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**ASSESSMENT
REPORT
09-01**

**FEDERAL DIGITAL SYSTEM (FDSYS)
INDEPENDENT VERIFICATION AND
VALIDATION (IV&V) – FOURTH
QUARTER REPORT ON RISK
MANAGEMENT, ISSUES, AND
TRACEABILITY**

November 4, 2008

OFFICE OF INSPECTOR GENERAL



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Memorandum

OFFICE OF THE INSPECTOR GENERAL

DATE: November 4, 2008

REPLY TO

ATTN OF: Assistant Inspector General for Audits and Inspections

SUBJECT: Federal Digital System (FDsys) Independent Verification and Validation (IV&V) – Fourth Quarter Report on Risk Management, Issues, and Traceability
Report Number 09-01

TO: Chief Information Officer

The GPO Office of Inspector General (OIG) is conducting independent verification and validation (IV&V) of GPO's Federal Digital System (FDsys)¹ implementation. The OIG contracted with American Systems² to conduct IV&V for the public release of FDsys Release 1.C.³ As part of its contract with the OIG, American Systems is assessing the state of program management, technical and testing plans and other efforts related to the rollout of Release 1.C. American Systems is required by the contract to issue to the OIG a quarterly Risk Management, Issues, and Traceability Report, providing observations and recommendations on the program's technical, schedule, and cost risks as well as requirements traceability of those risks and the effectiveness of the program management processes in controlling risk avoidance. Additionally, at the end of each FDsys release phase, American Systems is required to issue a release phase summary program management report that addresses delivery of the technical baseline per the FDsys Master Program Schedule and the risks that affect the schedule's critical path to the next phase.

The enclosed report is American Systems' quarterly report for the period April 2008 to June 2008. Section 7 of the report contains five recommendations designed to improve current and future FDsys project efforts. Management concurred with each of the five recommendations. We consider the actions proposed by management responsive to each

¹ The FDsys program is a multimillion dollar effort that GPO is funding and managing to modernize the GPO information collection, processing, and dissemination capabilities it performs for the three branches of the Federal Government.

² American Systems, located in Chantilly, Virginia, is a large information technology company with significant experience in the realm of IV&V for Federal civilian and Defense agencies, including the Department of State, the Navy, and the U.S. Agency for International Development.

³ American Systems IV&V methodology is referenced to the framework established by the Institute of Electrical and Electronic Engineers (IEEE) Standard 1012-2004, the IEEE Standard for Software Verification and Validation.

of the recommendations. Management's response is included in its entirety in Appendix A of the report. The recommendations are resolved and will remain open until management has completed the proposed actions and IV&V has completed follow-up work. The status of each recommendation upon issuance of this report is included in Appendix B. The final report distribution is in Appendix C.

In their response to this report (see Appendix A), management requested that a draft of each quarterly report be provided no later than one week after the end of the reporting period. However, the OIG's contract with American Systems requires that each quarterly report be delivered to the OIG no later than two weeks after the end of each quarter. Once received, the report goes through an OIG review process before issuance to management for comments. Therefore, it is not possible to meet management's specific request. We will, however, as we have done previously, continue to brief management during each review period on findings and recommendations identified as IV&V tasks are completed.

If you have questions concerning this report or the IV&V process, please contact Mr. Brent Melson, Deputy Assistant Inspector General for Audits and Inspections at (202) 512-2037, or me at (202) 512-2009.



Kevin J. Carson
Assistant Inspector General for Audits and Inspections

Attachment

cc:

Chief of Staff

Chief Management Officer

Chief Technology Officer

ATTACHMENT

IV&V RISK MANAGEMENT, ISSUES, AND TRACEABILITY REPORT	
TO:	Brent Melson, COTR
FROM:	IV&V, Jon Valett
IV&V OF:	Quarterly Report (Final – Document Number 01-036)
SUBJECT:	April – June 2008 Quarterly Report
DATE:	July 31, 2008
CC:	Dan Rose, David Harold, John Best, Chris Parr, Shawn O'Rourke

This report presents the critical technical, schedule, and cost risks identified for the Government Printing Office (GPO) Federal Digital System (FDsys) Program. Specifically, it provides a high-level overview of the key risks and issues that IV&V has identified within the last quarter. This report also addresses IV&V task reports covering Security Requirements and the Risk Management Plan and Program that were performed over this same time period. Also during this quarter, IV&V reviewed a *Quick Look Assessment of the GPO FDsys Development Approach* provided by Flatirons Solutions, a Systems Engineering and Technical Assistance (SETA) contractor hired by GPO. The results of that review are contained in this report.

