Final CCMS Application Assessment Report

(Document Version 1.3)

August 31, 2011

REVISION HISTORY

Version	Date	Name of Author	Summary of Changes
v1.0	8/12/2011	K3 Solutions	Initial Draft.
v1.1	8/25/2011	K3 Solutions	Updated to include Task 3 findings, initial review comments, and finalized Executive Summary.
v1.2	8/30/2011	K3 Solutions	Updated to address comments received from final findings briefing and review feedback.
v1.3	8/31/2011	K3 Solutions	Updated to address additional comments

TABLE OF CONTENTS

EXHIBITS

EXECUTIVE SUMMARY

The California Court Case Management System (CCMS) is a large complex system that has over 5,000 requirements, 6,000,000 lines of code, and 19,000 test scripts. As a result of this complexity, the Independent Code Quality Assessment (ICQA) team performed a Criticality Analysis and Risk Assessment (CARA) to identify a strategy to optimally review the CCMS system across the five tasks as defined in the Statement of Work (SOW). The ICQA team performed an unbiased comprehensive assessment of key CCMS areas to gain an understanding of potential areas of risk. Overall, the ICQA team reviewed 154 requirements, 65 document artifacts, 32 code components comprised of hundreds of code modules, and 33 test scripts. In addition, ICQA tested 82 scripts, witnessed the execution of 22 scripts, and analyzed the regression test results of 2112 scripts. Throughout the project, the ICQA team worked closely yet (technically, managerially, and financially) independent of the Administrative Office of the Courts (AOC) Project Management Office (PMO), the Deloitte development team, the Product Acceptance Test (PAT) testers, and the Integrated System Diagnostics (ISD) Standard CMMI Appraisal Method for Process Improvement (SCAMPI) team to gain an understanding of the CCMS system and validate the assessment findings at the conclusion of each task.

Throughout the ICQA project, the ICQA team identified numerous strengths as well as opportunities for improvement. Based on their review and analysis, the most significant recommendations are noted below:

Strengths

- The CCMS architecture is scalable and has a solid foundation. The design artifacts are well written system artifacts that are complete with comprehensive architecture diagrams and accompanying descriptions and specifications of each component, consistent with industry best practices. In addition, the use of the established National Information Exchange Model (NIEM) standard as a foundation is an industry best practice. NIEM is used by federal, state, and local government agencies as data exchange standards that enable information sharing.
- Testing of CCMS has been well planned and comprehensive. All test scripts and corresponding defects are centrally stored in a test repository, which allows for easy management of test artifacts and provides a clear history of all system issues identified through the testing effort. PAT testers are comprised of experienced court SMEs with significant knowledge of CCMS functionality, as well as professional testers who have extensive knowledge of testing best practices and use of the HP QC tool. In addition, testers are using the HP Quality Center (HPQC) tool in the correct manner to plan, execute the various test scenarios/scripts and report defects using industry best practices. CCMS testing results have shown an extraordinary high pass rate.
    - Previous PAT test results, from test events prior to ICQA involvement, have shown an extraordinary high pass rate (~97%) of over 20,000 test scripts executed.
    - Exploratory Test had a 100% pass rate (out of 82 test scripts)
    - Test Witness of PAT resulted in a 86.4% pass rate (out of 22 test scripts)
    - Regression Test Analysis had a 99.8% pass rate (out of 2112 test scripts)
- All CCMS artifacts are under proper configuration management control. Tools such as BART, HPQC, Rational Clear Case, and Rational Requisite Pro to manage the

Requirements, Design, Code, and Test data. Deliverables data is also maintained in eRoom with appropriate security measures.

Opportunities for Improvement

Exhibit 1 highlights the opportunities for improvement identified by the ICQA team. Although these opportunities for improvement are not CCMS problems, they should be resolved through application of the suggested recommendations before they become real CCMS issues. Each finding includes a risk assessment as defined below:

- ***Low*** - Insignificant Risk to CCMS maintainability or sustainability
- ***Medium*** - Moderate Risk to CCMS maintainability or sustainability and may require leadership approval for risk mitigation, may impact schedule, cost and performance
- ***High*** - Significant Risk to CCMS maintainability or sustainability with impacts to schedule, cost and performance for risk mitigation and requires leadership approval for risk mitigation

Exhibit 1 ICQA Identified CCMS Improvement Opportunities

#	Opportunity for Improvement	Risk	Recommendation
1	The CCMS Quality Assurance program needs an increase in rigor and efficiency to effectively determine the quality of CCMS artifacts.	Medium - This weakness poses a risk to the process for maintaining CCMS, as a mechanism needs to be established to properly review and audit all CCMS artifacts to ensure its quality and compliance.	Empower the IV&V or Quality Assurance team to perform comprehensive milestone "gate" reviews throughout the Software Development Lifecycle, which culminates in approval certifications and stakeholder sign-off.
2	CCMS project needs an increase in rigor and efficiency for their Measurement and Analysis program that quantifies CCMS performance.	Medium - This weakness poses a risk to the process for maintaining CCMS as there is currently no mechanism in place to effectively monitor the performance of the project across the engineering areas.	Enhancing the metrics plan to cover the engineering process areas would also alleviate several weaknesses identified in Integrated Project Management.
3	A global finding of the CCMS SCAMPI across different process areas focused on the project's inconsistency in routinely collecting, submitting, and acting on improvement information across the CCMS organization, either at the Deloitte PMO or Enterprise levels (as it relates to CCMS).	Medium – This weakness poses a risk to the process for maintaining CCMS as there is currently no mechanism to implement improvement opportunities and prevent previous issues from reoccurring.	Establish a mechanism to properly collect lessons learned or improvement opportunities in order to prevent quality issues and project delays from re-occurring post-deployment.

#	Opportunity for Improvement	Risk	Recommendation
4	There is limited unit testing throughout the CCMS code.	Medium – Maintainability of CCMS is decreased as manual unit testing is inefficient and can severely hinder emergency releases when required.	When CCMS is deployed in Production, the development team should begin creating automated JUnit tests for key code modules and adding these tests to continuous integration build scripts.
5	Backwards traceability in the code and design is minimal.	Medium – Maintainability of CCMS is decreased as backwards traceability helps developers understand the system dependencies when future changes are introduced into the system.	When CCMS is deployed in Production, the development team should continue adding code comments to key code modules and adding backwards traceability references to design artifacts. .
6	Some CCMS code modules are not adequately documented, and there are minimal descriptions of the processing, data, and interfaces of the functions. .	Low – Maintainability of CCMS is decreased because code comments provide developers/reviewers a clear description of the functionality of the module. Comments can also provide a record of the changes that occurred within the module as well as the developer's identity in the event questions arise about the code itself.	When CCMS is deployed in Production, the development team should continue adding code comments to key code modules and adding backwards traceability references to design artifacts.
7	There is no Master Document List for the project that would allow stakeholders to review the vast amount of CCMS documentation that is appropriately stored in their corresponding repositories.	Low – Maintainability of CCMS is decreased because the volume of documents can be a challenge to understand. A system overview guide would help ensure system knowledge is readily shared across all personnel.	A system guide for developers should be developed. This guide would serve as a training guide for new project personnel to help them understand all the existing system features and artifacts.

#	Opportunity for Improvement	Risk	Recommendation
8	The use of a Waterfall SDLC may produce CCMS enhancements for future releases at a slow pace.	Low – Maintainability of CCMS is decreased as manual unit testing is inefficient and can severely hinder emergency releases when required.	Introduction of an Agile development approach into future enhancements would increase the extensibility of CCMS while also reducing risk. Agile development breaks tasks into small increments with minimal planning. Agile methods emphasize face-to-face communication and works closely with the customer/product owner to ensure features are developed correctly. Iterations are short time frames that typically last from one to four weeks. Each iteration involves a team working through a full software development cycle including planning, requirements, design, development, and test while allowing for the incorporation of quality assurance throughout the iteration. During the test stage a working product is demonstrated to stakeholders. This minimizes overall risk and allows the project to adapt to changes quickly as they arise.

Upon compiling all the risks from Exhibit 1, ICQA assessed the overall CCMS risk rating in accordance with the SOW objectives.

Exhibit 2 ICQA Overall CCMS Risk Ratings

ICQA Objective	Risk
Quality of the processes used to create the CCMS software	Medium
Appropriateness of the processes used to create the CCMS software	Low
Quality of CCMS software	Low
Consistency of CCMS software	Low
Maintainability of CCMS software	Medium

Increased rigor of program performance to plan and more IV&V quality built in methodology would bring the program in alignment and mitigate the maintainability and sustainability risks/findings as noted in this assessment. ***In summary, based on the results of our combined assessments, we expect that CCMS will perform as designed once it is deployed into the Production environment***.

1 INTRODUCTION

The Judicial Council of California, chaired by the Chief Justice of California, is the chief policy making agency of the California judicial system. The California Constitution directs the Council to improve the administration of justice by surveying judicial business, recommending improvements to the Courts, and making recommendations annually to the Governor and the Legislature. The Council also adopts rules for Court administration, practice, and procedure, and performs other functions prescribed by law. The AOC is the staff agency for the Council and assists both the Council and its chair in performing their duties.

The CCMS V4 project is a software development effort intended to create and deploy a single statewide case management system to support California's trial courts. The CCMS project combines code from the AOC's CCMS V3 and concepts from the AOC's CCMS V2 and expands upon the services and functionality provided by those systems. The CCMS V4 development effort began in 2007, but experienced significant quality issues in December 2009/January 2010. As a result, the CCMS project was delayed approximately one year to address identified issues, and recently re-entered acceptance testing for core system functionality.

