PERFORMANCE AND FINANCIAL RELATED AUDIT
OF THE

AUTOMATED INFORMATION SYSTEMS

MICHIGAN DEPARTMENT OF TRANSPORTATION

July 2000

59-590-99

EXECUTIVE DIGEST

AUTOMATED INFORMATION SYSTEMS

INTRODUCTION

This report, issued in July 2000, contains the results of our performance* and financial related audit* of the Automated Information Systems, Michigan Department of Transportation (MDOT). The financial related portion of our audit covered the period October 1, 1998 through September 30, 1999.

AUDIT PURPOSE

This performance and financial related audit was conducted as part of the constitutional responsibility of the Office of the Auditor General. Performance audits are conducted on a priority basis related to the potential for improving effectiveness* and efficiency* . Financial related audits are conducted at various intervals to permit the Auditor General to express an opinion on the State's financial statements. Also, this audit complements the departmentwide financial audit of MDOT.

BACKGROUND

The Office of Information Management (OIM), headed by the chief information officer (CIO), provides data processing services to MDOT. The mission* of OIM is to provide the highest quality information and communication capabilities needed to implement MDOT's business objectives and strategies. Some of the primary responsibilities of OIM include developing and implementing new applications; purchasing, installing, and

* *See glossary at end of report for definition.*

maintaining hardware and software; and managing MDOT's Statewide data communications network.

During our audit period, MDOT developed several new systems, including the Transportation Management System (TMS), MDOT Architecture Project (MAP) Financial Obligation System (MFOS), and the MAP Database. MDOT redeveloped many of its mainframe systems into client-server* systems, including Trns*port* and FieldManager*. Each of these systems is used for managing the various phases of road and bridge construction projects. During our audit fieldwork, MDOT was in the process of developing Safestat*.

AUDIT OBJECTIVES, CONCLUSIONS, AND NOTEWORTHY ACCOMPLISHMENTS

Audit Objective: To assess the effectiveness of MDOT's project and contract management controls over system development projects.

Conclusion: MDOT did not implement effective project and contract management controls over system development projects. Our assessment disclosed three material conditions* :

- MDOT did not implement an effective information technology (IT) control environment (Finding 1).

- MDOT did not comply with the Department of Management and Budget and MDOT policies and procedures for contracting for system development (Finding 2).

- MDOT had not established controls to ensure the effective and efficient use of all IT funds (Finding 3).

* *See glossary at end of report for definition.*

In addition, we identified reportable conditions* regarding system development payments, project management controls, project deliverables, project cost reporting, project history, and a quality assurance process (Findings 4 through 9).

Between June 1995 and February 1999, law enforcement agencies conducted an investigation of alleged improprieties in MDOT's system development contracting process. The investigation concluded that administrative policies had been violated.

Audit Objective: To assess the effectiveness of MDOT's internal control* over its automated information systems.

Conclusion: MDOT's internal control over its automated information systems was generally effective. However, we identified reportable conditions regarding postimplementation review, completeness of TMS, and the TMS database (Findings 10 through 12). We also identified reportable conditions regarding TMS, MFOS, and Trns*port access controls; usercode and password security; audit trails; and processing controls (Findings 13 through 16).

Audit Objective: To assess the effectiveness of MDOT's general controls over management, development, and security of its automated information systems.

Conclusion: MDOT did not have effective general controls over management, development, and security

* *See glossary at end of report for definition.*

of its automated information systems. Our assessment disclosed one material condition:

- MDOT did not implement and document a system development life cycle methodology to identify the procedures to be followed when information systems are being designed, developed, and maintained. Also, MDOT did not develop comprehensive TMS and MFOS system documentation (Finding 17).

In addition, we identified reportable conditions regarding system documentation standards, program change controls, security risk assessments, a security program, local area network (LAN) access controls, backup and recovery controls, a disaster recovery plan, and retention of electronic records (Findings 18 through 25).

Noteworthy Accomplishments: MDOT has taken steps to improve controls over its Automated Information Systems. MDOT created a help desk and an IT customer service function; it increased the performance rate of the network; and it replaced most of MDOT's computer hardware and established a schedule for future hardware replacement. MDOT informed us that these steps have resulted in improved employee satisfaction with IT services. Also, MDOT used good project management techniques and a quality assurance process during its year 2000 remediation efforts. As a result, the cost of year 2000 remediation was $3.2 million, compared to the original estimate of $14 million. Also as a result, MDOT received the American Association of State Highway and Transportation Officials' (AASHTO's) Trail Blazer's Award for its year 2000 efforts. Further, MDOT informed us that employee morale within OIM has improved since it hired

the current CIO and the implementation of some of his initiatives.

AUDIT SCOPE AND METHODOLOGY

Our audit scope was to examine the information processing and other records of the Automated Information Systems. Also, our audit scope was to examine the financial related records for the period October 1, 1998 through September 30, 1999. Our audit was conducted in accordance with *Government Auditing Standards* issued by the Comptroller General of the United States and, accordingly, included such tests of the records and such other auditing procedures as we considered necessary in the circumstances.

Our methodology included an examination of MDOT's information processing and other records for the period October 1, 1991 through November 30, 1999. Our methodology also included developing a preliminary assessment of OIM and the automated information systems. We then analyzed the information and determined where to concentrate our detailed analysis and testing. We performed an assessment of internal control over TMS, MFOS, Trns*port, FieldManager, and the MAP Database. We evaluated the results of our testing and reported our findings.

AGENCY RESPONSES

Our audit report contains 25 findings and 28 corresponding recommendations. MDOT's preliminary response indicated that it agreed with all the recommendations.

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July 27, 2000

Mr. Barton W. LaBelle, Chairperson
State Transportation Commission
and
Mr. James R. DeSana, Director
Michigan Department of Transportation
Transportation Building
Lansing, Michigan

Dear Mr. LaBelle and Mr. DeSana:

This is our report on the performance and financial related audit of the Automated Information Systems, Michigan Department of Transportation. The financial related portion of our audit covered the period October 1, 1998 through September 30, 1999.

This report contains our executive digest; description of agency; audit objectives, scope, and methodology and agency responses; comments, findings, recommendations, and agency preliminary responses; and a glossary of acronyms and terms.

Our comments, findings, and recommendations are organized by audit objective. The agency preliminary responses were taken from the agency's responses subsequent to our audit fieldwork. The *Michigan Compiled Laws* and administrative procedures require that the audited agency develop a formal response within 60 days after release of the audit report.

We appreciate the courtesy and cooperation extended to us during this audit.

Sincerely,

Thomas H. McTavish, C.P.A.
Auditor General

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MICHIGAN DEPARTMENT OF TRANSPORTATION

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Description of Agency

Office of Information Management (OIM)

OIM, headed by the chief information officer (CIO), provides data processing services to the Michigan Department of Transportation (MDOT). The mission of OIM is to provide the highest quality information and communication capabilities needed to implement MDOT's business objectives and strategies. Some of the primary responsibilities of OIM include developing and implementing new applications; purchasing, installing, and maintaining hardware and software; and managing MDOT's Statewide data communications network. Formerly known as the Engineering and Scientific Data Center, OIM was formed in 1993. OIM is an organizational component of the Administrative Offices within the Director's Office. During our audit period, seven different persons were in the position of CIO. MDOT appointed the current CIO in August 1997. As of July 31, 1999, OIM had a staff of 31 full-time employees.

Between June 1995 and February 1999, law enforcement agencies conducted an investigation of alleged improprieties in MDOT's system development contracting process. The investigation concluded that administrative policies had been violated.

In conjunction with the law enforcement agencies, the Office of Commission Audits (OCA) completed a review of MDOT's administration of selected information technology (IT) projects.

OCA's review covered the period October 1, 1991 through February 28, 1998 and was made for the purposes of reviewing allegations regarding MDOT's administration of selected IT agreements and assisting law enforcement agencies in gathering documentation for their investigations.

OCA's review, expected to be released in July 2000, contained 9 findings primarily directed at MDOT's consultant selection process, the contracting process, contract administration, and related controls over the selected IT systems. The report is available from OCA.

Our audit included the same period covered under OCA's review report and also extended through November 30, 1999. Our audit was a more comprehensive audit of

general and application controls and included additional systems that were not included in OCA's review. However, in some instances, the findings contained in this report were also included in the review report. We have indicated when those instances occurred.

During our audit period, MDOT developed the following new systems and redeveloped several mainframe systems into client-server systems:

1. Transportation Management System (TMS)

   The Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) authorized funding for highways, highway safety, and mass transportation for fiscal years 1992-93 through 1996-97. In addition to carrying out the associated Statewide and metropolitan planning requirements, ISTEA mandated the development and implementation of six management systems by October 1, 1995 for managing highway pavement, bridges, highway safety, traffic congestion, public transportation facilities and equipment, and intermodal transportation facilities and systems. These six management systems, collectively known as TMS, are the Bridge Management System* (BMS), Congestion Management System* (CMS), Intermodal Management System* (IMS), Pavement Management System* (PMS), Public Transportation Management System* (PTMS), and Safety Management System* (SMS). TMS also included development of an integrated database to serve as the foundation for the six management systems.

   MDOT originally proposed development of three additional systems which were the Construction Management System, Maintenance Management System, and Real Estate Management System. These three additional systems were eventually dropped from the project. The six management systems were supposed to integrate with a geographic information system (GIS) as a way to use maps to request and display information from the TMS database.

   The purpose of TMS was to provide a management tool that would allow MDOT to plan, budget, analyze, inventory, and monitor all aspects of transportation and the transportation-related infrastructure.