This is the fourth IV&V quarterly report and covers the period from April 2008 to June 2008. It includes information taken from the following:

- IV&V Task Report, *Evaluate FDsys System Security Plan*, April 22, 2008;
- IV&V Task Report, *Design Phase Risk Analysis*, July 2, 2008; and
- IV&V Quick Look Report – Draft, *Evaluate Initial FDsys Release 1C.2 Program Review Meetings*, July 7, 2008⁴.

Over the last quarter several areas of the program appear to be making significant progress:

- The risk program has been restarted (reference Section 5).
- Configuration management activities are moving in the right direction. IV&V will review the configuration management plan and adherence to process during the next quarter.
- Test planning is underway. IV&V will review test plans during the next quarter.
- The PMO designated a team to begin the planning of the training efforts needed to support the deployment of FDsys RIC2. A high level training schedule and list of planned deliverables has been presented. An initial Training Plan has been

⁴ The referenced report was never issued as a final because all of the findings of the draft report are included in this quarterly. The draft report included references to a Program Review meeting that was held on July 1, 2008. The analysis of that meeting is included in this report.

developed. This early attention to system training and organizational change will be critical to stakeholder acceptance of FDsys when it is deployed. At this point, however, the existing R1C2 documentation/design details are insufficient to develop detailed training materials (e.g., manuals that contain step-by-step procedures to perform tasks).

- The conduct of formal review meetings on a regular basis (e.g., monthly) is very beneficial to the FDsys Program. These meetings provide a forum for the FDsys team to coordinate activities, evaluate progress, and discuss problem areas. Each meeting includes an agenda that encompasses the current tasks being performed. Representatives from the Program Management Office (PMO), Harris, and the other PMO Contractors present information related to their efforts. Questions/concerns (if any) from the team members are addressed.

1. Technical Risks Identified

During the last quarter several technical risks were identified:

- An Integrated Master Schedule (IMS) and an approved Project Management Plan (PMP) still does not exist. The lack of a detailed IMS continues to hamper the Program. A critical path cannot be defined; overall progress cannot be determined; cost expenditures versus accomplishments cannot be measured; and, the coordination of development activities is difficult. The ability to ensure deployment at the specified date (December 2008) without an IMS is highly unlikely.
- The PMO determined that a re-design of the Documentum Repository was required because the previous design was deemed to be overly complex and did not make the best use of Documentum capabilities. While this decision may be the correct one for the overall technical solution, the decision delays the completion of system design (i.e., the System Design Document (SDD)) and may impact some software components being developed by Harris.
- The Bill of Materials (BOM) for the Test environment has been completed and the equipment has been ordered. Because the design is not yet complete, there is a technical risk that the equipment ordered for the Test environment will not be sufficient to support testing.
- During the quarter, IV&V reviewed the technical requirements and design artifacts being developed by the program. While the design is not complete, IV&V identified some areas of concern that may become technical risks:
 - The R1C2 requirements baseline is not finalized. The decomposition of the system requirements into derived software requirements is complete for 11 of the 35 software components. The quality of the derived requirements in terms of testability and clarity remains questionable. Simultaneous development of requirements and detailed design is a poor system development practice that substantially increases the risk of mistakes and rework. In addition, a traceability of all requirements to the system design (including COTS) has not been performed. Without this

- trace, it is very hard to determine if the detailed design satisfies all system requirements.
- The design methodology being used to develop the detailed design is not clear. The artifacts that have been generated to-date do not represent a consistent flow from the architecture to a detailed design. There is currently no established methodology that brings the various artifacts (TDF's, workflows, use cases, CDDs, etc.) together to form a coherent design.
 - System Integration Test (SIT) planning is directly related to the “engineering builds” that will be used to iteratively develop the system. The scope and content of these builds have not yet been fully defined. The SIT will be a substantial effort requiring many test cases and procedures. Delays in defining these builds may impact SIT planning efforts, creating a risk that the SIT plan will not be sufficiently detailed to adequately test the system.

