



A REPORT
TO THE
MONTANA
LEGISLATURE

INFORMATION SYSTEMS AUDIT

*Public Employee
Retirement Information
System (PERIS)
Development Life Cycle*

*Montana Public Employee Retirement
Administration*

SEPTEMBER 2014

LEGISLATIVE AUDIT
DIVISION

14DP-03

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IS audits are performed as stand-alone audits of IS controls or in conjunction with financial-compliance and/or performance audits conducted by the office. These audits are done under the oversight of the Legislative Audit Committee which is a bicameral and bipartisan standing committee of the Montana Legislature. The committee consists of six members of the Senate and six members of the House of Representatives.

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September 2014

The Legislative Audit Committee
of the Montana State Legislature:

This is our information systems audit of Public Employee Retirement Information System Development managed by the Montana Public Employee Retirement Administration (MPERA).

This report provides information about the development process of the new retirement information system. This report includes recommendations for better monitoring and documentation of project management decisions by MPERA to ensure the system meets its needs.

We wish to express our appreciation to MPERA personnel for their cooperation and assistance during the audit.

Respectfully submitted,

/s/ Tori Hunthausen

Tori Hunthausen, CPA
Legislative Auditor

TABLE OF CONTENTS

Figures and Tables.....	ii
Appointed and Administrative Officials	iii
Report Summary	S-1
CHAPTER I – INTRODUCTION.....	1
Introduction	1
Background.....	1
System Development Life Cycle	2
Audit Scope and Objective.....	2
Methodology.....	3
Audit Conclusion	4
CHAPTER II – PERIS DEVELOPMENT.....	5
Introduction.....	5
Contracted Support.....	6
MPERA System Development Life Cycle	6
Report Organization	8
CHAPTER III – PROCESS CONTROLS	9
Introduction	9
Commitment Review.....	9
Controls Included in Commitments	9
User Involvement	10
Other State Implementations	11
Commitment Assurance	11
Commitment Sample Definition	12
Commitment Mapping Review	12
UCS Reference Review	14
Test Case Reference Review	15
Change Management.....	17
MPERAs Change Management Plan	19
Required Formal Review of Change Requests	19
CHAPTER IV – USER ACCEPTANCE TESTING	21
Introduction.....	21
PERIS UAT Methodology.....	21
Pressure on User Acceptance Testing	22
ADMINISTRATION RESPONSE	
Montana Public Employee Retirement Administration	A-1

FIGURES AND TABLES

Figures

Figure 1	System Development Life Cycle Phases.....	7
Figure 2	Commitment Confirmation	13
Figure 3	Solution Installation Testing.....	16
Figure 4	MPERA Change Management Process	18

Tables

Table 1	Glossary of System Development Terms	5
Table 2	UCS Reference Results	14
Table 3	Test Case Reference Results	16

APPOINTED AND ADMINISTRATIVE OFFICIALS

			<u>Term Expires</u>
Public Employees' Retirement Board	Scott Moore, President	Miles City	4/1/15
	Mike McGinley, Vice President	Dillion	4/1/18
	Sheena Wilson	Helena	4/1/18
	Maggie Peterson	Anaconda	4/1/19
	Melissa Strecker	Missoula	4/1/17
	Timm Twardoski	Helena	4/1/16
	Warren Dupuis	Helena	4/1/19
Administrative Officials	Dore Schwinden, Executive Director		
	Patricia Davis, Member Services Bureau Chief		
	Barbara Quinn, Fiscal Services Bureau Chief		
	Melanie Symons, Chief Legal Counsel		
	Hollie Koehler, Internal Auditor		
	June Dosier, Information Systems Bureau Chief		



MONTANA LEGISLATIVE AUDIT DIVISION

INFORMATION SYSTEMS AUDIT

Public Employee Retirement Information System Development Life Cycle

Montana Public Employee Retirement Administration

SEPTEMBER 2014

14DP-03

REPORT SUMMARY

The Montana Public Employee Retirement Administration is investing over \$11 million to develop a new pension management information system. Improved monitoring and documentation of project management decisions will help implement the system on time and within budget.

