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**TRANSPORTATION  
ENGINEERING PROJECT  
MANAGEMENT: SURVEY OF  
PRACTICE**

**Prepared For:**

Utah Department of Transportation  
Research Division

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16. Abstract  Utah Department of Transportation (UDOT) project managers (PMs) have identified inefficiencies in the legacy system electronic Program Management (ePM) used to manage consultant contracts and invoices. To help UDOT prepare for potential system improvements, this research examines other agencies' use of similar systems and gathers information about a limited set of other project management practices employed by state departments of transportation (DOTs).  The major tasks of this research included a two-part survey of state DOTs to gather information about the automated systems used to manage consultant contracts and invoices, and about selected project management practices. A second survey of selected state and federal agency contacts focused solely on automated systems for contract and invoice management. A literature search supplemented survey findings.  Responding agencies have found success with a range of commercial and in-house tools and practices to manage contracts and process invoices, and they are generally satisfied with their processes and systems. The survey identified few common project management practices, but did gather details about agencies' current practices for assigning responsibilities to PMs, design managers and resident engineers during the design and construction phases of a project; using design project schedules; estimating cash flow; and training PMs.					
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## TABLE OF CONTENTS

LIST OF TABLES .....	vi
LIST OF ACRONYMS .....	vii
EXECUTIVE SUMMARY .....	1
1.0 INTRODUCTION .....	3
1.1 Problem Statement.....	3
1.2 Objectives .....	3
1.3 Outline of Report .....	4
2.0 CONSULTANT CONTRACT AND INVOICE MANAGEMENT SYSTEMS .....	5
2.1 Overview.....	5
2.2 Case Studies: Combined Contract Management and Invoice Processing Systems .....	6
2.2.1 Colorado DOT (SAP Modules) .....	6
2.2.2 Massachusetts DOT (Project Info).....	9
2.2.3 Minnesota DOT (Contracts Agreements Auditing Tracking System).....	11
2.2.4 Montana DOT (Consultant Information System) .....	15
2.2.5 North Carolina DOT (SAP Enterprise Resource Planning).....	17
2.2.6 North Dakota DOT (Contract Management Software).....	19
2.3 Case Studies: Contract Management Systems.....	21
2.3.1 Kentucky Transportation Cabinet (SharePoint Professional Services Contract Application) .....	21
2.3.2 Utah Department of Administrative Services (Total Contract Manager) .....	23
2.4 Case Studies: Invoice Processing Systems .....	26
2.4.1 Florida DOT (Consultant Invoice Transmittal System).....	26
2.4.2 Georgia DOT (Consultant Management Information System).....	29
2.5 System Upgrades or New Systems in Process.....	30
2.5.1 Ohio DOT (OAKS).....	31
2.5.2 South Carolina DOT (Project Programming System) .....	32
2.5.3 New Jersey DOT (Unnamed SAAS System).....	33
2.5.4 Other System Development Plans.....	34

3.0 PROJECT MANAGEMENT PRACTICES .....	37
3.1 Overview .....	37
3.2 Project Manager Roles and Responsibilities .....	37
3.2.1 Single or Multiple Project Managers .....	37
3.2.2 Roles During Design .....	38
3.2.3 Roles During Construction .....	40
3.2.4 Other Agencies' Use of Project Managers .....	41
3.2.5 Related Resources .....	42
3.3 Design Project Schedules .....	45
3.3.1 Related Resources .....	46
3.4 Estimating Cash Flow .....	47
3.4.1 Related Resource .....	48
3.5 Project Manager Certification .....	48
3.6 Project Manager Training .....	50
3.6.1 Types of Training .....	50
3.6.2 Training Hours .....	51
3.6.3 Training Programs .....	51
3.6.4 Training Program Successes .....	53
3.6.5 Related Resources .....	53
4.0 CONCLUSIONS .....	57
4.1 Summary .....	57
4.2 Findings .....	57
4.2.1 Contract Management and Invoice Processing Systems .....	57
4.2.2 System Description .....	58
4.2.3 System Training .....	59
4.2.4 System Assessment .....	60
4.2.5 System Development Plans .....	61
4.2.6 Project Manager Roles and Responsibilities .....	62
4.2.7 Design Project Schedules .....	62
4.2.8 Estimating Cash Flow .....	62
4.2.9 Project Manager Certification .....	62

4.2.10 Project Manager Training .....	63
4.3 Limitations and Challenges .....	63
APPENDIX A: SURVEY QUESTIONS.....	65
APPENDIX B: CONTACT INFORMATION .....	70
APPENDIX C: FLORIDA DOT: Cash Forecasting Overview .....	72
APPENDIX D: COLORADO DOT: PMAP Update.....	81

## LIST OF TABLES

Table 2.1 SAP Rating (Colorado DOT).....	8
Table 2.2 Project Info Rating (Massachusetts DOT).....	10
Table 2.3 Contracts Agreements Auditing Tracking System Rating (Minnesota DOT).....	13
Table 2.4 Consultant Information System Rating (Montana DOT) .....	16
Table 2.5 SAP Enterprise Resource Planning Rating (North Carolina DOT).....	18
Table 2.6 Combined Management System Overview (North Dakota DOT).....	19
Table 2.7 Contract Management Software Rating (North Dakota DOT).....	20
Table 2.8 Contract Management System Overview (KYTC).....	21
Table 2.9 SharePoint Professional Services Contract Application Rating (KYTC).....	23
Table 2.10 Contract Management System Overview (Utah DAS).....	23
Table 2.11 Total Contract Manager Rating (Utah DAS).....	25
Table 2.12 Invoice Processing System Overview (Florida DOT) .....	26
Table 2.13 Consultant Invoice Transmittal System Rating (Florida DOT).....	28
Table 3.1 Project Manager and Design Manager Roles During Design.....	38
Table 3.2 Project Manager and Resident Engineer Roles During Construction.....	40
Table 3.3 Systems Used for Design Project Schedules .....	45
Table 3.4 Practices to Estimate Cash Flow.....	47
Table 3.5 Project Manager Certification and Other Requirements.....	48
Table 3.6 Types of Training.....	50
Table 3.7 Annual PM Training Hours .....	51
Table 4.1 Summary of Respondents' Management Systems.....	57

## **LIST OF ACRONYMS**

AASHTO	American Association of State and Highway Transportation Officials
CAATS	Contracts Agreements Auditing Tracking System
CIS	Consultant Information System
CITS	Consultant Invoice Transmittal System
CMIS	Consultant Management Information System
CMS	Contract Management Software
DAS	Department of Administrative Services
DOT	department of transportation
DPS	director of Professional Services
ECC	Enterprise Resource Planning (ERP) Central Component
ePM	electronic Program Management
ERP	enterprise resource planning
FHWA	Federal Highway Administration
KYTC	Kentucky Transportation Cabinet
MMRS	Massachusetts Management and Accounting System
OAKS	Ohio Administrative Knowledge System
P2S	Project Programming System
PE	professional engineer
PM	project manager
PMAP	Project Management Advancement Program
PMI	Project Management Institute
PMP	Project Management Professional
PMRS	Project Management and Reporting System
PO	purchase order
PPMS	Program and Project Management System
PS&E	plans, specifications and estimates
RE	resident engineer
SAAS	software as a service
SAFe	Scope and Fee System
SRM	Supplier Relationship Management



SWIFT	Statewide Integrated Financial Tools
TCC	Transportation Core Curriculum
TETP	Transportation Engineering Training Program
UDOT	Utah Department of Transportation

## **EXECUTIVE SUMMARY**

Utah Department of Transportation (UDOT) project managers (PMs) use a legacy system called electronic Program Management (ePM) to manage consultant contracts and invoices. PMs have identified inefficiencies in system processing, which they hope to address when modifying or replacing ePM. To help prepare for potential system improvements, UDOT initiated this project to learn from the experiences of other government agencies using similar systems. UDOT is also interested in other effective project management practices used by state departments of transportation (DOTs).

Information for this project was gathered through a literature search and two surveys:

- A two-part survey of state DOTs gathered information about a) automated management systems, and b) selected project management practices (PM roles and responsibilities, design project schedules, and PM certification and training).
- A second survey of selected non-DOT state and federal agencies focused solely on automated systems for contract and invoice management.

More than half of the 28 respondents to the two surveys on automated systems for contract and invoice management either support a current system to manage contracts and invoices or are preparing to upgrade or implement one. Most agencies use a single system or an integrated process that employs multiple systems to manage contracts and invoices. Many of the systems are either relatively new or in development at the time this report was published. Most are custom systems developed in-house or with a vendor. Six other agencies reported plans to upgrade existing systems or develop new ones.

The training provided to prepare new system users varied widely, with some agencies dedicating considerably more time and resources than others. Notable training practices include using a commercial online tool to develop training materials, assigning a PM to conduct training before and after implementation, and providing a support team on-site when the system goes live. All respondents reported successes with their systems, most often citing the benefits of system integration and increases in efficiency.

Most respondents to the survey questions related to project management practices use a single PM for the typical project. If multiple PMs are used, the transition often occurs between

design and construction. Survey responses did not identify a standard practice for distinguishing between the roles of PM, design manager and resident engineer during the design and construction phases of a project.

All respondents use design project schedules, though some agencies apply them on a limited basis. Oracle Primavera is the most commonly used scheduling system among respondents. Almost all respondents have found that design project schedules improve project delivery. Survey responses did not reveal a standard practice to estimate cash flow. Several agencies use an unspecified budgeting process, while others use a risk-based cost estimate or reporting. One of the more detailed practices identified by respondents is an in-house cash forecast system that applies a multistep process to generate expenditure projections.

Only one respondent requires some form of certification for its PMs. Two agencies either offer or are preparing programs for PMs to obtain an internal voluntary certification; another agency provides support for PMs wishing to obtain the Project Management Professional certification provided by the Project Management Institute. All but one respondent provides training for PMs. In-house training tends to be more common than external training, though both are offered by most respondents. The number of training hours provided annually ranged widely, though most agencies offer at least 15 training hours per year. Most respondents reported benefits associated with training their PMs, citing enhancements in the knowledge base of PMs and improved project management.

### ***Summary***

Responding agencies have found success with a range of commercial and in-house tools and practices to manage contracts and process invoices, and are generally satisfied with their systems and processes. Project management practices also differ among respondents, and the scope of this project did not permit an in-depth examination of the benefits and drawbacks of each practice. Follow-up contacts to selected state DOTs participating in this project's surveys could gather additional information of interest to UDOT as it considers enhancements to its automated management of contracts and invoices and other project management practices.

## **1.0 INTRODUCTION**

### **1.1 Problem Statement**

Utah Department of Transportation (UDOT) project managers (PMs) use a legacy system called electronic Program Management (ePM) to manage consultant contracts and invoices. They have identified inefficiencies in system processing, which they hope to address when modifying or replacing ePM. To help prepare for potential system improvements, UDOT is seeking information from other state departments of transportation (DOTs) and from other governmental agencies conducting engineering-related activities about the automated systems and processes used to manage consultant contracts and invoicing.

UDOT is also interested in effective practices used by state DOTs in other areas of project management, such as project delivery, to enhance the effectiveness of UDOT's 26 PMs. For UDOT, project delivery includes the activities associated with project scoping, environmental review, planning, design and estimating that occur before advertising a transportation project for construction. UDOT's PMs also manage the scope, schedule and budget during the construction phase of a project in cooperation with the resident engineer (RE).

### **1.2 Objectives**

This research examined other agencies' use of automated systems to manage contracts and invoices, and analyzed a limited set of project management practices related to project delivery. Information on these topics was gathered through a literature search and two surveys—one survey of state DOTs about the automated systems used to manage consultant contracts and invoices and selected project management practices (PM roles and responsibilities, design project schedules, and PM certification and training), and a second survey of state government procurement officers and selected state and federal agency contacts that focused solely on automated systems for contract and invoice management.

### **1.3 Outline of Report**

This report is organized in the following sections:

- Section 2, Consultant Contract and Invoice Management Systems, describes the automated systems used by survey respondents to manage consultant contracts and process invoices. Ten case studies highlight the range of system experiences shared by state agency respondents. This section also includes related resources identified during the literature search.
- Section 3, Project Management Practices, synthesizes survey results related to project management practices and provides additional related resources.
- Section 4, Conclusions, compiles and summarizes results from the two surveys and the literature search, highlighting common themes and critical findings.

## **2.0 CONSULTANT CONTRACT AND INVOICE MANAGEMENT SYSTEMS**

### **2.1 Overview**

This section presents findings from the two surveys that gathered information about the automated systems used to manage consultant contracts and process invoices. Findings from the surveys are augmented by results of a literature search. [Appendix A](#) provides the full text of the survey questions. Contact information for individuals providing information for this report is included in [Appendix B](#).

Survey recipients included state DOT members of the American Association of State and Highway Transportation Officials (AASHTO) Subcommittee on Design, state government procurement officers, and selected state and federal agency contacts thought to have experience with automated systems that manage contracts and invoices for engineering-related projects. Twenty-eight agencies provided complete responses to the questions related to contract and invoice management systems. Ten of these agencies currently support contract and invoice management systems:

- Colorado DOT
- Florida DOT
- Georgia DOT
- Kentucky Transportation Cabinet (KYTC)
- Massachusetts DOT
- Minnesota DOT
- Montana DOT
- North Carolina DOT
- North Dakota DOT
- Utah Department of Administrative Services

Seven agencies reported plans to upgrade a current system or implement a new one to manage consultant contracts and process invoices:

- Arkansas State Highway and Transportation Department
- California DOT

- Nevada DOT
- New Jersey DOT
- Ohio DOT
- South Carolina DOT
- Wisconsin DOT

Case studies of the systems currently in use are presented below, followed by a summary of agency plans to upgrade existing systems or develop new ones. The case studies are organized in three categories:

- Combined contract management and invoice processing systems
- Contract management systems
- Invoice processing systems

The level of detail in each case study varies depending on the depth and breadth of survey responses and the publicly available information about the systems.

## **2.2 Case Studies: Combined Contract Management and Invoice Processing Systems**

Below are brief case studies for six state DOTs using interrelated contract management and invoice processing systems or a single system to manage both processes:

- Colorado
- Massachusetts
- Minnesota
- Montana
- North Carolina
- North Dakota

### 2.2.1 Colorado DOT (SAP Modules)

Colorado DOT uses a commercial product—SAP—to manage consultant contracts and process invoices. SAP ERP Central Component (ECC) includes modules used to create and manage contracts and other modules used for financial and records management. SAP ECC was

launched in 2006 over a 14-month period. The procurement-specific module used to manage contracts, SAP Supplier Relationship Management (SRM), was rolled out in phases over more than two years, and fully implemented in 2014. Costs specific to the procurement and invoicing modules cannot be segregated from overall SAP system costs.

#### *2.2.1.1 System Description*

Colorado DOT uses SAP's Document Builder module to create and approve contracts; SAP SRM is used to manage purchase orders (POs) and contracts. The SAP ECC financial module processes invoices.

The process starts with end users submitting a Shopping Cart, which is converted to either a PO or contract. The agency has characterized its new procurement process as providing an "Amazon.com-like experience." When the PO or contract receives final approval, receiving documents and invoices are processed through the SAP financial module. Invoices are processed in two steps: One user in a business office enters and parks, or holds, an invoice; a second user—a supervisor—posts the invoices to the financial module in SAP.

While invoices for the design portion of a project are fully processed within SAP, construction-related invoices require the use of AASHTOWare Project SiteManager, a construction management tool. Colorado DOT staff track the percentage completion of each construction project in SiteManager, which generates billings based on amounts already paid to a consultant and a project's current percent of completion. SiteManager-generated billings are migrated to SAP for invoice processing.