2. Schedule Risks Identified

There are a number of FDsys schedule risks that accompany the above technical risks. Without an IMS, IV&V cannot truly evaluate the program schedule; however, a notional schedule was presented at the FDsys Program Review Meeting held May 21, 2008. The deployment date of late 2008 was also presented at the Program Review Meeting held on July 1, 2008. The following schedule risks have been identified:

- As stated in Section 1, the lack of a detailed plan and IMS is a significant schedule risk.
- The scheduled date for conduct of the FDsys R1C2 Detailed Design Review (DDR) has been changed twice. Targeted initially for May 2008, DDR was pushed out to June 30, 2008 during the May Program Review. DDR was again moved to a yet unspecified date in August during the June Program Review. Given that the DDR has slipped at least two (2) months since the original plan, achieving the goal of a December 2008 deployment is highly unlikely.
- During the May 21, 2008 Program Review the presentation stated that a number of plans were scheduled to be delivered during June (including the IMS, PMP, Master Test Plan, User and Beta Test Plans, Configuration Management Plan, and Training Plan). None of these plans or schedules were completed by June. While missing the dates for any of these plans could not be viewed as significant, the pattern of missing even notional schedule dates indicates either an insufficient schedule development process or a potential lack of schedule discipline. Given the already aggressive high-level schedule, any lack of schedule discipline must be viewed as a schedule risk to the overall deployment schedule.
- Delays in SIT planning may cause schedule delays.
- The test equipment has not been delivered. The stated schedule for the beginning of test (middle of August) is at risk due to delays in delivery of the test equipment.

- The specifications for only 2 Parsers are complete/underway. Although they are expected to be easier than those for the first two collections, the specifications for the remaining 23 collections required for R1C2 has not begun. The ability to develop all 25 Parsers in time to deploy R1C2 by the end of 2008 is questionable. In fact, the Risk Management team has identified Parser development as one of the top Program risks.
- A lack of clearly defined security controls and responsibilities creates a schedule risk. This risk is discussed in Section 4 of this report.

3. Cost Risks Identified

There are inherent cost risks associated with the technical and schedule risks. Program cost has been presented at the Program Review meetings with the indication that funds will be expended by January 2009; however, there is no correlation between the cost to-date and performance (e.g., amount of total software completed). Since there is no IMS and PMP and therefore no earned value data, expenditures cannot be evaluated with respect to Program progress.

- By their nature, cost risks are directly correlated with schedule risks. Any schedule increase generally results in additional costs.

4. System Security Plan Evaluation

During this quarter, IV&V performed an evaluation of the *FDsys System Security Plan* (SSP). The following risks were identified:

- The confidentiality, integrity and availability protection of FDsys is critical for successful operational purposes, regulatory compliance and public confidence. The purpose of the *GPO FDsys SSP* is to provide an overview of the security requirements of the system and describe the controls in place or planned for meeting those requirements. The *GPO FDsys SSP* does contain a very methodical and detailed list of agency based security requirements that would meet most government standards for security. However, it does not explain how those security requirements are being implemented, by who (system level, or agency level and therefore a common control) and how the agency based security controls relate/map to the FIPS 200⁵ mandated minimum security controls.
- The *GPO FDsys SSP* should also delineate responsibilities and expected behavior of all individuals who access the system. The *GPO FDsys SSP* fails to clearly and concisely provide sufficient detail for the Certification Authority and the Authorizing Official to base their initial acceptance and agreement of the security

⁵ FIPS 200 is the Federal Information Processing Standards (FIPS) Publication 200, March 2006, Minimum Security Requirements for Federal Information and Information Systems.

posture and residual risk associated with FDsys. Failure to clearly define the complete system architecture and associated security controls puts the system receiving a final Approval To Operate (ATO) in jeopardy and therefore delays the operational deployment to the GPO stakeholders, and the public.

The detailed IV&V recommendations related to this task were delivered to the GPO Chief Information Officer (CIO) in a report dated April 22, 2008 and were briefed to the CIO and the program manager on April 28, 2008. A summary recommendation from this task is provided in Section 7 of this report.