In order to assure the AOC and the State of California that quality issues have been successfully dealt with prior to exiting acceptance testing and beginning deployment to three early adopter courts, the ICQA project performed an independent review of CCMS to determine whether significant quality or maintainability problems remain. During the period of June 2011 through August 2011, the ICQA team conducted independent assessments of the CCMS by reviewing system documents, plans, processes, and configuration components as well as conducting exploratory testing and test witnessing. The ICQA Project was broken down into five Task Areas, which are described in greater detail in the following section:

- **Task 1 -** Independent CCMS Application Assessment Strategy and Plan
- **Task 2 -** Independent Random CCMS Development Deliverables and Artifacts Review
- **Task 3 -** Independent CCMS Application Assessment of Select CCMS components based on reported SCAMPI process issues
- **Task 4 -** Independent Exploratory Testing of CCMS Components
- **Task 5 -** Produce CCMS Application Assessment Report

This document provides the final CCMS Application Assessment Report which documents assessment work performed by the ICQA team.

2 DOCUMENT REFERENCES

The following subsections highlight the CCMS documents that were referenced in preparation of this final report.

2.1 Task 1 - Independent CCMS Application Assessment Strategy and Plan

Exhibit 3 highlights the documents that were referenced in preparation of the Independent CCMS Application Assessment Strategy and Plan.

Exhibit 3 CCMS Artifacts Referenced

Document Name	File Name	Version	Version Date
State of California Agreement 1023314	K3 Solutions (CCMS Code Quality Assessment) 1023314-signed.pdf	1.0	6/17/2011
Software Development Life Cycle Standard	AOC Software Development Life Cycle _V2-Draft.pdf	N/A	11/5/2010

2.2 Task 2 - Independent Random CCMS Development Deliverables and Artifacts Review

Exhibits 4 - 7 highlight the documents and artifacts that were assessed in preparation of the CCMS Development Deliverables and Artifacts Review Assessment.

Exhibit 4 Requirements Documents/Artifacts Assessed

Document Name	File Name	Version	Version Date
CCMS-V4 Core Product Final Functional Design Section 36 - Updated Requirements Traceability Matrix, Interpreter Management (21 of 215 requirements)	V4FFD_Section36_submitted_v1.xls	1.0	9/7/2008
CCMS-V4 Core Product Final Functional Design Section 36 - Updated Requirements Traceability Matrix, Data Exchanges (34 of 240 requirements)	V4FFD_Section36_submitted_v1.xls	1.0	9/7/2008
CCMS-V4 Core Product Final Functional Design Section 36 - Updated Requirements Traceability Matrix, Courtroom/Hearings (16 of 357 requirements)	V4FFD_Section36_submitted_v1.xls	1.0	9/7/2008
CCMS-V4 Core Product Final Functional Design Section 36 - Updated Requirements Traceability Matrix, Case Management (34 of 579 requirements)	V4FFD_Section36_submitted_v1.xls	1.0	9/7/2008
CCMS-V4 Core Product Final Functional Design Section 36 - Updated Requirements Traceability Matrix, Calendaring Scheduling (24 of 252 requirements)	V4FFD_Section36_submitted_v1.xls	1.0	9/7/2008

Document Name	File Name	Version	Version Date
CCMS-V4 Core Product Final Functional Design Section 36 - Updated Requirements Traceability Matrix, Nonfunctional Requirements (25 of 760 requirements)	V4FFD_Section36_submitted_v1.xls	1.0	9/7/2008
Intermediate Functional Design Traceability Matrix	Intermediate Functional Design Traceability Matrix_submitted.xls		2/10/2008
Framework Design Traceability Matrix	Framework Design Traceability Matrix_submitted_2.xls		10/23/2007
HP Quality Center Requirements	http://ccmsv4qc.glbsnet.com/qcbin/start_a.htm	N/A	N/A
State of California Agreement 1004701, Exhibit A4.59.01, Revision 3	N/A	0.19	2/3/2011

Exhibit 5 Design Documents/Artifacts Assessed

Document Name	File Name	Version	Version Date
CCMS-V4 Core Product Final Functional Design Section 1-35	V4FFD_Section X.X_submitted_v1.pdf	1.0	9/7/2008
Framework Model Architecture	Framework Model Architecture_baseline_v1.pdf	1.0	10/19/2007
CCMS-V4 Development and Test Infrastructure Design	Development%20and%20Test%20Infrastructure%20Design_baseline_v2.1.pdf	2.1	5/1/2009
CCMS-V4 Security Design	CCMS-V4_Security_Design_Submitted_v5.pdf	2.0	3/13/2009
CCMS-V4 Final Data Dictionary – Columns	CCMS-V4 Final Data Dictionary - Columns.xls	N/A	4/15/2009
CCMS Conversion – Migration Utility Design	CCMS Conversion - Migration Utility Design_submitted_v3.pdf	3.0	1/15/2010
Functional Design for CCMS-V4 Data Exchanges	V4FDDX_Section 4.X_submitted_v1.pdf	1.0	9/7/2008

Exhibit 6 Code Documents/Artifacts Assessed

Document Name	File Name	Version	Version Date
CCMS Portal - build_scripts/	/Portal-CP2-INT/PortalDevelopment/CCMS/build_scripts/	N/A	N/A
CCMS Portal – ccms_jpa_entity/	/Portal-CP2-INT/PortalDevelopment/CCMS/ccms_jpa_entity/	N/A	N/A
CCMS Portal – ccms_test/	/Portal-CP2-INT/PortalDevelopment/CCMS/ccms_test /	N/A	N/A
CCMS Portal – ccms_webservice/	/Portal-CP2-INT/PortalDevelopment/CCMS/ccms_webservice/	N/A	N/A
CCMS Portal – ccms_webservice_client/	/Portal-CP2-INT/PortalDevelopment/CCMS/ccms_webservice_client/	N/A	N/A
CCMS Portal – ccms_webservice_client_test/	/Portal-CP2-INT/PortalDevelopment/CCMS/ccms_webservice_client_test/	N/A	N/A
CCMS Portal – ccms_webservice_test/	/Portal-CP2-INT/PortalDevelopment/CCMS/ccms_webservice_test/	N/A	N/A
OIM Portal –	/Portal-CP2-	N/A	N/A

Document Name	File Name	Version	Version Date
ccms_portal_oim_web/	INT/PortalDevelopment/OIMApplications/ ccms_portal_oim_web/		
CCMS Core – build_scripts/	/CP2-INT/V3Project/V3/build_scripts/	N/A	N/A
CCMS Core – ccms_diagnostics_web/	/CP2-INT/V3Project/V3/ ccms_diagnostics_web/	N/A	N/A
CCMS Core – ccms_fa_test	/CP2-INT/V3Project/V3/ ccms_fa_test/	N/A	N/A
CCMS Core – ccms_jpa_entity	/CP2-INT/V3Project/V3/ ccms_jpa_entity/	N/A	N/A
CCMS Core – ccms_mbean	/CP2-INT/V3Project/V3/ ccms_mbean/	N/A	N/A
CCMS Core – ccms_test	/CP2-INT/V3Project/V3/ccms_ test/	N/A	N/A
CCMS Core – ccms_webservice	/CP2-INT/V3Project/V3/ ccms_webservice/	N/A	N/A
CCMS Core – ccms_webservice_client	/CP2-INT/V3Project/V3/ ccms_webservice_client/	N/A	N/A
CCMS Core – ccms_xml	/CP2-INT/V3Project/V3/ ccms_xml/	N/A	N/A
CCMS Core – dms_web	/CP2-INT/V3Project/V3/ dms_web/	N/A	N/A
CCMS Core – framework_app	/CP2-INT/V3Project/V3/ framework_app/	N/A	N/A
CCMS Core – framework_ejb	/CP2-INT/V3Project/V3/ framework_ejb/	N/A	N/A
CCMS Core – framework_web	/CP2-INT/V3Project/V3/ framework_web /	N/A	N/A
CCMS Core – framework_xml	/CP2-INT/V3Project/V3/ framework_xml /	N/A	N/A
CCMS Core – v3_app	/CP2-INT/V3Project/V3/ v3_app/	N/A	N/A
CCMS Core – v3_app_ext	/CP2-INT/V3Project/V3/ v3_app_ext/	N/A	N/A
CCMS Core – v3_batch_app	/CP2-INT/V3Project/V3/ v3_batch_app/	N/A	N/A
CCMS Core – v3_batch_ejb	/CP2-INT/V3Project/V3/ v3_batch_ejb/	N/A	N/A
CCMS Core – v3_common_app	/CP2-INT/V3Project/V3/ v3_common_app/	N/A	N/A
CCMS Core – v3_common_ejb	/CP2-INT/V3Project/V3/ v3_common_ejb/	N/A	N/A
CCMS Core – v3_ejb	/CP2-INT/V3Project/V3/ v3_ejb/	N/A	N/A
CCMS Core – v3_uber_app	/CP2-INT/V3Project/V3/ v3_uber_app/	N/A	N/A
CCMS Core – v3_uber_ejb	/CP2-INT/V3Project/V3/ v3_uber_ejb/	N/A	N/A
CCMS Core – v3_web	/CP2-INT/V3Project/V3/ v3_web/	N/A	N/A
CCMS-V4 Design and Coding Standards	CCMS-V4 Design And Coding Standards_1.1.pdf	1.1	3/7/2008
PMD and Findbugs Reports	Static Code Analysis Report (Core) 07.07.2011.xls Static Code Analysis Report (Portal) 07.07.2011.xls	N/A	7/7/2011
Fortify Scan Reports	Portal_Framework-Fortify_Security_Report.pdf Portal_NonFramework_Fortify_Security_Report.pdf	N/A	7/7/2011