SAP modules are fully integrated and include, in addition to SRM and Document Builder, SAP Project Systems (project management system); SAP Finance and Controlling (financial management system); and SAP Records Management (document management system).

#### *2.2.1.2 Training*

The agency uses ANCILE uPerform, a training tool that creates, manages and distributes software learning content, to generate course materials, work instructions and class presentations. Work instructions provide step-by-step procedures, including screen shots and a description of



when each procedure should be used. Initial training took the form of in-classroom instruction, online courses and distribution of work instructions. The agency recommends on-site training and on-site preparation for a new system, including a support team available on-site to address questions as the system goes live.

*2.2.1.3 System Assessment*

System integration is one of the primary benefits of the SAP modules. The agency can process contracts, POs and most of the corresponding invoices in a single integrated system; data and reports are also available within a single system. While the system is not as user-friendly as it could be, it has been effective. Ongoing training and support are vital to the success of the system, as is effective communication.

Table 2.1 presents the respondent’s ratings of system features and functions. None received a rating lower than 3 (satisfied).

**Table 2.1 SAP Rating (Colorado DOT)**

<b><u>System Features</u></b>	<b><u>System Functions</u></b>
Ease of use = 4	Opportunity for collaboration = N/A
Flexibility = 4	Comprehensive project tracking = 3
Reliability = 4	Project communication = 3
Effectiveness = 4	Scheduling tasks/generating system alerts = 4
Good value = 3	Data import/export = 4
System upgrades = 3	Reporting = 4
Vendor support = 3	Data analysis = 3
	Integration with other systems/databases = 3
	Management of historical data = 4
<b>Overall satisfaction with the system = 4</b>	
<i>Rating Scale: 1 (not at all satisfied) to 5 (extremely satisfied)</i>	

#### 2.2.1.4 Related Resources

**“CDOT Contracting Improvement Initiative Reduces Contracting Time by 19%, Implementing ‘Amazon.com-like’ Experience,”** Business Center, Colorado Department of Transportation, August 31, 2015.

<https://www.codot.gov/business/process-improvement/lean-case-studies/cdot-contracting-improvement>

This Web page summarizes Colorado DOT’s Contracting Improvement Initiative, which began in 2010 to improve the agency’s contracting and procurement processes.

**SAP ERP**, SAP, undated.

<http://www.sap.com/product/enterprise-management/erp.html>

This Web page describes SAP product offerings, training and support.

**AASHTOWare Project SiteManager**, AASHTO, undated.

<http://www.aashtoware.org/Project/Pages/SiteManager.aspx?PID=19>

This tool is used by Colorado DOT to manage construction-related invoices.

**uPerform**, ANCILE, 2016.

<http://www.ancile.com/products/uperform/overview/>

*From the website:* ANCILE uPerform performance support features delivers high-quality software learning content to employees right when they need it most—on-the-job and within the application. It allows subject matter experts to quickly create, edit, and publish procedures, simulations, and eLearning courses, and then instantly distribute that content to the entire workforce via the web.

#### 2.2.2 Massachusetts DOT (Project Info)

Massachusetts DOT launched Project Info in 2006 to track contracts and invoices. Implementation of this customized system developed specifically for the agency took approximately one year; on-the-job training prepared new users. The agency uses a second statewide system, Massachusetts Management and Accounting System (MMRS), to issue payments.

### 2.2.2.1 System Description

Management of open-ended, assignment-based contracts begins when the director of the responsible section receives a request for assignment. The director approves the request, and the PM requests the scope and work hours from the consultant. The PM negotiates, reviews and approves the scope and work hour estimate, and the contract manager (not always the PM) issues the Notice to Proceed. Project Info is updated to reflect the assignment number, a six-digit project file number (unique for each project), and the amount of each assignment.

Invoices are received by an accounting staff member, who logs the invoice in Project Info upon receipt. The invoice is forwarded to the PM, who signs off on payment. An accounting staff member enters the amount paid in Project Info and sends the invoice to a fiscal staff member, who enters the invoice amount into MMRS to complete the payment process.

### 2.2.2.2 System Assessment

The multistep process required to determine how much has been spent on a particular assignment in a task order contract has proved to be challenging, but overall, the respondent is satisfied with Project Info. Table 2.2 presents the respondent's ratings of system features and functions.

**Table 2.2 Project Info Rating (Massachusetts DOT)**

<b><u>System Features</u></b>	<b><u>System Functions</u></b>
Ease of use = 4	Opportunity for collaboration = 3
Flexibility = 4	Comprehensive project tracking = 3
Reliability = 4	Project communication = 3
Effectiveness = 4	Scheduling tasks/generating system alerts = 3
Good value = 4	Data import/export = 2
System upgrades = 4	Reporting = 2
Vendor support = 4	Data analysis = 3
	Integration with other systems/databases = 3
	Management of historical data = 3
<b>Overall satisfaction with the system = 3</b>	
<i>Rating Scale: 1 (not at all satisfied) to 5 (extremely satisfied)</i>	

### 2.2.2.3 *Related Resource*

**Payment Invoice Processing Procedures for Design Services**, Massachusetts Highway Department, The Commonwealth of Massachusetts, January 2014.

<http://www.massdot.state.ma.us/Portals/8/docs/projectManagement/invoiceProcedures.pdf>

This document describes the manual processes associated with processing an invoice.

### 2.2.3 Minnesota DOT (Contracts Agreements Auditing Tracking System)

Launched in February 2015 after an 18-month development period, Contracts Agreements Auditing Tracking System (CAATS) is a contract management application developed by Minnesota DOT to record, track and report on the 3,000 to 4,000 contracts the agency administers each year. The agency's workflow to approve invoices has been in use since 2012. In 2016, the agency began using the same workflow to route contracts and associated documents for signature. The contract workflow continues to be refined, and currently not all contracts are processed electronically.

Minnesota DOT uses CAATS in conjunction with eDOCS, a document management system provided by OpenText Corporation. SWIFT (Statewide Integrated Financial Tools), a statewide PeopleSoft-based financial, procurement and reporting system implemented in 2012, is used to make the actual payments.

#### *2.2.3.1 System Description*

A May 2016 newsletter article (see Related Resources below for this citation) describes CAATS' development and some of the system's features:

The CAATS project is the beginning of a long-term, strategic approach to how MnDOT manages contracts and contract data. The initial release of the CAATS application, in February 2015, automated the assignment of contract numbers, replacing a manual process. The CAATS 3.0.0 production release provides the framework to manage data on all contracts. It provides full functionality to track all professional/technical contracts throughout their entire life cycle from posting an RFP, encumbering funds, obtaining contract signatures, paying invoices and tracking amendments, through final closeout and final audit.

The CAATS 3.0.0 production release replaces the functionality formerly provided by four separate systems—the Contract Management Application, the External Audit Tracking System, the Consultant Agreements Reporting and Tracking Application and the Metro Contracts Application. CAATS will be the MnDOT system of record for contracts, agreements and associated documents throughout the life cycle of the contract, with the exception of highway construction contracts administered by the Office of Construction & Innovative Contracting.

CAATS is user-friendly, and the agency has found that minimal training is required to prepare new users. A modern browser is recommended to optimize the user experience.

#### *Workflow for Contracts*

Various workflows were built to process contracting documents. The process begins when a staff member saves the contract document in eDOCS. A profile is created that includes criteria such as the dollar value or the type of work being performed, which will trigger appropriate routing of the document for signature.

Once the profile is complete, the staff member distributes the document to the appropriate signers. As the document progresses through the workflow process, approval dates are populated in CAATS, which provides real-time data on a contract during the signature process. When the last required signature is obtained, an email trigger generates a notice to the staff member initiating the workflow to advise that the document is fully signed. (Adobe Acrobat is used as the signing tool.) The contract document is stored in eDOCS and is automatically updated with each signature as it occurs. With the final signature, the document in eDOCS is tagged as the final version of the contract.

#### *Workflow for Invoices*

All invoices are received electronically and housed in a Microsoft Outlook mailbox. To initiate the workflow process, a staff member opens the invoice and associated documents, saves them in eDOCS and creates a profile. The system generates an email that is sent to the PM, who accesses an eDOCS worklist to view the invoice and approve or contest it. Once the invoice is approved, an email is sent to the contract administrator, who goes into the worklist to approve or contest the payment, or add comments. All dates and comments are reflected in the CAATS

database in real time. Once approvals are obtained, a task is created in the worklist for the individual responsible for making payment. This is the last step in the workflow, and the actual payment is made in SWIFT. SWIFT payment data appears in CAATS.

*2.2.3.2 System Assessment*

The respondent noted that “invoice processing is a huge success. We are far ahead of other agencies. We are still working on the contracting piece.” Internal analysis indicates a “huge savings” by transitioning to electronic invoice processing.

The May 2016 MnDOT Newline article (see Related Resources below) authored by the CAATS project champion highlighted these benefits of CAATS:

- Reduces redundant data in multiple legacy systems.
- Interfaces with SWIFT data through the Minnesota DOT warehouse.
- Automates a number of workflow processes, including contract certification forms, contract signatures and invoice approvals.
- Includes the ability to track real-time approval dates using electronic signatures.
- Allows easy access to all contract-related documents stored in eDOCS, accessible via one contract management application.
- Provides confidence that contracts comply with legal obligations and are managed and reported from a single source accurately and consistently.

Minnesota DOT gave CAATS some of the highest ratings of any system examined for this project. Table 2.3 presents the respondent’s ratings of system features and functions.

**Table 2.3 Contracts Agreements Auditing Tracking System Rating (Minnesota DOT)**

<b><u>System Features</u></b>	<b><u>System Functions</u></b>
Ease of use = 5	Opportunity for collaboration = 5
Flexibility = 5	Comprehensive project tracking = 5
Reliability = 5	Project communication = N/A
Effectiveness = 5	Scheduling tasks/generating system alerts = N/A
Good value = 4	Data import/export = 5
System upgrades = 4	Reporting = 4
Vendor support = 5	Data analysis = 5
	Integration with other systems/databases = 5

<b><u>System Features</u></b>	<b><u>System Functions</u></b>
	Management of historical data = 5
<b>Overall satisfaction with the system = 5</b>	
<i>Rating Scale: 1 (not at all satisfied) to 5 (extremely satisfied)</i>	

### 2.2.3.3 Future Plans

Phase II will wrap up in June 2017 as the CAATS project team leverages the functionality and framework developed in Phase I for nonprofessional technical Minnesota DOT contracts.

### 2.2.3.4 Related Resources

**“Contract Management Application Achieves Major Production Milestone,”** Betsy Parker, *MnDOT Newslines*, May 25, 2016.

<http://www.newslines.dot.state.mn.us/archive/16/May/25.html> (Click on the hyperlinked article title at the top of the page.)

This newsletter article describes the impetus for developing CAATS and addresses system functionality and benefits.

**OpenText eDOCS**, OpenText Corporation, 2016.

<http://www.opentext.com/what-we-do/products/specialty-technologies/edocs-information-management>

Minnesota DOT uses eDOCS to organize and store documents. The agency’s workflow for managing contracts and invoices begins with eDOCS and continues with CAATS.

**Welcome to the SWIFT Project**, Minnesota Management and Budget, State of Minnesota, undated.

<http://www.swift.state.mn.us/home>

SWIFT incorporates administrative functions across state agencies, including financial, procurement, reporting and human resources/payroll, and is used by Minnesota DOT to make the actual payments.

#### 2.2.4 Montana DOT (Consultant Information System)

Montana DOT developed the Consultant Information System (CIS) in-house to manage the selection of consultants, support the administration of consultant contracts and process invoices. In 2012, after a two-year implementation, CIS was in wide use within the agency.

##### *2.2.4.1 System Description*

As the June 2016 Consultant Services Manual (see Related Resources below) indicates, CIS “provides a central, automated source for the Consultant Design Bureau to facilitate its responsibilities to monitor and manage the work performed by Consultant firms.” Among the system’s features is the ability to segregate data into multiple formats (e.g., by consultant or project type) to allow for meaningful comparisons.

CIS integrates with Program and Project Management System (PPMS), the agency’s primary tool for managing federal aid programs and projects. The Contract Tracking System, administered by the state’s Administration Division, tracks actual contract expenditures against all department contracts.

When a consultant enters into a contract with Montana DOT, the PM enters the contract data in CIS. PMs are also responsible for reviewing invoices upon receipt and entering them in CIS. CIS checks each invoice against the contract ceiling, overhead rate and subconsultant payments. An agency financial officer updates CIS when payment is made. CIS automatically generates email notifications if an invoice is not paid within a specified time frame.

##### *2.2.4.2 Training*

The agency provided one to two days of training when the system was implemented. Day-to-day use continues to reveal tips and tricks that staff members share informally.

##### *2.2.4.3 System Assessment*

The respondent noted that CIS serves as a “good analysis tool for consultant workload,” but highlighted its inability to integrate with other systems. Table 2.4 presents the respondent’s ratings of system features and functions.



**Table 2.4 Consultant Information System Rating (Montana DOT)**

<u>System Features</u>	<u>System Functions</u>
Ease of use = 4	Opportunity for collaboration = 3
Flexibility = 3	Comprehensive project tracking = N/A
Reliability = 5	Project communication = N/A
Effectiveness = 4	Scheduling tasks/generating system alerts = 4
Good value = 4	Data import/export = 1
System upgrades = 2	Reporting = 5
Vendor support = 4	Data analysis = 5
	Integration with other systems/databases = 2
	Management of historical data = 5
<b>Overall satisfaction with the system = 4</b>	
<i>Rating Scale: 1 (not at all satisfied) to 5 (extremely satisfied)</i>	

Recent publications indicate that the agency is considering a replacement for CIS. A 2014 information technology plan includes a proposed project, Contract Tracking and Monitoring. A goal of this project, estimated to cost \$2 million, is to retire two systems developed in-house—the Purchasing Section’s Contract Tracking System and the Consultant Design Bureau’s CIS. A 2016 strategic plan indicates that interest in replacing CIS continues, citing concerns about duplicate data entry and potential reconciliation issues. See Related Resources below for citations for these publications.

*2.2.4.4 Related Resources*

**Consultant Services Manual**, Montana Department of Transportation, June 2016.

[http://www.mdt.mt.gov/other/webdata/external/cdb/consultant\\_manual/consultant-design-manual\\_combined.pdf](http://www.mdt.mt.gov/other/webdata/external/cdb/consultant_manual/consultant-design-manual_combined.pdf)

Information about CIS appears throughout this document. A brief summary of the system begins on page 55 of the PDF.

**Agency IT Plan for 2014**, Montana Department of Transportation, 2014.

<https://sitsd.mt.gov/Portals/77/docs/IT%20Plans/Agencies%20IT%20Plans/2014%20plans/Transportation%20Dept%20IT%20Plan%202014.pdf>

This Montana DOT plan for information technology is for the period July 2014 through June 2019. See page 19 for a description of the proposed Contract Tracking and Monitoring project.

**Strategic Enterprise Architecture Design and Implementation Plan; Current Situation Analysis Interim Report**, Montana Department of Transportation, May 2016.

[https://www.mdt.mt.gov/other/webdata/external/research/DOCS/RESEARCH\\_PROJ/IT\\_ARCH/TASK\\_3.PDF](https://www.mdt.mt.gov/other/webdata/external/research/DOCS/RESEARCH_PROJ/IT_ARCH/TASK_3.PDF)

Page 55 of the report (page 61 of the PDF) includes a recommendation to “[i]mplement an enterprise-wide contract management system as part of the proposed ERP [enterprise resource planning] project or as a separate initiative.”

