stage of the development cycle. This will tie requirements from the SRS to lower level designs and tests of the resulting program.

### Software Development Process

SQA will audit deliverables between each phase of the software development lifecycle. This will not preclude any other audits from being carried out.

### Project Reviews

#### Formal Reviews

All deliverables must be submitted for formal review at latest the day before they are to be delivered. Any deliverable revision submitted after this time will not be formally reviewed and so will not be delivered to the client. During formal review any discrepancies will result in modification without consultation however corrective recommendations will be sent to the team member responsible post-delivery to assist in increasing the quality of future projects.

#### Informal Reviews

##### Design Walk-throughs

SQA will be invited to any and all design walkthroughs to help ensure that the design complies with: the quality standards of the project, the software requirements specification and ensures the design process is of a high quality.

##### Code Walk-throughs

SQA will be invited to any and all code walkthroughs to help ensure that the code complies with: the quality standards of the project, software requirements specification and ensure that the code is peer reviewed.

### Tools and Techniques

SQA will assure that the quality of all program critical components does not affect the quality of ECMS. This includes third party libraries, frameworks and compilers. Case tools and tools used to create documentation need not be controlled.

### Software Configuration Management

Software configuration management is the management of the progression of the software’s definition from general concept to strict technical requirements. This ensures that all stages are client focussed and that there are no discrepancies between documents from different stages.

This will take the form of change logs and the policy that when a document is altered all dependents must be checked for consistency. Consistency shall also be checked as part of the formal audit at the end of a development phase.

### Release Procedures

Internal version control will use the .NET convention of: major version, minor version, revision number and build number i.e. 1.0.5.20042. This number will be removed prior to delivery to the client

External version control are identified by the number after the title, the first version will not have a number.

### Change Control

Change control will be managed using Git which whilst it has not been audited by SQA it is well established as a quality product.

When a release is sent to someone outside of the development team for testing purposes it will be sent with a short version description which will describe the scope of the current version, any known faults and the version number of the software.

### Problem Reporting

Any problems will be reported to the lead programmer and must include the test number that corresponds with what the user was doing, a description of the problem and the version number of the software. A copy of all problems reported will also be kept by SQA and transferred to Internal Audit on delivery of software deliverables for archiving.

### Software Testing

#### Unit Test

Unit tests are necessary to ensure that each individual class functions properly these will be carried out by the lead programmer due to the fact it is a form of white box testing and therefore requires intimate knowledge of the code.

#### Suitability Testing

Suitability testing will make sure that the functionality of the program fits the initial spec received from the client and the software requirements specification. It will be the responsibility of SQA to test this and cannot involve any team member which has programmed the software.

#### Usability Testing

Usability testing will check that ECMS is usable by young children and non-IT professionals. It will be the responsibility of the project manager to arrange these tests with an entity external to the entire project.

#### Integration Testing

This will be the last round of testing to occur and will ensure that ECMS will run on the client’s systems. This will be conducted by the programming and software installation team.

# Phase 1 Quality Audit

|  |  |
| --- | --- |
| **Auditor** | Mark Robinson |
| **Audit Date** | 23/FEB/2012 |

## Documentation

|  |  |  |  |
| --- | --- | --- | --- |
| Standard Number | Time of Implementation | Compliant? | Comments |
| DO1 | Throughout | ✓ |  |
| DO2 | Throughout | ✓ |  |
| DO3 | Throughout | ✓ |  |
| DO4 | Throughout | ✓ |  |
| DO5 | Throughout | ✓ |  |
| DO6 | Throughout | ✓ |  |
| DO7 | Throughout | ✓ |  |
| DO8 | Throughout | ✓ |  |

## Development

|  |  |  |  |
| --- | --- | --- | --- |
| Standard Number | Time of Implementation | Compliant? | Comments |
| DE1 | Throughout | 🗶 |  |
| DE2 | Throughout | ✓ |  |
| DE3 | Beginning of project | ✓ |  |
| DE4 | Throughout | ✓ |  |
| DE5 | Beginning of project | ✓ |  |
| DE6 | Throughout | ✓ | Was followed as best as possible with the quality plan being created as part of phase one. |
| DE7 | Throughout | ✓ | Was followed but largely ineffective due to lack of strict specifications of what sections included and the time it took to complete work. |

## Implementation

|  |  |  |  |
| --- | --- | --- | --- |
| Standard Number | Time of Implementation | Compliant? | Comments |
| I1 | Implementation | N/A |  |
| I2 | Testing | N/A |  |
| I3 | Implementation | N/A |  |
| I4 | Design | ✓ |  |
| I5 | Design | ✓ |  |
| I6 | Implementation | N/A |  |
| I7 | Implementation | N/A |  |
| I8 | Design | N/A |  |
| I9 | Design / Implementation | ✓ |  |
| I10 | Implementation | N/A |  |
| I11 | Implementation | N/A |  |
| I12 | Design | N/A |  |
| I13 | Implementation | N/A |  |
| I14 | Implementation | N/A |  |
| I15 | Implementation | N/A |  |
| I16 | Design | ✓ |  |
| I17 | Implementation | N/A |  |
| I18 | Implementation | N/A |  |
| I19 | Implementation | N/A |  |
| I20 | Implementation | N/A |  |
| I21 | Implementation | N/A |  |
| I22 | Implementation | N/A |  |
| I23 | Implementation | N/A |  |
| I24 | Testing | N/A |  |
| I25 | Throughout | ✓ |  |
| I26 | Evaluation | N/A |  |
| I27 | Implementation | N/A |  |
| I28 | Implementation | N/A |  |