Context

The Montana Public Employee Retirement Administration (MPERA) manages retirement plans for 71,000 members. These members include active and retired city, county, school district, and state employees. Employers and their employees rely on MPERA to calculate retirement benefits, create and maintain member activity, process claims and payments, along with other customer service activities.

Information systems are used to assist MPERA staff in these activities, but current business processes are paper driven, manual, and time intensive. These factors have impacted MPERA's customer service and ability to provide support for Montana's employers and employees.

For these reasons, MPERA initiated the MPERAtiv project. This project is multifaceted and estimated to cost \$11.7 million. The major project of MPERAtiv is the implementation of a single, complete pension system, the Public Employee Retirement Information System (PERIS), that will increase usability and improve the ability to provide services to customers. This project started in 2012, and the main system is expected to be implemented in the summer of 2015. Multiple vendors have been contracted for the MPERAtiv project, including PERIS system development.

Since MPERA is spending considerable resources on the development of PERIS and PERIS manages vital information, this audit reviewed the system development processes to help ensure PERIS meets expectations as defined in the contract. If risks are not mitigated throughout system development, the system could potentially be delayed, experience cost overruns, or not function as intended. Conducting the audit while the system is being developed allows MPERA to make improvements to the process before the next phase of development and through the remainder of the project.

Results

Audit work showed the expectations of the system set out in the contract include important controls such as security, data integrity, and user access controls. Additionally, MPERA has been involving users in system development via newsletters, workshops, webinars, and established an employer advisory group. MPERA has also developed a plan that, if implemented, ensures employers impacted by the system change will be ready for the implementation.

Audit work also found established processes to manage expectations; however, controls

(continued on back)

to ensure each expectation is being met and documented at each stage of the process need to be established. By implementing these controls, MPERA will have better assurance that its expectations of the system are met.

MPERA established a formal change management process; however, in order to expedite changes without impact to the project schedule, an informal process is being followed. This increases the risk of a change being implemented without all involved parties knowing, without executive approval, or without formal realization and documentation of the impact to the project. By following a formal change management plan, MPERA will have better assurance that changes only occur if impact to the project is understood and all required parties have approved the change

Changes within the project that reduced the time for user acceptance testing (UAT) were also identified. UAT is done to ensure system functionality performs in business scenarios and to reduce risks to MPERA after the system is implemented. The duration of UAT needs to be sufficient in order for MPERA to complete all necessary testing to ensure the system performs as expected.

Recommendation Concurrence	
Concur	3
Partially Concur	0
Do Not Concur	0
Source: Agency audit response included in final report.	

Chapter I – Introduction

Introduction

The Montana Public Employee Retirement Administration (MPERA) manages retirement plans for public employees within the state agencies and local governments. The following retirement plans are administered by MPERA.

- ◆ Public Employees’ Retirement System – Defined Benefit Retirement Plan (PERS-DBRP)
- ◆ Public Employees’ Retirement System – Defined Contribution Retirement Plan (PERS-DCRP)
- ◆ Judges’ Retirement System (JRS)
- ◆ Highway Patrol Officers’ Retirement System (HPORS)
- ◆ Sheriffs’ Retirement System (SRS)
- ◆ Game Warden and Peace Officers’ Retirement System (GWPORS)
- ◆ Municipal Police Officers’ Retirement System (MPORS)
- ◆ Firefighters’ United Retirement System (FURS)
- ◆ Volunteer Firefighters’ Compensation Act (VFCA)
- ◆ 457 Deferred Compensation Supplemental Retirement Plan

These plans consist of approximately 71,000 members and roughly \$5.8 billion of investments for public employees. Employers and their employees rely on MPERA to calculate retirement benefits, create and maintain member activity, process claims and payments, along with other customer service activities. Information systems are used to assist MPERA staff in these activities.

Background

MPERA’s current business processes to calculate benefits and manage its members are paper driven and manual. These processes are time intensive due to the added manual approvals necessary to assure accurate processing. Spreadsheets are used to assist in these manual calculations, including benefit calculations and retirement processing, but do not completely mitigate risks of error. MPERA has recognized these factors impact its customer service and ability to provide support for Montana’s employers and employees. Along with time-intensive processes, some of the systems are over 25 years old, making it difficult to find Information Technology (IT) staff with the knowledge to maintain them. For these reasons, MPERA initiated the MPERAtiv project.

