

AUDITOR'S REPORT

INFORMATION TECHNOLOGY CENTER ANNUAL DISASTER RECOVERY EXERCISE



October 3, 2014

**Barbara J. Schott, C.P.A.
Harris County Auditor**

Mike Post, C.P.A.
Chief Assistant County Auditor
Accounting Division

Mark Ledman, CISA, M.P.A.
Chief Assistant County Auditor
Audit Division



1001 Preston, Suite 800
Houston, Texas 77002-1817
(713) 755-6505

FAX (713) 755-8932
Help Line (713) 755-HELP

BARBARA J. SCHOTT, C.P.A.
HARRIS COUNTY AUDITOR

October 3, 2014

Mr. Bruce High
Chief Information Officer
406 Caroline, 4th Floor
Houston, Texas 77002

RE: Information Technology Center Annual Disaster Recovery Exercise conducted during the week of May 12, 2014

The Audit Services Department performed procedures relative to the Information Technology Center (ITC) Annual Disaster Recovery (DR) exercise. The objective of the engagement was to evaluate whether the ITC DR Plan was properly executed to restore the County's financial accounting system's (IFAS System) operating system, applications, and databases, as well as users' connectivity testing associated with the general ledger, cash receipts, accounts payable, payroll, and fixed assets. Our procedures included the following:

- Reviewed ITC policy to determine the adequacy of the DR controls/components created to be relied upon in a disaster event.
- Evaluated the progress of implementing previously reported recommendations.
- Reviewed the recovery milestones achieved, and the related documentation.
- Determined whether selected module users could timely access the IFAS System applications and process transactions.
- Determined whether certain critical IFAS System security and configuration tables were appropriately restored.

The engagement process included providing you with engagement and scope letters and conducting an entrance and exit conference with your personnel. The purpose of the letters and conferences was to explain the process, identify areas of concern, describe the procedures to be performed, discuss issues identified during the engagement, and solicit suggestions for resolving the issues. A draft report was provided to you and your personnel for review.

The enclosed Auditor's Report presents the significant issues identified during our procedures, recommendations developed in conjunction with your staff, and any actions you have taken to implement the recommendations. Less significant issues and recommendations have been verbally communicated to your staff.

We appreciate the time and attention provided by you and your staff during this engagement.

Sincerely,



Barbara J. Schott
County Auditor

cc: District Judges
County Judge Ed Emmett
Commissioners:
 R. Jack Cagle
 El Franco Lee
 Jack Morman
 Steve Radack
Devon Anderson
Vince Ryan
William J. Jackson

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OVERVIEW

ITC performs a business recovery exercise annually. Beginning with Fiscal Year (FY) 2014, the exercise has been held at the IBM Availability Services Recovery Facility in Boulder, Colorado (Facility). Since 2011, a team from Harris County has monitored the exercise from Houston. In preparation for the business recovery exercise, ITC entered into a contract with IBM that allows the County to utilize a four-day continuous block of time to perform the business recovery exercise. The exercise began at 9:00 a.m. on Monday, May 12th with the system restoration, and ended at 9:00 a.m. on Friday, May 16th after user testing had been completed. The purpose of the business recovery exercise was to demonstrate that certain critical County financial and business systems can be effectively recovered in the event of a disaster.

The Team from Harris County was comprised of ITC technical and managerial personnel. The Team was responsible for recovering the IFAS System as well as other critical systems (Justice Information Management System, Justice Courts Information System, etc.). This engagement focused on validating the success of the IFAS System recovery. The Team worked continuously to restore the IFAS System, which consists of the Advance Interactive Executive operating system (AIX), Informix database, software applications, the IFAS application, and transaction histories.

The IFAS System is an Enterprise Resource Planning (ERP) application that is relied upon to make budgetary and managerial decisions as well as pay vendors and employees. The IFAS System is comprised of approximately 35 modules, 1,800 system and database tables, and over 1,550 user accounts used to process, record, and report the County's financial activities. Some of the more pervasive modules used Countywide include: Security, Workflow, Person Entity (PEID), Budget, Human Resources, Daily Time Entry, Payroll, Purchasing, Accounts Payable, Encumbrance, Accounts Receivable, Fixed Assets, General Ledger, and Bank Reconciliation. The database tables store information related to individual transactions, and the system tables store the security and configuration settings that define the internal controls and operating processes within the IFAS System.