* *See glossary at end of report for definition.*

In April 1993, MDOT contracted with a software consulting firm for ISTEA phase I, which included rapid solutions workshops and system planning for TMS. In January 1994, MDOT contracted with the contractor for ISTEA phase II, which was the system design of TMS. The work statement for ISTEA phase II specified that the six management systems must be implemented by January 1, 1995. In July 1994, MDOT contracted for ISTEA phase IIA, which was for updating the design specifications that were not satisfactorily completed in phase II. In December 1994, MDOT contracted for ISTEA phase III, which was for development of TMS. Finally, in January 1996, MDOT contracted for ISTEA phase IV, which was continued development of TMS.

In 1996, the ISTEA legislation was repealed and states were no longer required to develop the six management systems. However, MDOT continued its development efforts. MDOT implemented portions of BMS, CMS, IMS, PTMS, and SMS. MDOT had not implemented PMS or GIS. As of July 31, 1999, MDOT had expended approximately $22.2 million on TMS development.

2. MAP Financial Obligation System (MFOS)

MFOS automates MDOT's process of obtaining Federal Highway Administration (FHWA) authorization and funding for transportation projects. Initially, MDOT contracted with a software consulting firm in 1992 to develop the Financial Obligation System (FOS). Several months later, MDOT began development of the MDOT Architecture Project (MAP) Database and determined that FOS should integrate with MAP. Once integrated with MAP, FOS became known as MFOS.

MDOT contracted with a software consulting firm in 1994 for development of MFOS, which would integrate FOS with MAP and improve deficiencies identified in FOS. This contract is referred to as MAP III. However, in 1996, MDOT assumed development responsibilities for MFOS and terminated the contract because of numerous functionality errors and performance problems. MDOT contracted with another consultant to help finish MFOS. MDOT spent approximately $2.6 million on MFOS development.

3. MAP Database

MDOT developed the MAP Database to address its need to standardize and improve access to data and to establish data administration procedures. The MAP

Database is an integrated database that provides the foundation for MDOT's strategic information systems, including MFOS. MDOT contracted with a consulting firm in December 1992 to begin the initial design of the MAP Database. MDOT also contracted for database design (MAP phase I) and implementation (MAP phase II). In November 1993, MDOT contracted with another consulting firm for MAP phase III, which included moving data from FOS to the MAP Database.

4. Trns*port

Trns*port is a series of related, automated systems for managing construction projects, including managing price and quantity estimates, funding, proposal preparation, contractor prequalification and certification, letting, field office construction activities including contractor payments, and project history. Trns*port interfaces with MFOS, FieldManager, and the Federal Billing System, among others. Various portions of the systems are used by many divisions within MDOT, region offices, transportation service centers, design consultant companies, and construction companies. Trns*port replaced the Engineer's Estimate, Bid Tab, and Construction Estimate Systems. Trns*port is licensed from the American Association of State Highway and Transportation Officials (AASHTO). MDOT spent approximately $2.5 million to develop Trns*port.

5. FieldManager

FieldManager is a construction management system used to manage and track road and bridge construction projects. It is used by more than 1,000 users including staff at MDOT's transportation service centers, construction field offices, local government agencies, and construction contractors. Business functions automated by FieldManager include contractor payments, inspector's daily reports, daily diaries, work item progress, contract modifications, material usage, stockpile management, and project finalization. Construction projects are initiated in Trns*port. Once construction begins, FieldManager helps MDOT to monitor and review the work activities that occur throughout the life of each project. Data is recorded on notebook computers at the construction sites on FieldBook, a subsystem of FieldManager, and transferred to a network or desktop computer at the field office. FieldManager sends construction activity data to Trns*port daily. FieldManager replaced the Construction Project Record Keeping System (CPRKS)

and was developed in 1995 by a software consulting firm. MDOT spent approximately $857,000 to develop FieldManager.

6. Safestat

In July 1999 (during our audit fieldwork), MDOT began development of Safestat. Safestat will provide the Traffic and Safety Division with a system for recording and tracking incoming requests for studies and/or projects to improve the safety and operation of Michigan roads. MDOT was developing Safestat in three releases with the first release being implemented in November 1999. MDOT contracted with a software consulting firm for the development and implementation of Safestat. The estimated cost of Safestat is approximately $700,000.

Audit Objectives, Scope, and Methodology and Agency Responses

Audit Objectives

Our performance and financial related audit of the Automated Information Systems, Michigan Department of Transportation (MDOT), had the following objectives:

1. To assess the effectiveness of MDOT's project and contract management controls over system development projects.

2. To assess the effectiveness of MDOT's internal control over its automated information systems.

3. To assess the effectiveness of MDOT's general controls over management, development, and security of its automated information systems.

Audit Scope

Our audit scope was to examine the information processing and other records of the Automated Information Systems. Also, our audit scope was to examine the financial related records for the period October 1, 1998 through September 30, 1999. Our audit was conducted in accordance with *Government Auditing Standards* issued by the Comptroller General of the United States and, accordingly, included such tests of the records and such other auditing procedures as we considered necessary in the circumstances.

Audit Methodology

Our methodology included examination of MDOT's information processing and other records for the period October 1, 1991 through November 30, 1999. Our work was performed between January and November 1999. To accomplish our audit objectives, our audit methodology included the following phases:

1. Preliminary Review and Evaluation Phase

   We identified MDOT's automated information systems and performed a risk assessment of each system to determine those systems with the highest risk. Our risk assessment considered the critical nature of the information processed through

each system as well as the number and dollar value of transactions processed. We used this assessment to determine the systems to audit and the extent of our detailed analysis and testing.

2. Detailed Analysis and Testing Phase

We performed an assessment of internal control over TMS, MFOS, Trns*port, FieldManager, and the MAP Database pertaining to (a) general controls which included project and contract management, system development and maintenance, system documentation, database, and security controls over the systems and MDOT's local area network (LAN), and (b) application controls which included data input, data processing, and data output controls. We also performed a limited assessment of project management and system development controls of a system under development at the time of our audit fieldwork (Safestat). Specifically, we assessed:

a. Effectiveness of Project and Contract Management:

(1) We interviewed project managers and obtained background information regarding the history and current status of TMS, MFOS, Trns*port, and FieldManager.

(2) We examined contracts for system development services to determine whether the contracts were written in the best interests of the State. We also assessed procedures for monitoring services provided by consultants.

(3) We evaluated MDOT's prior and current practices for approving and awarding contracts for system development services and for authorizing and processing payments against those contracts.

(4) We determined the propriety of expenditures for system development.

(5) We assessed project management's procedures for monitoring system development progress and costs.

(6) We evaluated the roles, responsibilities, and authorities of the project managers and project teams. We evaluated the composition of the project teams. We also evaluated the project manager's methodology for project planning, monitoring, and reporting.

(7) We assessed controls over Safestat to assess whether improvements have been made in the areas of project and contract management.

b. Internal Control Over Automated Information Systems:

(1) We evaluated controls over access and use of TMS, MFOS, Trns*port, and FieldManager.

(2) We assessed and documented the internal control over data input, data processing, and data output of TMS, MFOS, Trns*port, and FieldManager. We also conducted tests to determine whether the controls were working as intended.

(3) We assessed the completeness and timeliness of data on the TMS database and the ability of TMS to effectively meet users' needs. We reviewed the extent of the use of TMS.

c. Effectiveness of Controls over Management, Development, and Security:

(1) We assessed OIM's management controls including its information technology master plan; standards and procedures for system development, system documentation, and program change controls; and its information technology security program.

(2) We examined the policies and procedures for the development of TMS, MFOS, Trns*port, and FieldManager. We reviewed the system development methodology used by consultants to develop TMS, MFOS, Trns*port, and FieldManager.

(3) We examined TMS, MFOS, Trns*port, and FieldManager system documentation for completeness.

(4) We evaluated the program change control process.

(5) We evaluated controls over security of TMS, MFOS, Trns*port, FieldManager, and MDOT's LAN.

(6) We verified system development and documentation controls over Safestat to assess whether improvements had been made to the development process.

3. Evaluation and Reporting Phase

We evaluated and reported on the results of the preliminary review and evaluation phase and the detailed analysis and testing phase.

Agency Responses

Our audit report contains 25 findings and 28 corresponding recommendations. MDOT's preliminary response indicated that it agreed with all the recommendations.

The agency preliminary response which follows each recommendation in our report was taken from the agency's written comments and oral discussion subsequent to our audit fieldwork. Section 18.1462 of the *Michigan Compiled Laws* and Department of Management and Budget Administrative Guide procedure 1280.02 require MDOT to develop a formal response to our audit findings and recommendations within 60 days after release of the audit report.

COMMENTS, FINDINGS, RECOMMENDATIONS, AND AGENCY PRELIMINARY RESPONSES

EFFECTIVENESS OF PROJECT AND CONTRACT MANAGEMENT

COMMENT

Background: The success or failure of a system development project depends on effective project management. Effective project management includes organizational and financial controls; accountability for decisions, actions, and performance of the end product; and effective executive support and leadership. An audit of project management controls focuses on project team responsibility, project planning and budgeting, project monitoring and reporting, and the skills of the project team members.

Audit Objective: To assess the effectiveness of the Michigan Department of Transportation's (MDOT's) project and contract management controls over system development projects.

Conclusion: MDOT did not implement effective project and contract management controls over system development projects. Our assessment disclosed three material conditions regarding the information technology (IT) control environment, procurement process, and use of IT funds. In addition, we identified reportable conditions regarding system development payments, project management controls, project deliverables, project cost reporting, project history, and a quality assurance (QA) process.

Between June 1995 and February 1999, law enforcement agencies conducted an investigation of alleged improprieties in MDOT's system development contracting process. The investigation concluded that administrative policies had been violated.