MPERAtiv is broken out into four separate projects. The major project of MPERAtiv, and the focus of this audit, is the implementation of a single, complete pension

management information system, Public Employee Retirement Information System (PERIS). PERIS is projected to increase functionality and improve the ability to provide services to Montana employees and retirees. To fund the project, the Public Employees' Retirement Board approved a portion of pension administration and plan investment funds each fiscal year. The MPERAtiv project began in 2012 and PERIS is expected to be implemented in the summer of 2015.

System Development Life Cycle

The PERIS system development follows a general life cycle to ensure the system is complete and functions well when it is time to implement. A development life cycle facilitates increased project efficiency, mitigates risks, and organizes the work needed to develop the system. The general flow of a life cycle is outlined below:

- ◆ **Research and Analysis.** Gathering information about the system and developing possible solutions to a problem. Specific needs and expectations are identified.
- ◆ **Design.** Creating a system that meets all of the needs and expectations identified earlier.
- ◆ **Testing.** Ensuring the system operates as expected and is ready to be used.
- ◆ **Implementation.** Making the system available for use, including training users before they are expected to use the system. Monitoring system performance after it is implemented for errors is also done.
- ◆ **Support and Evolution.** The daily work to manage the system and keep it running.

Within this life cycle, the earlier an issue or risk is identified, the less expensive and quicker it will be to resolve. MPERA's fiduciary responsibility to members to properly manage contributions, account balances, and benefit payments compounds the need for this project to run on time and efficiently. The total cost to develop and implement the system is estimated to be \$11.7 million. To date, almost \$5.2 million in development costs have been incurred. Due to these factors, it is important that risks and issues are identified and remedied as early as possible during the development of PERIS.

Audit Scope and Objective

This audit focuses on the development of PERIS, specifically within the design phase. This audit was completed pre-implementation and does not provide assurance specific to system functionality or performance that will be implemented. The scope of our work focused on the processes used by MPERA to manage PERIS project development, rather than specifically assessing the design or other features of the system itself. Following implementation of PERIS, further opportunities to audit specific aspects of system functionality or performance could be identified.

Adopting a specific methodology to organize each phase of the system development life cycle is important to ensure the design, development, and testing of the system is completed accurately and efficiently. Our audit assessment found MPERA adopted a specific methodology for the PERIS project and is following the procedures outlined in the methodology. Therefore, our focus was isolated to the detailed processes of managing system expectations through the system development life cycle. This includes compiling and documenting all system expectations early to ensure the developed system meets MPERA's needs, designing the system to address those needs, and testing the system prior to implementation to ensure system expectations are met. In the PERIS development, these expectations are referred to as commitments. Commitments define exactly what MPERA expects the system to do and must be satisfied by the final product. Audit work reviewed process controls in place to manage these commitments. Based on assessment work, one objective was developed.

Determine if controls are in place to ensure business commitments are developed, tested, and maintained throughout the System Development Life Cycle.

Methodology

Steps taken to conclude on this objective include:

- ◆ Review commitments for system controls.
- ◆ Contact other states that have implemented this system to understand their commitment process.
- ◆ Testing a sample of commitments at various points in the life cycle for reference in documentation.
- ◆ Verify a change management plan is established.
- ◆ Review change requests for proper documentation and approvals according to change management plan.
- ◆ Verify approvals were documented.
- ◆ Interview MPERA staff, contractors, and employers that will use the system for understanding of their involvement in the project.
- ◆ Survey of employers.

Methodology also included comparing specific PERIS processes to the terms established in its system development contract. Additionally, we reviewed industry best practices which suggest implementing specific controls to help ensure system implementation success.

Audit Conclusion

MPERA has established commitments that include system controls in areas of security, user profiles, data integrity, availability, and specific system functionality. Other suggested best practices, such as involving users in the system development, were also identified. We found processes to manage commitments throughout the system development life cycle; however, controls should be strengthened to provide MPERA assurance that the system meets its needs and any changes to the system are approved prior to implementation.