Exhibit 7 Test Documents/Artifacts Assessed

Document Name	File Name	Version	Version Date
CCMS-V4 Core Product Acceptance Test Plan	CCMS-V4 Core Product Acceptance Test Plan_submitted_v1.5.doc	1.5	10/22/2010
HP Quality Center - CORE – MH001 (Mental Health: Conservatorship) Scenario (4 of 27 scripts)	http://ccmsv4qc.glbsnet.com/qcbin/ start_a.htm	N/A	N/A

Document Name	File Name	Version	Version Date
HP Quality Center - CORE – FIS_008 (Fiscal) Scenario (3 of 8 scripts)	http://ccmsv4qc.glbsnet.com/qcbin/start_a.htm	N/A	N/A
HP Quality Center - CORE – PEF-001 (P/E/Fam, Venue Transactions) Scenario (2 of 6 scripts)	http://ccmsv4qc.glbsnet.com/qcbin/start_a.htm	N/A	N/A
HP Quality Center - CORE – SP_INT_005 (Interpreter Management) Scenario (2 of 7 scripts)	http://ccmsv4qc.glbsnet.com/qcbin/start_a.htm	N/A	N/A
HP Quality Center - CORE – JUV_007 (Juvenile) Scenario (3 of 12 scripts)	http://ccmsv4qc.glbsnet.com/qcbin/start_a.htm	N/A	N/A
HP Quality Center – NON-CORE – FEL-PR004 (Felony) Scenario (8 of 38 scripts)	http://ccmsv4qc.glbsnet.com/qcbin/start_a.htm	N/A	N/A
HP Quality Center - CORE – APL-015 (Appeals) Scenario (3 of 12 scripts)	http://ccmsv4qc.glbsnet.com/qcbin/start_a.htm	N/A	N/A
HP Quality Center - CORE – SP_REP_002 (Court Reporter Management) Scenario (4 of 4 scripts)	http://ccmsv4qc.glbsnet.com/qcbin/start_a.htm	N/A	N/A
HP Quality Center - CORE – Initiate Case - Maintain reserved Case Numbers Scenario (2 of 3 scripts)	http://ccmsv4qc.glbsnet.com/qcbin/start_a.htm	N/A	N/A
HP Quality Center - CORE – Hearing on Multiple Cases (Courtroom) Scenario (2 of 5 scripts)	http://ccmsv4qc.glbsnet.com/qcbin/start_a.htm	N/A	N/A
CCMS-V4 Core Product Integration Test and Product Acceptance Test Scripts	CCMS-V4_Product_Int_and Acceptance_Test_Scripts_Submitted_v2.pdf	2.0	8/14/2009
CCMS-V4 Stress Test, Training-Documentation, and Product Acceptance Test Infrastructure Design	CCMS-V4 Stress Test, Training, and Product Acceptance Test Infrastructure Design_submitted_v1.5.docx	2.0	3/13/2009
CCMS-V4 Core Software Product PAT Test Results	CCMS-V4 Core PAT Test Results_v2.pdf	2.0	5/2/2011

2.3 Task 3 - Independent CCMS Application Assessment of Select CCMS components based on reported SCAMPI process issues

Exhibit 8 highlights the documents that were referenced in preparation of the Independent CCMS Application Assessment based on SCAMPI results.

Exhibit 8 CCMS SCAMPI Artifacts Referenced

Document Name	File Name	Version	Version Date
Appraisal Plan	Appraisal Plan v3.0 Final.pdf	3.0	7/21/2011
SCAMPI Appraisal Preparation Checklist	ISD SCAMPI Appraisal Preparation Checklist 110727.xls	N/A	7/27/2011
AOC / Deloitte CCMS SCAMPI Readiness Review Report	SCAMPI Readiness Review Report v5-final.pdf	5.0	7/20/2011
Information Needs	Information Needs 110722	N/A	7/22/2011
SCAMPI PIID	ISD Document Import AOC v12.xls	12.0	8/18/2011
Final Findings Brief - DRAFT	Final Findings Briefing 110819 v3 Draft.ppt	3.0	8/19/2011

Administrative Office of the Courts SCAMPI Appraisal			
Final Findings Supporting Material	FF v1.ppt	1.0	8/19/2011

2.4 Task 4 - Independent Exploratory Testing of CCMS Components

Exhibit 9 highlights the documents that were referenced in preparation of the Independent CCMS Exploratory Test Analysis Report.

Exhibit 9 Test Artifacts Referenced

Document Name	File Name	Version	Version Date
CCMS-V4 Core Product Acceptance Test Plan	CCMS-V4 Core Product Acceptance Test Plan_submitted_v1.5.doc	1.5	10/22/2010
CORE PAT Final Regression Execution Report	CORE_PAT_Final_Regression_Execution_Report Image001 - image009.jpg	N/A	4/26/2011
CCMS-V4 Core Software Product PAT Test Results	CCMS-V4 Core PAT Test Results_v2.pdf	2.0	5/2/2011
HP Quality Center	http://ccmsv4qc.glbsnet.com/qcbin/ start_a.htm	N/A	N/A

2.5 Task 5 - Produce CCMS Application Assessment Report

Exhibit 10 highlights the documents that were referenced in preparation of this Final CCMS Application Assessment.

Exhibit 10 ICQA Documents Referenced

Document Name	File Name	Version	Version Date
Independent CCMS Application Assessment Strategy and Plan	CCMS-V4 Core Product Acceptance Test Plan_submitted_v1.5.doc	1.4	6/28/2011
CCMS Development Deliverables and Artifacts Review Assessment	CORE_PAT_Final_Regression_Execution_Report Image001 - image009.jpg	1.3	7/22/2011
Independent CCMS Application Assessment based on CMMI SCAMPI	CCMS-V4 Core PAT Test Results_v2.pdf	1.0	8/22/2011
Independent CCMS Exploratory Test Analysis Report	http://ccmsv4qc.glbsnet.com/qcbin/ start_a.htm	1.2	8/11/2011

3 METHODOLOGY

For each project task, the ICQA applied a specific methodology approach to the execution of the assessments based on our well-defined independent verification and validation methodology and industry standards and best practices presented in Exhibit 11.

Exhibit 11 Industry Standards and Best Practices used in the ICQA Methodology

Application	Standard
Task 1 - Independent CCMS Application Assessment Strategy and Plan	PMI Project Management Body of Knowledge, Fourth Edition
Task 1 - Independent CCMS Application Assessment Strategy and Plan	IEEE 1012-2004 – Standard for Software Verification and Validation Plans
Task 2 - Conduct Random CCMS Development Deliverables and Artifacts Review	IEEE 12207.0 – Software Life Cycle Processes
Task 2 - Conduct Random CCMS Development Deliverables and Artifacts Review	International Organization of Standardization (ISO) 9001:2008 Standards and Guidelines
Task 3 - Independent CCMS Application Assessment of Select CCMS components based on reported SCAMPI process issues	CMMI for Development, v1.2
Task 4 - Independent Exploratory Testing of CCMS Components	IEEE 829-2008 – Standard for Software Test Documentation
Task 5 - Produce CCMS Application Assessment Report	IEEE 610.12-1990 – Standard Glossary of Software Engineering Terminology

3.1 Task 1 - Independent CCMS Application Assessment Strategy and Plan

3.1.1 Develop a Strategy Outlining a Detailed Approach for the CCMS Application Assessment

The ICQA team analyzed the Statement of Work, and then leveraged our ICQA methodology, and our expertise in technologies relevant to AOC. We conducted a CARA, and interviewed key CCMS stakeholders to discuss key system features and the most critical areas of risk. The CARA allowed the ICQA team to customize our approach and prioritize efforts, mitigating system and program risks.

3.1.2 Include a Plan Detailing Required Resources

The CARA results provided input to the creation the Project Schedule plan. The ICQA team worked with AOC and Deloitte CCMS project managers to develop the application assessment schedule to identify dependencies, and to the extent possible, avoid negative impact to the CCMS product acceptance schedule. The Project Schedule plan activities integrate with the existing CCMS project schedules and can be seen in Section 3.2 of the Independent CCMS Application Assessment Strategy and Plan.

3.1.3 Identify CCMS Required Environment and Tools

The results of the CARA and analysis of the Statement of Work allowed the ICQA team to understand the CCMS environment and the tools that are readily available to conduct the ICQA tasks. A list of the environment requirements can be found in Section 3.4.1 and the tools required are found in Section 3.5.1 of the Independent CCMS Application Assessment Strategy and Plan.

3.1.4 Develop and Propose a Timeline that includes Milestones

The Project Schedule includes a timeline that highlights the milestones that were defined in the Statement of Work. This schedule can be found in Section 3.2 of the Independent CCMS Application Assessment Strategy and Plan.

3.1.5 Include Project Assumptions and Requirements

Project assumptions were based on the results of the CARA and the analysis of the Statement of Work. A list of all identified project assumptions can be found in Section 1.4 of the Independent CCMS Application Assessment Strategy and Plan.