In order to ensure that the restore was successful and that the system modules were accessible, IFAS System module owner representatives were notified and invited to process predetermined transactions, generate reports, and perform other functions to determine whether connectivity existed and whether the application and transaction files were properly restored. ITC management in Houston were responsible for coordinating activities between the Team and the remote users located in Houston.

RESULTS

ITC has been working to ensure that the processes used to recover the IFAS System would be successful in this exercise. Based upon the procedures performed, the ITC Team appears to have successfully restored the majority of the IFAS System's operating system and databases; loaded the security, configuration, and transaction files; and established connectivity between the County and the Facility, although some of the steps performed by IBM could not be verified.

This DR exercise consists of preparing for and recovering the critical financial system in a non-surprise, “scheduled” disaster scenario, such as a hurricane, and does not address any other disaster scenario that does not provide days of warning before occurring. As a result, it is not possible to conclude whether the success of the annual business recovery exercise really prepares the County’s financial areas to resume normal operations in a timely manner.

Also, there were several issues which had an unfavorable impact on user testing and validation of the restoration and user testing results:

- ITC did not collect adequate documentary evidence from IBM to verify the recovery of the IFAS System as required by procedure documentation. With no documented verification available for the system configuration, we were unable to verify recovery milestones claimed by ITC personnel.
- There were many issues that denied users timely access to the IFAS System. Users were unable to process transactions during the exercise timeframe. Furthermore, inconsistent network connectivity, lack of access to required devices such as printers and scanners, and the inability for the Workflow module to function as required led to many user system verification tests not being conducted.
- We were unable to determine whether certain critical IFAS System security and configuration tables were appropriately restored. ITC personnel changed the date of the backup without providing notice, leading to the wrong data for comparison being used. This led to the inability to verify the backup process.

Additionally, while some progress has been made toward improving the DR exercise, the process could be strengthened by resolving the following deficiencies:

- While a written policy had been initiated for formalizing the DR process, it has not been updated in several years. The DR exercise process documentation and an informal undocumented process have taken the place of such a policy. This lack of current policy documentation could lead to inefficiencies and prevent restoration of the IFAS System in a true DR situation.
- It does not appear that all previously reported recommendations have been adequately addressed at this time, such as the collection of adequate proof to verify system recovery mentioned above.

Based on the procedures performed, it does not appear that in a disaster situation the current DR process can adequately prepare the County’s financial areas to resume normal operations in a timely fashion.

ISSUES AND RECOMENDATIONS

Subject	Background	Issue	Recommendation	Management Response
Test Result Failures	<p>Prior to the start of the DR exercise, ITC requests each department to provide plans for testing. These plans outline the steps required to be taken to verify that the system has been recovered to a state where the required data is available, the system resources needed to access and process the data are functional, and that the required output can be produced. Also, prior to the start of the user testing phase, ITC requests that users schedule a time slot to perform the testing. Once system testing is made available to the IFAS users, each department participating in the DR exercise sends a team to perform the test steps, gather the required testing results, and have department management</p>	<p>Only two departments of the 18 that were involved in the DR exercise were able to fully complete the testing successfully. Only 59% of total test steps for all departments were successful. The results were due to:</p> <ol style="list-style-type: none"> 1. Network issues (15%) 2. Time constraints (15%) 3. Connectivity issues (31%) 4. Scanning (8%) 5. Printing (8%) 6. Workflow module not functioning (8%) 7. Unknown (15%) <p>It is not possible to determine if the DR processes in place would be able to restore needed IFAS System functionality in the event of a disaster situation.</p>	<p>ITC management should perform an in-depth evaluation of the various activities that caused user testing to not be completed successfully, and create action plans to ensure future DR exercises be completed successfully.</p>	<p>ITC is in the process of reengineering the way DR is handled in the immediate future, by using a stationary replicated site located on the north side of Houston. This should no longer be an issue.</p> <ol style="list-style-type: none"> 1. Network issues: Since the DR site is fully under the control of Harris County, all network equipment is compatible with our production environment. Also the network is local and will not experience latency issues. 2. Time Constraints: The method of a replicate DR instance the time to stand up the instance is expected to be thirty minutes to one hour. This will allow ample time for testing. 3. Connectivity issues: Addressed same as issues number 1. 4. Scanning: Scanning issues

