

M E M O R A N D U M

FINAL AUDIT REPORT WITH RECOMMENDATIONS

Internal Operations No. 08-005



SUBJECT: Review of Trapeze, the Bus Rail
Scheduling and Dispatch System

DATE: March 25, 2008

FROM: IG/OIG – Helen Lew /s/

TO: GMGR – John B. Catoe

This **Final Audit Report** entitled, *Review of Trapeze, the Bus Rail Scheduling and Dispatch System*, presents the results of our audit. The objectives of the audit were to assess whether Booz Allen Hamilton and the Trapeze Software Group: (1) met the Washington Metropolitan Area Transit Authority's (WMATA) contractual requirements and (2) delivered the benefits envisioned in an effective manner.

Background

WMATA created the Infrastructure Renewal Program (IRP) in 1999, which was a multiyear, multibillion dollar initiative to repair, rehabilitate or replace every element of the aging bus and rail system. WMATA wanted to upgrade its information technology and replace its non-integrated legacy systems with commercial, off-the-shelf products. To accomplish this effort, the Information Technology Renewal Program (ITRP) was created. The ITRP was an initiative by WMATA to focus on the information technology aspects of the renewal of the bus and rail system.

Five key functional areas were chosen to benefit from the effort to rebuild and renew the information technology infrastructure. The areas chosen were: (1) financial management, (2) capital program management, (3) maintenance and material management, (4) personnel and payroll, and (5) bus and rail scheduling and dispatch. We performed an audit of the Bus Rail Scheduling and Dispatch System, referred to as Trapeze in this report. This system was expected to create a schedule for bus and rail operators; a system-wide program to allow operators and station

managers to choose or change their work assignments every six months; an employee payment system; and a means to track leave and human resource information, e.g., commendations and training.

WMATA entered into a contract in March 2001 with the Federal Systems Integration and Management Center (FEDSIM), an arm of the U.S. General Services Administration, to fulfill its information technology needs. FEDSIM was responsible for obtaining the services of an information technology (IT) Integration Project Planner to assist in the development of the technical specifications and implementation plan.

On June 22, 2001, WMATA accepted the FEDSIM recommendation that a FEDSIM task order be awarded to Logistics Management Institute (LMI) for the provision of IT Integration Project Planner Services. On July 30, 2002, FEDSIM Task Order Request (TOR) for IT Integration Services was issued. Based on the recommendations of the Project Planner, LMI, the TOR referenced Trapeze Software as a “Preferred Commercial Off the Shelf Solution (COTS)” for the bus rail scheduling and dispatch system.

On December 10, 2002, FEDSIM submitted to WMATA a recommendation that a FEDSIM task order contract be awarded to Booz, Allen and Hamilton (BAH) for the provision of IT Integrator Services at WMATA. On December 11, 2002, WMATA accepted the FEDSIM recommendation.

BAH and the Trapeze Software Group entered into a contract on January 2003. The Trapeze software product was purchased by BAH and installed on WMATA’s computer systems. The license agreement combined with the maintenance agreement totaled \$3,025,808.

On June 16, 2005, WMATA awarded a conditional cost-plus, fixed-fee contract (No. F05140) directly to BAH for the continuation of the same post-production

support IT Integration work that BAH was providing to WMATA through the FEDSIM blanket ordering agreement task order. BAH's price proposal was accepted contingent upon the completion of a WMATA cost audit and the final negotiation of price and other terms and conditions.¹

On August 8, 2006, the price, terms and conditions of the BAH contract of June 16, 2005, were finalized. The contract included a section that stated WMATA will review and verify that all deliverables were submitted by the contractor to fulfill the requirements and standards stated in the contract.

Audit Results

We found that WMATA does not have complete documentation that sets out all the functional, technical and any other requirements for deliverables for Trapeze. As a result, WMATA does not know whether the requirements for the bus rail scheduling and dispatch system have been met.

In addition, we found that infrastructure issues at WMATA are adversely affecting the efficient use of Trapeze and that WMATA does not use all of the functional capabilities available in Trapeze.