FINDING

1. Control Environment

MDOT did not implement an effective IT control environment.

Internal control is a process which is designed to provide reasonable assurance regarding the effectiveness and efficiency of operations, reliability of financial reporting, and compliance with applicable laws and regulations. Internal control consists of five interrelated components, one of which is the control environment. The control environment sets the tone of the organization and influences the control consciousness of its people. Control environment factors include the integrity, ethical values, and competence of the organization's employees; the management's philosophy and operating style; the way management assigns authority and responsibility; and the attention and direction provided by management.

We reviewed contracts for the Transportation Management System (TMS) and the MDOT Architecture Project (MAP) Financial Obligation System (MFOS) projects which MDOT awarded from January 1992 through September 1996. We identified significant weaknesses over the contracting, payment, and development processes which resulted from an ineffective control environment. These weaknesses include:

a. MDOT had not implemented controls to ensure the propriety and proper approval of contractor payments (Findings 2 through 4).

b. MDOT had not implemented controls to ensure effective project and contract management (Findings 5 through 9).

c. MDOT had not implemented system development, system documentation, and program change controls (Findings 17 through 19).

d. MDOT had not implemented controls to ensure the security of MDOT's local area network (LAN) and automated information systems (Findings 13, 14, and 21 through 23).

e. MDOT had not established a methodology for Office of Commission Audits (OCA) involvement in the system development process to identify control issues as a system is being developed.

Six of the project and contract management findings identified in this report occurred between January 1992 and May 1996 under previous MDOT and Office of Information Management (OIM) administration. MDOT appointed a new chief information officer (CIO) in 1997. MDOT and the CIO have developed draft procedures for project management and have centralized control over system development contracts and payments. We observed that these controls were implemented for Safestat, a system under development during our audit fieldwork. However, there are additional controls that MDOT should develop and implement to help prevent the weaknesses identified in this report from recurring. These additional controls include system development, system documentation, program maintenance, and security controls.

RECOMMENDATION

We recommend that MDOT implement an effective IT control environment.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with this recommendation and has taken steps to implement an effective IT control environment. Some of the specific steps taken have been included in the agency preliminary responses corresponding to the subsequent audit findings. MDOT informed us that, once these steps were implemented, OIM demonstrated substantial improvement of the control environment for IT development. In summary, the new CIO and the entire management team have placed a great deal of emphasis on improving the control environment and will continue to do so.

FINDING

2. Procurement Process

MDOT did not comply with the Department of Management and Budget (DMB) and MDOT policies and procedures for contracting for system development. In addition, MDOT did not formalize its process for administering and letting system development contracts.

As a result, MDOT awarded contracts to a system development contractor that failed to develop and deliver complete systems. We noted:

a. MDOT entered into agreements and split payments to circumvent DMB purchasing rules. In fiscal years 1992-93 and 1993-94, MDOT made 22 payments to four contractors for amounts just under $10,000 each. Making payments in this manner and for these amounts violates DMB Administrative Guide procedure 510.06, which prohibits the splitting of similar services into separate purchase orders in order to avoid the bid process. It also violates DMB Administrative Guide procedure 1310.11, which requires DMB approval for acquisition of information processing resources valued at $10,000 or greater.

b. MDOT did not obtain DMB approval for contractual services contracts for the Financial Obligation System (FOS), MAP I, MAP II, and Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) I contracts. These contracts totaled $8.7 million. At the time these contracts were issued, DMB Administrative Guide procedure 510.06 required DMB Office of Purchasing approval on contracts of $10,000 or more. Not obtaining DMB approval allowed MDOT to circumvent controls and reviews designed to help ensure that services were properly procured.

   The OCA review report also identified the absence of required DMB approvals for the Project Information System (PINS) and FOS.

c. MDOT did not obtain competitive bids or adequately justify its use of sole-source contracts for the FOS, MAP II, and ISTEA I contracts with a contractor. In some instances, the DMB Office of Purchasing questioned MDOT's rationale for not bidding the contracts. The Management and Budget Act (Act 431, P.A. 1984) requires DMB to determine that competitive bidding is not appropriate before MDOT uses another procurement method, such as sole-source contracting. MDOT justified the sole-source contracts based on time constraints and the contractor's previous experience at MDOT. These were not valid reasons for using sole-source contracts. In addition, MDOT misrepresented the ISTEA project to DMB as a rapid application development project as a way to justify sole-source contracts.

As a result of not competitively bidding these contracts, MDOT unnecessarily curtailed competition for State contracts.

The OCA review report also noted that MDOT did not have sufficient documentation for the use of a sole-source contract for PINS.

MDOT now has a management approval process for sole-source contracts.

d. MDOT awarded contracts for ISTEA II, ISTEA IIA, ISTEA III, and MAP III without consistently utilizing a joint evaluation committee (JEC) or providing adequate rationale to justify the selection of the contractor. MDOT procedures required the use of a JEC with a minimum of four members to review bids and select contractors for system development projects.

For example, for ISTEA II, MDOT awarded the contract to the contractor despite several significant weaknesses identified by the JEC, such as the contractor's failure to adequately address data management issues, a weak discussion of project management, and a failure to demonstrate the ability to provide adequate project documentation. For two contracts, MDOT did not use a JEC, and for one contract, the JEC did not contain the minimum number of members.

MDOT now consults with DMB prior to executing system development contracts. In addition, MDOT has documented and implemented a management approval process for contracting for system development projects. However, MDOT should formalize its process for administering and letting contracts.

RECOMMENDATIONS

We recommend that MDOT comply with DMB and MDOT policies and procedures for contracting for system development.

We also recommend that MDOT formalize its process for administering and letting system development contracts.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with the first recommendation and is in compliance with DMB and MDOT policies and procedures for contracting for system development. MDOT informed us that it consistently uses DMB Administrative Guide procedures 510.06 and 1310.11 when contracting for system development and consults with DMB prior to executing system development contracts.

MDOT agreed with the second recommendation and is in the process of formalizing the OIM process for administering and letting system development contracts. Formal instructions are currently being drafted with an expected publication date of August 31, 2000. IT contract administration, budgeting, and spending have all been centralized in OIM under the CIO.

FINDING

3. Use of IT Funds

MDOT had not established controls to ensure the effective and efficient use of all IT funds.

Our review of IT expenditures for fiscal years 1992-93 through 1996-97 disclosed numerous instances in which MDOT paid for IT services but did not receive a useful product or the anticipated benefit. We noted:

a. MDOT paid an additional $2.1 million above the original bid price for the TMS design documents. MDOT paid a system development contractor approximately $2.9 million to develop a system interface design, system design specifications, and a data model for TMS. However, the contractor did not deliver acceptable design documents as indicated by the TMS project leaders and a QA review. Rather than require the contractor to modify and deliver acceptable design documents for the original bid price, MDOT entered into another contract with the same contractor for approximately $2.1 million to correct the design documents.

b. MDOT paid approximately $768,000 for a geographic information system (GIS) for TMS that was never delivered by the contractor. As a result, TMS

does not have the mapping capabilities that were required in the TMS design documents.

c. MDOT paid approximately $1.2 million for empowerment training as part of its FOS and ISTEA IV contracts. Empowerment training was designed to provide OIM with the technical and administrative knowledge to support and maintain the applications. Some employees who went through the training informed us that, generally, the empowerment training was not conducted in a manner that allowed the employees to learn the software tools. Because MDOT continues to contract for support and maintenance of the applications, rather than maintain the systems in-house, the empowerment training does not appear to have been an efficient and effective use of funds.

   MDOT indicated that some system support and maintenance is contracted due to staff resource decisions.

d. MDOT spent an unknown amount on a configuration management manual which it never implemented. The development of the configuration management manual was part of the $2.8 million MAP III contract. The contractor completed the manual; however, MDOT did not use it.

   MDOT did not require the contractor to identify a specific price for the manual or the other deliverables of the MAP III contract. Therefore, the cost of the configuration management manual could not be determined.

e. The OCA review report noted that MDOT paid approximately $176,000 and $197,000 for technical training classes and data modeling classes, respectively, for which evidence did not exist to prove that the training occurred. The invoices for the technical training classes listed MDOT employees in attendance. However, MDOT timekeeping records indicated that the employees were on sick, annual, or other leave during most of the time the classes occurred. We were informed that the payments for data modeling classes were for development work on the MAP project rather than for training.

MDOT should determine the possibility of recovering the contract-related expenditures identified in parts a. through e.

These payments occurred between January 1992 and May 1996. Since that time, MDOT and OIM have changed leadership and have improved controls, including verification of receipt of deliverables and management oversight of IT-related expenditures.

RECOMMENDATIONS

We recommend that MDOT continue to strengthen controls to ensure the effective and efficient use of all IT funds.

We also recommend that MDOT recover the expenditures related to the unfulfilled contracts.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with the first recommendation. MDOT informed us that it has centralized its IT budget to ensure that all IT spending is reviewed and approved by OIM, under the direction of the new CIO. In addition, MDOT informed us that all IT contracts, planned equipment expenditures, software licenses, and proposed IT projects are submitted to MDOT management and the State Transportation Commission IT Subcommittee Chairman for approval as part of the annual budget process.

MDOT agreed with the second recommendation. MDOT is currently in the process of auditing its major IT contracts and is following the procedures identified in MDOT Guidance Document No. 10044, dated September 3, 1998, to recover expenditures related to unfulfilled contract deliverables.