ISSUES AND RECOMENDATIONS				
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Test Result Failures (Cont.)	verify the test results.			should be able to be worked out ahead of time due to the fact that the new DR environment will be available all the time and not just for the four day DR Test period. 5. Printing: Addressed same as issue number 4. 6. Workflow: Addressed same as number 4. 7. Unknown: Will always be unknown.
Recovery Verification Documentation	ITC management provides detailed recovery procedures to IBM requiring screen prints of the four critical milestones during the off-site recovery exercise. These screen prints document the recoveries of the TSM database, IFAS System file, Informix (production) database, and IFAS System application, and are used to verify that the required actions were properly executed. In addition, the screen prints can be utilized to identify problems during	IBM did not provide the system documentation (screen prints) as required by the DR procedures. The screen prints for the recovery of the Informix database were also not provided by ITC. Without this information, ITC cannot document that: 1. The system was recovered in the DR exercise window. 2. Correct system settings were used. Incorrect settings could have led to additional work	ITC management should ensure that the required backup documentation is collected during the DR exercise.	ITC is in the process of reengineering the way DR is handled in the immediate future, by using a stationary replicated site located on the north side of Houston. This should no longer be an issue. The screen shot of the system configuration will not be applicable, since the operating systems will be prebuilt. We will have to develop an alternate method to prove that the operating system configuration stay in sync.

ISSUES AND RECOMENDATIONS

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Recovery Verification Documentation (Cont.)	the recovery exercise.	<p>being required which could contribute to delays in completing the system restoration.</p> <p>3. Configuration settings were implemented as required. Errors in these settings could contribute to issues hindering user acceptance testing.</p> <p>Three times in the last four years, required system documentation (screen prints) were not provided as required by DR procedures.</p>		
System Backup Date Discrepancy	At the start of the DR exercise, ITC generates a backup tape that is used to restore the IFAS System database. After restoring the database, ITC extracts files that are then compared to files obtained from the production environment to identify 100% of the deviations between production and the restored environment.	The ITC backup team failed to notify participants of a deviation from the DR plan. The creation date of the backup file was changed and the change was not communicated. As this file was used to restore the system, the correct data was not available for testing, resulting in the inability to perform system validation testing.	ITC Management needs to communicate any deviations in the time that the disaster recovery backup tape is generated so that the proper data can be gathered for verification testing.	<p>ITC is in the process of reengineering the way DR is handled in the immediate future, by using a stationary replicated site located on the north side of Houston. This should no longer be an issue.</p> <p>The new DR method will not utilize backup tapes.</p>

ISSUES AND RECOMENDATIONS

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ITC DR Guidance	ITC uses portions of ISO 27002 and National Institute of Standards and Technology (NIST) Special Publication (SP) 800-84 as guidance in the creation and maintenance of the DR procedures they perform.	<p>ITC uses generalized Information Technology (IT) guidance in place of guidance created for the expressed purpose of creating, maintaining, and updating a DR process.</p> <p>The documents used by ITC provide broad guidance for security, testing, training, and performance of IT exercises but do not specifically address the contents or requirements of a DR plan and its required processes. The use of these generalized guidance documents could result in DR specific issues not being addressed in the DR process, preventing ITC from recovering the system successfully.</p>	ITC should consider using purpose-specific guidance, like NIST 800-34, Contingency Planning Guide for Federal Information Systems, to ensure that DR needs are directly addressed.	ITC management will review the NIST 800-34 Contingent Planning Guide for Federal Information Systems, to determine how it may apply to the new DR methods.
Updating Issue/Error Log	ITC implemented a basic error-tracking document called the "IBM Disaster Recovery Issues Log." The purpose of this document	There is no ITC process in place for ensuring that the "IBM Disaster Recovery Issues Log" is updated and complete. At least two	ITC management should ensure there is a process in place so that the "IBM Disaster Recovery Issues Log" is properly updated as	Since the new DR environment and process is completely in the control of ITC, ITC management will make sure issues are tracked