3.2 Task 2 – Independent Random CCMS Development Deliverables and Artifacts Review

The ICQA team selected and identified a random sampling of twenty-five CCMS requirements, twenty-five CCMS designs, twenty-five CCMS code modules, and twenty-five CCMS test scripts to review.

3.2.1 Assessment Approach

The CCMS documents and artifacts were assessed on several criteria discussed in the following subsections, which were used to determine if the system meets AOC standards and is consistent with the overall CCMS architecture. Not all evaluation categories apply to all CCMS deliverables/artifacts.

3.2.1.1 Requirements Review

The requirements review activity assessed system requirements, including functional and performance requirements, external interfaces, security requirements, data definitions, installation and acceptance requirements, user operation and execution requirements, and user maintenance requirements. The objectives were to ensure the correctness, completeness, clarity, testability, and consistency of the CCMS requirements. The evaluation categories used to assess CCMS documentation for Requirements include the following:

- **Correctness** – Each requirement accurately describes the functionality to be delivered.
- **Unambiguous** – Requirements only have one interpretation.
- **Verifiability/Testability** – Requirements can be validated through testing or other verification methods.
- **Traceability -** Product fulfills and is mapped to its allocated requirements.
- **General Completeness** - Product is complete and includes the appropriate level of detail.

- **Standardization -** Requirement statements are achievable, necessary, verifiable, unambiguous, complete, implementation independent, ranked for importance, concise, and traceable and have unique identifiers, as defined by Institute of Electrical and Electronic Engineers (IEEE) standards.
- **Consistency –** Requirements are internally and externally consistent.
- **Data Usage –** Requirements address how the data will be used by the system.
- **Functionality -** Requirements address the various business scenarios that exist for the system.
- **Interface -** Interfaces are organized separately and address each direction of the interface.
- **Maintainability –** Requirements address the ability to maintain the system to correct defects or enhance the system.
- **Performance –** Requirements address the response times, throughputs, and concurrency for the system.
- **Reliability/Security –** Requirements address the ability to protect the system components and data.
- **Feasibility** – Requirements can be developed into a system within the known capabilities and limitations of the system and its environment.

3.2.1.2 Design Review

In the design review activity, the ICQA team determined whether the design is a correct, accurate, and complete transformation of the requirements and that no unintended features were introduced. The evaluation categories used to assess CCMS documentation for Design include the following:

- **General** – Product is complete and includes the appropriate level of detail. Product meets applicable standards and requirements. Designed components comply with supported standards. Product fulfills and is mapped to its allocated requirements.
- **System Architecture** – The inventory of hardware, software, network, and other infrastructure components (whether commercial off-the-shelf [COTS] or custom-built) are comprehensive. Software components are clearly tied to the hardware and network components on which they are installed and run. Supported architectural and design patterns are leveraged. Applicable technical reference models are adhered to.
- **Front-end Interface** – Human machine interfaces, interface descriptions, and screen layouts are comprehensive.
- **Detailed Design** – Designs are decomposed with increasing levels of detail. Product is internally and externally consistent. Additionally, design descriptions must be consistent with documented data flows, interface descriptions, and requirements.
- **External Interfaces** – Interfaces are organized separately and address each direction of the interface.

3.2.1.3 Code Review

The code review activity verified and validated that the CCMS design to code, database structures, and related machine-executable representations transformations are correct, compliant, and complete. During this activity, ICQA analyzed the source code and unit test cases using validation tools and code inspection techniques. The evaluation categories used to assess CCMS documentation for Code include:

- **Quality Attributes** – Product meets CCMS-V4 Design and Coding Standards. Supported design and coding patterns shall be leveraged. Applicable technical reference models shall be adhered to.

3.2.1.4 Test Review

The test review activity ensured that the unit, subsystem, and system requirements are satisfied by execution of development and integration/system testing and that the system satisfied the needs of the users as demonstrated by the execution of acceptance testing. The evaluation categories used to assess CCMS documentation for Test include:

- **Completeness** – Testing addresses the various system scenarios.
- **Test Management –** Test planning and coordination is conducted in an efficient manner.
- **Approval/Revision Process** - Test change and configuration management processes have been detailed and implemented.
- **Objective/Scope** – Test objectives and scope have been adequately defined.
- **System Overview –** The system that the test is conducted on has been described adequately.
- **Environment Management** – Test environment has been detailed sufficiently. Test data specifications have been included.
- **Requirements Management –** Requirements traceability has been included within test cases.
- **Defect Management** – Defect Management has been planned and coordinated in sufficient detail.
- **Test Strategy** – Testing processes and approach has been defined and implemented.

3.2.2 Traceability

The ICQA team verified that each of the artifacts selected has an acceptable level of traceability from requirements through design, development and test cases. The best practices approach to requirements management is to create an end-to-end traceability between requirements and the related artifacts and documentation that supports the design, configuration, development and testing of these requirements. The traceability ensures that requirements drive the project and that requirements are directly traceable to test cases and to solutions and work products. Bi-directional traceability, both forward and backward traceability and a key foundation to requirements management were performed and verified.

- Forward traceability ensures proper direction of the evolving product (that we are building the right product) and indicates the completeness of the subsequent implementation. (i.e., requirements → design → code → test scenario → test script)
- Backwards traceability helps ensure that the evolving product remains on the correct track with regard to the original and/or evolving requirements (that we are building the product right). (i.e., code → design → requirements)

Traceability prevents loss of legacy system functionality and prevents system "overreach". The ICQA team verified that CCMS code samplings can be traced backward to requirements and design components and forward to test scenarios, test scripts and test results. Exhibit 12 shows the traceability threads performed for this assessment.

Exhibit 12 Traceable CCMS Artifacts Assessed by ICQA

Requirements	Design Component	Code	Test Scenario
CCMS-V4 Core Product Final Functional Design Section 36 - Updated Requirements Traceability Matrix, Interpreter Management (21 of 215 requirements)	CCMS-V4 Core Product Final Functional Design Section 25: Interpreter Management	CCMS Core – v3_app	HP Quality Center - CORE – SP_INT_005 (Interpreter Management) Scenario
CCMS-V4 Core Product Final Functional Design Section 36 - Updated Requirements Traceability Matrix, Courtroom/Hearings (16 of 357 requirements)	CCMS-V4 Core Product Final Functional Design Section 8: Courtroom	CCMS Core – v3_app CCMS Core – v3_common_app	HP Quality Center - CORE – Hearing on Multiple Cases (Courtroom) Scenario
CCMS-V4 Core Product Final Functional Design Section 36 - Updated Requirements Traceability Matrix, Case Management (34 of 579 requirements)	CCMS-V4 Core Product Final Functional Design Section 18: Case Management	CCMS Core – v3_app	HP Quality Center - CORE – Initiate Case - Maintain reserved Case Numbers Scenario CCMS-V4-APP04 Perform Search
CCMS-V4 Core Product Final Functional Design Section 36 - Updated Requirements Traceability Matrix, Calendaring Scheduling (24 of 252 requirements)	CCMS-V4 Core Product Final Functional Design Section 24: Calendaring/Scheduling	CCMS Core – v3_app CCMS Core – v3_common_app	HP Quality Center - CORE - CCMS-V4-CAL06 Finalize Calendar Event Scenario

3.2.3 Severity Classifications

Severity ratings were consistent across all document/artifact assessments and are defined as follows:

- **Low** – Applies to issues that do not have a direct impact on the reader's ability to understand the item but are inconsistent with standards.
- **Medium** – Applies to issues that detract from the reader's ability to comprehend the item and how the project will address it.
- **High** – Applies to issues that impact the scope of the project.

3.3 Task 3 - Independent CCMS Application Assessment of Select CCMS components based on reported SCAMPI process issues

Concurrent with the ICQA project, the AOC sponsored a project focused SCAMPI Class A appraisal of the CCMS development project to obtain an independent opinion about quality and appropriateness of the processes used to create the software as well as an assessment of the quality, consistency and maintainability of the software itself. The CCMS SCAMPI appraisal documented the current process maturity baseline of the CCMS project against the CMMI Staged representation v1.2. This was a benchmarking appraisal of process capability that was performed in accordance with established organizational policies and procedures to determine whether the project was performed in accordance with CMMI Level 3 standards.

Our approach to performing this ICQA task focused on three main activities, which are discussed in the subsections below. The ICQA team used the following severity ratings defined below to assess the CCMS SCAMPI findings:

The ICQA team used the following severity ratings defined below:

- **Low** – Applies to issues that do not have a direct or immediate impact on the project's scope or success and risk to maintainability and sustainability is low
- **Medium** – Applies to issues that have a more long term impact on the project's scope or success and risk to maintainability and sustainability is moderate
- **High** – Applies to issues that have an immediate impact to the scope of the project or require management approval for corrective action and have significant risk to maintainability and sustainability.

3.3.1 Review the Preliminary SCAMPI Assessment Report

The ICQA team reviewed the Appraisal Plan to understand the scope and approach the CCMS SCAMPI team followed throughout the Readiness Review to the on-site appraisal. The ICQA team monitored the updated SCAMPI Appraisal Preparation Checklist, which documented SCAMPI preparations. At the conclusion of the Readiness Review, the ICQA team reviewed the AOC/Deloitte CCMS SCAMPI Readiness Review Report produced by the SCAMPI vendor.