In the General Manager's March 3, 2008 response to a draft of this report, he concurred with our findings and recommendations. He submitted two attachments outlining his response (attachment 1) and procurement milestones (attachment 2). The complete text of attachment 1 is included as an attachment to this report. Attachment 2 will be made available upon request.

Finding 1- Key Documentation Is Lacking or Does Not Exist on Trapeze

Federal Acquisition Regulation (FAR) subpart 4.801 requires the head of each office performing contracting, contract administration, or paying functions to establish files containing the records of all contractual actions. The documentation

¹ The results of the audit were reported in Audit Memo C06-008 dated August 15, 2005.

in the files should be sufficient to constitute a complete history of the transaction. Of particular relevance, section 4.801(b) (3) requires that such documentation in the files “shall be sufficient to constitute a complete history of the transaction for the purpose of - (3) providing information for reviews and investigations.” Also, WMATA’s Record Management Manual states that contract administration and vendor files should be maintained and reviewed annually.

WMATA does not have complete documentation that sets out all the functional, technical and any other requirements for Trapeze deliverables. The Office of Operations Planning and Administrative Support (OPAS) and the Department of Information Technology could not provide us with the documentation of all the functional, technical and other requirements for Trapeze. Nor did the Office of Procurement and Materials (PRMT) have all the necessary documentation. PRMT had only the contract file for the contract with FEDSIM, which does not and is not expected to contain a complete record of this information prior to contract close-out. The information should be available from the project office’s contract files maintained by the Contracting Officer’s Technical Representative (COTR).

Because we could not obtain the necessary documentation to determine whether WMATA received all the deliverables it contracted for with Trapeze, we used the LMI specifications to attempt to determine whether requirements for the bus rail scheduling and dispatch system were met. For example, we found that the Trapeze system can create operator assignments, keep track of daily and weekly work assignments, track vacation and sick leave, dispatch vehicles and trains, and collect human resources information. Nonetheless, it is critical that OPAS, in coordination with the Department of Information Technology (IT), determine if the Trapeze Software Group met the expectations for the bus rail scheduling and dispatch system and if not, take appropriate corrective action.

Recommendations

We recommend that the General Manager:

1. Direct OPAS, in coordination with IT, to confirm that the Trapeze Software Group has met all the requirements for the bus rail scheduling and dispatch system and document its conclusions.
2. Direct the Chief Financial Officer to take appropriate action in the future to ensure that files maintained by the project office include complete documentation of contract requirements and deliverables.

Management Comment

Management concurred with our recommendations. Specifically, absent documented requirements, the Department of Information Technology (IT) and the Office of Service Support (OPAS) will prepare a proxy list of requirements based on their understanding of bus/rail scheduling and dispatch. IT and OPAS will review whether these requirements have been met by the Trapeze vendor and the system's implementer, Booz Allen Hamilton. IT and OPAS will complete these reviews by the end of March 2008.

In addition, the Office of Procurement and Material (PRMT) has initiated an effort to correct the findings in our report relating to file maintenance. All contract administrators have been instructed to review their assigned contract files to ensure that all of the required documentation has been included. Maintenance of the files will be part of the employee evaluation process for each contract administrator.

PRMT also developed and implemented a Contracting Officer's Technical Representative (COTR) training program, which includes a manual that addresses the audit findings concerning documentation, monitoring of contractor performance and inspection and acceptance of deliverables. PRMT scheduled training sessions on January 31 and February 7, 2008.

Finding 2- Infrastructure Issues Affect Efficient Use of Trapeze Bus Rail Scheduling and Dispatch System

Users often complained that Trapeze is slow and non-responsive. While WMATA apparently wanted 99.95² percent availability for this system, users complained that availability was considerably less. They also complained that the system is not accessible.

We found that some of the complaints about Trapeze were the result of infrastructure issues rather than problems caused by Trapeze. For example, the software relies on WMATA facilities that are in some cases over 70 years old; the communications technology is old and obsolete. Also, Trapeze initially shared a server with other software applications, which caused some system degradation that slowed its response time. Trapeze got its own server on August 4, 2007. While this resulted in some improvements, there are still some who complain about the slow response time.