In addition, because of the dollar amounts involved with the ISTEA contracts, MDOT feels that these contracts should be reviewed to identify what deliverables were received/completed and attempt to recover costs from the consultants for those items not received/completed. MDOT will formulate a team, which will include the MDOT project manager for the ISTEA contracts, Commission Audit, and the OIM contract administrator, to identify those items that were not received/completed and discuss

the possibility of cost recovery with the Department of Attorney General, including the statute of limitations for breach of contract. This will be initiated by October 1, 2000.

FINDING

4. System Development Payments

MDOT did not maintain effective internal control over system development payments.

Internal control policies and procedures should consist of verification of services provided by the system development contractors, verification of travel and living expenses, verification of contractor time sheets, proper DMB approval of contracts, and approval and pre-audit of invoices. With the establishment of proper internal control, abuses and errors are less likely to occur.

Our review of selected procurement procedures, contracts, and invoices disclosed the following weaknesses:

a. MDOT did not ensure that contracts required the system development contractor to provide basic project information on invoices, such as project name, federal project number, job number, description of work completed, and billing dates. This resulted in MDOT making some duplicate payments to the contractor and applying some payments to the wrong contract. Without sufficient details of work performed, MDOT could not verify and accurately record invoices.

   MDOT subsequently identified and corrected the duplicate and misapplied payments.

b. MDOT did not ensure that system development contractor invoices itemized employee travel and living expenses, and did not require contractors to submit verifiable documentation such as hotel and airline receipts. As a result, MDOT could not determine if the payments complied with State travel regulations as required by the contracts.

c. MDOT did not ensure the validity and accuracy of time sheets submitted by the system development contractors. The contractors' billings included a time sheet indicating the hours worked for each of the contractors' employees. However, MDOT did not require its project managers to attest to the accuracy of the time sheets. Lack of independent verification could result in contractors being paid for time which was not worked.

As of fiscal year 1997-98, MDOT obtains project manager approval on time sheets.

d. MDOT did not obtain DMB approval before allowing a subcontractor to work on a project. The contract prohibited the contractor from delegating work to a subcontractor not named in the bid without the written consent of the DMB director of purchasing. Allowing work to be performed by an unauthorized subcontractor decreases the likelihood of successful project completion.

e. MDOT did not ensure that system development contractors billed for services at the specified contract rates prior to making payment. We reviewed 88 invoices and identified 20 invoices paid by MDOT for which the billed rate did not agree with the rate specified in the contract. Proper pre-auditing of the invoices would detect differences in billing rates.

OCA audited and subsequently adjusted 16 of the invoices. The other 4 invoices will be audited in fiscal year 1999-2000.

f. MDOT did not ensure that payments were only made on properly executed contracts. As a result, MDOT paid system development contractors approximately $651,000 and $276,000 for work on two projects before signed contracts had been executed. This exposed MDOT to a monetary liability for work performed without an approved contract.

g. MDOT did not process system development contractor payments in compliance with MDOT accounting procedures. We reviewed 88 invoices and determined that 28 were not properly checked, pre-audited, or certified prior to payment. As a result, MDOT did not detect and prevent the weaknesses noted in parts a. through f. of this finding.

Subsequent to these weaknesses occurring, in 1998 MDOT centralized the responsibility for administering contracts and improved controls over contractor payments. For example, for Safestat, MDOT requires the contractor to supply time sheets that indicate the phase of work, the project leader approves the time sheets, and OIM audits the invoices prior to payment.

RECOMMENDATION

We recommend that MDOT continue to maintain effective internal control over system development payments.

AGENCY PRELIMINARY RESPONSE

MDOT agreed and will continue to maintain effective internal control over system development payments. MDOT informed us that, since 1997, it has required a) contractors to provide basic project information on invoices to ensure verification of services; b) contractors to submit documentation in support of travel and living expenses to ensure their validity and accuracy; c) verification by MDOT project managers of contractor time sheets to ensure their validity and accuracy; d) proper DMB approval of contracts; and e) pre-audit of invoices to ensure that rates billed are in accordance with the approved contract rates. Formal written procedures will be published on August 31, 2000.

FINDING

5. Project Management Controls

MDOT had not implemented project management controls to ensure effective and timely system development.

DMB Administrative Guide procedure 1310.08 established guidelines and standards for project management of system development activities. Effective project management encompasses six major activities: project planning, project organization, project control, project leadership, project coordination, and project reporting.

In our review of TMS and MFOS, we noted weaknesses in the following areas:

a. MDOT did not require contractors to develop a project master plan for the development of either system. DMB Administrative Guide procedure 1310.08 requires project organization, including the creation of a detailed plan outlining the work to be performed, people assigned to each task, and specific milestones and end products. A project master plan is necessary to effectively manage a large system development project and to accurately determine a project completion date. The work statements for the systems required that the contractors provide a project plan, however, the project managers informed us that none was ever provided.

b. MDOT did not ensure that project managers had information systems background and knowledge to effectively manage the projects. DMB Administrative Guide procedure 1310.08 states that project leadership may be the most significant management function. Without experience in developing and managing system development projects, it was difficult for project managers to ensure the quality and adequacy of the work completed by the contractors. MDOT should provide project managers with training and guidance to help them effectively manage system development projects.

c. MDOT did not ensure that project managers had appropriate authority and responsibilities for controlling the projects. Project control, according to DMB Administrative Guide procedure 1310.08, keeps the project on track and ensures that the project is completed on schedule and within budget, and that the project meets users' business needs. Project managers should have complete responsibility for the project. However, project managers informed us that they were not responsible for or aware of all contract-related matters, did not have the authority to withhold payment for deliverables, and did not approve all changes to the project scope. MDOT should define the roles and responsibilities of project managers to ensure that project managers are empowered with sufficient authority to fulfill the project plan.

   For Safestat, MDOT gave the project manager the authority to effectively manage the project.

The lack of project management contributed to systems being developed in an untimely manner, exceeding project cost estimates, and not completely meeting user needs.

MDOT has adopted an IT project management process and is establishing project management procedures.

RECOMMENDATION

We recommend that MDOT implement project management controls to ensure effective and timely system development.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with this recommendation. MDOT informed us that OIM has established a project management methodology consistent with DMB Administrative Guide procedure 1310.07 and the Project Management Body of Knowledge (PMBOK). This methodology incorporates required activities, deliverables and controls based on industry established practices for IT project management, system life cycle development, and contract administration. This methodology also requires the development of detailed project plans to manage and control the project, assign resources, and ensure compliance with cost, quality, and time constraints. In addition, MDOT informed us that it has adopted the Statewide standard methodology tool, which provides a mechanism for project planning, controlling, reporting, and communication. Also, MDOT project managers are accountable for project budgets and must seek re-approval when a project exceeds 10% of planned costs. Further, MDOT informed us that project managers are being trained in sound project management practices.

FINDING

6. Project Deliverables

MDOT did not identify system development project deliverables and completion dates and had not established a process for holding contractors responsible for the deliverables and completion dates. Defining a clear and comprehensive set of contract deliverables and holding consultants responsible for deliverables and

completion dates is a key factor for ensuring effective project management and successful system development.

Our review of selected contracts disclosed:

a. MDOT's contracts for system development did not specifically identify the deliverables to be completed by the consultants, including expected milestones and completion dates. Contracts for some systems contained very brief and vague deliverables, while other contracts contained no deliverables. In addition, the contracts did not identify penalties for lack of performance.

   MDOT should ensure that future system development contracts contain specific project deliverables and completion dates. This may help MDOT more accurately estimate project completion dates and ensure that the delivered systems satisfy MDOT's needs.

b. MDOT did not ensure that consultants fulfilled their contract obligations before paying the consultants. We identified several instances in which MDOT paid contractors the full contract price even though a contractor did not complete the required work. For example, MDOT paid a contractor in full for incomplete system design documents, project plans, data models, and system functionality. Also, MDOT paid three different contractors to do the design and implementation of MFOS; however, only the third contractor implemented MFOS.

For Safestat, MDOT did not explicitly state the deliverables that the contractor was to provide. However, MDOT did identify project completion dates and monitor the progress of the contractor.

RECOMMENDATION

We recommend that MDOT identify system development project deliverables and completion dates and establish a process for holding contractors responsible for the deliverables and completion dates.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with this recommendation. MDOT informed us that it has created an IT project management methodology that identifies specific deliverables and completion dates. Although contracts cannot always be written to include specific project deliverables, MDOT does take steps to hold contractors responsible for delivering quality work. Contracts specify incentives for early completion and define specific deliverables where appropriate.

FINDING

7. Project Cost Reporting

MDOT did not implement a process to identify and monitor direct expenditures related to its system development projects.

The project teams, OIM, and MDOT's Bureau of Finance and Administration did not maintain detailed records of expenditures by project. As a result, MDOT could not identify and provide us with actual costs of six system development projects. Such project costs could include contractual services, classified employees, hardware, travel, training, and other project costs.

We identified that MDOT had expended approximately $35.9 million on contractual services for the six development projects, as follows:

System	Amount Expended (in millions)
Transportation Management System (TMS)	$22.2
MDOT Architecture Project (MAP)	4.4
Project Information System (PINS)/MAP Project Information System	3.4
Financial Obligation System (FOS)/MAP Financial Obligation System (MFOS)	2.6
Trns*port	2.5
FieldManager (Construction Project Record Keeping System)	.8
	$35.9

Without accurate and detailed records of project expenditures, MDOT cannot effectively measure the cost of the project against actual work done. To help ensure that MDOT maintains and reports accurate cost records of system development projects, it should implement a standard cost reporting system for all development projects.

RECOMMENDATION

We recommend that MDOT implement a process to identify and monitor direct expenditures related to its system development projects.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with this recommendation and informed us that it has implemented a process to identify and monitor direct expenditures related to system development contracts. With the Year 2000 project that began in 1997, MDOT began tracking direct project costs. Recent major projects that have captured direct costs include: Year 2000, Operational Maintenance Management System (OMMS), and Safestat.