3.3.2 Verify a Sample of CCMS Work Products to assess quality and consistency

During the Readiness Review, the CCMS SCAMPI team used the CCMS Process Implementation Indicator Descriptions (PIID) to review relevant CCMS project artifacts that are representative of CMMI process area practices. The ICQA team compared the worksheets to ascertain that the CCMS SCAMPI team assessed the same version of each CCMS artifact and ensure the integrity of the ICQA findings.

3.3.3 Work with the SCAMPI team to clarify questions

In addition to reviewing the CCMS SCAMPI artifacts, the ICQA team worked closely with CCMS SCAMPI team to understand their appraisal approach and asked clarification questions as needed. The ICQA team participated in most of the weekly CCMS SCAMPI planning meetings with the AOC and ISD team, and attended the Final Briefing at the conclusion of the CCMS SCAMPI project.

3.4 Task 4 - Independent Exploratory Testing of CCMS Components

As part of our comprehensive verification and validation approach, the ICQA team conducted exploratory testing of CCMS in the Product Acceptance Test (PAT) environment. The Exploratory Testing task was focused on determining whether both verification and validation had sufficiently been performed. Verification and Validation are defined as:

- **Verification** – ***Is the system built right***? The verification process provides objective evidence that all life cycle processes have been properly and adequately performed.
- **Validation** – ***Is the right system built***? The validation process provides objective evidence of product compliance with both the system's functional requirements and the users' needs. Does the system meet the users' requirements?

The ICQA team's goal towards this task was to determine how the CCMS V4 system handles the most challenging and critical test scenarios, as determined by the CARA conducted by the ICQA team with CCMS stakeholders. The CARA consisted of a series of meetings with CCMS stakeholders to discuss key system features and the most critical areas of risk. The results of the CARA allowed the ICQA to customize our approach, by focusing our efforts on conducting Exploratory Testing on CCMS Core components, Test Witnessing PAT execution of CCMS External components, and Analyzing the latest Regression Test Results conducted on CCMS in the PAT environment, which are discussed in the subsections below.

The ICQA team used the following severity ratings defined below:

- **Low** – Applies to issues that do not have a direct impact on the tester's ability to understand the item but are inconsistent with testing standards.
- **Medium** – Applies to issues that detract from the tester's ability to comprehend the item and how the project will address it.
- **High** – Applies to issues that impact the scope of the project.

3.4.1 Exploratory Testing

As CCMS is currently undergoing PAT on the External components, the ICQA team was constrained on the types of test scenarios that could be executed in the PAT environment. In order to preserve the integrity of the PAT results and minimize disruption to the PAT testers, the ICQA team worked with AOC and Deloitte test managers to identify approximately 100 test scripts across eight (8) scenarios focusing on the CCMS Core component. In addition, the ICQA team conducted *off-script testing*, varying from the test script by branching to execute additional test paths, which verified the robustness of CCMS. This also included *negative testing*; (testing for the purpose of causing the system to error and then ensuring proper recovery after error). Any defects discovered were documented and reported using the methodology defined by Deloitte in Section 5 of the CCMS Product Acceptance Test Plan and Exhibit 13 below.

Exhibit 13 CCMS Test Defect Severity Definition

Severity	Definition
1	A critical component or the entire Application has stopped or is so severely impacted that the Application or component cannot reasonably continue to operate and there is no workaround available. Data is corrupted or data integrity issues related to security/confidentiality lead to noncompliance with legal requirements or regulations.
2	A critical component of the Application is unavailable or does not work but a workaround is available. A non-critical component of the Application is unavailable or does not work and there is no workaround.
3	A non-critical component result is not as expected but a work around is available and there is no significant impact to an end-user.
4	All Defects other than Severity Level 1 Defect, Severity Level 2 Defect, Severity Level 3 Defect (e.g., minor or cosmetic defects).

3.4.2 Test Witnessing

In order to validate the results of the CCMS External components, the ICQA team worked alongside the PAT testers to witness their execution of assigned test scripts. Test witnessing allowed ICQA to monitor the fidelity of test execution to the approved test procedures. In addition, ICQA sampled the defect tracking process to ensure defect resolutions were properly documented and to trace any documentation and/or code changes required as a result of the defect. Finally, test witnessing also allowed ICQA to determine whether end-to-end test scenarios were executed.

3.4.3 Regression Test Review

Although Product Acceptance Test uses the same test plans as the Integration Test, the test execution results may not have produced the same outcome as they may have involved different versions of the CCMS code, or varying test environment configurations. The ICQA team assessed the automated regression test of CCMS that was executed using AOC's HP QuickTest Professional. In addition, the ICQA team analyzed the defects that occurred in the Integration Test and Product Acceptance test to identify potential problem areas that may have occurred during regression test execution.

3.5 Task 5 - Produce CCMS Application Assessment Report

At the conclusion of the project, the ICQA team consolidated our observations, findings and recommendations as discussed in the subsections below.

3.5.1 Consolidate Assessment Findings and Comments

As discussed in the previous sections, at the conclusion of each task, the ICQA team generated an assessment report, which contained the findings and comments relevant to the task activities performed. The ICQA team reviewed each report with the AOC and relevant stakeholders to ensure clarity on the findings and recommendations. Using the feedback provided by the AOC

and stakeholders, the ICQA team updated the reports accordingly and consolidated them in Section 4 below.

3.5.2 Create Executive CCMS Application Assessment Summary

The Executive Summary report, which is included at the beginning of this document, provides an independent assessment of the overall technical state of the CCMS implementation at that milestone. This summary includes a recap of tasks conducted during the Activity, identified discrepancies and their disposition, unresolved issues, and recommendations and observations.

3.5.3 Update the Description of Assessment Approach

Section 3 contains a summary of the assessment approach task activities. It is important to note that no deviations to the CCMS Application Assessment Strategy and Plan occurred throughout the ICQA project.

3.5.4 Identify each CCMS Component, Subsystem, and File reviewed

As the ICQA team performed the task activities described in the previous sections, an account of all the CCMS components, subsystems and files that were reviewed was documented in each assessment report. Section 3 contains a list of all the documents and artifacts that were referenced for each ICQA task.

3.5.5 Include Completed Assessment Checklists

The ICQA team performed the task activities assessments using the checklists described in the previous sections. As each CCMS artifact or component is assessed, the checklists will be populated with observation findings and comments. These completed assessment checklists will be included within the corresponding sections of Section 4.

3.5.6 Summarize the Overall Assessment Results

Section 4 summarizes the activities, tasks, and results, including the status and disposition of all findings or Test Problem Reports (TPRs) encountered throughout the project. It provides an assessment of the overall system quality and provides recommendations and observations regarding product and process.

4 FINDINGS

4.1 Task 2 - Independent Random CCMS Development Deliverables and Artifacts Review

During the assessment period the ICQA provided several findings reports for each Task Area (Tasks 2 - 4) performed. Findings with a rating of Medium or higher are depicted in Exhibit 14 below and included as a part of this report.

Exhibit 14 CCMS Review Comments

Design Review Comments			
#	**Comment**	**Severity**	**Recommendation**
1	There is no backwards traceability to the requirements in each section of the CCMS core functional design, so it is difficult to map specific CCMS design components to the source requirements.	Medium	Backwards traceability helps ensure that the evolving CCMS components remain on the correct track with regards to the original and/or evolving requirements (that we are building the product right). The objective is to ensure that we are not expanding the scope of the project by adding design elements, code, tests or other work products that are not called out in the requirements (i.e., “gold plating”). If there is a change needed in the implementation or if the developers come up with a creative, new technical solution, that change or solution should be traced backwards to the requirements and the business needs to ensure that it is within the scope of the desired product.
2	Some of the CCMS detailed design components do not provide a description of the mechanism and implementation of the application’s functionality within the system.	Medium	Although there is a general architecture "framework" and high level functional designs, the design artifacts do not show the interconnections between specific application components nor the interfacing of the components to external systems. Design models should be created so that a developer with a typical coding capacity can implement and follow through the architecture. Design models should capture information flows among major architectural component of the application (e.g., from Web Tier to ISB to DBs etc).
Code Review Comments			
#	**Comment**	**Severity**	**Recommendation**
3	There is no backwards traceability to the requirements in any of the reviewed CCMS code modules, so it is difficult to map specific CCMS components to the source requirements.	Medium	As mentioned previously, backwards traceability is important for several reasons. Another benefit of backward traceability comes when a defect is identified in one of the work products. For example, if a piece of code has a defect, the traceability matrix can be used to help determine the root cause of that defect.
4	There is limited unit testing throughout the CCMS code.	Medium	JUnit is a regression-testing framework that developers can use to write unit tests as they develop systems. Eliminating defects early in the process usually avoids lengthy and tedious debugging later in the project.

Test Review Comments			
#	**Comment**	**Severity**	**Recommendation**
5	There is limited validation of the specific requirements in the test scripts and some test scripts map to several requirements or compound requirements without sufficient detail. Use of verification points is inconsistent and limited.	Medium	Validation of requirements within the test scripts is critical in determining if the system meets the intended functionality.

Exhibit 15 shows the completed checklists that the ICQA team used for this task.