5. Assess Design Phase Risk Management Plan and Process

During this quarter, IV&V also performed an assessment of the FDsys Risk Management Plan (RMP) and Risk Management Process. The findings of the report can be summarized as follows:

- The PMO has reinstated an active risk management program. This is a very positive development for the overall management of the FDsys program. A good risk management program enables a program office to identify and mitigate program risks before they become problems.
- The RMP has been updated to reflect the reorganization of responsibilities between Harris and the GPO. Risk Review Board (RRB) meetings are being held every two weeks, as specified in the RMP. Risk Handling Plans are being developed by Risk Owners, and are reviewed by the RRB. The Risk Database is being updated and the status of risks are being reviewed and evaluated by the RRB.
- A number of specific recommendations for improvement were made for both the Risk Management Plan and Risk Management Process.

The IV&V recommendations related to this task were delivered to the GPO CIO in a report dated July 2, 2008. Following that delivery, IV&V and the FDsys Program Manager and Risk Manager met to review the recommendations. The specific recommendations were discussed and many have been adopted by the PMO. The PMO intends to update their plans and processes to include those recommendations. This collaborative approach provided more timely improvement to the PMO processes and will be used in future IV&V reviews of specific program plans and processes.

A single, more general, recommendation from the report is provided in Section 7 of this report.

6. Review SETA Contractor Quick Look Report

Another IV&V task completed during this quarter was an analysis of the Flatirons Solutions *Quick Look Assessment of the GPO FDsys Development Approach*.⁶ Without restating the Flatirons report, the findings can be summarized as follows:

- The Concept of Operations cannot be used as a foundation for development.⁷
- A complete set of system architecture views do not exist.
- Requirement definition and traceability is incomplete.
- Key design features are incomplete.
- Project management artifacts do not exist.
- The BOM may not meet the needs of the incomplete design and the equipment may not be available in time for SIT.
- The FDsys PMO needs to align the program around a development methodology.

IV&V agrees with all of these findings.

The report concludes "...that the current approach to deliver a system in CY2008 is not achievable using the current system artifacts and development methodology." IV&V agrees with this conclusion.

The report recommends an Agile⁸ development methodology for FDsys. While IV&V agrees that adopting the iterative aspects of Agile would greatly improve the management and likelihood of success for FDsys, it should not be viewed as a "silver bullet". Iterative development with well defined builds is one way for GPO to begin to gain technical and management control of FDsys. Other aspects of the Agile methodology are typically most successful with relatively mature development organizations. While GPO and their contractors might benefit from the Agile methodology, they should not adopt it without significant training and coaching. Fully adopting Agile at this point in the development of RIC2 may cause further schedule delays.

Some of the artifacts that result from an Agile methodology, such as user stories, already exist in a number of different forms (e.g., use cases, workflows, and TDFs). GPO should try to develop a consistent set of artifacts that are traceable to one another and provide an

⁶ Flatirons Solutions was hired in May of 2008 as a Systems Engineering and Technical Assistance Contractor (SETA). Their first task was to review the current technical and programmatic state of the FDsys program and provide evaluation and recommendations for achieving a December 2008 operational system.

⁷ The FDsys PMO has never intended the current ConOps to be a departure point for the design. IV&V's understanding has been that the ConOps provided a starting point for requirements development and that certain system concepts have evolved since the ConOps was developed. The scenarios provided by the ConOps have been replaced by other artifacts, such as use cases and workflows.

⁸ Agile is a software development methodology that focuses on collaborative development, requirements adaptability and short development iterations.

end-to-end solution for FDsys. Perhaps some aspects of the Agile methodology could be adapted to provide that consistent set of artifacts.

The IV&V recommendations related to this task are provided in Section 7 of this report.

7. Recommendations

- 1) IV&V recommends that the recently started program reviews continue on a monthly basis. They are both valuable and necessary for program success.

Management's Response. Concur. GPO concurs with the recommendation. The complete text of management's response is in Appendix A.

Evaluation of Management's Response. Management's actions are responsive to the recommendation. The recommendation is resolved, but will remain undispositioned and open for reporting purposes until corrective actions are completed.