#### 2.2.5 North Carolina DOT (SAP Enterprise Resource Planning)

North Carolina DOT implemented SAP Enterprise Resource Planning (ERP) in 2002 to manage purchasing, payroll and project management. Training is ongoing with an emphasis on specific areas such as time entry, purchase orders and invoicing. The SAP modules provide users with online tutorials and other “how-to” information.

##### *2.2.5.1 System Description*

After a project has been scoped with a private engineering firm, the agency develops man-day estimates using a standardized task list. This information is used to determine a lump sum contract amount, and the executed contract information is entered in SAP. Time charges and costs are tracked through the life of the project. Consulting firms submit invoices, usually monthly, and invoice information is reviewed and entered into SAP for payment. Multiple levels of review and approval are executed before payments are authorized.

##### *2.2.5.2 System Assessment*

SAP provides a uniform system for the department to track and manage contract and project information. The system makes it easy to locate historical contract and invoice

information, but the volume of information available in the system can sometimes be overwhelming.

Table 2.5 presents the respondent’s ratings of system features and functions. Flexibility, reliability, effectiveness and comprehensive project tracking received the highest ratings.

**Table 2.5 SAP Enterprise Resource Planning Rating (North Carolina DOT)**

<u>System Features</u>	<u>System Functions</u>
Ease of use = 3	Opportunity for collaboration = 3
Flexibility = 4	Comprehensive project tracking = 4
Reliability = 4	Project communication = 3
Effectiveness = 4	Scheduling tasks/generating system alerts = 3
Good value = N/A	Data import/export = 3
System upgrades = 3	Reporting = 3
Vendor support = N/A	Data analysis = 3
	Integration with other systems/databases = 3
	Management of historical data = 3
<b>Overall satisfaction with the system = 3</b>	
<i>Rating Scale: 1 (not at all satisfied) to 5 (extremely satisfied)</i>	

### 2.2.5.3 Related Resources

**Contract Administration—Entering Contracts in SAP**, Transportation Planning Branch, North Carolina Department of Transportation, April 2012.

[https://connect.ncdot.gov/projects/planning/TransPlanManuals/Entering\\_Contracts\\_SAP.pdf](https://connect.ncdot.gov/projects/planning/TransPlanManuals/Entering_Contracts_SAP.pdf)

This procedure describes the process for setting up a contract in SAP.

**Process Consultant/Agency Invoices**, Transportation Planning Branch, North Carolina Department of Transportation, January 2008.

[https://connect.ncdot.gov/projects/planning/TransPlanManuals/Process\\_Consultant\\_Agency\\_Invoices.pdf](https://connect.ncdot.gov/projects/planning/TransPlanManuals/Process_Consultant_Agency_Invoices.pdf)

This procedure describes the actions required to process invoices from private engineering firms and public agencies.

## 2.2.6 North Dakota DOT (Contract Management Software)

Table 2.6 provides an overview of the custom system used by North Dakota DOT to manage the contract life cycle and process invoices.

**Table 2.6 Combined Management System Overview (North Dakota DOT)**

<b>System Name:</b>	<b>Contract Management Software</b>
<b>System Type:</b>	Enterprise software developed for the agency by Softech & Associates
<b>When Implemented:</b>	2010
<b>Time to Implement:</b>	One year
<b>Implementation Cost:</b>	\$300,000
<b>Ongoing Maintenance Costs:</b>	\$30,000

### 2.2.6.1 System Description

Contract Management Software (CMS) users can create standard form contracts, risk management appendices and cover memos within the application; nonstandard form contracts are generated outside of CMS. Users can also manage any supporting documents within the application. All contract documents are electronically housed in a FileNet repository for easy access.

Contracts are submitted electronically for review and approval. The document is routed among responsible divisions (construction, design and local government), allowing staff to access work items through private inboxes and shared work queues. Users create *Contract Payable Setups* and *Payment Requests* for active contracts, and submit them for approval and processing. Each request can have its own supporting documents and audit history captured by CMS. The system also allows contract managers to keep track of contract milestones and assign tasks to staff members overseeing completion of milestones. Users can also close or terminate a contract, activating record retention schedules for associated documents.

All invoicing activities are processed through CMS. Consultant invoices are submitted through CMS and forwarded to each responsible division for processing. The system's *Contract & Payment Information* tab includes fields that are filled automatically from the contract

record—previous billed amount, current invoice amount, previous billed profit (prime) and previous retainage.

*2.2.6.2 Training*

Staff members from each division received eight hours of hands-on training before system implementation. Post-implementation training is provided only when the system is updated.

*2.2.6.3 System Assessment*

CMS is a comprehensive system that can be modified as needed. The system tracks, reports and files all contracts and invoices. While there are occasional system glitches, the vendor has responded quickly with solutions. As the respondent noted, CMS has “greatly improved” the agency’s processing practices, reducing a three- to four-day contract processing period to approximately 10 minutes. Invoices can be easily tracked, and every contract dollar can be accounted for quickly.

CMS does not schedule tasks or generate system alerts, and does not integrate with other systems or databases. Even with those limitations, the respondent is extremely satisfied with the system, and provided the highest ratings of system features and functions of any respondent.

Table 2.7 presents the respondent’s ratings.

**Table 2.7 Contract Management Software Rating (North Dakota DOT)**

<b><u>System Features</u></b>	<b><u>System Functions</u></b>
Ease of use = 5	Opportunity for collaboration = 5
Flexibility = 5	Comprehensive project tracking = 5
Reliability = 5	Project communication = 5
Effectiveness = 5	Scheduling tasks/generating system alerts = N/A
Good value = 5	Data import/export = 5
System upgrades = 5	Reporting = 5
Vendor support = 5	Data analysis = 4
	Integration with other systems/databases = N/A
	Management of historical data = 5
<b>Overall satisfaction with the system = 5</b>	
<i>Rating Scale: 1 (not at all satisfied) to 5 (extremely satisfied)</i>	

#### 2.2.6.4 Related Resources

**Consultant Administration Services Procedure Manual**, North Dakota Department of Transportation, July 2015.

<http://www.fmmetrocog.org/new/assets/documents/Policies/Procedure%20manual.pdf>

See Appendix J, Contract Management System, which begins on page 73 of the PDF, for a brief description of CMS.

**FileNet Content Manager**, IBM, undated.

<http://www-03.ibm.com/software/products/en/filecontmana>

This website describes the document management system North Dakota DOT uses in conjunction with CMS.

### 2.3 Case Studies: Contract Management Systems

The case studies below describe a customized version of SharePoint used by Kentucky Transportation Cabinet (KYTC) to manage its contracts, and the recent implementation of the SciQuest contract management system by Utah Department of Administrative Services (DAS).

#### 2.3.1 Kentucky Transportation Cabinet (SharePoint Professional Services Contract Application)

Table 2.8 provides an overview of the custom system used by KYTC to manage agency contracts.

**Table 2.8 Contract Management System Overview (KYTC)**

<b>System Name:</b>	<b>SharePoint Professional Services Contract Application</b>
<b>System Type:</b>	Customized Web-based software developed for the agency
<b>When Implemented:</b>	2014
<b>Time to Implement:</b>	One to two years
<b>Implementation Cost:</b>	\$400,000
<b>Ongoing Maintenance Costs:</b>	Minimal

### *2.3.1.1 System Description*

KYTC uses a custom-developed Professional Services Contract application in SharePoint to manage its contract workflow; delivery of contracts is external to the system. The Professional Services Contract application allows users to centrally manage a database that includes advertisements, projects, contracts, production hour estimates and an associated project schedule timeline. Users can create a contract and manage its details, including a contract's associated projects, procurement schedule and associated documents. The application's Similar Negotiated Projects Tool is an Excel spreadsheet preloaded with previously negotiated production hours used to quickly search for and compare previously negotiated projects.

Among the workflows employed in managing contracts is this one for contract document approval:

- The director of Professional Services (DPS) is assigned an approval task.
- The DPS will be notified via email that a contract awaits approval. Within the notification email, the DPS will be provided a link to review the contract; a second link is provided to approve the contract.
- Once approved, the system will conclude the approval process.
- The contract administrator and Professional Services team receive regular email alerts about the contract's approval progress. Email alerts are generated when the contract is approved by the DPS.

SharePoint integrates with the agency's Oracle preconstruction software and eMARS, a statewide financial management system used to process all state government agency invoices. The consultant submits pay estimates to the district's PM, who sends them to the central office for processing through eMARS. SharePoint is also used as a document management system. Five to six half-day training seminars prepared the agency's 200-plus PMs to use the new system.

### *2.3.1.2 System Assessment*

The SharePoint system has saved time and allowed for more effective collaboration. Training for some of the less technologically inclined users who rarely use the system has proved challenging. Table 2.9 presents the respondent's ratings of system features and functions.

**Table 2.9 SharePoint Professional Services Contract Application Rating (KYTC)**

<u>System Features</u>	<u>System Functions</u>
Ease of use = 3	Opportunity for collaboration = 5
Flexibility = 3	Comprehensive project tracking = 5
Reliability = 3	Project communication = 4
Effectiveness = 4	Scheduling tasks/generating system alerts = 4
Good value = 3	Data import/export = 4
System upgrades = 2	Reporting = 4
Vendor support = 4	Data analysis = 3
	Integration with other systems/databases = 2
	Management of historical data = 3
<b>Overall satisfaction with the system = 3</b>	
<i>Rating Scale: 1 (not at all satisfied) to 5 (extremely satisfied)</i>	

*2.3.1.3 Related Resource*

**TC 40-408 Pay Estimate Instructions**, Kentucky Transportation Cabinet, undated.

<http://transportation.ky.gov/Professional-Services/Forms/TC%2040-408%20Pay%20Estimate%20Instructions.pdf>

This document provides instructions for preparing and processing final payments in eMARS, the statewide system used to process invoices.

2.3.2 Utah Department of Administrative Services (Total Contract Manager)

Table 2.10 provides an overview of Total Contract Manager, the contract management system currently being implemented by Utah DAS.

**Table 2.10 Contract Management System Overview (Utah DAS)**

<b>System Name:</b>	<b>SciQuest Total Contract Manager</b>
<b>System Type:</b>	Commercial software as a service (SAAS)
<b>When Implemented:</b>	Implementation in process
<b>Time to Implement:</b>	30 days to configure the system; anticipate 90 days to implement.



<b>System Name:</b>	<b>SciQuest Total Contract Manager</b>
<b>Implementation Costs:</b>	Licensing: \$265,119 (five-year contract) Additional implementation costs include \$57,445 for professional services support with an IBM consultant, and \$104,002 for professional services support through SciQuest.
<b>Ongoing Maintenance Costs:</b>	No ongoing maintenance costs with a product SAAS other than the licensing fee identified above. An internal PM guided implementation and will provide ongoing system management (expected to require 10 percent of the PM's time).

### 2.3.2.1 System Description

The State of Utah recently transitioned its online bidding service to SciQuest. In conjunction with that transition, the suite of SciQuest products purchased by the state was rolled out in waves, with Total Contract Manager included in the final wave of implementation. The initial configuration was completed early this year; the department is just beginning to use the Total Contract Manager module.

The contract management process begins with a solicitation created through the SciQuest Sourcing Director module. Once awarded, the solicitation is transitioned to the Total Contract Manager module.

### 2.3.2.2 Training

Training is conducted by an internal PM in collaboration with the SciQuest administrative team and includes classroom sessions, desktop guides and staff use of a vendor-provided training system. Two hours of training are required to prepare a new user. Training will continue after initial implementation, estimated at 30 minutes per week per user.

### 2.3.2.3 System Assessment

The department expects Total Contract Manager to increase efficiency, allowing a purchasing agent to automate most tasks and enter contract information only once. The system provides automatic notification of contract review and expiration, which will help in planning for

future solicitations. The system requires less printing of paper documents and allows for more streamlined communications with agencies and vendors.

When asked about system challenges, the respondent noted that the system provides a basic search function, and sometimes it can be difficult to locate a contract. Migration of existing contracts required data not already in the system, which delayed the data import process.

Though the system has been in use for a very short time, the respondent expressed a high level of satisfaction when asked to rate its features and functions. Table 2.11 presents the respondent’s ratings.

**Table 2.11 Total Contract Manager Rating (Utah DAS)**

<b><u>System Features</u></b>	<b><u>System Functions</u></b>
Ease of use = 4	Opportunity for collaboration = N/A
Flexibility = 5	Comprehensive project tracking = 4
Reliability = 4	Project communication = 3
Effectiveness = N/A	Scheduling tasks/generating system alerts = 5
Good value = 4	Data import/export = 5
System upgrades = N/A	Reporting = 4
Vendor support = N/A	Data analysis = 3
	Integration with other systems/databases = 3
	Management of historical data = 4
<b>Overall satisfaction with the system = 4</b>	
<i>Rating Scale: 1 (not at all satisfied) to 5 (extremely satisfied)</i>	

*2.3.2.4 Related Resource*

**Total Contract Manager: Contract Management Software**, SciQuest, 2016.

<https://www.sciquest.com/solutions/total-contract-manager-contract-management-software>

This vendor website highlights features and benefits of Total Contract Manager:

- Streamline contract management through better collaboration from authoring to approval, and improve compliance by storing all contracts in a single central repository.

- Minimize authoring times with dynamic contract generation and a library of standard template[s] for full contracts, clauses and individual obligations.
- Eliminate risk of errors and missed obligations with a single point of information about all contract terms and conditions.
- Get real-time updates through Contract Performance, Compliance and Expiration dashboards.

## 2.4 Case Studies: Invoice Processing Systems

The case studies below highlight custom invoice processing systems maintained by Florida DOT and Georgia DOT.

### 2.4.1 Florida DOT (Consultant Invoice Transmittal System)

Table 2.12 provides an overview of Florida DOT’s invoice processing system.

**Table 2.12 Invoice Processing System Overview (Florida DOT)**

<b>System Name:</b>	<b>Consultant Invoice Transmittal System</b>
<b>System Type:</b>	Customized system developed by the agency
<b>When Implemented:</b>	July 2002 (statewide rollout)
<b>Time to Implement:</b>	Four years
<b>Implementation Cost:</b>	\$2 million
<b>Ongoing Maintenance Costs:</b>	\$80,000

#### 2.4.1.1 System Description

A recently published user guide describes the Consultant Invoice Transmittal System (CITS) as a “Web-enabled electronic system designed to automate the method of generation, submittal and review of Professional Services contracts and consultant invoices via the Intranet.” The system has more than 2,000 total users; more than 600 firms have access to the system as external users. The workflow is as follows:

- Contract documents are entered by the agency’s Professional Services staff following negotiations with the consultant.

- Financial Services staff members review contracts to ensure accuracy.
- The consultant enters and submits the invoice in CITS and submits all supporting documentation to project management staff in the preferred format.
- Project management staff reviews and approves or rejects invoices for payment, ensuring the work effort is complete.
- Financial Services staff audits and approves or rejects invoices for payment.

CITS includes details about consultant contracts, invoices to review, invoices in progress and rejected invoices. System functions available for both internal and external users include these for consultants:

- Clicking on the “Invoices to Review” link allows the prime consultant to review a subconsultant’s invoice.
- Using the “Invoices in Progress” link gives the consultant access to invoices that have not been submitted to Florida DOT.
- Viewing items accessible through the “Rejected Invoices” link gives the consultant access to rejected invoices that can be corrected and resubmitted.

Consultants receiving payment through CITS can receive a paper check or direct deposit.

CITS interfaces with all in-house customized systems, including financial management systems such as Contract Funds Management System, Florida Accounting Information Resource and Electronic Estimates Delivery.

#### *2.4.1.2 Training*

The agency coordinated extensive training over a six-month period before system implementation and continues to provide training as needed. Training includes in-person, hands-on training and PowerPoint presentations. More information about training appears in Related Resources below.