ISSUES AND RECOMENDATIONS				
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Updating Issue/Error Log (Cont.)	was to track issues with the project, document the condition, what was done about the condition, and disposition.	<p>issues were not documented in the log as follows:</p> <ol style="list-style-type: none"> 1. The system expelled all users around 4:30 p.m. on Thursday May 15th 2. Workflow did not function as required. <p>Without adequate tracking and documentation, there is the potential for issues and errors taking place during the exercise to not be resolved in a timely fashion in a real disaster recovery situation.</p>	issues are identified and are timely worked and resolved.	consistently.
Issue/Error Log Components	ITC implemented a basic error-tracking document called the "IBM Disaster Recovery Issues Log" that tracked some basic information on issues and error situations encountered during the DR exercise. During the Auditor's Office Accounts Payable Toll Road Refunds Upload project dated June 28,	<p>The current Issue/Error Log contains minimal information and could be improved by including the following fields to which ITC management had previously agreed:</p> <ol style="list-style-type: none"> 1. Error ID 2. Description of the error 3. Type of error 4. Date error first occurred 	ITC management should incorporate the agreed to data items into the Issue/Error Log document to assist in the proper tracking and disposition of any project errors or issues.	Since the new DR environment and process is completely in the control of ITC, ITC management will incorporate the suggested additional items into the Issue/Error Log.

ISSUES AND RECOMENDATIONS

Subject	Background	Issue	Recommendation	Management Response
Issue/Error Log Components (Cont.)	2013, ITC management agreed to implement a template that included additional information that would be beneficial for tracking any IT process error situation.	5. Group recording the error 6. Who the error was assigned to for diagnosis and resolution 7. Severity of error 8. Current status of the error 9. Supporting documents 10. Description of the resolution. Without detailed records, it could be difficult to determine the root cause of an issue and how it was resolved. This could lead to the same error situation occurring during an actual DR situation. Without the availability of detailed information, the restoration of the IFAS System in a real DR situation may not be performed in a timely fashion, if at all.		
Formal DR Policy	ITC has a policy document that was initiated by SunGard Professional	Although ITC has a process that has been developed over time, it has not been	ITC management should update the DR policy document that addresses	ITC will work with the Auditor's Office to develop new processes and

ISSUES AND RECOMENDATIONS

Subject	Background	Issue	Recommendation	Management Response
Formal DR Policy (Cont.)	Services, but it has not been fully updated since May 2009.	<p>updated into a formal written policy for planning and managing DR activities, such as:</p> <ol style="list-style-type: none"> 1. Responsibilities 2. Duties 3. Response time frames 4. Contact information <p>Without a formal, communicated policy, personnel might not know the correct steps to take in a DR situation, resulting in County systems not being brought back into production successfully.</p>	responsibilities, duties, response time frames, and contact information.	documentation.
Testing Scenario	The DR exercise consists of preparing for and recovering the critical financial system in a non-surprise, "scheduled" disaster scenario, such as a hurricane, and does not address any other disaster scenario that does not provide days of warning before occurring, such as fire or loss of access to the	It is not possible to conclude whether the success of the exercise would really prepare the County's financial areas to resume normal operations in a timely manner in a true disaster situation. The testing scheduled is not comprehensive enough and still needs to address many critical areas such as:	ITC management, in conjunction with Auditor's Office management, should create a more robust testing plan for use in future DR exercise planning.	ITC management will assist Auditor management with their test plans upon request

ISSUES AND RECOMENDATIONS

Subject	Background	Issue	Recommendation	Management Response
Testing Scenario (Cont.)	data center building.	<ol style="list-style-type: none"> 1. User testing of the system through remote locations or hot sites simulating actual disaster conditions whereby staff may not be able to travel to the downtown location. 2. Expanding the disaster recovery testing period to enable more end users to test more types and greater volumes of transactions and processes simulating actual disaster conditions. 3. Adjusting IFAS System access security levels temporarily to expand and accommodate end user testing for individuals to perform testing of different tasks not normally part of their job responsibilities during the simulated disaster condition when the primary personnel might not be available. 		