MDOT's project management methodology includes a process that the project managers use to capture direct project costs. In addition, project managers are trained in this process when they start new projects. MDOT informed us that it adopted the project management methodology in October 1999.

FINDING

8. Project History

MDOT did not have a mechanism to capture and store important system development project information. For TMS and MFOS, we noted:

a. OIM did not maintain complete contract information related to all system development projects including copies of contracts, documentation of contract approvals, contract change orders, invoices, and other correspondence. We obtained some of this documentation from MDOT's Financial Operations Division and DMB's Office of Purchasing. However, to ensure the proper

administration of its contracts OIM should maintain complete contract documentation.

As of March 1996, all contract information related to system development projects, including copies of contracts, documentation of contract approvals, change orders, invoices, and other correspondence, has been maintained by OIM.

b. OIM did not have a repository to capture project information related to all system development projects. As a result, current project managers did not have the historical project records that were created prior to their tenure with the project. A repository should store all information related to a project from its inception to its completion. We were informed by project managers that cost-benefit analyses, feasibility studies, user requirements documents, and project master plans had been created. However, the project managers did not have and could not provide us with these documents. Project managers also did not have all documents and deliverables completed by contractors.

To preserve MDOT's history of system development projects, MDOT should establish an information repository for all major system development projects.

RECOMMENDATION

We recommend that MDOT establish a process to capture and store important system development project information.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with this recommendation and informed us that it has complied. MDOT stated that it has captured contract information since March 1996 and has retained project information since August 1997.

FINDING

9. QA Process

MDOT had not established a QA process over its system development projects.

DMB Administrative Guide procedure 1310.09 requires that a QA function be established for major system development projects. QA is an independent and impartial assessment of project methods and techniques and of the work produced during the course of system development. A QA function would help ensure that systems meet the defined needs and specifications of the users, are implemented on time, and avoid cost overruns.

MDOT hired a QA contractor in 1994 during phase II of the TMS project who identified significant weaknesses in the design of TMS. However, subsequent and current system development projects did not have a QA function. MDOT did implement a QA function over its year 2000 remediation efforts.

RECOMMENDATION

We recommend that MDOT establish a QA process over its system development projects.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with this recommendation and informed us that it has complied. In October 1999, OIM adopted a project management methodology that includes the implementation of a quality assurance process. Appropriate development projects will include a quality assurance component based on best practices in the industry. All project deliverables will be approved or disapproved based on quality assurance standards. The project management and quality assurance initiatives will be directed by the OIM Project Office.

INTERNAL CONTROL OVER AUTOMATED INFORMATION SYSTEMS

COMMENT

Audit Objective: To assess the effectiveness of MDOT's internal control over its automated information systems.

Conclusion: MDOT's internal control over its automated information systems was generally effective. However, we identified reportable conditions regarding postimplementation review, completeness of TMS, and the TMS database. We also identified reportable conditions regarding TMS, MFOS, and Trns*port access controls; usercode and password security; audit trails; and processing controls.

FINDING

10. Postimplementation Review

MDOT did not conduct postimplementation reviews of its automated information systems.

DMB Administrative Guide procedure 1310.07 requires that a postimplementation review be conducted as the final phase of the system development process. A postimplementation review consists of evaluating the performance of the new system and ensuring that:

a. The system meets planned objectives, provides the expected economic benefits, and realizes any projected reductions in personnel.

b. Users understand all capabilities of the system.

c. User training has been sufficient.

d. Errors are reasonably low and are corrected on a current basis, only minor program modifications are outstanding, databases balance, controls are maintained on a timely basis, and reports are prepared on time and balanced before distribution.

e. The system is fully and efficiently operational.

The postimplementation review phase should result in a report that consists of an assessment of the success and shortcomings of a system in terms of anticipated benefits and costs, plans to address system deficiencies and inefficiencies, and plans for the ongoing assessment of overall system performance.

We determined that TMS, as currently implemented, does not completely meet MDOT's needs (Finding 11), does not contain current and complete information (Finding 12), and is not being accessed and used frequently. For example, during a 12-week period, access to the five TMS subsystems ranged from 31% to 77%. These usage rates may be reasonable for a management system. Some users informed us that their jobs did not require them to access TMS frequently. However, other users cited that TMS did not contain the information that they needed, TMS did not contain current and accurate information, or information could be obtained from other systems. A postimplementation review would have helped MDOT identify these problems.

Subsequent to our bringing this matter to management's attention, MDOT added the postimplementation review phase to its project management model.

RECOMMENDATION

We recommend that MDOT conduct postimplementation reviews of its automated information systems.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with this recommendation and informed us that it has added a post-implementation review phase to its project management methodology that was adopted in October 1999. MDOT also informed us that it will conduct post-implementation reviews of its future projects and that OIM conducted a post-implementation review of its Year 2000 project and developed a report for the CIO.

FINDING

11. Completeness of TMS

MDOT did not ensure that it developed a complete and effective TMS.

As of July 31, 1999, MDOT spent approximately $22.2 million on development of TMS. A design document, which identified the functions that were to be automated in TMS, was created for each of the six TMS subsystems. The design documents listed management questions that MDOT wanted TMS to answer. These management

questions would enable MDOT to more effectively and efficiently make decisions about road, bridge, congestion, safety, public transit, and intermodal projects.

TMS was not completely developed according to the design document specifications and could not answer many of the management questions identified in the TMS design documents. Our review of TMS disclosed:

a. MDOT had not implemented the Pavement Management System (PMS) that was included in the ISTEA system development contracts. The purpose of PMS was to provide a process for analyzing and summarizing pavement information. MDOT uses its existing mainframe pavement management system and another system, the Road Quality Forecasting System (RQFS), to achieve the functions of PMS. Recently, another contractor developed a pavement management system but MDOT has not completely tested it or integrated it into TMS.

b. MDOT did not ensure that the Bridge Management System (BMS) had all of the desired system specifications, including bridge inspection forecasts, bridge maintenance histories, construction histories, inspection dates, reach-all inspections, life cycle cost analysis, performance measures, critical bridge points, rehabilitation needs, and prioritization process. BMS also did not contain data required to coordinate bridge and TMS projects and run problem identification and trend analysis scenarios.

c. MDOT did not ensure that the PTMS had all of the desired system specifications, including strategy analysis, remaining service life projections, cost-benefit analysis, service agency integration, and various status reports. PTMS also did not contain data required to project the 5, 10, and 20-year vehicle, equipment, and facility needs and utilize prioritization tools.

d. MDOT did not ensure that IMS had all of the desired system specifications, including analysis of facilities, systems, and services and ties between intermodal projects and departmental strategic and policy systems.

e. MDOT did not ensure that CMS had all of the desired system specifications, including progress measures, goal analysis, transit routes, analysis of

alternative solutions, strategy implementation feedback, performance measures, and cost-benefit calculations. CMS also did not contain data required to analyze the incorporation of transit and non-highway travel information.

f. MDOT did not ensure that SMS had all of the desired system specifications, including signs inventory, signals inventory, safety candidate project listing, scanned accident reports, link to roadsoft roadway, intersection layouts, railroad site package, strategy development routines, and federal reporting. SMS also did not contain data for each year and location to carry out comparison calculations.

g. MDOT did not develop an effective electronic interface between TMS and the MAP database. TMS should interface with MAP, however, this capability has not been developed effectively. The request for approval to contract for development of ISTEA III stated that TMS would integrate with MAP. Also, the design documents developed during ISTEA II indicated that TMS would integrate with MAP. An effective interface would help ensure that TMS is updated in a timely manner with information about completed construction projects from MAP.

h. MDOT did not ensure that TMS provided the data to generate the State Transportation Improvement Program (STIP). The TMS design documents stated that TMS would support the planning process by identifying improvement needs and provide the basis for STIP development. Although TMS does not provide the data to generate the STIP, MDOT was able to create the STIP through MAP.

MDOT informed us that the design documents are outdated and many of the preceding capabilities are no longer needed in TMS or are being accomplished through other systems.

RECOMMENDATION

We recommend that MDOT ensure the development of a complete and effective TMS.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with this recommendation. MDOT will continue to develop, maintain, and use TMS in response to changing business needs, legislative and executive change, and technology changes.

FINDING

12. TMS Database

MDOT could improve the completeness and timeliness of data in the TMS database. Our review disclosed:

a. The TMS database consisted of 933 tables. However, 98 of the tables did not contain any data. These tables did not contain data because the data was not available, the data was dependent upon a module of TMS that had not been developed, or the tables were being developed for future use. MDOT should ensure the completeness of the TMS database in order to provide users with information they need to make management decisions.

   Because TMS did not contain current data, users informed us that they continue to use other systems and databases that TMS was supposed to replace.

b. SMS did not contain current data. We noted:

   (1) The SMS interchange features file, roadway features file, and intersection features file did not contain current information. SMS did not have a data entry screen for staff to update these files. In addition, the Traffic and Safety Division did not have sufficient staff to gather and update the files. The most recent data in these files was from December 1996.

   (2) The SMS crash files did not contain current information. MDOT's Statewide Transportation Planning Division only updates the crash files once a year, however, crash data is available monthly. As a result, MDOT's Traffic and Safety Division input the crash data onto another system and use that system instead of TMS.

This finding was also reported in our performance audit of the Traffic and Safety Division. MDOT responded that it planned to initiate discussions by February 28, 1999 for developing a process for quarterly updates of the SMS data.