#### *2.4.1.3 System Assessment*

CITS eliminated pre-audits and most post-audits on invoices, and reduced the time required to process a consultant invoice payment from 45 days to one week. Training and

legislative changes have proved challenging for the agency’s continued use of the system. Table 2.13 presents the respondent’s ratings of system features and functions. While the overall system rating is high, CITS offers fewer features and functions than other systems examined for this project.

**Table 2.13 Consultant Invoice Transmittal System Rating (Florida DOT)**

<b><u>System Features</u></b>	<b><u>System Functions</u></b>
Ease of use = 4	Opportunity for collaboration = N/A
Flexibility = 4	Comprehensive project tracking = N/A
Reliability = 5	Project communication = N/A
Effectiveness = 5	Scheduling tasks/generating system alerts = N/A
Good value = 4	Data import/export = 2
System upgrades = 4	Reporting = 3
Vendor support = N/A	Data analysis = 3
	Integration with other systems/databases = 4
	Management of historical data = 3
<b>Overall satisfaction with the system = 4</b>	
<i>Rating Scale: 1 (not at all satisfied) to 5 (extremely satisfied)</i>	

#### 2.4.1.4 Related Resources

**Consultant Invoice Transmittal System**, Florida Department of Transportation, 2016.

[http://www.fdot.gov/procurement/Welcome\\_to\\_CITS.shtm](http://www.fdot.gov/procurement/Welcome_to_CITS.shtm)

This website provides links to training and documents related to CITS.

**Consultant Invoice Transmittal System (CITS)**, Florida Department of Transportation, August 2016.

[http://www.fdot.gov/procurement/CITS\\_Training/cits.pdf](http://www.fdot.gov/procurement/CITS_Training/cits.pdf)

This training manual, with screen shots, provides information about completing all elements of the consultant invoice process, including how to take corrective action to ensure efficient processing of invoice and contract data.

**Consultant Invoice Transmittal System (CITS): Project Manager Overview**, Florida Department of Transportation, undated.

[http://www.fdot.gov/procurement/CITS\\_Training/CITS\\_Project\\_Management\\_Training.ppt](http://www.fdot.gov/procurement/CITS_Training/CITS_Project_Management_Training.ppt)

This 57-slide presentation provides screen shots and instructions for PMs about:

- The purpose and role of the CITS application
- Proper invoice processing
- Relationship of CITS to consultant contracting
- Abilities and limitations of CITS in project management.

#### 2.4.2 Georgia DOT (Consultant Management Information System)

##### *2.4.2.1 System Description*

Implemented more than six years ago, Georgia DOT's Consultant Management Information System (CMIS) provides a secure Web interface for vendors to enter invoice information and supporting documentation. This commercial product customized for agency use allows for vendor and agency coordination of invoicing via the Web, with most conventional invoices reviewed and approved electronically through CMIS. CMIS interfaces with other major Georgia DOT systems (accounts payable, PeopleSoft and others) so information in the system is accurate and up to date. The agency uses a PowerPoint presentation in a seminar setting to prepare new CMIS users.

##### *2.4.2.2 System Assessment*

CMIS removed the need for paper copies, reduced the administrative burden on agency staff, and resulted in time savings for staff and consultants. The respondent noted that it can be challenging to approve and prepare consultants for system use and ensure that internal staff is prepared to use the system.

The respondent rated a series of system features and functions on a scale of 1 (not at all satisfied) to 5 (extremely satisfied). Most factors received a rating of 3 (satisfied) or were not applicable to the system. The respondent did not provide an overall system rating.

### 2.4.2.3 *Related Resources*

**Welcome to CMIS: Consultant Management Information System**, Georgia Department of Transportation, undated.

[http://www.dot.ga.gov/PartnerSmart/Business/Documents/ConsultantResources/CMIS\\_External\\_Manual.pdf](http://www.dot.ga.gov/PartnerSmart/Business/Documents/ConsultantResources/CMIS_External_Manual.pdf)

This user manual for external consultants describes how vendors can submit invoices and supporting documentation to Georgia DOT.

**Professional Services Consultant Invoices**, Interdepartment Correspondence, Georgia Department of Transportation, March 2014.

<http://www.dot.ga.gov/PartnerSmart/Business/Documents/ConsultantResources/Professional%20Services%20Consultant%20Invoices%20Memo.pdf>

This memorandum describes an internal review of consultant invoices. The memo indicates that the agency will no longer require supporting documentation with consultant invoices other than what is required in CMIS.

**CMIS Invoicing Frequently Asked Questions**, Georgia Department of Transportation, undated.

<http://www.dot.ga.gov/PartnerSmart/Business/Documents/ConsultantResources/CMISInvoicingFAQs.pdf>

This FAQ addresses questions often posed by consultants when submitting invoices via CMIS.

## **2.5 System Upgrades or New Systems in Process**

Three agencies are upgrading existing systems or developing new ones. Ohio DOT is upgrading an existing system to more efficiently manage contracts and invoices, while South Carolina DOT is enhancing a commercially developed system to include consultant contract information. New Jersey DOT is designing a new contract management and invoice processing system using a commercial SAAS product.

## 2.5.1 Ohio DOT (OAKS)

### *2.5.1.1 Current System*

Ohio DOT is developing an automated invoice and approval process as part of a larger system upgrade of its existing Ohio Administrative Knowledge System (OAKS) enterprise system. OAKS is a PeopleSoft application suite that includes finance, human capital management, enterprise performance management, enterprise learning management and customer relationship management modules. OAKS deployment was completed in July 2008.

The agency currently uses a combination of systems and tools to provide Consultant Services functionality:

- *Consultant Service System/Consultant Evaluation System*. This is the primary system supporting consultant evaluation and selection.
- *Scope and Fee System (SAFe)*. This custom system supports consultant scope and fee document preparation.
- *Ellis*. This system contains traditional capital project information.
- *Excel workbooks*. Used offline, these workbooks perform complicated calculations to support consultant project billing and reconciliation activities.

The new Consultant Services system for capital program delivery is expected to replace existing manual and semiautomated methods for managing consultants and will ensure integration with existing systems. A June 2015 design document contains more information about the changes the new system is expected to bring (see Related Resource below).

### *2.5.1.2 System Upgrade*

IBM, the vendor selected to complete the system upgrade, has determined that several enhancements to SAFe are required along with further integration with other elements of the new Consultant Services system. Ellis will also remain in use and be integrated with the new accounting/finance and Consultant Services systems. The Excel workbooks that currently automate a series of calculations do not integrate with SAFe or the accounting system. The upgraded system will include full online functionality for these calculations and ensure integration with the new Consultant Services and financial systems.



### 2.5.1.3 *Related Resource*

**OAKSenterprise Supplement 1: ODOT Statement of Work; Migration to OAKS with Enhanced Functionality**, State of Ohio Departments of Transportation and Administrative Services, June 2015.

[https://procure.ohio.gov/ProcOppForm/0A1158\\_Supplement%201%20ODOT%20Migration.pdf](https://procure.ohio.gov/ProcOppForm/0A1158_Supplement%201%20ODOT%20Migration.pdf)

See page 290 of this document for a description of Ohio DOT's current Consultant Services environment followed by details of the changes associated with the system upgrade.

## 2.5.2 South Carolina DOT (Project Programming System)

### 2.5.2.1 *Current System*

South Carolina DOT uses a commercial project management database—Project Programming System (P2S), developed by PMG Software Professionals—to house project-related information that includes detailed funding data. The agency is working with the P2S vendor on a system upgrade that will include consultant contract information.

### 2.5.2.2 *System Upgrade*

The main focus of the current effort is the transition from multiple Access and Excel databases to a single integrated system. The agency plans to eventually automate processes such as the request to solicit, development of the scope and man-hour estimate, and consultant evaluation. The agency is in the preliminary stages of scoping the tasks to be included in the upgrade. Once tasks have been identified and approved, the agency expects the upgrade to be completed in approximately nine to 12 months.

With the upgrade, the agency is aiming to capture the following information for all basic, modification, task order, work order and small purchase contracts:

- Solicitation phase (search, view and edit solicitation information, including vendor responses).
- Proposal phase (search, view and edit proposal information, including capturing the record of negotiations and subcontractor information).

- Contracts phase (search, view and edit contract information, including related construction projects, contract and modification information, and payment approvals with subcontractor payout).

The upgrade will also provide standard reports for the agency's Professional Services staff.

#### *2.5.2.3 Preparing for Implementation*

Most of the new edit functionality will be made available only to the Professional Services staff, which is a fairly small group. Staff will be heavily involved in all aspects of design and will have an opportunity to test the system before delivery and implementation. All other internal users will be notified with a brief summary of enhancements when the new functionality is in place. The agency offers training three to four times each year that covers the entire system; any new functionality will be addressed in future training sessions.

#### *2.5.2.4 Related Resource*

**Project Programming System (P2S): Leading the Way in Project Programming**, PMG Software Professionals, 2014.

[http://www.pmgpro.com/project\\_programming.html](http://www.pmgpro.com/project_programming.html)

This vendor website describes the P2S product.

### 2.5.3 New Jersey DOT (Unnamed SAAS System)

#### *2.5.3.1 New Contract Management and Invoice Processing System*

New Jersey DOT designed a new contract and invoice management system using e-Builder, a SAAS cloud-based construction management solution. The agency used many elements of e-Builder "out of the box," but customized the system to enhance the business application. At the time this report was published, the new system was being beta-tested and expected to be in full-scale use within a few months. Over the next few months, key processes and the cost module will be activated and enhanced. Discovery and design of an invoicing component that meets agency needs will begin soon.

The new system will be integrated with the agency's Project Management and Reporting System (PMRS). Other products that are not directly associated with the initial e-Builder implementation but are part of PMRS include Bluebeam Revu, a product used to create, edit and mark up PDF files, and a digital signature program. User guidance in development includes a "how-to" cheat sheet and quick-reference guide.

#### 2.5.3.2 *Related Resource*

**e-Builder Enterprise**, e-Builder, 2016.

<https://www.e-builder.net/products/ebuilder-enterprise>

*From the website's FAQ:* e-Builder is the leading provider of fully integrated, cloud-based construction program management software with an owner-centric focus. ... e-Builder's Web Service API and Integration Tools make it possible for leading ERP, accounting, GIS, project management and other in-house systems to share data with e-Builder Enterprise without extensive customization. ... The average implementation is between 90-120 days for e-Builder Enterprise.

#### 2.5.4 Other System Development Plans

Three agencies are in the early stages of system development or just beginning the testing phase; a fourth expects automation to take some time:

- Arkansas State Highway and Transportation Department is preparing to use an electronic invoicing system under development in-house; Doc Express is being tested for management of consultant contracts and correspondence.
- The California DOT respondent noted that the agency is "working on different elements of automation for the consultant contracts and invoicing but does not possess a system right now to manage both. The process of automation will take years."
- Nevada DOT is upgrading its in-house system to process internal electronic invoice approvals, generate a payment voucher, accept approvals of the payment voucher, and communicate with the financial system to make payment to the consultant.
- Wisconsin DOT is switching to an e-contracting solution using Aurigo Masterworks to address both contracting and invoicing.

#### 2.5.4.1 Related Resources

**Doc Express**, Info Tech, Inc., 2016.

[https://www.infotechfl.com/doc\\_express](https://www.infotechfl.com/doc_express)

Arkansas State Highway and Transportation Department is testing Doc Express as a contract management solution. *From the vendor's website:*

**What it is:**

A paperless contracting system that creates a secure, digital filing cabinet for the documents exchanged during a construction project and allows for digital and electronic signatures.

**What it does:**

Allows users to access, exchange and digitally sign electronic contract documents (material certs, test results and more) with project stakeholders and business partners.  
Provides a project archive.

**Aurigo Masterworks**, Aurigo Software Technologies Inc., 2016.

<https://www.aurigo.com/>

Aurigo provides capital program and project portfolio management software. The Web articles cited below describe two recent Aurigo Masterworks contracts to handle the consultant contracting process from creation to closeout (Wisconsin DOT) and support construction management (Utah DOT).

**“WisDOT Contracts to Go Paperless Using Aurigo Masterworks Capital Program Management System Over the Cloud,”** *News Detail*, Aurigo Software Technologies Inc., 2016.

[http://www.aurigo.com/knowledge-centre/news/news-detail/?news\\_id=75](http://www.aurigo.com/knowledge-centre/news/news-detail/?news_id=75)

*From the article:* [Wisconsin DOT's] BPD [Bureau of Project Development] currently uses a paper-intensive process that will be automated by Aurigo Masterworks. Delivered over the cloud and integrated with WisDOT's existing programs, including financial management system Oracle PeopleSoft and CARS [Contract Administration Reporting System, an in-house system], Aurigo Masterworks will streamline contract solicitation,

selection, development, execution, and tracking, in addition to the reporting mandated by the Federal Highway Administration.

**“Utah DOT Selects Aurigo Masterworks Capital Program and Project Management Software in Multi-Year Deal to Upgrade Its Entire Legacy Construction Management System,”** *News Detail*, Aurigo Software Technologies Inc., 2016.

[http://www.aurigo.com/knowledge-centre/news/news-detail/?news\\_id=67](http://www.aurigo.com/knowledge-centre/news/news-detail/?news_id=67)

*From the article:* Aurigo Software is pleased to announce that the Utah Department of Transportation (Utah DOT) has selected Aurigo Masterworks as its new Construction Project Controls software that will be deployed over the cloud.

As per a notification by the State of Utah, Aurigo Masterworks will replace all of their legacy programs for construction management. Utah DOT also stated that it has identified six major areas of expected improvements by using Masterworks and projects annual savings of between \$9.5 to \$19 million. In the demonstration phase of a detailed evaluation, Aurigo Software scored significantly more (on all counts) than other competitors, FACS [Field Automated Communication Systems, a provider of cloud-based construction management software] & e-Builder were ranked a distant second & third, respectively.

## **3.0 PROJECT MANAGEMENT PRACTICES**

### **3.1 Overview**

This section presents findings from the portion of the survey that gathered information about project management practices from members of the AASHTO Subcommittee on Design. Fifteen state DOTs responded to this portion of the survey:

- Arkansas
- California
- Colorado
- Florida
- Georgia
- Idaho
- Kentucky
- Massachusetts
- Minnesota
- New Hampshire
- New Jersey
- North Carolina
- North Dakota
- Ohio
- Wisconsin

The survey gathered information in three topic areas: PM roles and responsibilities, design project schedules, and PM certification and training. Survey responses varied in their level of detail, and some respondents did not respond to all questions. The full text of the survey questions appears in [Appendix A](#).

### **3.2 Project Manager Roles and Responsibilities**

#### **3.2.1 Single or Multiple Project Managers**

Most respondents use a single PM for the typical project. Only four states reported using multiple PMs throughout the project development cycle:

- **Colorado.** While at times a PM will continue with a project into construction, most often the designer/PM hands the project off to a construction PM.
- **Florida.** Generally, different PMs are used for different phases (project development and environment, design and construction).
- **Minnesota.** Once the project is awarded and moves into construction, the design PM becomes an advisor and the construction PM becomes the project's PM.
- **Wisconsin.** One PM manages a project from planning to design; a second PM manages the project from design to construction.

### 3.2.2 Roles During Design

The survey asked respondents to describe the roles of the PM and design manager/lead during the design phase of a project. Most respondents described a specific—and varied—set of responsibilities for each role. While most PMs are focused on management tasks, design managers may be responsible for producing project deliverables or provide oversight for the PM. Table 3.1 describes these roles for each respondent.