# Phase 2 Quality Audit

|  |  |
| --- | --- |
| **Auditor** | Mark Robinson |
| **Audit Date** | 19/AUG/2012 |

## Documentation

|  |  |  |  |
| --- | --- | --- | --- |
| Standard Number | Time of Implementation | Compliant? | Comments |
| DO1 | Throughout | ✓ |  |
| DO2 | Throughout | ✓ |  |
| DO3 | Throughout | ✓ |  |
| DO4 | Throughout | ✓ |  |
| DO5 | Throughout | ✓ |  |
| DO6 | Throughout | ✓ |  |
| DO7 | Throughout | 🗶 | This was not possible on exchanged documentation due to time constraints. |
| DO8 | Throughout | 🗶 | This was not possible on exchanged documentation due to time constraints. |

## Development

|  |  |  |  |
| --- | --- | --- | --- |
| Standard Number | Time of Implementation | Compliant? | Comments |
| DE1 | Throughout | 🗶 |  |
| DE2 | Throughout | ✓ |  |
| DE3 | Beginning of project | N/A |  |
| DE4 | Throughout | ✓ |  |
| DE5 | Beginning of project | N/A |  |
| DE6 | Throughout | ✓ |  |
| DE7 | Throughout | 🗶 | Did not work as due to quality and time constraint issues. |

## Implementation

|  |  |  |  |
| --- | --- | --- | --- |
| Standard Number | Time of Implementation | Compliant? | Comments |
| I1 | Implementation | ✓ |  |
| I2 | Testing | N/A |  |
| I3 | Implementation | N/A |  |
| I4 | Design | N/A |  |
| I5 | Design | N/A |  |
| I6 | Implementation | N/A |  |
| I7 | Implementation | N/A |  |
| I8 | Design | ✓ |  |
| I9 | Design / Implementation | ✓ |  |
| I10 | Implementation | ✓ |  |
| I11 | Implementation | ✓ |  |
| I12 | Design | N/A |  |
| I13 | Implementation | N/A |  |
| I14 | Implementation | N/A |  |
| I15 | Implementation | N/A |  |
| I16 | Design | ✓ |  |
| I17 | Implementation | N/A |  |
| I18 | Implementation | N/A |  |
| I19 | Implementation | N/A |  |
| I20 | Implementation | N/A |  |
| I21 | Implementation | N/A |  |
| I22 | Implementation | N/A |  |
| I23 | Implementation | N/A |  |
| I24 | Testing | N/A |  |
| I25 | Throughout | ✓ |  |
| I26 | Evaluation | N/A |  |
| I27 | Implementation | ✓ |  |
| I28 | Implementation | N/A |  |

# Phase 3 Quality Audit

|  |  |
| --- | --- |
| **Auditor** | Mark Robinson |
| **Audit Date** | 24/APR/2012 |

## Documentation

|  |  |  |  |
| --- | --- | --- | --- |
| Standard Number | Time of Implementation | Compliant? | Comments |
| DO1 | Throughout | ✓ |  |
| DO2 | Throughout | ✓ |  |
| DO3 | Throughout | ✓ |  |
| DO4 | Throughout | ✓ |  |
| DO5 | Throughout | ✓ |  |
| DO6 | Throughout | ✓ |  |
| DO7 | Throughout | ✓ |  |
| DO8 | Throughout | ✓ |  |

## Development

|  |  |  |  |
| --- | --- | --- | --- |
| Standard Number | Time of Implementation | Compliant? | Comments |
| DE1 | Throughout | N/A |  |
| DE2 | Throughout | ✓ |  |
| DE3 | Beginning of project | N/A |  |
| DE4 | Throughout | ✓ |  |
| DE5 | Beginning of project | N/A |  |
| DE6 | Throughout | ✓ |  |
| DE7 | Throughout | 🗶 | Did not work as due to time constraint issues. |

## Implementation

|  |  |  |  |
| --- | --- | --- | --- |
| Standard Number | Time of Implementation | Compliant? | Comments |
| I1 | Implementation | ✓ |  |
| I2 | Testing | 🗶 |  |
| I3 | Implementation | ✓ | Impossible to guarantee as plenty of factors are out of our control. |
| I4 | Design | ✓ |  |
| I5 | Design | ✓ |  |
| I6 | Implementation | ✓ |  |
| I7 | Implementation | ✓ |  |
| I8 | Design | ✓ |  |
| I9 | Design / Implementation | ✓ | Impossible to guarantee however almost all data has been externalised from the client’s system and the software acts as a strict client. Therefore the only security issue which is out of our control post distribution is the network |
| I10 | Implementation | ✓ |  |
| I11 | Implementation | ✓ |  |
| I12 | Design | ✓ |  |
| I13 | Implementation | ✓ |  |
| I14 | Implementation | ✓ |  |
| I15 | Implementation | ✓ |  |
| I16 | Design | ✓ |  |
| I17 | Implementation | ✓ |  |
| I18 | Implementation | ✓ |  |
| I19 | Implementation | ✓ |  |
| I20 | Implementation | ✓ |  |
| I21 | Implementation | ✓ |  |
| I22 | Implementation | ✓ |  |
| I23 | Implementation | ✓ |  |
| I24 | Testing | ✓ |  |
| I25 | Throughout | ✓ |  |
| I26 | Evaluation | ✓ |  |
| I27 | Implementation | 🗶 |  |
| I28 | Implementation | ✓ |  |