- 2) IV&V recommends that the PMO clearly establish a design methodology that shows how all design artifacts being developed consistently flow from the system architecture down to the detailed design. The methodology chosen should be clearly documented for all engineers and developers.

Management's Response. Concur. GPO concurs that the design methodology going forward must be established and communicated to the technical team. As indicated previously, the plan is to use lessons learned from the first release to establish the appropriate methodology for future releases (see Appendix A).

Evaluation of Management's Response. Management's actions are responsive to the recommendation. The recommendation is resolved, but will remain undispositioned and open for reporting purposes until corrective actions are completed.

- 3) IV&V recommends that the PMO establish the R1C2 requirements baseline and complete the trace of each requirement to the low level component (software component, COTS, hardware) within the detailed design that is responsible for its implementation.

Management's Response. Concur. GPO agrees and the team is working to complete the traceability (see Appendix A).

Evaluation of Management's Response. Management's actions are responsive to the recommendation. The recommendation is resolved, but will remain undispositioned and open for reporting purposes until corrective actions are completed.

- 4) IV&V recommends that GPO begin an update to the SSP. Prior to beginning that update, the PMO should meet with IV&V to discuss detailed recommendations contained in that task report. The PMO should then decide which recommendations are appropriate for that update.

Management's Response. Concur. GPO agrees and the team is working to update the SSP (see Appendix A).

Evaluation of Management's Response. Management's actions are responsive to the recommendation. The recommendation is resolved, but will remain undispositioned and open for reporting purposes until corrective actions are completed.

- 5) IV&V recommends that the Risk Manager regularly review all IV&V reports for identification of additional risks to be tracked in the Risk Database.

Management's Response. Concur. GPO will commit to including the risk manager in the distribution for all IV&V materials (see Appendix A).

Evaluation of Management's Response. Management's actions are responsive to the recommendation. The recommendation is resolved, but will remain undispositioned and open for reporting purposes until corrective actions are completed.

Appendix A. Management's Response



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MEMORANDUM

DATE: September 22, 2008

REPLY TO
ATTN OF: Chief Information Officer

SUBJECT: Quarterly Report (Final – Document Number 01-036) - April – June 2008
Quarterly Report

TO: Assistant Inspector General for Audits and Inspections

Thank you for the opportunity to respond to the recent IV&V RISK MANAGEMENT, ISSUES, AND TRACEABILITY REPORT and recommendations regarding GPO's Federal Digital System (FDsys).

The program leadership team and I agree with many of the IV&V observations and recommendations and we are taking the necessary steps to ensure that FDsys is delivered successfully.

While this report is more balanced than the previous reports, there is still a disparity in the confidence expressed between areas where the Program team is taking corrective measures and where the IV&V team expresses concerns about the overall program. Specifically, the IV&V report can only state that the program "... **appears** to be making significant progress" in certain areas; however, the IV&V report is more definitive that the program will not deliver in December 2008 ("...the goal of a December 2008 deployment is **highly unlikely**"). Additionally, there is a disconnect between the Draft Assessment Report and the cover letter. Specifically, the cover letter states "During this period, American **Systems noted significant improvements** in the areas of...". However, the report maintains the verbiage "Over the last quarter several areas of the program **appear** to be making significant progress." We appreciate their assessment of risk in the Program team's capability to deliver, but we also feel that the team is indeed making significant progress.

As a general comment it would be much more effective if the reports were provided in a more timely fashion. While the report covers a period of April-June, there is a 1.5 month gap between the covered period and report issuance to the CIO. Given the progress the team is making, this delay makes it difficult to calibrate with the timeframe being assessed. I would like to request that a draft report be provided to me no later than one (1) week after the end of the reporting period.

This response is broken into two parts. The first part addresses items that should be addressed (issues and a few minor inaccuracies) by the report. The second part addresses the recommendations.

Part 1 – Issues

1. Technical Risks Identified

Issue #1: 1st Bullet under Technical Risks Identified - The report indicates that an IMS and PMP do not exist. It is true they have not been baselined through CCB, however we do have a preliminary IMS and draft PMP, which contain most of the data required of an IMS and PMP and are being used to help manage the program. Once the design is completed (anticipated 9/11) the IMS and PMP will be formally established.