**Table 3.1 Project Manager and Design Manager Roles During Design**

State	Project Manager Role	Design Manager/Lead Role
<b>Arkansas</b>	Serves as the point of contact for the consultant.	Not described
<b>California</b>	Monitors and supports the budget, updates the risk register and monitors the project schedule.	Ensures the on-time delivery of the plans, specifications and estimate (PS&E).
<b>Colorado</b>	<p>(Region environmental staff manages a project from inception to beginning of formal design.)</p> <ul style="list-style-type: none"> <li>Prepares the project plan; maintains the scope, schedule and budget of the design, and cost estimate for construction.</li> </ul> <p>(Planning staff prepares a cost estimate at project inception for projects with a categorical exclusion.)</p> <ul style="list-style-type: none"> <li>Acts as contract manager for consultant designs.</li> </ul>	<ul style="list-style-type: none"> <li>In most cases for internally designed projects, the same staff person serves as roadway designer and PM.</li> <li>The agency is beginning to more deliberately distinguish between the PM and roadway designer.</li> </ul>
<b>Florida</b>	Involved in scope development, staff hour negotiations, phase reviews (quality assurance), consultant management, monitoring the scope, schedule and budget, risk management and more.	Not described
<b>Georgia</b>	<ul style="list-style-type: none"> <li>Drives the schedule, monitors the budget and focuses on the scope.</li> <li>Obtains deliverables from design leads according to the schedule and plans the development process.</li> </ul>	Meets deliverable dates for specific milestones and activities.
<b>Idaho</b>	<ul style="list-style-type: none"> <li>Can be designers or environmental planners who hire, manage and process invoices for consultants during design.</li> <li>Often have additional workload in project development.</li> </ul>	Works with in-house staff to train, mentor and coach on project development.

State	Project Manager Role	Design Manager/Lead Role
<b>Kentucky</b>	Responsible for every detail of project scope, schedule and budget through every phase.	Not described
<b>Massachusetts</b>	<ul style="list-style-type: none"> <li>• Distributes 25%, 75% and 100% PS&amp;E for review.</li> <li>• Coordinates with various review sections and the designer to advance the design.</li> <li>• Conducts design public hearings and public information meetings.</li> <li>• Updates Project Info (project management database) with cost information, submittal dates and any issues.</li> </ul>	<ul style="list-style-type: none"> <li>• Produces 25%, 75% and 100% PS&amp;E deliverables.</li> <li>• Works with the Highway Division’s PM to advance the design.</li> <li>• Produces any required reports (e.g., design exception, functional design, geotechnical, hydraulics).</li> <li>• Addresses all comments and participates in comment resolution meetings.</li> <li>• Produces meeting materials and participates in the design public hearing and public information meetings.</li> </ul>
<b>Minnesota</b>	<ul style="list-style-type: none"> <li>• No common description of PM roles and responsibilities.</li> <li>• Respondent identifies role as being responsible for everything that impacts the scope, schedule and budget; most agency PMs would not concur.</li> </ul>	Provides valuable input into the project.
<b>New Hampshire</b>	<ul style="list-style-type: none"> <li>• Manages the scope, budget and schedule through the design phase.</li> <li>• Provides oversight of environmental requirements, public outreach and coordination with other federal and state agencies.</li> </ul>	<ul style="list-style-type: none"> <li>• Assists the PM in design and oversight.</li> <li>• Manages programs and projects to include guardrail safety, culvert replacement and paving.</li> </ul>
<b>New Jersey</b>	Manages all aspects of a project’s design, including overseeing the designer, design scope, schedule, cost, risks and quality.	Oversees and assists the PM.
<b>North Carolina</b>	<ul style="list-style-type: none"> <li>• Responsible for scoping, man-day estimates, plan reviews, budgets, schedules and coordination with internal and external customers.</li> <li>• Oversees large group of projects and is the direct supervisor of the design manager, who oversees a subset of projects and a small group of design engineers.</li> </ul>	<ul style="list-style-type: none"> <li>• Responsible for scoping information, man-day estimates, plan reviews and schedules.</li> <li>• Works closely with private engineering firms on project-specific tasks.</li> </ul>
<b>Ohio</b>	Responsible for project delivery to the point of contract sale, including direction to consultants, schedule, communication with stakeholders and scheduling internal resources.	Various office administrators at both district and central offices coordinate with PMs to schedule resources needed for review of deliverables, coordination with resource agencies, permits, etc.



State	Project Manager Role	Design Manager/Lead Role
Wisconsin	Manages the scope, schedule and budget of the project and ensures quality of the design.	Designs the project and coordinates the scope, schedule and budget information with the PM.

### 3.2.3 Roles During Construction

For some respondents, PMs take on more of an advisory role during the construction phase of a project, while other agencies' PMs retain the same level of responsibility throughout design and construction. Table 3.2 describes the roles of respondents' PMs and resident engineers (REs) during the construction phase of a project.

**Table 3.2 Project Manager and Resident Engineer Roles During Construction**

State	Project Manager Role	Resident Engineer Role
Arkansas	Not described	Monitors completion of work according to standard specifications and any project- or site-specific special provisions.
California	Monitors budget and project schedule; updates risk register.	Ensures contract compliance and adherence to the PS&E.
Colorado	Available for questions related to the design.	<ul style="list-style-type: none"> <li>• Supports the project engineer (construction PM) on issues that may arise.</li> <li>• Plays a role in resolving disputes and claims, if needed.</li> </ul> (See Related Resources on page 42 for a complete description of the RE role.)
Florida	Initiates consultant's post-design services, addresses requests for information, tracks design errors and omissions, and coordinates with construction PM as needed.	Not described
Georgia	No longer involved in daily activities; consults with RE as needed.	Responsible for daily activities, including payment of contractor; contacts PM on design-related issues.
Massachusetts	Provides information during construction (e.g., extra work orders, design changes).	<ul style="list-style-type: none"> <li>• Ensures contractor follows the PS&amp;E.</li> <li>• Obtains construction schedule; assigns inspectors.</li> <li>• Keeps daily logs of work performed.</li> <li>• Prepares pay estimates.</li> </ul>
Minnesota	Responsible for scope, schedule and budget.	Typically supervises the work of the PM, but on larger, more complicated projects the RE may serve as the PM.

State	Project Manager Role	Resident Engineer Role
<b>New Hampshire</b>	<ul style="list-style-type: none"> <li>Addresses field design issues and budget adjustments through project estimate and assists with final voucher for the project.</li> <li>Encouraged to meet with the field team during construction.</li> </ul>	<ul style="list-style-type: none"> <li>Retains full oversight of project construction, invoice approvals and product acceptance, contract adjustments, municipal involvement, and utility relocation and coordination.</li> <li>Coordinates plan interpretation and excess spending assessment.</li> </ul>
<b>New Jersey</b>	Retains responsibility for the project, assisted by the construction team.	Oversees construction; field manager oversees and assists the RE.
<b>North Carolina</b>	<ul style="list-style-type: none"> <li>Ensures construction revisions are processed in a timely manner.</li> <li>Investigates and provides solutions to design-related questions.</li> </ul>	Oversees the construction of projects; contacts PM as needed.
<b>Ohio</b>	On call for questions and coordination with design consultants, but no formal role in administration of construction contracts.	Draws on in-house and consultant resources to assist in inspection and other duties.
<b>Wisconsin</b>	Manages the scope, schedule and budget; approves field adjustments.	Ensures the project is built according to specifications, documenting necessary approvals and making field adjustments as needed.

### 3.2.4 Other Agencies' Use of Project Managers

An October 2009 NCHRP Domestic Scan report provided brief descriptions of the PM models used by states not responding to this project's survey. The following excerpts from Chapter 3, Project Management (see page 42 of this report for the citation), describe project management practices in Missouri, Virginia and Washington:

**Missouri**—MoDOT has adopted a project manager model where PMs do not have direct reports but manage teams of individuals gathered based on the project's technical needs. The PMs are mostly located in the district offices and call upon resources from both those offices and centralized headquarters units.

**Virginia**—Virginia's DOT (VDOT) has various types of project managers, and the project management function is decentralized to nine districts. Megaproject PMs (i.e., multibillion dollar projects with statewide significance, such as Woodrow Wilson Bridge and Springfield Interchange in Northern Virginia) have dedicated project teams composed of in-house and consultant staff; these PMs have the highest levels of authority and direct access to the Chief

Engineer and the Commissioner. Dedicated PMs are responsible for more complex and higher risk projects while “dual-hatted” PMs are also responsible for the technical discipline duties, manage turn-key, and lower risk projects. Depending on the project complexity and requirements, VDOT employs a “cradle-to-grave” project management approach or defines a handoff from the Preliminary Engineering PM to the Construction PM at award phase. Virginia differentiates project management requirements by the project’s type and size.

**Washington**—WSDOT has used project managers for many years. Even with large projects using general engineering consultants to perform the majority of the work, a state employee oversees those efforts. PMs follow assigned projects through the bidding process, after which they are turned over to a new PM or Resident Engineer. Resources to fill a project’s technical needs are gathered internally and externally to provide the needed expertise. Typically, WSDOT’s project managers are professional engineers.

The scan report also addressed the implications of a centralized versus decentralized approach to project management, noting that “in each case the PM’s authority was clear and recognized by other members of the team and the agency. With authority comes accountability; each of these agencies combined these project attributes in a way that left no questions about who was in charge and responsible for project delivery.”

### 3.2.5 Related Resources

The publications below address the practices of PMs in state DOTs responding to the survey for this project (Colorado and Wisconsin), as well as the practices employed by other agencies that did not respond to the survey (Arizona, Missouri, Virginia and Washington).

#### *3.2.5.1 Multiple States*

**Best Practices in Project Delivery Management: Scan Team Report**, NCHRP Project 20-68A, Scan 07-01, National Cooperative Highway Research Program, October 2009.

[http://onlinepubs.trb.org/onlinepubs/nchrp/docs/nchrp20-68A\\_07-01.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/docs/nchrp20-68A_07-01.pdf)

Excerpts from this domestic scan report, which describes successful project management practices in a variety of transportation agencies, are cited in the previous section of this report.

State DOTs participating in this scan were Arizona, Florida, Missouri, Utah, Virginia and Washington.

### 3.2.5.2 Colorado DOT

**Standard Specifications for Road and Bridge Construction**, Colorado Department of Transportation, 2011.

[https://www.codot.gov/business/designsupport/2011-construction-specifications/2011-Specs/2011-specs-book/2011-Specs-Book.pdf/at\\_download/file](https://www.codot.gov/business/designsupport/2011-construction-specifications/2011-Specs/2011-specs-book/2011-Specs-Book.pdf/at_download/file)

Page 3 of the specifications (page 13 of the PDF) includes this description of responsibilities for a Colorado DOT RE:

**101.10 CDOT Resident Engineer.** The Resident Engineer is directly responsible for the overall administration of assigned construction projects. Unless the CDOT Project Engineer is a Professional Engineer, the Resident Engineer is CDOT's full time engineer in responsible charge of the project. The Resident Engineer will delegate authority to Project Engineers consistent with their experience and abilities. Only a CDOT Resident Engineer can approve and sign vouchers for interim and final Contractor pay estimates. Only a CDOT Resident Engineer can authorize and sign changes to the Contract if the Project Engineer is a Consultant Employee.

A description of a Colorado DOT project engineer's responsibilities appears on page 7 of the specifications (page 17 of the PDF):

**101.51 Project Engineer.** The Chief Engineer's duly authorized representative who may be a CDOT employee or an employee of a consulting engineer (consultant) under contract to CDOT as defined below:

(a) *CDOT Project Engineer.* The CDOT employee, assigned by the Resident Engineer, who is the Chief Engineer's duly authorized representative. The CDOT Project Engineer is in direct charge of the work and is responsible for the administration and satisfactory completion of the project under contract.

(b) *Consultant Project Engineer.* The consultant employee under the responsible charge of the consultant's Professional Engineer who is in direct charge of the work and is responsible for the administration and satisfactory completion of the project.

The Consultant Project Engineer's duties are delegated by the CDOT Resident Engineer in accordance with the scope of work in the consultant's contract with CDOT. The Consultant Project Engineer is not authorized to sign or approve Contract Modification Orders.

### *3.2.5.3 Virginia DOT*

**VDOT Project Management**, VDOT Department Policy Memoranda (DPM) Manual, Virginia Department of Transportation, February 2008.

[http://www.virginiadot.org/business/resources/PM\\_DPM.pdf](http://www.virginiadot.org/business/resources/PM_DPM.pdf)

This document is used in tandem with the policy cited below to define the agency's project management methodology. Roles and responsibilities are described here, with further details available in the policy.

**Project Management Policy**, PMO-Policy-2011-1, Virginia Department of Transportation, July 2011.

[http://www.virginiadot.org/business/resources/VDOT\\_PM\\_Policy.pdf](http://www.virginiadot.org/business/resources/VDOT_PM_Policy.pdf)

The purpose of this policy indicates “[t]he project manager has overall responsibility for guiding the project through the development and delivery process. This policy is intended to bring clarity in establishing responsibility, authority and accountability in the development and delivery of a project.”

### *3.2.5.4 Washington State DOT*

**The WSDOT 5-Step Project Management Process**, Washington State Department of Transportation, undated.

<http://www.wsdot.wa.gov/publications/fulltext/ProjectMgmt/WSDOTProjMgmtProcessMatrix.pdf>

This one-page summary of Washington State DOT's project management process identifies the responsible parties, provides a description of the task or activity and how it impacts those responsible, and describes the outcome or work product of each step in the process.

3.2.5.5 *Wisconsin DOT*

**FDM 2-15-1 Project Integration Management**, Chapter 2, Project Management, Section 15, Project Integration Management, Facilities Development Manual, Wisconsin Department of Transportation, December 2014.

<http://wisconsin.gov/rdwy/fdm/fd-02-15.pdf>

This document describes the roles and responsibilities of participants in Wisconsin DOT’s project management process.

**3.3 Design Project Schedules**

A design project schedule can be used to improve project delivery, and most schedules require the use of some type of software or system. All respondents use these schedules, though some agencies apply them on a limited basis. The most commonly used scheduling system among respondents is Oracle Primavera. All but the Arkansas respondent noted that the use of design project schedules has improved project delivery. Ohio DOT is considering development of a new scheduling tool to supplement the deliverable dates residing in an in-house program. Table 3.3 summarizes survey responses.

**Table 3.3 Systems Used for Design Project Schedules**

Type of System	State	Comment
<b>Excel spreadsheet</b>	Kentucky	N/A
<b>Microsoft Project</b>	Colorado	Only some offices use design phase schedules. Generally, the offices using schedules have better control over delivery. The agency is beginning to leverage this practice across the organization.
	Massachusetts	The agency has identified the need to regularly obtain revised project schedules and recently began requiring monthly updates to project schedules.
	New Hampshire	The agency is implementing internal controls for PMs to manage project schedules.
<b>Oracle Primavera</b>	California, Florida, New Jersey, North Dakota	N/A
	Georgia	N/A

Type of System	State	Comment
	Minnesota	Improved project delivery could be attributed to design schedules or increased attention to on-time delivery.
	Wisconsin	Only large or major projects use Primavera.
<b>Other systems</b>	Arkansas	Multiple programs may be used (Microsoft Project, Oracle Primavera, Microsoft Excel or Word) to detail milestone dates and time between milestones.
	North Carolina	A SAP scheduling tool (STaRS) is used for all projects (see Related Resources below).
	Ohio	The agency is considering development of more elaborate scheduling tools to supplement the basic deliverable dates included in Ellis, an internally developed planning and funding program.
	Wisconsin	An in-house program is used to update schedules for most projects.

### 3.3.1 Related Resources

**Primavera Enterprise Project Portfolio Management**, Oracle, undated.

<https://www.oracle.com/applications/primavera/index.html>

This website provides links to product descriptions and other support materials for the Primavera suite of products.