Another infrastructure issue that could affect Trapeze is the copper cable or T-1 lines it uses. T-1 lines are the primary method of connectivity between the garages, terminals and the server. The T-1 lines are old copper cable and affect data transmission because they are slow and can lose data. IT recognizes this and plans to replace them with fiber optic cable. Fiber optic cable is faster and can transmit more data than the old copper cable lines. IT officials believe that replacing the T-1 lines with fiber optic cable will correct the response time problem with Trapeze.

Some users also attribute the slow response time and accessibility problem on the communication lines used to transmit data through the Citrix software application. We discussed this problem with IT and were told that Citrix is not considered an impediment to the system's response time. IT officials explained that they disconnected the Citrix software for a period of time and found that there was no

² Source: LMI Functional and Technical Requirements for the Bus Rail Scheduling and Dispatch System software.

difference in the system's performance when Citrix was operable and when it was disconnected.

To adequately address users' complaints about the accessibility to Trapeze, WMATA would benefit from an assessment of its communications infrastructure. Acquiring current technology would enhance the data communications capability of Trapeze and help assure good user services to all, including the riding public.

Recommendation

We recommend that the General Manager:

3. Direct the Assistant General Manager, IT, to conduct an assessment of WMATA's communications infrastructure to determine if it adequately addresses current and future needs in Trapeze.

Management Comment

Management concurred with our recommendation. PRMT released an IT authorized Request for Proposal (RFP) in October 2007. The intent of this RFP is to replace the legacy copper-based data circuits with faster, fiber optic based data circuits at approximately 24 Metro locations that are not located in its right-of-way. These new circuits will provide approximately six times the bandwidth as the legacy circuits (10 Mbps versus 1.54 Mbps). PRMT and IT are currently negotiating contract terms with Verizon. Once contract terms are reached, the circuits are expected to be installed within six months.

As part of the Authority-wide voice and data network infrastructure upgrade (Metro-Net), all data network hardware at the Bus locations where the Trapeze application is in use will be replaced with new state-of-the-art network hardware. The network hardware will have full routing and power redundancy capabilities and will add to the overall stability of Trapeze.

Finding 3 - WMATA Is Not Using Trapeze to Its Fullest Capability

WMATA does not use all of the functional capabilities available in Trapeze. Users continue to schedule and dispatch bus and rail work assignments manually rather than use Trapeze. The result is duplication of effort and inefficient business processes.

According to the functional requirements that LMI prepared, Trapeze is comprised of three components: (1) employee payment, (2) route and vehicle scheduling and (3) operator assignment and tracking. The employee payment component feeds into the WMATA Payroll Processing System so that all employees are paid in accordance with the appropriate pay codes for active or inactive employees, vacation leave, sick leave, etc.

The second component, route and vehicle scheduling, is in place and uses information from WMATA's database to plan and schedule routes. This component consists of trip building, which includes trips scheduled by route, service, and direction; time points; and running times. Run cutting, the process of creating driver assignments and runs that operators pick in the assignment process, is also included in the route and vehicle scheduling component.

The third component, operator assignment and tracking, is also available. It has three major subprocesses: (1) work pick, which converts daily assignments into weekly work assignments, while observing relevant work rules; (2) daily dispatch and operations, which dispatches vehicles and trains after they have been assigned to runs; and (3) timekeeping/attendance, which are activities associated with the scheduling and dispatch of bus and rail personnel, including work hours, attendance, vacation and sick leave, and other information such as training, commendations, and grievances.

Although Trapeze is capable of performing the daily dispatch and operations function, some users prefer to manually schedule and dispatch their work

assignments rather than use Trapeze. This is due to infrastructure issues and because there are no policies and procedures requiring use of all the capabilities offered by Trapeze. We also found that the route and vehicle scheduling component, which is used in OPAS, is not used to provide run cutting services for Rail Services. The run cutting function is used for Bus Services. The Assistant Manager in OPAS' Scheduling Branch (Rail) told us that his employees are not trained to use the run cutting function.