RECOMMENDATION

We recommend that MDOT improve the completeness and timeliness of data in the TMS database.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with this recommendation. In regard to part a., MDOT informed us that it has complied. In regard to part b.(1), MDOT informed us that it is reviewing other mechanisms and data sources to provide the necessary data. The Bureau of Highways within MDOT will address this issue. In regard to part b.(2) and in response to the audit of the Traffic and Safety Division, MDOT developed the Crash Reporting Information System (CRIS) in February 1999 and is modifying TMS and CRIS to make the data available to both TMS and CRIS. This will provide the most current available data from the Michigan Department of State Police. This will be accomplished by November 2000.

FINDING

13. TMS, MFOS, and Trns*port Access Controls

MDOT had not established complete control procedures to prevent unauthorized access and use of its systems. Our review disclosed:

a. MDOT did not restrict TMS super user capabilities to appropriate users. Administrator capabilities allow a user to access all TMS database files and to create new TMS users. These capabilities should be restricted to prevent unauthorized access and use of the TMS database. We identified nine TMS users with super user capabilities whose job responsibilities did not require such capabilities.

b. MDOT did not restrict the MFOS Federal Highway Administration (FHWA) user role to appropriate users. The FHWA user role has the ability to approve or

reject federally funded projects and should be restricted to FHWA employees. No additional funding can be approved by the FHWA user role. Our review identified 10 users with access to the FHWA user role on the MFOS production database. Three of the 10 users were MDOT employees who need access to the FHWA user role on the test database only. MDOT should restrict access of the three employees to the FHWA user role on the test database. The other seven users were IT contractors who should not have access to the MFOS production database. MDOT should restrict the access of its IT contractors to the MFOS test and development databases.

Subsequent to our bringing this matter to management's attention, MDOT deleted the employees' and the contractors' access to the production database.

c. MDOT did not ensure that each Trns*port user used a unique usercode and password. All Trns*port users share one of several usercodes. Consequently, MDOT was unable to identify the individuals that use each usercode. Requiring the use of unique usercodes and passwords would help provide accountability for transactions. MDOT should request that the American Association of State Highway and Transportation Officials (AASHTO) develop the capability for unique usercodes and passwords.

d. MDOT did not secure the initialization files for its client server systems. MDOT uses initialization files to establish configuration and security parameters for the systems. The initialization files are installed on each client computer and executed when the system is opened. The initialization files contain information that should be secured and protected from unauthorized access. However, we determined that the files could be accessed and modified by system users.

Subsequent to our audit fieldwork, MDOT informed us that it secured the initialization files.

e. MDOT did not adequately restrict access to some TMS database tables. Six TMS tables allowed public access to all users of the database. These tables should be restricted to only authorized persons.

RECOMMENDATION

We recommend that MDOT establish additional control procedures to prevent unauthorized access and use of its systems.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with this recommendation. MDOT informed us that it is concerned with security of its applications and is vigilant in watching for security risks. Where problems are identified, management acts promptly to fix them as well as takes a proactive stance to identify and prevent potential problems from occurring. MDOT informed us that it has corrected the weaknesses noted in the finding.

FINDING

14. Usercode and Password Security

MDOT should establish control procedures over usercode and password security.

Control procedures help ensure that only authorized users access or change data. We reviewed usercode and password security over the LAN and four of MDOT's automated information systems: TMS, MFOS, Trns*port, and FieldManager. Our review disclosed:

a. MDOT did not delete usercodes of employees who had terminated employment. We identified 155 active LAN usercodes that belonged to former employees in the region offices. We also identified 59 active usercodes for TMS and MFOS that belonged to former employees. Allowing usercodes of former employees to remain active increases the risk of unauthorized changes to the LAN and automated information systems.

b. MDOT did not require users to periodically change their passwords for any of the four systems. In addition, MDOT did not require users to change their passwords at first use. DMB Administrative Guide procedure 1310.02 requires that passwords be periodically changed. Changing passwords initially and on a regular basis helps ensure password confidentiality and reduces the risk of unauthorized access to the system. MDOT should implement available security features to improve password security.

c. MDOT did not establish and enforce sound password rules for any of the four systems. To help prevent the compromise of passwords, there should be a minimum of six characters and include both letters and numbers. In addition, the use of previous and easily guessed passwords should be prohibited.

d. MDOT did not automatically disconnect computer workstations or use password-protected screen savers after a reasonable period of inactivity for any of the four systems we reviewed. This could result in unauthorized system access if the workstation is left unattended. DMB Administrative Guide procedure 1310.02 requires that workstations automatically log off if left unattended for a specific period of time.

RECOMMENDATION

We recommend that MDOT establish control procedures over usercode and password security.

AGENCY PRELIMINARY RESPONSE

MDOT agreed and informed us that it complied with this recommendation on July 19, 1999. MDOT informed us that it centralized user authentication to one common network directory which requires new passwords to be changed and applies stricter password rules, and will be synchronized with the human resources employee database.

FINDING

15. Audit Trails

MDOT did not ensure that system audit trails provide complete identifying information about each transaction. We noted:

a. FieldManager did not provide a complete history of contractor payments. Field offices generate biweekly contractor pay estimates. FieldManager creates each contractor's pay estimate by combining completed unpaid items from inspector daily reports. However, FieldManager does not create an audit trail that identifies which inspector daily reports are included in the contractor

pay estimate. As a result, MDOT cannot track contractor payments through the system.

b. Trns*port did not record complete identifying information about each transaction input into Trns*port. The system did not record the date, time, and usercode of each transaction. Recording this information would enable MDOT to identify the originator of each transaction.

RECOMMENDATION

We recommend that MDOT ensure that system audit trails provide complete identifying information about each transaction.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with this recommendation. However, in regard to part a. of the finding, the cost of developing and implementing this functionality will be weighed against the derived benefits to determine if it is cost effective.

In regard to part b. of the finding, MDOT licenses this product from AASHTO and is not able to modify the source code. Trns*port is updated in a variety of ways from other systems and has an extensive security system that limits user functions and project access. MDOT will evaluate the business risk, development cost, and other benefits. MDOT will then ask AASHTO to modify the applications to develop the audit trail, if appropriate.

For further system development, MDOT informed us that it will assess the costs and benefits of audit trails and implement as appropriate.

FINDING

16. Processing Controls

MDOT had not established or enforced controls to ensure the completeness and accuracy of data transferred between systems. We noted:

a. MDOT used import and export files to transfer information between FieldBook and FieldManager and FieldManager and Trns*port. However, automated

processing control totals were not generated to ensure the completeness of file transfers between the three systems. As a result, several region offices informed us that they experienced problems with the completeness of data transferred.

MDOT had established a reconciliation process to verify the accuracy of contractor payment estimate documents transferred between FieldManager and Trns*port. However, 3 out of 12 region offices indicated that they did not perform the reconciliation.

b. MAP sends data to or receives data from three MDOT systems (Construction Activities File, Federal/State Master File, and Construction Estimate System [CES]) and one federal system (Fiscal Management Information System [FMIS]).

We noted that for the Construction Activities File download and the CES interface, MDOT did not have a mechanism, such as the reconciliation of control totals or record counts, to ensure the completeness and accuracy of the data transferred to and from MAP. MDOT had a sufficient manual reconciliation process for its FMIS, Federal/State Master File, and Construction Activities File upload interfaces.

Reconciliation of control totals would help management determine if records were lost during the interface processing cycle. Also, retaining the reconciliation documentation for review would provide an audit trail if records were lost.

For future system development projects, MDOT should ensure that processing controls are designed and implemented.

RECOMMENDATION

We recommend that MDOT establish and enforce controls to ensure the completeness and accuracy of data transferred between systems.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with this recommendation and informed us that it will ensure that processing controls are designed and implemented for future projects.

In regard to part a. of the finding, FieldManager release 3.1 will have automated control totals to ensure the completeness and accuracy of the contract initialization files. MDOT informed us that it is testing this release and will begin implementation at the start of the 2001 construction season.

EFFECTIVENESS OF CONTROLS OVER MANAGEMENT, DEVELOPMENT, AND SECURITY

COMMENT

Audit Objective: To assess the effectiveness of MDOT's general controls over management, development, and security of its automated information systems.

Conclusion: MDOT did not have effective general controls over the management, development, and security of its automated information systems. Our assessment disclosed one material condition regarding system development methodology and documentation. In addition, we identified reportable conditions regarding system documentation standards, program change controls, security risk assessments, a security program, LAN access controls, backup and recovery controls, a disaster recovery plan, and retention of electronic records.

Noteworthy Accomplishments: MDOT has taken steps to improve controls over its Automated Information Systems. MDOT created a help desk and an IT customer service function; it increased the performance rate of the network; and it replaced most of MDOT's computer hardware and established a schedule for future hardware replacement. MDOT informed us that these steps have resulted in improved employee satisfaction with IT services. Also, MDOT used good project management techniques and a QA process during its year 2000 remediation efforts. As a result, the cost of year 2000 remediation was $3.2 million, compared to the original estimate of $14 million. Also as a result, MDOT received AASHTO's Trail Blazer's Award for its year 2000 efforts. Further, MDOT informed us that employee morale within OIM has improved since it hired the current CIO and the implementation of some of his initiatives.

FINDING

17. System Development Methodology and System Documentation

MDOT did not implement and document a system development life cycle methodology to identify the procedures to be followed when information systems are being designed, developed, and maintained. Also, MDOT did not develop comprehensive TMS and MFOS system documentation.

DMB Administrative Guide procedure 1310.07 establishes procedures and guidelines for developing effective information processing systems. It requires that departments select a development methodology that encompasses five phases: project definition, design, development, installation, and postimplementation review.