**Project**, Microsoft, undated.

<https://products.office.com/en-us/project/project-and-portfolio-management-software>

This website describes Microsoft's Project & Portfolio Management, integrated planning tools that aid in project tracking.

**Comprehensive Transportation Asset Management: The North Carolina Experience, Part Two**, Transportation Asset Management Case Studies, Federal Highway Administration, 2006.

<https://www.fhwa.dot.gov/asset/hif12006/hif12006.pdf>

Though somewhat dated, this Federal Highway Administration (FHWA) publication describes the STaRS scheduling tool highlighted by the survey respondent; see page 16 of the document (page 18 of the PDF).

### 3.4 Estimating Cash Flow

Table 3.4 presents the range of practices used by respondents to estimate cash flow. Among these practices are the use of specific budgets and a risk-based cost estimate, and the use of systems or databases developed in-house to track and manage funds.

**Table 3.4 Practices to Estimate Cash Flow**

Practice	State	Description
<b>Budgeting</b>	Colorado	Project a cash spending target, and identify how individual projects roll up to a program of projects.
	Kentucky	Apply a cash flow-based budget for all project phases (design, real estate, utility and construction).
	Wisconsin	Manage the work complete versus expenditures.
<b>Multiple estimates</b>	New Hampshire	Develop individual fiscal year cash flow estimates for projects expected to be designed and/or constructed over multiple years and construction seasons.
<b>Reporting</b>	Massachusetts, North Dakota	N/A
<b>Risk-based cost estimates</b>	Minnesota	Run risk-based cost estimates, often using a Monte Carlo analysis.
<b>Systems or databases</b>	California	Use a database to track allocations and expenditures.
	Florida	Apply a three-step process using an in-house cash forecast system: <ul style="list-style-type: none"> <li>• Apply roll forward rates to determine the net plan or remaining balance.</li> <li>• Apply commitment rates to determine the projected commitment flow.</li> <li>• Apply payout rates to determine the actual expenditure projection of that flow.</li> </ul> (See Related Resource below for more information.)
	New Jersey	Use a mainframe application, Financial Management Information System.
<b>Future plans</b>	Ohio	Budget funds by fiscal year without elaborate cash flow tools. Currently in the discovery phase with vendor to consider adding this functionality to a system upgrade in process.



### 3.4.1 Related Resource

**Cash Forecasting Overview: Disbursement Projections**, Office of Comptroller, Florida Department of Transportation, undated.

See [Appendix C](#).

This brief presentation describes the three-step cash forecasting system developed by Florida DOT. Also addressed are special project flows for projects that have defined payout schedules and do not follow the normal payout structure.

### 3.5 Project Manager Certification

Only Ohio DOT requires some form of certification for its PMs. Most respondents indicated that no special certification is required. In Arkansas, New Hampshire and Wisconsin, PMs must be professional engineers (PEs), and almost all of KYTC's PMs are PEs (approximately 95 percent). Table 3.5 summarizes respondents' certification and other requirements for their PMs.

**Table 3.5 Project Manager Certification and Other Requirements**

State	Professional Engineer	Some Form of Agency Certification	On-the-Job Training No Certification Earned	No Special Certification Required
Arkansas	X			
California				X
Colorado				X
Florida				X
Georgia				X
Kentucky				X
Massachusetts				X
Minnesota				X
New Hampshire	X			

State	Professional Engineer	Some Form of Agency Certification	On-the-Job Training No Certification Earned	No Special Certification Required
New Jersey				X
North Carolina			X	
North Dakota			X	
Ohio		X		
Wisconsin	X			
<b>Total Number of Respondents</b>				
	3	1	2	8

Some respondents offered additional comments about their requirements for PM certification:

- **California.** The agency sponsors a program for PMs to obtain the Project Management Professional (PMP) certification provided by the Project Management Institute (PMI). The agency also maintains a PM certification curriculum.
- **Colorado.** No certifications are required, but every project is overseen by a PE, with a PE responsible for both the design and construction of every project.
- **Georgia.** Most PMs have experience or the knowledge associated with the PMP certification, but the certification is not required.

Ohio DOT—the only respondent to report an internal certification program—requires PMs to complete an internal PM curriculum. In Colorado, development of a voluntary internal PM certification program is in process. The new program will designate staff members as an Apprentice PM, PM I or PM II. These will be working titles, with no official tie to the level of project that a staff member can manage based on their PM designation. See pages 51 and 54 of this report for more information about this certification program.

### 3.6 Project Manager Training

#### 3.6.1 Types of Training

All states but Arkansas provide training for PMs. In-house training is most common, either through in-person classes or multiday courses, seminars and workshops. None of the respondents offer external training that is paid for by staff members. Most respondents offer more than one type of training. Table 3.6 summarizes the types of training provided by respondents.

**Table 3.6 Types of Training**

State	In-House In-Person Classes	In-House Multiday Courses, Seminars, Workshops	Online Courses Developed In-House	External In-Person Classes (paid by agency)	External Multiday Courses, Seminars, Workshops	Online Courses Developed by Third Party
California	X	X	X	X	X	
Colorado	X	X	X	X		X
Florida	X	X	X			
Georgia		X				
Kentucky	X	X	X	X	X	X
Massachusetts	X	X		X	X	X
Minnesota	X			X	X	X
New Hampshire	X	X		X	X	X
New Jersey	X	X	X	X		
North Carolina	X	X	X	X	X	X
North Dakota	X					
Ohio			X			X
Wisconsin	X	X	X			
<b>Total Number of Respondents</b>	11	10	8	8	6	7

### 3.6.2 Training Hours

The range of annual training hours provided to PMs varied widely, though almost all agencies offer at least 15 training hours per year. Transportation agencies in Colorado, Kentucky, Minnesota, New Jersey and Ohio appear to have the most robust PM training programs based on the training hour commitments reported. Table 3.7 summarizes the annual PM training hours provided by respondents.

**Table 3.7 Annual PM Training Hours**

<b>Range of Training Hours Per Year</b>	<b>Actual Annual Training Hours</b>	<b>State</b>
<b>Less than 10</b>	1	North Dakota
	4	California
<b>10 to 25</b>	16	Massachusetts
	Less than 20	New Hampshire
	20	Wisconsin
<b>26 to 50</b>	40	Colorado
	50	Kentucky, Minnesota
<b>More than 50</b>	48 to 64	New Jersey
	~ 80	Ohio
<b>Varies</b>	Varies	Florida, Georgia

### 3.6.3 Training Programs

The Colorado and Florida respondents offered details about their training programs or plans to enhance current training practices. This information along with a brief summary of other agency training programs follows.

#### *3.6.3.1 Colorado DOT*

Colorado DOT's Transportation Engineering Training Program (TETP) develops and delivers PM training to staff in both design and construction. Since the first five-day Transportation Core Curriculum (TCC) class offered in 2006, more than 500 staff members have participated in the TCC course. The Colorado DOT respondent noted that the agency "has one of

the more developed and successful training programs. Historically, we have had a portfolio of courses that supervisors can send their employees to as they see fit. However, we are developing a more deliberate training program where we are putting the classes into career paths based upon position.” A full-time staff member manages and administers the program. An annual budget is available to hire a consultant to update and maintain course materials.

The Project Management Advancement Program (PMAP) is a certification program “designed specifically for CDOT that leverages project management best practices from PMI, FHWA, and most importantly, CDOT.” The program employs on-the-job experience, coursework, mentorship and peer group experiences. The agency’s promotional materials encourage participants to “remember that this is a program and not just a class. Think of PMAP as a career map for project management.”

Colorado DOT’s PM training classes are taught almost exclusively by project delivery staff. As the respondent noted, “this is much more effective than hiring consultants to deliver the training.” (See Related Resources on page 54 of this report for more information about Colorado DOT’s training programs.)

### *3.6.3.2 Florida DOT*

Florida DOT is currently developing a PM training program “to help provide timely training to PMs as they advance in their project management careers.” The program will include a formalized onboarding program, computer-based training, webinars, an in-person multiday Project Management Academy and courses targeted to participant needs.

### *3.6.3.3 Other Agency Training Programs*

Other agencies with training programs include KYTC, which provides collaborative training opportunities for its PMs. In Massachusetts, much of the agency’s training is provided through the Baystate Roads program administered through University of Massachusetts Amherst. New Hampshire DOT has developed in-house training on a variety of topics. Online training through FHWA and National Highway Institute supplements in-house offerings based on recommendations from the agency’s training committee.

### 3.6.4 Training Program Successes

When asked about the positive impacts of their training programs, several agencies reported improved project management:

- **California.** PMs participating in PM certification courses “seem to run better projects with respect to cost and schedule.”
- **Kentucky.** PM training has enhanced understanding of core philosophies and improved the agency’s project delivery success rate.
- **New Jersey.** PMs and assistant PMs are “better prepared to address the project management challenges they face.”
- **Ohio.** The respondent noted that “project management has improved.”
- **Wisconsin.** Training has helped staff members “realize the importance of solid project management and how it can help them achieve a successful project.”

Several agencies indicated that training enhances the knowledge base and skill set of participants, which translates into more effective project management:

- **Massachusetts.** Training has improved knowledge of roadway design elements and enhanced project management skills.
- **Minnesota.** There is a greater awareness of the role of the PM and a common language among individuals inside the agency.
- **New Hampshire.** The agency’s training makes PMs aware of the newest technology and environmental issues and practices.
- **North Carolina.** PM training has improved leadership and management skills.

### 3.6.5 Related Resources

The publications below address the training resources and programs offered by Colorado, Florida, Georgia, Massachusetts and New Jersey DOTs. Also included is information about training at Washington State DOT and the PMP certification offered by PMI.

### 3.6.5.1 Colorado DOT

**Transportation Engineering Training Program**, Colorado Department of Transportation, undated.

<https://www.codot.gov/programs/tetp>

This website offers course descriptions for the agency's training program and links to courses offered by training partners.

**Transportation Engineering Training Program**, *TETP Newsletter*, Colorado Department of Transportation, Volume 1, September 2016.

<https://www.codot.gov/programs/tetp/programs/tetp/documents/2016-17/tetp-newsletter-september-2016.pdf>

This newsletter provides a list of current course offerings for Colorado DOT's TETP.

**Project Management Advancement Program (PMAP) July 2016 Update**, Colorado Department of Transportation, 2016.

See [Appendix D](#).

Included in this update is this summary of the benefits for PMAP participants:

- PMAP training will focus on skills to help PMs anticipate and control project risks as well as more accurately forecast project costs, project milestones and advertisement dates.
- Program participants will be prepared to manage projects in an evolving, enhanced project management culture at CDOT.
- Participants will learn about project management in a framework more closely aligned with the PMI. The coursework will provide background for those seeking a PMP certification.

### 3.6.5.2 Florida DOT

**Project Management Handbook**, Project Management Division, Florida Department of Transportation, March 2016.

<http://www.fdot.gov/designsupport/pmhandbook/1-PMHB-Complete.pdf>

This comprehensive project management handbook is directed to both the inexperienced PM as a “good source of information for training” and to experienced PMs, who can use the handbook as

a resource for up-to-date guidance on policy, procedures and practices associated with project management within the agency.

**Project Managers Tool Box**, Florida Department of Transportation, 2016.

<http://www.fdot.gov/designsupport/ToolBox/default.shtm>

The external tools provided in this tool box to assist Florida DOT PMs include:

- *Project Concept Report: Guidelines for Development*. This document provides guidance on drafting the project scope and establishing a realistic budget and schedule.
- *Risk-Based Graded Approach Analysis*. This Excel worksheet is used to determine where to assign PM resources; define the scope of the project; evaluate risk elements; and obtain agreement from team members.

#### 3.6.5.3 Georgia DOT

**Project Manager Handbook**, Office of Program Delivery, Georgia Department of Transportation, 2012.

<http://www.dot.ga.gov/PartnerSmart/Business/Documents/ProjectMgmt/PMHandbook.pdf>

This handbook for Georgia DOT's PMs is intended to:

- Guide the project team through the project delivery process.
- Identify, monitor and mitigate risks.
- Strengthen communication throughout the project's development.
- Ensure continuity of project knowledge between phases through a single point of contact, documentation, reporting and communication.
- Utilize management and project tools to ensure the project's success.

#### 3.6.5.4 Massachusetts DOT

**Baystate Roads**, University of Massachusetts Amherst, 2016.

[http://www.umasstransportationcenter.org/umtc/Baystate\\_Roads.asp](http://www.umasstransportationcenter.org/umtc/Baystate_Roads.asp)

This is the website for the training program used by Massachusetts DOT to train its PMs.



#### 3.6.5.5 *New Jersey DOT*

**Training: Capital Project Delivery**, New Jersey Department of Transportation, May 2016.

<http://www.state.nj.us/transportation/capital/pd/training.shtm>

Training modules available at this website include:

- Risk management and parameter expansion
- Project delivery process overview
- Construction management
- Errors and omissions
- Performance evaluation
- Quality management

#### 3.6.5.6 *Washington State DOT*

**Project Management Training Program**, Washington State Department of Transportation, 2016.

<http://www.wsdot.wa.gov/Projects/ProjectMgmt/Training.htm>

This website provides information about course offerings for PMs, including WSDOT Project Management Process, Scheduling Basics, Advanced Project Management and Introduction to Cost Estimating. The agency's Project Management Academy, an in-person training event, will transition to an e-learning platform. Links to project management e-learning courses are available at

<http://www.wsdot.wa.gov/Projects/ProjectMgmt/ProjectManagementPMRSElearning.htm>.

#### 3.6.5.7 *Project Management Institute*

**Project Management Professional (PMP)**, Project Management Institute Inc., 2016.

<https://www.pmi.org/certifications/types/project-management-pmp>

This is the website for the organization offering the PMP certification. The site offers training materials and other publications related to the certification.

## 4.0 CONCLUSIONS

### 4.1 Summary

UDOT is considering an upgrade to or replacement of ePM, its legacy system to manage consultant contracts and invoices. To help prepare for potential system improvements, UDOT is seeking information from other agencies using similar systems. UDOT is also interested in effective practices used by other state DOTs in specific areas of project management. To support this effort, this project examined relevant publications and conducted surveys of agencies expected to have experience with automated systems to manage contracts and invoices, and effective practices for project management.

### 4.2 Findings

#### 4.2.1 Contract Management and Invoice Processing Systems

Table 4.1 provides summary information about the management systems highlighted in this report.

**Table 4.1 Summary of Respondents' Management Systems**

Agency	System Name	System Type	Contract, Invoice, Both	When Implemented	Cost to Implement	Annual Cost to Maintain
<b>Arkansas State Highway and Transportation Department</b>	Doc Express	Commercial	Contract	New	N/A	N/A
<b>Colorado DOT</b>	SAP	Commercial	Both	2006/2014	N/A	N/A
<b>Florida DOT</b>	Consultant Invoice Transmittal System	Custom	Invoice	2002	\$2 million	\$80,000
<b>Georgia DOT</b>	Consultant Management Information System	Commercial / custom	Invoice	2010	N/A	N/A
<b>KYTC</b>	SharePoint Professional Services Contract App	Custom	Contract	2014	\$400,000	Minimal
<b>Massachusetts DOT</b>	Project Info	Custom	Both	2006	N/A	N/A
<b>Minnesota DOT</b>	Contracts Agreements Auditing Tracking System	Custom	Both	2015	N/A	N/A

Agency	System Name	System Type	Contract, Invoice, Both	When Implemented	Cost to Implement	Annual Cost to Maintain
Montana DOT	Consultant Information System	Custom	Both	2012	N/A	N/A
Nevada DOT	Unnamed in-house system	Custom	Invoice	Upgrade	N/A	N/A
New Jersey DOT	Unnamed system using e-Builder	Commercial (SAAS) / custom	Both	New	N/A	N/A
North Carolina DOT	SAP	Commercial	Both	2002	N/A	N/A
North Dakota DOT	Contract Management Software	Custom	Both	2010	\$300,000	\$30,000
Ohio DOT	OAKS	Custom	Both	Upgrade	N/A	N/A
South Carolina DOT	Project Programming System	Commercial / custom	Both	Upgrade	N/A	N/A
Utah DAS	SciQuest Total Contract Manager	Commercial (SAAS)	Contract	2016	\$265,119 (five years) + \$161,447	None
Wisconsin DOT	Aurigo Masterworks	Commercial	Both	New	N/A	N/A

#### 4.2.2 System Description

More than half of the 28 survey respondents either support a current system to manage contracts and invoices or are preparing to upgrade or implement one. A majority of these respondents use a single system or an integrated process that employs multiple systems to manage contracts and invoices. Many of the systems are either relatively new or in development at the time of publication. The systems used by Florida DOT and North Carolina DOT have been in operation the longest, since 2002.