Issue #2: 2nd Bullet under Technical Risks Identified – The design of the Documentum repository will not impact software components being developed by Harris. The IV&V report implies that Harris is currently working on code that **may not** be used which is not the case. Suggest changing the wording in the last sentence to: “...and may impact some of the software components that may be developed by Harris.”

Issue #3: 3rd Bullet under Technical Risks Identified – While it is possible, even likely, that the design will change the equipment needs for the Test instance our analysis indicates that the Test instance may be over scoped and that equipment will be repurposed for the Production instance. We are confident that the HW for the Test instance will be more than adequate to support the new design.

Issue #4: 4th Bullet, 1st sub-bullet under Technical Risks Identified – The text “*The decomposition...is complete for 11 of the 35... the quality of the derived requirements ... remains questionable.*” is reasonably accurate for the point in time of the report. However, significant work has been done in the meantime to mitigate this issue, and all components have derived requirements.

Issue #5: 4th Bullet, 2nd sub-bullet under Technical Risks Identified – The text regarding the design methodology should be clarified. The FDsys team is using a hybrid approach for the first public release. While we understand and agree that this is not optimal, we will use lessons learned from the first release to ensure a consistent design methodology for subsequent releases.

Issue #5: 5th Bullet – The text “*The scope and content of these builds have not yet been fully defined.*” is reasonably accurate for the point in time of the report. However, significant work has been done in the meantime to mitigate this issue and the scope and expected content of the builds is being finalized and will be presented at the Detailed Design Review.

2. Schedule Risks Identified

Issue #6: 2nd Bullet – While the Detailed Design review (DDR) was moved to accommodate the completion of the repository design, measures were taken to reduce the schedule impact on this change. A design review was conducted on Drop 1 to allow concurrent development and design to occur. While GPO acknowledges risk in this approach, the belief is that the components developed in Drop 1 were well defined and able to be developed in advance of the repository development. GPO disagrees with the conclusion that the December delivery date is unlikely. We believe that the emerging design is much more efficient and that we have the right skill mix on the program to deliver the first release.

Issue #7: 3rd Bullet – It is correct the plans were not developed by the originally planned dates; however these plans were impacted by the decision to parallel the development of Drop 1 with the completion of the repository design and therefore needed to be updated to reflect the current environment. These plans are currently working through the CCB process or have been accepted and are under CM control.

Issue #7: 4th Bullet – The text "*Delays in SIT planning ...*" has already been covered in the report and is therefore redundant.

Issue #8: 5th Bullet – The text "*The test equipment has not been delivered....*" is accurate for the point in time of the report. However, this is no longer an accurate statement. Test equipment is being racked, stacked and software loads are occurring. In addition a major power upgrade was successfully completed which will support Test and Production. The Test instance is on schedule.

3. Cost Risks Identified

No Issues

4. System Security Plan Evaluation

No Issues:

5. Assess Design Phase Risk Management Plan and Process

No Issues

6. Review SETA Contractor Quick Look Report

Issue #9: 6th Bullet – This has been covered previously. There is concern that the equipment in place for test will be over scoped; however, as mentioned previously in this response plans are in place to repurpose this equipment for production. The equipment will be available for SIT.

Part 2 – Recommendations:

Recommendation #1: Program Reviews – GPO concurs with this recommendation.

Recommendation #2: Design Methodology – GPO concurs that the design methodology going forward must be established and communicated to the technical team. As indicated previously in this report the plan is to use lessons learned from the first release to establish the appropriate design methodology for future releases.

Recommendation #3: Requirements Baseline and Traceability - GPO agrees and the team is working to complete the traceability. This activity should be complete by September 11, 2008.

Recommendation #4: Update to the System Security Plan - GPO agrees and the team is working to update the SSP. This activity should be complete by September 12, 2008.

Recommendation #5: Risk Manager Review of IV&V – GPO concurs and will commit to including the risk manager in the distribution for all IV&V materials.



MICHAEL L. WASH

Appendix B. Status of Recommendations

Recommendation No.	Resolved	Unresolved	Open/ECD*	Closed
1	X		TBD	
2	X		TBD	
3	X		9/11/08	
4	X		9/12/08	
5	X		TBD	

*Estimated Completion Date

Appendix C. Report Distribution

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