Our review of TMS and MFOS system development and documentation disclosed the following weaknesses:

a. MDOT did not sufficiently plan the development of TMS, FOS, and MFOS. DMB Administrative Guide procedure 1310.07 requires that the project definition phase include identification of software alternatives and costs, and development of a feasibility study. MDOT could not provide us with any documentation of the project definition phase for TMS or MFOS or of its decision to convert systems from the mainframe to the client-server.

   MDOT informed us that it made a conscious decision to develop client-server systems, which was leading-edge technology. The reasons leading to this decision include multiple files and systems, incompatible systems, an aging mainframe platform, an aging workforce, the proliferation of personal computers, and a need to move quickly due to ISTEA legislation.

b. MDOT did not have complete documentation of the system design phase of TMS, FOS, and MFOS. Complete system design is necessary to help ensure that the system will meet the users' needs.

   DMB Administrative Guide procedure 1310.07 defines major activities of the system design phase, such as documenting the current business process, defining the detailed user requirements, developing the conceptual system

design, preparing the detailed system design, and determining performance requirements. While some system design activities did occur, MDOT did not have documentation that it completed all these activities.

MDOT did not define the current business process of TMS, FOS, MFOS, and FieldManager before beginning system design. Also, MDOT did not document user requirements or update conceptual and detailed designs for TMS and MFOS. Without a clear definition of the business process and well-defined user requirements and design documents, MDOT may not develop systems that completely meet the users' needs.

Although there was no documentation for FOS, FOS was an operational system for five years. MDOT informed us that FOS met its needs and enabled it to process the increasing number of federal projects that it could not have processed with the previous manual system.

c. MDOT did not prepare complete system documentation of the development phase of TMS, FOS, and MFOS. We determined that system documentation did not include program specifications, including program descriptions, program changes, and program logic; documentation of system edits; and testing documentation, including test plans, test data, and test results.

d. MDOT did not completely prepare and maintain documentation of the installation phase of MFOS. DMB Administrative Guide procedure 1310.07 states that major activities of the installation phase include developing a conversion plan, ensuring that data is ready for conversion, and developing user procedures. We noted:

(1) MDOT did not prepare a conversion plan for converting FOS to MFOS. A conversion plan would help ensure that data is complete and accurate prior to conversion, that data is ready for conversion, and that conversion responsibilities are defined. As a result, MDOT paid approximately $242,000 to a contractor for data conversion work above what was specified in the original contract.

(2) MDOT did not develop complete user procedures for MFOS and BMS. We noted that the procedures did not identify data sources or the process for entering data into the systems. Documented procedures help provide users with a clear and accurate understanding of the system and help prevent processing delays in the event of personnel turnover. In addition, procedures are necessary to ensure consistency and accuracy of data input.

MDOT informed us that it eliminated some steps of the methodology when it used rapid application development (RAD). RAD sessions are conducted with system designers in the room along with the business users. Some traditional system documentation is not generated when using this technique.

MDOT implemented system documentation standards and guidelines in July 1995. However, MDOT did not ensure that contracted system developers adhered to these standards and guidelines when developing TMS, FOS, and MFOS. MDOT did enforce the standards and guidelines in the development of FieldManager. As a result, MDOT received adequate system documentation for FieldManager. In addition, MDOT implemented a project management model that includes a system development methodology.

The OCA review report also noted the need for MDOT to document and implement a system development methodology.

RECOMMENDATIONS

We recommend that MDOT implement and document a system development life cycle methodology to identify the procedures to be followed when information systems are being designed, developed, and maintained.

We also recommend that MDOT develop comprehensive TMS and MFOS system documentation.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with these recommendations. As noted in its response to Finding 5, MDOT implemented and documented a system development life cycle

methodology in October 1999 to identify the procedures to be followed when information systems are being designed, developed, and maintained.

In regard to the second recommendation, MDOT stated that it cannot comply at this time. MDOT indicated that creating this documentation for existing systems is not a valuable use of its limited developed resources. However, MDOT informed us that it will prepare system documentation for future development projects.

FINDING

18. System Documentation Standards

MDOT had not developed system documentation standards appropriate for client-server systems.

Documentation standards are needed to ensure that contractors and in-house developers properly design, develop, and document client-server systems. MDOT implemented system documentation standards and guidelines in July 1995. However, the system documentation generated for a client-server system is very different from that of MDOT's traditional mainframe systems.

In our review of 4 client-server systems, we determined that 3 did not have complete system documentation. The fourth had complete documentation after the project's QA contractor identified and requested the necessary documentation.

MDOT should develop and enforce documentation standards appropriate for client-server systems to help ensure the proper design of systems and to help ensure that it receives the documentation that is appropriate for client-server systems.

RECOMMENDATION

We recommend that MDOT develop system documentation standards appropriate for client-server systems.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with this recommendation. MDOT informed us that it has included documentation deliverables within its IT project management methodology. MDOT

informed us that it is working with DMB to develop specifications and templates appropriate for the client-server environment. MDOT also informed us that a group consisting of all the agency CIOs in the State is adopting project management standards that include documentation standards. The expected publication date is July 2000.

Additionally, MDOT informed us that it is investigating the best approach for creating an electronic repository for system documentation that would allow the user to easily store and retrieve project and system documentation.

FINDING

19. Program Change Controls

MDOT had not completely established and implemented control procedures to ensure the integrity and accuracy of the methodology for making changes to its computer programs. Our review disclosed:

a. MDOT did not document and maintain all requests for program modifications. For TMS and MFOS, MDOT did not obtain and document user approval for all program changes. In addition, for MFOS, MDOT did not use a change request form to document change requests and approvals. The use of a standardized form helps ensure that all requests are clearly communicated and that approvals are documented.

b. MDOT had not implemented a process that restricts access to computer programs to help ensure the integrity of program changes. TMS and MFOS programmers had the capability to move changes to programs into production. The ability to move changes to programs into production should be restricted to someone not responsible for making program changes. Allowing programmers to move changes to programs into production increases the risk that unauthorized changes could be made to the source code.

c. MDOT did not ensure that MFOS computer programs were secure and protected from unauthorized use. Our review disclosed that programmers had unrestricted access to the MFOS computer programs. MDOT should limit programmer access to only those MFOS programs that are being maintained

by that programmer. In addition, all MDOT staff had read access to the directory where programs are stored. Most staff did not have work responsibilities that would necessitate this access.

d. MDOT did not ensure that all changes to TMS and MFOS were adequately tested. In addition, MDOT did not ensure that all tested changes were reviewed and approved by the user, programming supervisor, and configuration manager before moving the changed program into production. Complete testing is a necessary control to help ensure that programs work as intended and that changes did not adversely affect the overall accuracy of the system.

e. MDOT had not established program version controls including maintaining numbered program versions and a record of all program changes. All programs should be maintained in controlled software libraries to help ensure the integrity of current versions and provide a historical record of old versions.

   MDOT uses automated library control software for version control of its mainframe computer systems. However, MDOT had not implemented library control software for its client-server systems. Such software would establish an audit trail of program changes, maintain version number control, record and report program changes made, and maintain copies of previous versions. MDOT should determine the feasibility of acquiring and implementing library control software.

During our audit, DMB's Year 2000 Project Office identified MDOT's lack of change management procedures. Subsequently, MDOT issued client-server configuration management standards, implemented the Application Configuration Management System, and developed a data repository to assist project managers in documenting program changes.

RECOMMENDATION

We recommend that MDOT establish and implement control procedures to ensure the integrity and accuracy of the methodology for making changes to its computer programs.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with this recommendation and is taking steps to comply. MDOT issued client-server configuration management standards on March 24, 1999; implemented the Application Configuration Management System in May 1999, which formalized the process for making changes to its computer programs; and developed a data repository to assist project managers in documenting program changes. MDOT informed us that it is locating all its code files and registering them. MDOT is also in the process of evaluating automated configuration management software and is hiring a contractor to fulfill the standards and configuration management role.

FINDING

20. Security Risk Assessments

MDOT had not conducted security risk assessments of its automated information systems.

Risk management is the process of assessing risk, taking steps to reduce risk to an acceptable level, and maintaining that level of risk. Risk assessments help to identify system risks and ensure that appropriate, cost-effective safeguards are incorporated into major systems, such as TMS, MFOS, Trns*port, and FieldManager. Without periodic comprehensive risk assessments, security risks may go undetected and uncorrected.

Conducting risk assessments of TMS, MFOS, Trns*port, and FieldManager would help MDOT identify and reduce risks associated with software and data security, personnel security, and contingency plans to meet critical processing needs in the event of a disaster. For example, MDOT had not assessed the risk associated with an unauthorized person gaining access to its financial systems, including MFOS and Trns*port. In addition, MDOT had not assessed the risk of unauthorized program changes to these systems. Risk assessments would help MDOT to evaluate the effect of such issues.

RECOMMENDATION

We recommend that MDOT conduct security risk assessments of its automated information systems.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with this recommendation. MDOT informed us that it added risk assessments to its project management methodology and that it will conduct risk assessments during the technical requirements phase of system development. MDOT also informed us that it will conduct periodic risk assessments of its automated systems to ensure that they remain secure.

FINDING

21. Security Program

MDOT had not established a comprehensive data processing security program.

A comprehensive security program should include detailed policies and procedures for safeguarding all data processing resources and resources for monitoring information systems activity.