Minnesota DOT provides a good example of an integrated process that employs a single system as the primary repository of data. While CAATS is the agency’s primary resource for managing contracts and paying invoices, Minnesota DOT also uses eDOCS, a document management system that is the starting and ending point for managing contracts, and SWIFT, a statewide financial system used to make the actual payment. All activities associated with contract management and invoice processing are integrated with and reflected in CAATS.

Many respondents use a custom system, with some agencies taking responsibility for system development and others using a vendor to customize a commercial product. SAP,

implemented by Colorado DOT and North Carolina DOT, is the most commonly used commercial system. These agencies use SAP's integrated modules to manage contracts and invoices, and to perform other administrative processes. Some states are working with a vendor to customize an existing in-house system (Ohio), while others are working with commercial vendors and products to develop a customized tool (New Jersey and South Carolina).

Few respondents provided system costs. Among those who did report cost information, implementation costs ranged from \$300,000 to \$2 million; ongoing maintenance costs ranged from no or minimal costs to \$80,000 per year. Utah DAS pays a five-year licensing fee in addition to professional services support costs associated with system implementation. The Utah DAS respondent also noted that there are no ongoing costs for its SAAS product other than licensing fees.

#### 4.2.3 System Training

For several agencies, preparing to use a new automated system to manage contracts and/or invoices required relatively little training. Staff members learned how to use the system on the job, and they share tips and tricks informally after the system is implemented. When formal training is provided, respondents reported as little as a few hours to several days of training, typically delivered through hands-on or classroom instruction. Several agencies noted the importance of ongoing training. User guidance takes the form of manuals, work instructions, online tutorials or another type of step-by-step procedure. Examples of these training materials are provided in this report.

The Colorado DOT respondent recommended the use of an on-site support team to assist staff as the new system goes live. Ongoing training and support, and effective communication, proved to be vital to the success of Colorado DOT's system. Other noteworthy training-related practices include the following:

- Colorado DOT uses the training tool uPerform to create course materials, work instructions and class presentations.
- Florida DOT coordinated extensive training program over six months to prepare for system implementation.

- Utah DAS uses an internal PM, who collaborated with a vendor team to conduct training prior to implementation and will coordinate ongoing support after implementation.

#### 4.2.4 System Assessment

The survey asked respondents to rate a series of system features and functions, and to provide an overall system rating using the rating scale of 1 (not at all satisfied) to 5 (extremely satisfied). Of the respondents providing an overall system rating, Minnesota DOT and North Dakota DOT respondents gave their systems the highest possible rating of 5. Respondents from Colorado DOT, Florida DOT, Montana DOT and Utah DAS gave their systems an overall rating of 4; KYTC, Massachusetts DOT and North Carolina DOT respondents gave their systems a rating of 3 (satisfied).

##### *4.2.4.1 Successes*

All respondents reported some degree of success with their systems, with most commenting on the benefits of the system structure and increased efficiency as summarized below:

#### **System Structure**

- Comprehensive system can be modified as needed (North Dakota).
- System integration allows for processing within a single system (Colorado).
- Uniform system makes it easy to locate, track and manage information (North Carolina).

#### **Increased Efficiency**

- Allows for more effective collaboration and report tracking (Kentucky).
- Achieved “huge savings” by using electronic invoice processing (Minnesota).
- Eliminated pre- and post-audits on invoices (Florida).
- Enhanced efficiency by automating most tasks and requiring entry of contract information only once (Utah).
- Reduced the time required to process invoices from 45 days to one week (Florida).

- Reduced the administrative burden, saving time for staff and consultants (Georgia).
- Reduced a three- to four-day contract processing period to approximately 10 minutes (North Dakota).

#### 4.2.4.2 Challenges

Respondents were less likely to describe challenges than report successes with their management systems. Among the challenges:

- A basic search function (Utah).
- Inability to integrate with other systems (Montana).
- Legislative changes (Florida).
- Multistep processes (Massachusetts).
- Training (Florida, Georgia and Kentucky).

#### 4.2.5 System Development Plans

Six agencies reported plans to upgrade existing systems or develop new ones, or are in the early stages of system development:

- Arkansas State Highway and Transportation Department is testing Doc Express to manage consultant contracts.
- Nevada DOT is upgrading its in-house system to process invoices.
- New Jersey DOT is designing a new contract management and invoice processing system using e-Builder, a commercial SAAS product.
- Ohio DOT is upgrading an existing system to more efficiently manage contracts and invoices.
- South Carolina DOT is enhancing a commercially developed system to include consultant contract information.
- Wisconsin DOT is switching to an e-contracting solution using Aurigo Masterworks to address both contracting and invoicing.

#### 4.2.6 Project Manager Roles and Responsibilities

Most respondents use a single PM for the typical project. If multiple PMs are used, the transition often occurs between design and construction. Most respondents use both a PM and design manager/lead during the design phase of a project. Survey responses did not uncover a standard approach for distinguishing between the two roles, though most PMs appear to focus on management tasks rather than producing deliverables. In some cases, the design manager oversees the PM; in other cases, the relationship is more collaborative. Similarly, survey responses indicated no standard for allocating responsibilities between the PM and RE during construction, though the PM is often participating on a more limited basis during construction than during the design phase of the project.

#### 4.2.7 Design Project Schedules

All respondents use design project schedules, though some agencies apply them on a limited basis. The schedules reside in Excel spreadsheets, Microsoft Project, Oracle Primavera and systems developed in-house; Primavera is the most commonly used scheduling system among respondents. All but the Arkansas respondent noted that the use of design project schedules has improved project delivery. Ohio DOT is considering development of a new scheduling tool to supplement the deliverable dates residing in the agency's in-house program.

#### 4.2.8 Estimating Cash Flow

Survey responses did not reveal a standard practice to estimate cash flow. Several agencies use an unspecified budgeting process, while others use a risk-based cost estimate (Minnesota DOT) or periodic reporting (Massachusetts DOT). Florida DOT provided the most detail with its presentation describing the agency's cash forecast system that applies a three-step process to determine expenditure projections.

#### 4.2.9 Project Manager Certification

Only Ohio DOT requires some form of certification for its PMs. For a few agencies, the PE designation is a requirement for PMs; for other agencies, PMs are PEs as a matter of practice. Two agencies offer programs for PMs to obtain an internal voluntary certification (Colorado

DOT) or the external PMP certification (California DOT). Colorado DOT's PM certification program will assign specific job titles to participants based on their level of certification.

#### 4.2.10 Project Manager Training

All but one respondent provides training for PMs. In-house training tends to be more common than external training, though both are offered by most respondents. Respondents offer both in-person classes and online courses, though in-person classes are more common. The number of PM training hours provided annually ranged widely, though most agencies offer at least 15 training hours per year. Most respondents cited benefits of PM training, most often noting enhancements in the knowledge base of PMs and improved project management.

##### *4.2.10.1 Notable Training Programs*

Launched in 2006, Colorado DOT's PM training program has trained more than 500 staff members. A full-time staff member manages and administers the program; an annual budget is used to hire a consultant to update and maintain course materials. A new certification program for PMs includes on-the-job experience, coursework, mentorship and peer group experiences. Most training classes are taught by project delivery staff.

Florida DOT is developing a PM training program that will include a formal onboarding process, computer-based training, webinars and in-person classroom instruction. The program will also include a multiday seminar and courses targeted to specific needs (intermediate and advanced practices).

### **4.3 Limitations and Challenges**

The scope of this project did not permit an exhaustive review of literature in all topic areas covered in the surveys. The literature search conducted for this project focused on supplementing survey responses and identifying supporting documents for the systems, programs and processes described by respondents.

Findings from the survey identified no best or standard practice for automating the management of contracts and invoices. Responding agencies have found success with a range of



commercial and in-house tools and practices, and are generally satisfied with their processes and systems. Similarly, project management practices differ among respondents, and the scope of this project did not permit an in-depth examination of the benefits and drawbacks of each practice. Follow-up contacts to selected state DOTs participating in this project's surveys could gather additional information of interest to UDOT as it considers enhancements to its automated management of contracts and invoices and other project management practices.

## **APPENDIX A: SURVEY QUESTIONS**

The following survey was provided to state departments of transportation (DOTs), state government procurement officers, and selected state and federal agency contacts. Only state DOT respondents received both sections of the survey (electronic information management systems and project management practices).

The Utah Department of Transportation (UDOT) is interested in learning about a range of effective project management practices employed by other state DOTs to enhance the effectiveness of its own project managers. Of interest are the automated systems used to manage consultant contracts and invoicing, and other best practices employed by project managers during project delivery.

For UDOT, project delivery includes the activities associated with project scoping, environmental review, planning, design and estimating that occur prior to advertising a transportation project for construction. UDOT's project managers also oversee the scope, schedule and budget during the construction phase until a project is constructed and complete.

This survey gathers information about the systems, processes and practices used by state DOTs for project management in these topic areas:

- Systems used to process consultant contracts and invoices
- Project manager roles and responsibilities
- Design project schedules
- Project manager certification and training

Please provide information about your agency's project management practices by responding to the questions below. We would appreciate receiving your survey response by **October 28**. **UDOT will share results of the survey with survey respondents.**

Please let us know if you have any questions as you complete the survey. Thanks very much for your participation.

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## **Electronic Information Management Systems to Manage Consultant Contracts and Process Invoices**

Are you using an electronic information management system to automate the processing of consultant contracts and invoices? Invoice processing involves managing invoice submittals and approvals.

- Yes, we use a system to manage contracts, but we do not use a system to process invoices.
- Yes, we use a system to process invoices, but we do not use a system to manage contracts.
- Yes, we use one system to manage contracts and a second system to process invoices.
- Yes, we use the same system to manage contracts and process invoices.
- No, we're not using this type of system and have no plans to use one.
- No, we're not using this type of system, but we do have plans to implement one (please describe your plans to implement a system to manage your consultant contracts and/or process your invoices).

*Note:* The next three sections of the survey were presented to respondents differently based on how many systems a respondent uses. If a respondent uses *separate systems* to manage contracts and invoices, the respondent completed each of the following three sections of the survey twice—once for the contract management system and a second time for the invoice processing system. If a respondent uses a *combined system* to manage both contracts and invoices, the respondent completed the three sections only once.

### **System Description**

1. What type of system do you use to manage consultant contracts/process invoices (submittal and approval)? Select all that apply.
  - Enterprise (agencywide use)
  - Desktop-based (individual desktop use)
  - Single tool (e.g., Excel or software package)
  - Multiple tools (e.g., using Excel in conjunction with a software package)
  - Customized software developed specifically for/by our agency
  - Commercial off-the-shelf (COTS) product
  - COTS product customized for agency use
  - Software as a service
  - Other (please describe)
2. What is the name of your system/tool(s)? If you're using a commercial product, please provide the name of the product and the vendor.
3. Please provide the names of the other systems (including the vendor, if applicable) your contract management/invoice processing system integrates with.

- Project management system
  - Financial management system
  - Document management system
  - Other system (please describe)
4. Please briefly describe your workflow to manage consultant contracts/process invoices and how your system supports that workflow.
  5. If available, please provide links below to documentation about your contract management/invoice processing system. Send any files not available online to Chris Kline at [chris.kline@ctcandassociates.com](mailto:chris.kline@ctcandassociates.com).

### **System Implementation and Costs**

1. When did you implement the system?
2. How long did it take to implement the system?
3. What was your cost to implement the system? Include the cost to purchase software, if applicable, and other implementation expenses.
4. What are your ongoing annual maintenance costs?
5. What type of training, and how much, was required to prepare staff to use the system?

### **System Assessment**

1. Please indicate your level of satisfaction with each system characteristic/feature listed below using the rating scale of 1 = not at all satisfied to 5 = extremely satisfied.
  - Ease of use
  - Flexibility
  - Reliability
  - Effectiveness
  - Good value
  - System upgrades
  - Vendor support
  - Opportunity for collaboration
  - Comprehensive project tracking
  - Project communication
  - Scheduling tasks/generating system alerts
  - Data import/export
  - Reporting
  - Data analysis
  - Integration with other systems/databases

- Management of historical data
  - Overall satisfaction with the system
2. What successes have you experienced in connection with your contract management/invoice processing system?
  3. What challenges have you experienced in connection with your contract management/invoice processing system?
  4. Have you been able to quantify the impact of your contract management/invoice processing system in terms of time or cost savings, project manager performance or on-time project delivery? If yes, please describe these impacts and how you're measuring them.
  5. Please use this space to provide any comments or additional information about your answers above.

## **Project Management Practices**

### **Project Manager Roles and Responsibilities**

1. For the typical project, do you use a single or multiple project managers?

When multiple project managers are used, at what point(s) in the project delivery process is the transition made to a new project manager?

### ***Roles During Design***

2. Please describe the roles and responsibilities of your agency's project managers during the design phase of a project.
3. Please describe the roles and responsibilities of your agency's design managers/leads during the design phase of a project.
4. If your responses to Questions 2 and 3 have not already addressed it, please describe how the roles of the project manager and design manager/lead interact during the design phase of a project, if applicable.

### ***Roles During Construction***

5. Please describe the roles and responsibilities of your agency's project managers during the construction phase of a project.
6. Please describe the roles and responsibilities of your agency's resident engineers during the construction phase of a project.
7. If your responses to Questions 5 and 6 have not already addressed it, please describe how the roles of the project manager and resident engineer interact during the construction phase of a project, if applicable.

### **Design Project Schedules**

1. Does your agency use design project schedules?

2. What software do you use to schedule the design portion of projects?
3. Have design project schedules improved project delivery?
4. Please use this space to provide additional comments about design project schedules.

### **Cash Flow**

5. What methods does your agency use to estimate project cash flow?

### **Project Manager Certification and Training**

1. What certifications do you require for DOT project managers? Select all that apply.
  - Professional Engineer
  - Project Management Professional (through the Project Management Institute)
  - Some form of agency certification (please describe your certification program below)
  - On-the-job training/certification earned (please describe your certification program below)
  - On-the-job training/no certification earned
  - No special certification required
  - Other (please describe)

Please describe your agency's certification program.

2. Do you offer training for your project managers?
3. How is training provided? Select all that apply.
  - In-house in-person classes
  - In-house multiday courses, seminars, workshops, etc.
  - Online courses developed in-house
  - External in-person classes (paid by agency)
  - External in-person classes (paid by employee)
  - External multiday courses, seminars, workshops, etc.
  - Online courses developed by third party
  - Other (please describe)
4. Approximately how many training hours per year do your project managers receive?
5. What successes have you experienced in connection with project manager training?
6. If available, please provide links below to documentation associated with your project manager training program. Send any files not available online to Chris Kline at [chris.kline@ctcandassociates.com](mailto:chris.kline@ctcandassociates.com).
7. Please use this space to provide any comments or additional information about your answers above.