In addition, some users told us that Trapeze could not perform certain functions that WMATA had envisioned for the system. On the contrary, we found that Trapeze could perform some of the functions they thought the system was incapable of doing. Lack of familiarity with the functional requirements and capabilities of Trapeze is another reason why users rely on the old, manual processes. WMATA management would benefit from assessing their users' knowledge and skills with using Trapeze and scheduling appropriate employees for basic or refresher training.

The U.S. Government Accountability Office (GAO) prescribes *Standards for Internal Control in the Federal Government*. These standards can also be applied by other levels of government. One of the five standards relates to control environment. "Management and employees should establish and maintain an environment throughout the organization that sets a positive and supportive attitude toward internal control and conscientious management." One factor that affects the control environment is management's commitment to competence. "Management needs to identify appropriate knowledge and skills needed for various jobs and provide needed training. . . ."

Another internal control standard relates to control activities. "Internal control activities help ensure that management's directives are carried out. . . . Control activities are the policies, procedures, techniques, and mechanisms that enforce management's directives. . . . They help ensure that actions are taken to address risks."

Recommendations

We recommend that the General Manager:

4. Direct the Deputy General Manager to develop and implement policies and procedures requiring all appropriate employees to use Trapeze to the fullest extent within its capabilities to eliminate dual processing.
5. Direct the Deputy General Manager to assess the knowledge and skills of users of Trapeze to determine whether they need to identify appropriate employees who would benefit from taking a basic or refresher training course on Trapeze.

Management Comment

Management concurred with our recommendations. OPAS will take the lead and coordinate with Rail and Bus to accomplish the recommendations.

Objectives, Scope and Methodology

The objectives of the audit were to assess whether Booz Allen Hamilton and the Trapeze Software Group: (1) met WMATA contractual requirements and (2) delivered the benefits envisioned in an effective manner. The audit was conducted from July 20, 2007, to November 2, 2007. We focused mainly on the operator assignment and tracking function, but our review also included the route and vehicle scheduling; and employee payment components. Our scope was constrained because the Office of Procurement and Booz Allen Hamilton could not provide us with a copy of the contract to determine if the Trapeze Software Group met WMATA's contractual requirements.

To determine if Trapeze delivered the benefits envisioned, we interviewed officials in Bus Services, Rail Services, the Office of Accounting, the Department of Information Technology and the Office of Operations Planning and Administrative Support. We interviewed the Trapeze project manager and his staff; and staff in Procurement and Material Management.

We tested, with the assistance of the Trapeze project manager and his staff, selected features of Trapeze to determine if the features envisioned were provided. We reviewed documents prepared by Booz Allen Hamilton and the Logistics Management Institute. We also collected data from users to assess users' complaints before and after certain enhancements were made to Trapeze and/or related information technology equipment.

We contacted other transit authorities to determine their experiences with Trapeze or other systems that they might have purchased to implement their bus rail scheduling and dispatch systems. We contacted the following transit authorities: Dallas Area Regional Transportation, Cedar Rapids Transit, Southeastern Pennsylvania Transportation Authority, Miami-Dade Transit Authority, Chicago Transit Authority, Los Angeles County Metropolitan Transit Authority, Phoenix Transit Authority and King County Metro Transit. We also contacted MV Transportation, who operates WMATA's Para Transit Service, to discuss their experience in using Trapeze.

Administrative Matters

Corrective actions proposed (resolution phase) and implemented (closure phase) by the affected Departments/Offices will be monitored and tracked through the Office of Inspector General's Audit Accountability and Resolution Tracking System. Department policy requires that you develop a final corrective action plan (CAP) for our review in the automated system within 30 days of the issuance of this report. The CAP should set forth the specific action items and targeted completion dates necessary to implement final corrective actions on the findings and recommendations contained in this report.

We appreciate the cooperation and assistance extended to us during the audit. If you have any questions, please contact Andrew Clemmons, Assistant Inspector General-Audit, on (202) 962-1014 or me on (202) 962-2515.

/s/

Helen Lew
Inspector General

Attachment

cc:	CHOS	Shiva Pant	RAIL	Dave Kubicek
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