Exhibit 15 Completed Checklists

Checklist Name	Checklist Description	Attachment
Requirements Review Checklist	This checklist was used to determine whether the requirements are correct, unambiguous, testable, traceable, complete, standardized, consistent and maintainable.	Requirements_Checklist-complete v1.2.do
Design Review Checklist	This checklist was used to determine whether the CCMS design is a correct, accurate, and complete transformation of the requirements and that no unintended features are introduced.	Design_Checklist-complete v1.2.doc
Code Review Checklist	This checklist was used to review source code to determine whether CCMS code was implemented using AOC coding standards.	Code_Checklist-complete v1.2.doc
Test Plan Review Checklist	This checklist was used to determine whether the Test Plans meet the requirements to support all testing events for CCMS and satisfies its specified acceptance requirements.	Test_Plan_Checklist-complete v1.2.doc

4.2 Task 3 - Independent CCMS Application Assessment of Select CCMS components based on reported SCAMPI process issues

ISD used the SCAMPI v1.2 Method in performing their appraisal on the Deloitte Consulting organization for the CCMS Project. The SCAMPI v1.2 method has the following characteristics:

- uses CMMI v1.2 for Development
- is Assessment Requirements for CMMI compliant
- consists of a defined and structured set of team activities: interviews, document reviews, presentations

The results of the SCAMPI v1.2 method produced findings against the targeted Process Area Practices which are discussed in the following subsections. Exhibit 16 highlights the findings associated with this process area.

Exhibit 16 CCMS SCAMPI Findings

Requirements Management		
#	**Finding**	**Recommendation**
1	Project progress data indicate that thresholds/triggers defined in the measurement plan are not being actively used to drive corrective actions. Reports that are generated often do not include contextual information about the data to support corrective actions by the users of the data (e.g., when schedule variances are identified, comments about the variances don't always show analysis to facilitate follow on actions).	Measurement data regarding requirements should be analyzed at regular intervals and corrective actions should be created when threshold triggers have been reached. Update the Project Schedule to include corrective action milestone dates and data to support each item for improvement.
Project Planning		
#	**Finding**	**Recommendation**
2	The document histories of the evidence provided indicate version and date gaps (e.g., version jumps from V4.0 to V7.0 and there is a 2-year history gap in the Communications plan).	Provide a summarized line item to the change history logs where gaps exist highlighting the key items that changed in each document during the gap period and the source of the change to bring the document to current state.
Project Monitoring and Control		
#	**Finding**	**Recommendation**
3	Milestone reviews occurred during 2010, but were not observed to be routinely implemented in the project's process.	Create a more formal gate review process for moving forward with a template to capture any notes or risks from each milestone review. Provide a signature block for leadership/stakeholder and Independent Verification & Validation (IV&V) sign-off.
Measurement and Analysis (M&A)		
#	**Finding**	**Recommendation**
4	Most documented measurement objectives in the metrics plan (column A) are not objectives consistent with industry standard measurement performance objectives (e.g., Objective to reduce the quantity of fielded defects in the delivered product).	Measurement objectives should be consistent with the stated project goals documented within the CCMS Metrics Plan. Review metrics to ensure currency and cite rationale as to why the metrics were tailored to this project to ensure that history is documented.
5	In the program management area, Cost/Budget metrics are not specified in the Metrics Plan. Support metrics are not specified in the metrics plan other than QA audit metrics (e.g., M&A, CM). Full lifecycle engineering metrics are not specified other than testing related metrics (i.e., requirements, design, code, peer reviews)	The CCMS Metrics Plan should account for all types of measures that will help evaluate the performance of the project. This should include project management metrics, engineering metrics, and configuration management.

6	The measures specified in the CCMS metrics plan do not define the data collector role, the actual collection procedure (not source), and in most cases no analysis procedure is defined.	For each identified measure to be collected, the CCMS Metrics Plan should also include corresponding roles, collection techniques, and analysis methods for each measure.
7	Some key metrics in the workbook don't have metrics objectives, analysis procedures, thresholds, or analysis tools noted (example: SI testing # defects/severity).	The measurement repository should contain a traceability matrix that associates each measure with the measurement objective, analysis technique, and appropriate thresholds.
8	Some CCMS metrics that are defined in the metrics plan are not being collected and analyzed currently (e.g., summary QA audit metrics)	Assign a task owner and incorporate metrics analysis in to general status reporting (weekly or monthly). The IV&V or Quality Assurance team should periodically review the measurement repository against the CCMS Metrics Plan.
9	Project progress data indicate that thresholds/triggers defined in the measurement plan are not being actively used to drive corrective actions. Reports that are generated often do not include contextual information about the data to support corrective actions by the users of the data (e.g., when schedule variances are identified, comments about the variances don't always show analysis to facilitate follow on actions).	Measurement data regarding requirements should be analyzed at regular intervals and corrective actions should be created when threshold triggers have been reached. Update the Project Schedule to include corrective action milestone dates and data to support each item for improvement.
10	For some data that is collected, there is limited evidence of analysis/actions being taken (e.g., metrics from individual deliverable reviews, summary metrics about deliverables status, audit data).	Assign a task owner and incorporate metrics analysis in to general status reporting (weekly or monthly).
Process and Product Quality Assurance		
#	**Finding**	**Recommendation**
11	Audits were done in the past (circa 2008) but were not performed at all from a project level for multiple years.	Task IV&V or Quality Assurance with performing a ***sample*** audit of high risk areas to ensure process efficiency and artifact completeness, correctness, and consistency.
12	Evidence provided indicates that there are insufficient project resources assigned to performing process and product audits as a routine organizational function.	Task IV&V or Quality Assurance with performing a ***sample*** audit of high risk areas to ensure process efficiency and artifact completeness , correctness, and consistency.
13	Other than a 2010 CMMI compliance review - basically another gap analysis, there is no evidence of regularly scheduled and conducted audits of the quality assurance function or processes or work products.	Task IV&V or Quality Assurance with performing a ***sample*** audit of high risk areas to ensure process efficiency and artifact completeness , correctness, and consistency.

14	No evidence was observed of recent meetings, decks, minutes, etc. that are conducted with management to review status of quality assurance activities, tasks, results, and issues.	Task IV&V or Quality Assurance with performing a ***sample*** audit of high risk areas to ensure process efficiency and artifact completeness , correctness, and consistency.
Configuration Management		
#	**Finding**	**Recommendation**
15	Limited evidence was provided of routinely auditing key CM processes (e.g., audits of release process, build process, change control process).	Task IV&V or Quality Assurance with performing a ***sample*** audit of high risk areas to ensure process efficiency and artifact completeness , correctness, and consistency.
Requirements Development		
#	**Finding**	**Recommendation**
16	Project progress data indicate that thresholds/triggers defined in the measurement plan are not being actively used to drive corrective actions. Reports that are generated often do not include contextual information about the data to support corrective actions by the users of the data (e.g., when schedule variances are identified, comments about the variances don't always show analysis to facilitate follow on actions).	Measurement data regarding requirements should be analyzed at regular intervals and corrective actions should be created when threshold triggers have been reached. Update the Project Schedule to include corrective action milestone dates and data to support each item for improvement.
Technical Solution		
#	**Finding**	**Recommendation**
17	Project progress data indicate that thresholds/triggers defined in the measurement plan are not being actively used to drive corrective actions. Reports that are generated often do not include contextual information about the data to support corrective actions by the users of the data (e.g., when schedule variances are identified, comments about the variances don't always show analysis to facilitate follow on actions).	Measurement data regarding CCMS design should be analyzed at regular intervals and corrective actions should be created when threshold triggers have been reached. Update the Project Schedule to include corrective action milestone dates and data to support each item for improvement.

Product Integration		
#	**Finding**	**Recommendation**
18	Project progress data indicate that thresholds/triggers defined in the measurement plan are not being actively used to drive corrective actions. Reports that are generated often do not include contextual information about the data to support corrective actions by the users of the data (e.g., when schedule variances are identified, comments about the variances don't always show analysis to facilitate follow on actions).	Measurement data regarding CCMS code should be analyzed at regular intervals and corrective actions should be created when threshold triggers have been reached. Update the Project Schedule to include corrective action milestone dates and data to support each item for improvement.
Verification		
#	**Finding**	**Recommendation**
19	Analysis of peer review data is limited to correcting individual findings. No evidence was observed of analysis performed on collective issues identified during peer reviews to determine underlying issues with groups of work products or with the peer review process.	Measurement data regarding peer reviews should be analyzed at regular intervals and corrective actions should be created when issues are identified. Assign owners to ensure action is taken to resolve the group issues and improve the peer review process as needed.
Organizational Process Definition		
#	**Finding**	**Recommendation**
20	Metrics repository at Org level (Global) has effort and defect data primarily. Org repository doesn't yet have sufficient peer review data to do summary analysis. PR data is not being collected, analyzed, or used from a local CCMS repository. Metrics data from the projects are only provided to the Org level at project close out. CCMS metrics data is not in the Org repository. The CCMS metrics repository (eRoom) has not been populated with measurement data for years (with exception of weekly/monthly status).	Assign a task owner and incorporate metrics collection for each measure identified in the CCMS metrics plan. The IV&V or Quality Assurance team should periodically review the measurement repository against the CCMS Metrics Plan.
21	Project progress data indicate that thresholds/triggers defined in the measurement plan are not being actively used to drive corrective actions. Reports that are generated often do not include contextual information about the data to support corrective actions by the users of the data (e.g., when schedule variances are identified, comments about the variances don't always show analysis to facilitate follow on actions).	Measurement data should be analyzed at regular intervals and corrective actions should be created when threshold triggers have been reached. Update the Project Schedule to include corrective action milestone dates and data to support each item for improvement.