## **APPENDIX B: CONTACT INFORMATION**

Below is contact information for the individuals responding to the surveys or providing supplemental information for this project:

### **Arkansas**

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### **California**

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### **Kentucky**

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### **Maryland**

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Florida Department of  
**TRANSPORTATION**

# **CASH FORECASTING OVERVIEW**

**Disbursement Projections**

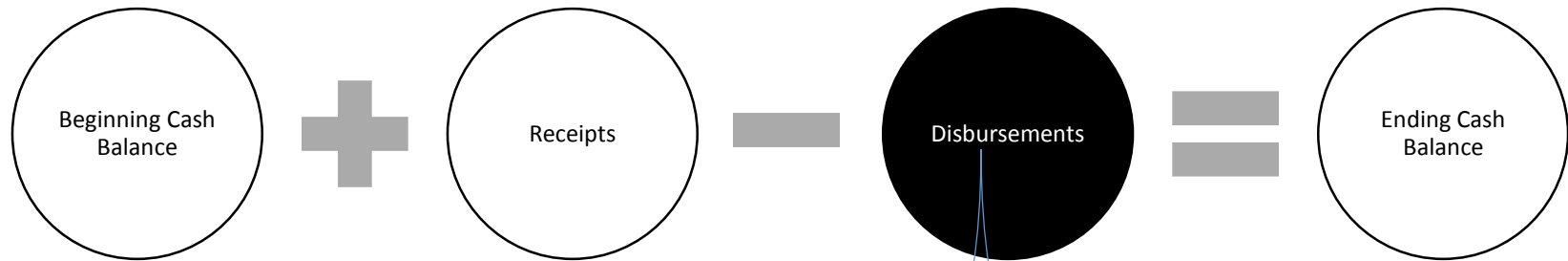
**OFFICE OF COMPTROLLER**



# Statutory Requirements

- Balanced Forecast of Cash and Expenditures that supports the Work Program  
(Section 339.135(4)(b)4., Florida Statutes)
- Minimum Balance Requirement  
(Section 339.135(6)(b), Florida Statutes)

# Disbursement Projections



Disbursements consist of:

- Expenditure Projections
- Specialized Project Flows

# Expenditure Projections

To determine Expenditure Projections, the Work Program Planned Commitments must be converted from a Commitment basis to the Department’s cash needs. Utilizing the planned commitments and rates, the Department is able to determine when and how much cash is needed on a monthly basis for several years. This process flows as follows:





## STEP 1

Roll Forward Rate - rates applied to dictate the amount of budget that will not be committed in a fiscal year and will “roll” into the following year. The remaining balance (Net Plan) will be the anticipated amount encumbered for that particular year.

Please note that Roll Forward is not cash associated to the current year. In the forecast, we are projecting roll forward budget to payout in future years as those projects are committed.

Example of Roll Forward Rate being applied:

	Current Year	Year 2	Year 3	Year 4	Year 5	Year 6
<b>Roll Forward Rate</b>	<b>0.20310</b>	<b>0.39560</b>	<b>0.39560</b>	<b>0.39560</b>	<b>0.39560</b>	<b>0.39560</b>
<b>Plan Amount</b>	<b>90,740,436</b>	<b>88,021,280</b>	<b>119,549,741</b>	<b>87,974,954</b>	<b>83,792,247</b>	<b>87,097,054</b>
<b>Rolled Forward</b>		<b>18,429,383</b>	<b>42,111,882</b>	<b>63,953,338</b>	<b>60,102,832</b>	<b>56,924,893</b>
<b>Adjusted Plan</b>	90,740,436	106,450,663	161,661,623	151,928,292	143,895,079	144,021,947
<b>Roll Forward Amount</b>	<b>18,429,383</b>	<b>42,111,882</b>	<b>63,953,338</b>	<b>60,102,832</b>	<b>56,924,893</b>	<b>56,975,082</b>
<b>Net Plan</b>	<b>72,311,053</b>	<b>64,338,780</b>	<b>97,708,285</b>	<b>91,825,460</b>	<b>86,970,186</b>	<b>87,046,865</b>
<b>Year 1 "actual" adjustments:</b>						
<b>Actual Expenditures</b>	<b>1,614,762</b>					
<b>Encumbrance Balance</b>	<b>48,082,360</b>					
<b>Remaining Net Plan</b>	<b>22,613,932</b>					



## STEP 2

Commitment Rates - rates applied to predict when planned projects will be encumbered on a monthly basis. This rate is applied to the Net Plan amount, which will determine the “Projected Commitment Flow”.

Example of Commitment Rates being applied:

Current Year Remaining Net Plan	K-01-N1 - FM COMPONENT												22,613,932
	August	September	October	November	December	January	February	March	April	May	June	Total	
Monthly Commitment Rates	0.22451	0.01571	0.01530	0.08718	0.20839	0.01762	0.15687	0.04195	0.04946	0.14389	0.00551	1.00000	
Remaining Months Rates	0.00000	0.00000	0.00000	0.00000	0.00000	0.01762	0.15687	0.04195	0.04946	0.14389	0.00551	0.41530	
Revised Rates	0.00000	0.00000	0.00000	0.00000	0.00000	0.04243	0.37773	0.10101	0.11909	0.34647	0.01327	1.00000	

Commitment Classification

Projected Commitment Flow	1.000	0	0	0	0	0	959,445	8,541,891	2,284,263	2,693,198	7,835,104	300,031	22,613,932
Range 1	1.000	0	0	0	0	0	959,445	8,541,891	2,284,263	2,693,198	7,835,104	300,031	22,613,932

Year 2 Net Plan													64,338,780	
	July	August	September	October	November	December	January	February	March	April	May	June	Total	
Monthly Commitment Rates	0.03361	0.22451	0.01571	0.01530	0.08718	0.20839	0.01762	0.15687	0.04195	0.04946	0.14389	0.00551	1.00000	
Projected Commitment Flow	1.000	2,162,426	14,444,700	1,010,762	984,383	5,609,055	13,407,558	1,133,649	10,092,824	2,699,012	3,182,196	9,257,707	354,507	64,338,780
Range 1	1.000	2,162,426	14,444,700	1,010,762	984,383	5,609,055	13,407,558	1,133,649	10,092,824	2,699,012	3,182,196	9,257,707	354,507	64,338,780



# Florida Department of TRANSPORTATION



## STEP 3

Payout Rates- are applied to each monthly “Projected Commitment Flow” to determine the actual expenditure projection of that flow. This rate predicts when to expect the encumbrance to be expended. Most projected payouts span over 48 months.

Example of Payout Rates being applied:

**Component K-01-N1**

Cash Flow Total Current Year	Projected Commitment
July Commitment Flow	0
August Commitment Flow	0
September Commitment Flow	0
October Commitment Flow	0
November Commitment Flow	0
December Commitment Flow	0
January Commitment Flow	959,445
February Commitment Flow	8,541,891
March Commitment Flow	2,284,263
April Commitment Flow	2,693,198
May Commitment Flow	7,835,104
June Commitment Flow	300,031
Totals	22,613,932

July	August	September	October	November	December	January	February	March	April	May	June
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	8,635
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	8,635

Annual Totals

FY 2014 - 2015

8,635

Annual Payout

0.0001

**Component K-01-N1**

Cash Flow Total Year 2	Projected Commitment
July Commitment Flow	2,162,426
August Commitment Flow	14,444,700
September Commitment Flow	1,010,762
October Commitment Flow	984,383
November Commitment Flow	5,609,055
December Commitment Flow	13,407,558
January Commitment Flow	1,133,649
February Commitment Flow	10,092,824
March Commitment Flow	2,699,012
April Commitment Flow	3,182,196
May Commitment Flow	9,257,707
June Commitment Flow	354,507
Totals	64,338,780

July	August	September	October	November	December	January	February	March	April	May	June
0	0	0	0	0	19,462	10,812	45,411	67,035	60,548	30,274	60,548
0	0	0	0	0	0	130,002	72,223	303,339	447,786	404,452	202,226
0	0	0	0	0	0	0	9,097	5,054	21,226	31,334	28,301
0	0	0	0	0	0	0	8,859	4,922	20,672	30,516	0
0	0	0	0	0	0	0	0	50,481	28,045	117,790	0
0	0	0	0	0	0	0	0	0	120,668	67,038	0
0	0	0	0	0	0	0	0	0	0	10,203	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
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0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	19,462	140,814	126,731	384,287	584,963	635,445

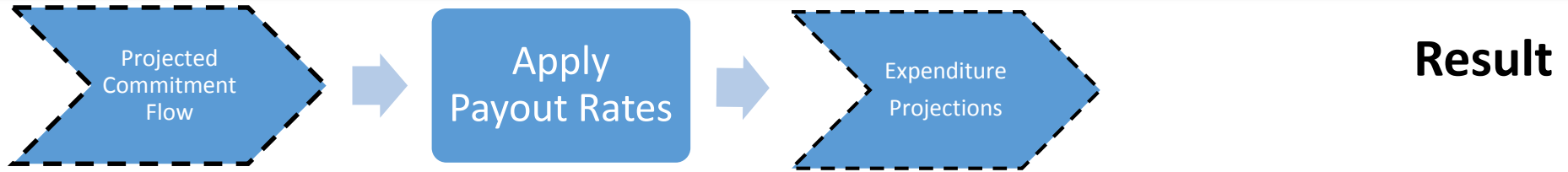
Annual Totals

FY 2015 - 2016

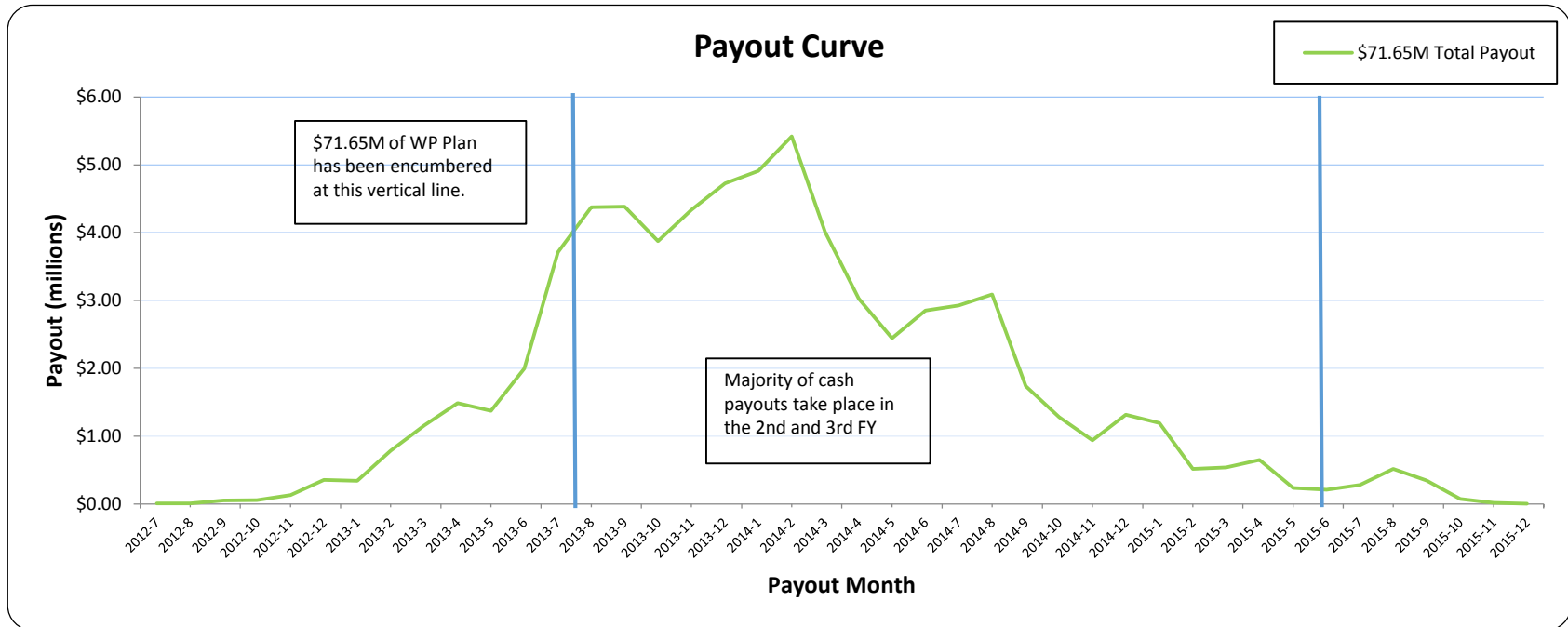
2,408,324

Annual Payout

0.0374



Graphical representation of entire payout curve:



As seen in this payout curve, although the WP plan (after roll forward) was encumbered in the FY it was programmed, the majority of the commitments actually pay out over the 2<sup>nd</sup> and 3<sup>rd</sup> fiscal year once the project has started.



# Specialized Project Flows

Select projects that have defined payout schedules and do not follow the normal payout structure. The commitments established for these type of projects are excluded from the rate process and are flowed based on scheduled timelines. These types of projects include, but are not limited to:

- Public Private Partnerships
- One Time Annual Payments
- Local Government Reimbursement
- State Infrastructure Bank Repayments
- Major projects such as the Miami Intermodal Center and SunRail



## What is the PMAP?

The Project Management Advancement Program (PMAP) is a comprehensive program to train and develop employees in the discipline of Project Management. The program will consist of a combination of on-the-job experience, coursework, mentorship, and peer group experiences. A key part to remember is that this is a program and not just a class. Think of PMAP as a career map for project management. This will include newly developed PM courses, as well as existing courses such as CPM Scheduling.

A more detailed mapping of the program will be shared on future updates.

## What's in it for Me?

- PMAP training will focus on skills to help PMs anticipate and control project risks as well as more accurately forecast project costs, project milestones, and advertisement dates.
- Program participants will be prepared to manage projects in an evolving, enhanced project management culture at CDOT.
- Participants will learn about project management in a framework more closely aligned with the Project Management Institute (PMI). The coursework will provide background for those seeking a PMP certification.

### For More Information

<http://intranet.dot.state.co.us/employees/Training/pmap>

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## Progress

On May 25<sup>th</sup>, and 26<sup>th</sup> the PMAP team conducted a Pilot Class for the newly built, “*Introduction to Project Management*” online class, and the “*Fundamentals of Project Management*” instructor led class. The students were a mix of region and headquarters staff primarily stemming from the project delivery teams (i.e. Design, Construction, ROW, Utilities, Business, etc.). The Pilot group provided valuable input into how the class should be amended to best fit CDOT’s needs. Thank You to the participants of the *Pilot Training*:

<b>Abra Geissler</b>	<b>Patrick Pittman</b>
<b>Adam Parks</b>	<b>Thu Tran</b>
<b>Eric Salemi</b>	<b>Todd Johnston</b>
<b>Jacob Rivera</b>	<b>Sina Khavary</b>
<b>Jocelyn Higashide</b>	<b>Scott McDaniel</b>
<b>Louis Keen</b>	<b>Morgan Murphy</b>
<b>Allison Wilson</b>	<b>Roselle Drahushak-Crow</b>

### High-Level Timeline

1. Spring 2016 – Pilot the, *Introduction to Project Management*, and *Fundamentals of Project Management* courses.
2. Fall 2016 – Begin Program Roll-Out - Details of Roll-Out Under Development.
3. Summer 2016 – Begin development of the next courses “*Project Controls/Managing People and Work*”, “*Scoping*”, and “*Cost Planner and Risk Management*”.
4. Summer 2016 – Amend the online “*Form 65*” course, into a, “*Project Financials*” course, and amend the current “*CPM Scheduling*” course.