Executive management has the responsibility to ensure the security and integrity of departmental data processing. One method of effectively addressing data processing security issues is by appointing a security officer as required by DMB Administrative Guide procedure 1310.02. MDOT had designated an individual as security officer, however, the security officer's responsibilities were limited to security of MDOT's Internet and intranet web sites. Also, the security officer was responsible for LAN administration and was, therefore, not an independent security officer. The duties of the security officer should be expanded to include all departmentwide security issues. Duties that the security officer should be assigned include:

a. Maintaining access rules to files and resources.

b. Maintaining security and confidentiality over the issuance and proper maintenance of authorized user identification numbers and passwords.

c. Implementing and enforcing security policies and procedures.

d. Periodically reviewing and evaluating the security policy and suggesting any necessary changes to management.

e. Monitoring security violations and taking corrective action to ensure that adequate security is provided.

f. Performing regular and random site inspections and user reviews to verify user awareness and compliance with established policies.

Although we did not identify any major security violations, MDOT's lack of a comprehensive security program resulted in a number of security weaknesses which are addressed in this report (Findings 13, 14, and 21 through 23). Having an independent security officer would provide a means for addressing these security weaknesses, monitoring security, and educating users about the importance of data processing security.

RECOMMENDATION

We recommend that MDOT establish a comprehensive data processing security program.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with this recommendation and assigned a new security officer in June 1999. MDOT informed us that the duties of the security officer have been expanded and that a comprehensive security program will be implemented.

FINDING

22. LAN Access Controls

MDOT had not established complete controls over access to LAN. Establishing additional controls would help ensure that only authorized users have access to

the data and applications on the LAN. We reviewed LAN file server security and noted:

a. MDOT did not disable LAN usercodes after a reasonable number of invalid sign-on attempts. Disabling user codes after a reasonable number of attempts prevents an individual from attempting to gain unauthorized access to the system. The number of invalid sign-on attempts allowed should depend on the critical and confidential nature of the system.

   Subsequent to our bringing this matter to management's attention, MDOT modified the LAN to permanently disable usercodes after a reasonable number of invalid sign-on attempts.

b. MDOT did not monitor LAN security violations. MDOT captured security information in a log file, but did not regularly review it. As a result, unauthorized access attempts could go undetected. DMB Administrative Guide procedure 1310.02 requires that security violations be logged, the log reviewed, and problems resolved.

c. MDOT did not ensure the physical security of file servers at the region offices. Four of the 7 region offices did not lock the room where its file servers were stored and did not lock the file server keyboards. Proper access controls over the file servers would help ensure the authorized use of the LAN and continued network operations.

RECOMMENDATION

We recommend that MDOT establish complete controls to prevent unauthorized access to and use of LAN.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with this recommendation and has complied with parts a. and b. of the finding. In regard to part c. of the finding, MDOT informed us that it will determine the best method to physically secure the file servers in the Region Offices. These file servers do not contain critical corporate data. The servers in the Regions are used primarily as print, file, and e-mail servers.

FINDING

23. Backup and Recovery Controls

MDOT had not established complete backup and file recovery controls. Improving backup and recovery controls would help ensure that the LAN critical systems and data files can be restored in the event of a disaster. Our review of backup and recovery controls disclosed:

a. MDOT did not store current copies of its LAN and database backup files off-site. In addition, MDOT did not store on-site backup files for the Design Division in a secure location. In the event that an on-site disaster left the database and LAN systems and data files unrecoverable, off-site backup files would help ensure the recovery of the files.

b. MDOT did not change the backup tapes for each of its incremental daily backups of the LAN. In the event of a problem with the backup tape file, up to 4 days of data and program files would be unrecoverable. MDOT should use a new backup tape for each incremental backup.

c. MDOT did not ensure that the region offices and transportation service centers stored copies of its backup files in an off-site location. We determined that 4 of the 7 region offices did not periodically store backup files in an off-site location. Backup files at the region offices and the transportation service centers are important because the data for FieldManager is kept on these servers.

Subsequent to our bringing this matter to management's attention, MDOT began storing LAN backup files off-site, began backing up the Design Division's files, and began using different tapes for daily backups. MDOT informed us that it is considering how to improve security at the region offices.

RECOMMENDATION

We recommend that MDOT expand its backup and file recovery controls.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with this recommendation and informed us that it has complied. MDOT stated that it now has procedures in place to change backup tapes every day and regularly store tapes off-site at all locations. The recommendation was implemented in late summer of 1999.

FINDING

24. Disaster Recovery Plan

MDOT had not developed a comprehensive disaster recovery plan.

MDOT should develop a disaster recovery plan to provide for continued operations in the event of a disaster. The disaster recovery plan should contain an updated and detailed description of all strategies, standards, procedures, schedules, and resources required to complete the disaster recovery process.

MDOT had not:

a. Completed a risk analysis to assess the risk of a prolonged service outage.

b. Conducted tests to ensure that critical applications and data are recoverable in the event of a disaster.

c. Provided a recovery site for critical MDOT applications.

d. Included disaster recovery planning responsibilities in its service level agreement with DMB, Office of Computing and Technology.

Completion of a disaster recovery plan may help MDOT ensure timely resumption of operations and recovery of data in the event of a disaster.

RECOMMENDATION

We recommend that MDOT develop a comprehensive disaster recovery plan.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with this recommendation. MDOT informed us that it developed a contingency plan to ensure continuity of operations for all business functions. The plan outlines activities required in the event of a disaster to maintain operations and coordinate activities with the State Emergency Operations Center. The Year 2000 Zero Hour Master Plan demonstrated that MDOT is able to maintain continuity of operations and is prepared to resume business in the event of a disaster. In addition, DMB is currently working on a disaster recovery plan. MDOT informed us that it is working with DMB to implement a disaster recovery plan that further strengthens its ability to continue operations.

FINDING

25. Retention of Electronic Records

MDOT had not incorporated the retention of electronic records into its record retention and disposal schedule.

MDOT's record retention schedule should include electronic mail (e-mail). According to Section 750.491 of the *Michigan Compiled Laws*, all official books, papers, or records created, received, or stored by a State agency are the property of the State of Michigan. E-mail messages that are made or received by a State employee in connection with the transaction of public business are public records. MDOT should define the type of e-mail messages that are public records and establish an appropriate retention period. Currently, MDOT retains all e-mail for approximately four months. MDOT should determine and implement an appropriate retention time for electronic records.

RECOMMENDATION

We recommend that MDOT incorporate the retention of electronic records into its record retention and disposal schedule.

AGENCY PRELIMINARY RESPONSE

MDOT agreed with this recommendation. MDOT informed us that it sets record retention and disposal schedules in consultation with the DMB Records Management Division.

Glossary of Acronyms and Terms

AASHTO	American Association of State Highway and Transportation Officials.
BMS	Bridge Management System. One of the six TMS systems.
CES	Construction Estimate System.
CIO	chief information officer.
client-server	An architecture in which one computer can get information from another. The client is the computer that asks for access to data, software, or services. The server, which can be anything from a personal computer to a mainframe, supplies the requested data or services for the client.
CMS	Congestion Management System. One of the six TMS systems.
CRIS	Crash Reporting Information System.
DMB	Department of Management and Budget.
effectiveness	Program success in achieving mission and goals.
efficiency	Achieving the most outputs and outcomes practical for the amount of resources applied or minimizing the amount of resources required to attain a certain level of outputs or outcomes.
FHWA	Federal Highway Administration.

FieldManager	FieldManager is a construction management system used to manage and track road and bridge construction projects for more than 1,000 users in Michigan.
financial related audit	An audit that includes determining whether (1) financial information is presented in accordance with established or stated criteria, (2) the entity has adhered to specific financial compliance requirements, or (3) the entity's internal control over financial reporting and/or safeguarding assets is suitably designed and implemented to achieve the control objectives.
FMIS	Fiscal Management Information System.
FOS	Financial Obligation System.
GIS	geographic information system.
IMS	Intermodal Management System. One of the six TMS systems.
internal control	The management control environment, management information system, and control policies and procedures established by management to provide reasonable assurance that goals are met; that resources are used in compliance with laws and regulations; and that valid and reliable performance related information is obtained and reported.
ISTEA	Intermodal Surface Transportation Efficiency Act of 1991.
IT	information technology.
JEC	joint evaluation committee.

local area network (LAN)	A series of interconnected computers, printers, and other computer equipment that share hardware and software resources. The service area is usually limited to a given floor, office area, or building.
MAP	MDOT Architecture Project.
material condition	A serious reportable condition which could impair the ability of management to operate a program in an effective and efficient manner and/or could adversely affect the opinion of an interested person concerning the effectiveness and efficiency of the program.
MDOT	Michigan Department of Transportation.
MFOS	MAP Financial Obligation System.
mission	The agency's main purpose or the reason the agency was established.
OCA	Office of Commission Audits.
OIM	Office of Information Management.
performance audit	An economy and efficiency audit or a program audit that is designed to provide an independent assessment of the performance of a governmental entity, program, activity, or function to improve public accountability and to facilitate decision making by parties responsible for overseeing or initiating corrective action.
PINS	Project Information System.
PMS	Pavement Management System. One of the six TMS systems.

PTMS	Public Transportation Management System. One of the six TMS systems.
QA	quality assurance.
reportable condition	A matter coming to the auditor's attention that, in the auditor's judgment, should be communicated because it represents either an opportunity for improvement or a significant deficiency in the design or operation of the internal control or in management's ability to operate a program in an effective and efficient manner.
RQFS	Road Quality Forecasting System.
Safestat	Safestat is an automated system that will provide the Traffic and Safety Division with a system for recording and tracking incoming requests for studies and/or projects to improve the safety and operation of Michigan roads.
SMS	Safety Management System. One of the six TMS systems.
STIP	State Transportation Improvement Program.
TMS	Transportation Management System.
Trns*port	A system made up of several modules used to manage a construction project from the design phase to completion.