22	The Playbook Metrics Guidelines (GD003) document does not address how to collect and store metrics data in the organizational repository.	Update the Playbook Metrics Guidelines to include specific guidance on how to collect and store metrics data in the organizational repository.
23	Evidence provided of organizational defect data collected shows charting of the data but no analysis. Identification of issues, causes of defects, and process changes based on the analysis was not observed.	Defect data should be analyzed at regular intervals and corrective actions should be created when threshold triggers have been reached. Perform a root cause analysis on 10% of the high severity organizational defects and create a corrective action plan with process improvements.
Organizational Training		
#	**Finding**	**Recommendation**
24	The CCMS project does not have a systematic training program overall that repeatedly delivers skills and knowledge needed by personnel in all roles.	Organize project planning and management documentation and provide a Master Document List (MDL), with key documents highlighted, that team members can review and use as informal training. Having an MDL will also assist with on-boarding new team members moving forward.
25	Some evidence of reporting training statistics was observed of local CCMS training status, metrics, issues, and actions being reported to program management, but this is not routine, systematic, or controlled over time against a defined training plan.	Training data should be analyzed at regular intervals and the training summary and analysis should be reported to management stakeholders.
26	There is no evidence of auditing the training capabilities of the CCMS project other than CMMI based external or internal appraisals.	Task IV&V or Quality Assurance with performing a ***sample*** audit of high risk areas to ensure process efficiency and artifact completeness , correctness, and consistency.
Integrated Project Management		
#	**Finding**	**Recommendation**
27	Recording and archiving of the basis of estimates in initial planning and re-planning was not apparent. Maintenance of estimates and basis of estimates appear to be maintained primarily in .ppt files.	Project planning estimates should be reviewed and updated by the Project Management Office (PMO) after each CCMS milestone or when the project scope has been changed.
28	No evidence was observed of using an organizational measurement repository to facilitate doing either original or re-plan estimates for the project.	Project planning estimates should be reviewed and updated by the PMO after each CCMS milestone or when the project scope has been changed. Project data should be stored within the measurement repository and used to calculate updated project estimates.
29	There is limited evidence that the entire set of project parameters used to plan and re-plan the project are monitored against plan (e.g., actual widgets such as screens, forms, reports).	Project planning estimates should be based on engineering calculations of the projected CCMS system.

30	Project progress data indicate that thresholds/triggers defined in the measurement plan are not being actively used to drive corrective actions. Reports that are generated often do not include contextual information about the data to support corrective actions by the users of the data (e.g., when schedule variances are identified, comments about the variances don't always show analysis to facilitate follow on actions).	Measurement data should be analyzed at regular intervals and corrective actions should be created when threshold triggers have been reached. Update the Project Schedule to include corrective action milestone dates and data to support each item for improvement.
31	Little evidence was observed of actively measuring and using data during the requirements and design phases to manage the project (other than cost and schedule and use cases).	Project planning estimates should be reviewed and updated by the PMO after each CCMS milestone or when the project scope has been changed. Project data should be stored within the measurement repository and used to calculate updated project estimates.
32	Analysis of metrics reports that are generated, in accordance with the metrics plan, and corrective actions resulting from the analysis, are not always supported by the evidence provided (see Weekly status minutes and charts and thread to issues log).	Perform a one-time re-sync of the status reports to the metrics reports and cite rationale for any gaps or inconsistencies. Verify the source of the metrics which are being provided in the status to identify any errors in collection.
33	All lessons learned reports provided are dated - nothing recent in the last two years has been done.	Lessons learned should be collected at the conclusion of each project milestone phase. Create a centrally located spreadsheet with detailed fields to capture lessons learned items from project members that they can update at their convenience. Sample spreadsheet fields include (Lessons Learned ID, Category, Description, Impact & Recurrence (high, medium, low), owner or champion, implementation time (short, medium, long), and Lessons Learned Actions.)
Risk Management		
#	**Finding**	**Recommendation**
34	Evidence was not observed of risk management training delivered, or training records it was received.	Update the project management training to include risk management. Maintain training records for all project personnel in a central location.
35	Although risks are monitored and statused, evidence was not observed of summary risk metrics being used to manage the risk management process.	Incorporate metrics capture and analysis moving forward during the risk management meetings.
Decision Analysis and Resolution (DAR)		
#	**Finding**	**Recommendation**
36	Evidence observed did not show the DAR process activities being monitored at the project level or reviewed with Management.	All project DARs should be submitted to management stakeholders for review and approval.

4.3 Task 4 - Independent Exploratory Testing of CCMS Components

The ICQA team executed 82 test scripts across 8 scenarios resulting in 100% pass rate. In addition, ICQA conducted ad-hoc and negative testing, which triggered the appropriate responses from the CCMS Core component. Exhibit 17 shows a detailed summary of the test scripts that were executed.

Exhibit 17 CCMS Exploratory Test Results

Number	Test Script Name	Date	Status
1	PEF_005_01 Create Profile, Name only and Mark as Frequent Filer	7/12/2011	Passed
2	PEF_005_02 Add Profile to Vexatious Litigant List	7/12/2011	Passed
3	PEF_005_03 Manage Vexatious Litigant List_Remove From List	7/12/2011	Passed
4	PEF_023_001_Add General Info	7/12/2011	Passed
5	PEF_023_002_Add Physical Info	7/12/2011	Passed
6	PEF_023_003_Add Additional Info	7/12/2011	Passed
7	PEF_023_004_Add Court Officer Position	7/12/2011	Passed
8	PEF_023_005_Search for Professional	7/12/2011	Passed
9	PEF_023_006_Remove Position and Add Another	7/12/2011	Passed
10	PEF_023_007_Search for Court Officer	7/12/2011	Passed
11	PEF_023_008_Search for Professional	7/12/2011	Passed
12	PEF_023_009_Search for Non-Professional	7/12/2011	Passed
13	PEF_023_010_Search All Person Entity	7/12/2011	Passed
14	JUV_007_001_ Initiate a Juvenile 300 case	7/13/2011	Passed
15	JUV_007_002 Record minutes for Detention hearing	7/13/2011	Passed
16	JUV_007_003 Add filing JV-505 Statement Regarding Parentage	7/13/2011	Passed
17	JUV_007_004.DX_Send notification to attorney_WORK AROUND	7/13/2011	Passed
18	JUV_007_006 Print calendar	7/13/2011	Passed
19	JUV_007_007_Print outcards	7/13/2011	Passed
20	JUV_007_008_Print pull list	7/13/2011	Passed
21	JUV_007_009.DX Record minute for Jurisdictional Hearing	7/13/2011	Passed
22	JUV_007_010 Record minutes for Dispositional Hearing	7/13/2011	Passed
23	JUV_007_011 Record minutes for 6 Month Review Hearing (In Home)	7/13/2011	Passed
24	JUV_007_012_Record minutes for the Permanency Hearing (12 Month Review)	7/13/2011	Passed
25	AC39_01a_Add Department	7/13/2011	Passed
26	AC39_01b_Update Department	7/13/2011	Passed
27	AC39_02a_Add Place	7/13/2011	Passed
28	AC39_02b_Update Place	7/13/2011	Passed
29	AC39_03a_Add Division	7/13/2011	Passed
30	AC39_03b_Update Division	7/13/2011	Passed
31	FIS_102_001_Initiate Traffic Case	7/14/2011	Passed
32	FIS_102_002.DX_Retrieve DMV Priors_DX WORKAROUND	7/14/2011	Passed
33	FIS_102_003_Calculate bail	7/14/2011	Passed
34	FIS_102_004_Record Payment on Case	7/14/2011	Passed
35	FIS_102_006_Distribute Payment	7/14/2011	Passed
36	FIS_102_007_Verify Disposition Information	7/14/2011	Passed
37	WQ01_01_Initiate Civil Limited, Unlawful Detainer Case_Task1	7/19/2011	Passed

Number	Test Script Name	Date	Status
38	WQ01_02_Initiate Civil Limited, Unlawful Detainer Case_Task2	7/19/2011	Passed
39	WQ01_03_View WQ Tasks	7/19/2011	Passed
40	WQ01_04_Manage WQ Users	7/19/2011	Passed
41	WQ01_04a_Assign Tasks En Masse	7/19/2011	Passed
42	WQ01_04b_Remove Task	7/19/2011	Passed
43	WQ01_05_Add Volume to Case File_Complete	7/19/2011	Passed
44	WQ01_06_Update Case Track_Canceling	7/19/2011	Passed
45	WQ01_07_Select In Progress Task	7/19/2011	Passed
46	WQ01_11_Print WQ	7/19/2011	Passed
47	FIS_COLL101_002_Calculate Bail	7/19/2011	Passed
48	FIS_COLL101_003_Search Partially Paid FFA	7/19/2011	Passed
49	FIS_COLL101_004_Verify Payment History	7/19/2011	Passed
50	FIS_COLL101_005_Switch Case in Context	7/19/2011	Passed
51	FIS_COLL101_007_Pay Full Case Balance on Both Cases	7/19/2011	Passed
52	FIS_COLL101_008_Update Count Disposition	7/19/2011	Passed
53	ADR01_Configure ADR Program Offices	7/20/2011	Passed
54	ADR02_Designate ADR Contacts	7/20/2011	Passed
55	ADR03_Configure ADR Location	7/20/2011	Passed
56	ADR04_Configure ADR Program Officer	7/20/2011	Passed
57	ADR05a_Configure Local Program - Judicial Arbitration	7/20/2011	Passed
58	ADR05b_Configure ADR Clocks - Judicial Arbitration	7/20/2011	Passed
59	ADR05c_Configure Local Program - Civil Action Mediation	7/20/2011	Passed
60	ADR05d_Configure ADR Clocks - Civil Action Mediation	7/20/2011	Passed
61	ADR05e_Configure Local Program - Generic Mediation	7/20/2011	Passed
62	ADR05f_Configure ADR Clocks - Generic Mediation	7/20/2011	Passed
63	ADR05g_Configure Local Program - Neutral Evaluation	7/20/2011	Passed
64	ADR05h_Configure ADR Clocks - Neutral Evaluation	7/20/2011	Passed
65	ADR05i_Configure Local Program - Settlement Conference	7/20/2011	Passed
66	ADR05j_Configure ADR Clocks - Settlement Conference	7/20/2011	Passed
67	ADR05k_Configure Local Program - Early Settlement Conference	7/20/2011	Passed
68	ADR05l_Configure ADR Clocks - Early Settlement Conference	7/20/2011	Passed
69	ADR06a_Configure ADR WQ - At Issue	7/20/2011	Passed
70	ADR06b_Configure ADR WQ - Agree to ADR	7/20/2011	Passed
71	ADR06c_Configure ADR WQ - All Parties File CMC	7/20/2011	Passed
72	ADR07_Configure Static Form Text	7/20/2011	Passed
73	FAM_019_001 Initiate family law Approval of Childs contract	7/21/2011	Passed
74	FAM_019_003 Scanned - initial filing documents	7/21/2011	Passed
75	FAM_019_004 Delivered - case file to research attorney	7/21/2011	Passed
76	FAM_019_005 Create Case note	7/21/2011	Passed
77	FAM_019_006 Delivered - case file to Judicial Officer	7/21/2011	Passed
78	FAM_019_007 Ordered - JO grants the request	7/21/2011	Passed
79	FAM_019_007b Update the Filing Status	7/21/2011	Passed
80	FAM_019_009 Dispose - case is disposed	7/21/2011	Passed
81	FAM_019_010 Filed - MC-357_358	7/21/2011	Passed

Number	Test Script Name	Date	Status
82	FAM_019_012 Scanned - subsequent filing documents	7/21/2011	Passed

4.3.1 Test Witnessing

The ICQA team witnessed 22 test scripts across 3 scenarios resulting in 86% pass rate. Exhibit 18 shows a detailed summary of the test scripts that were witnessed alongside the PAT testers.

Exhibit 18 CCMS Test Witnessing Results

Number	Test Script Name	Date	Status
1	FEL-PR004_034_File Petition for Continued Commitment (Mental Health Case)	7/12/2011	Passed
2	FEL-PR004_030_Record Minutes for Violation of Probation Event	7/11/2011	Passed
3	FEL-PR004_031_Schedule Placement Review (Mental Health Case)	7/12/2011	Passed
4	FEL-PR004_032.1.DX_Send Modified Disposition Notification	7/11/2011	Passed
5	FEL-PR004_032_Check In Participants and Capture and Finalize Minutes for Placement Hearing (Mental Health Case)	7/11/2011	Passed
6	FEL-PR004_033_Generate Order of Commitment	7/12/2011	Passed
7	FEL-PR004_034_File Petition for Continued Commitment (Mental Health Case)	7/12/2011	Passed
8	FEL-PR004_035_File Progress Report (Mental Health Case)	7/11/2011	Passed
9	FEL-PR004_036_Run Felony Weekly Pleas Report	7/11/2011	Failed
10	FEL-PR004_037_Run No Pending Activity Report	7/11/2011	Failed
11	FEL-PR004_038_Run Minute Code Execution Report	7/12/2011	Passed
12	SP_EFL_087_01.DX_Receive case amendment	7/11/2011	Passed
13	SP_EFL_087_02_Select E-Filing Transaction - Case Amendment FMI	7/11/2011	Passed
14	SP_EFL_087_03_E-Filing Review Screen Display Verification	7/11/2011	Passed
15	SP_EFL_087_09_Review submitted enhancements information	7/11/2011	Passed
16	SP_EFL_087_10_Review and edit submitted priors information	7/11/2011	Passed
17	SP_EFL_087_11_Proceed to Endorse-Accept	7/11/2011	Passed
18	MSD-TRF002_001_Initiate Case	7/19/2011	Passed
19	MSD-TRF002_002_Search Case	7/19/2011	Passed
20	MSD-TRF002_003.DX_Schedule Arraignment Event-Send Calendar Event Notification	7/19/2011	Passed
21	MSD-TRF002_004_Search for Arraignment Event	7/19/2011	Passed
22	MSD-TRF002_005.DX_Record Minutes for Arraignment Event-Send Minute Order Notification-Send Public Defender Case Assignment Notification	7/19/2011	Failed

The ICQA team worked with the PAT testers to open defects on those test scripts that failed. Additional details on the execution of each test script along with the traceability to each open defect can be found within HPQC.

In addition, Exhibit 19 lists the defects that were opened during test witnessing. When defects occurred, the ICQA team worked in conjunction with the PAT testers to communicate risks and errors immediately to the Deloitte team. The following test defects were identified/verified during the exploratory testing of the Product Acceptance Test. As of August 25th, all defects have been resolved and are closed. Additional details of each defect can be found in HPQC.

Exhibit 19 Defects Captured in HPQC

Defect	Name	Date	Severity
170330	INT2_CC14_SME1_14	04/21/2011	3
171219	SME1_11_PAT_CC11	04/27/2011	3
179136	FEL-PR004_032.1.DX_Send Modified Disposition Notification	7/11/2011	3
179185	FEL-PR004_036_Run Felony Weekly Pleas Report	7/11/2011	2
179112	FEL-PR004_031_Schedule Placement Review (Mental Health Case)	7/11/2011	3
179407	FEL-PR004_037_Run No Pending Activity Report	7/12/2011	2
180211	MSD-TRF002_005.DX_Record Minutes for Arraignment Event-Send Minute Order	7/19/2011	2

Attached is the completed Test Witness Review checklist providing details regarding the ICQA review criteria and findings.

Test_Witness_Checkl
ist-complete v1.2.doc

4.3.2 Regression Test Review

The regression test suite was comprised of existing test scripts (~2000), and was executed in the Product Acceptance Test environment. This generated an extensive sampling of test results, which is seen in Exhibit 20.

Exhibit 20 CCMS Regression Test Results

Test Group	Total Passed	Total Failed	Total Executed	Pass %
FAM	193	0	193	100.00%
FIS	329	1	330	99.70%
FMI	610	0	610	100.00%
FOC	65	0	65	100.00%
JUV	76	0	76	100.00%
SPC	361	3	364	99.18%
V3	474	0	474	100.00%
Grand Total	**2108**	**4**	**2112**	**99.81%**

The ICQA team verified that Defects #170330 & #171219 were opened as a result of the regression test scripts that failed. As indicated previously, all defects reported in Exhibit 18 have been resolved and closed.

Exhibit 21 details identified issues/findings with regards to the overall quality and robustness of the testing process and regression test review assessment.

Exhibit 21 Testing Process Issues/Comments

#	Issue/Comment	Severity	Recommendation
1	New Test Cases are being introduced during the PAT that were not executed during Integration Testing. While this was planned at an acceptable 10% allotment rate, there was a high level of script errors recorded. As a result, some Test Cases are being re-written during PAT which causes risk to the integrity and quality of the testing as well as the testing schedule.	Medium	Review existing testing/quality assurance process for test scripts and Deloitte must ensure any new test scripts that are introduced still go through the appropriate testing/quality assurance processes.
2	During the PAT execution and subsequent verification of the test cases in HPQC, it was unclear in the test scripts that all branches of requirements were tested.	Medium	Recommend these test scripts are reviewed for level of completeness and traceability for more thorough branch testing.
3	Some test script gaps existed during PAT to validate all of the business process. For example, test scripts had to be added during PAT to account for all processing related to criminal protective orders and DOJ/CLETS data exchanges. As similarly noted in Issue 1 the script gap was planned at an acceptable 10% allotment rate.	Medium	Include the IV&V team as well as court subject matter experts (SMEs) with significant court experience during the test planning phase. ICQA recommends these test scripts are reviewed by the IV&V and SMEs to identify gaps and proper courtroom scenarios as needed. As a best practice, a script gap allotment should be intended for a sporadically missed script here or there throughout the test suite, not recommended for all processing for a particular area of functionality.

Appendix A: Acronyms

The below table provides a list of acronyms and respective definitions that are used throughout this document:

Acronym	Definition
AOC	Administrative Office of the Courts
CARA	Criticality Analysis and Risk Assessment
CCMS	California Court Case Management System
CM	Configuration Management
CMMI	Capability Maturity Model Integration
COTS	Commercial Off-The-Shelf
CR	Change Request
DAR	Decision Analysis and Resolution
DB	Database
FFD	Final Functional Design
HP QC	Hewlett Packard Quality Center
ICQA	Independent Code Quality Assessment
IEEE	Institute of Electrical and Electronics Engineers
ISB	Integration Services Backbone
ISD	Integrated System Diagnostics
IV&V	Independent Verification and Validation
M&A	Measurement & Analysis
NIEM	National Information Exchange Model
PIID	Process Implementation Indicator Descriptions
PM	Project Manager
PMO	Project Management Office
QA	Quality Assurance
RM	Risk Management
PAT	Product Acceptance Test
SCAMPI	Standard CMMI Appraisal Method for Process Improvement
SDLC	Software Development Lifecycle
SI	Systems Integrator
TPR	Test Problem Reports