Chapter II – PERIS Development

Introduction

The Public Employee Retirement Information System (PERIS) development is the main focus of the MPERAtiv project. It has been in progress since 2012 and is currently working through the final design stages. When PERIS is implemented, it is expected to be the main support system for Montana Public Employee Retirement Administration (MPERA) staff, including functions to manage accounts for all public employees, calculate benefit payments, retirement and payroll processing, process claims and assist in customer service. The development process is further defined in this chapter.

For clarification of terminology used in this report, the following table is provided.

Term	Definition
System Development Life Cycle (SDLC)	The methodology to organize the processes to design, develop, and implement an information management system.
Commitments	A statement of scope that must be satisfied by the development vendor's solution. Each commitment states "what" single capability shall be provided and can be specific to a system expectation or a project expectation.
Commitment Path	Commitments should follow a traceable, documented path through the development process to ensure that all commitments are being satisfied.
Mapping	A commitment is tied, or mapped, to a corresponding Use Case Scenario (UCS) so that commitments can be tracked throughout the project. Being able to identify what UCS a commitment is mapped to helps ensure all commitments are satisfied.
Use Case Scenario (UCS)	A UCS can be thought of as a grouping of related commitments, which models the functionality of the proposed system. UCSs define the sequence of steps and the interaction between user actions and system functionality.
Business Rule	Business rules are criteria for how a system makes decisions. They are rules that define aspects of business and are answered true or false.
System Testing	Testing is done to ensure the system is functioning as expected. Various types of testing are completed throughout the SDLC. System testing refers to any type of testing done by a technical staff member, either by MPERA staff or the development vendor, as opposed to being testing by a system user, or non-technical staff member.
Test Case	Test cases are a formal specification of a set of test inputs, execution conditions, and expected results identified for the purpose of making an evaluation of the test system. These scripts instruct the tester what to do and what to expect.
Deliverable	Any work product produced to support the development of the system. This includes UCSs, test cases, training material, or project process plans.
User Acceptance Testing (UAT)	This is the last stage of testing, performed immediately before implementation. UAT ensures all system functionality is successfully running as expected by the user.

Source: Compiled by the Legislative Audit Division from MPERA records.

Contracted Support

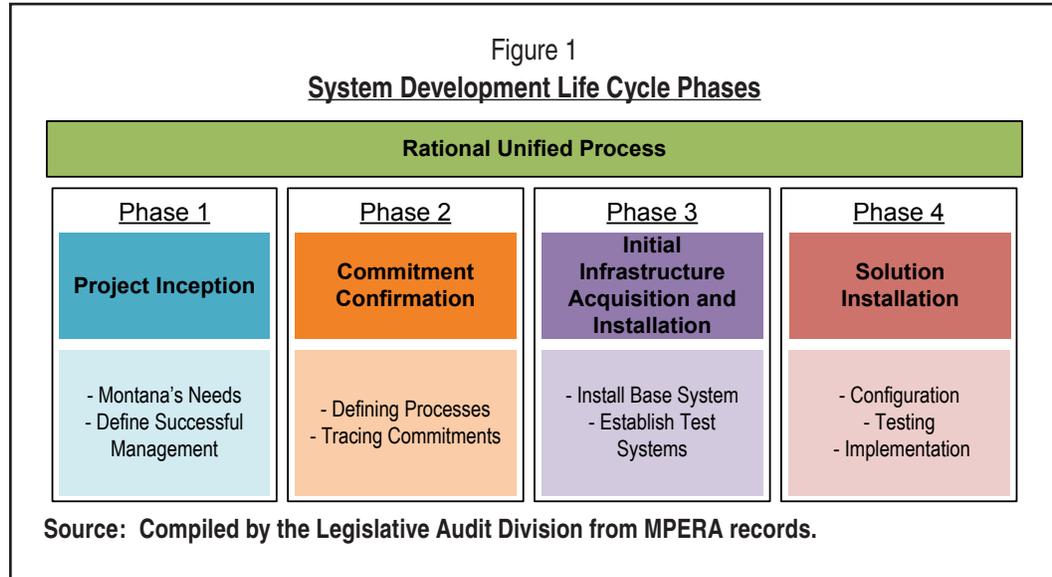
The MPERA information technology (IT) staff consists of nine FTE, which is a relatively small number of people to undertake a large project such as PERIS. MPERA identified this as a risk and contracted the development of the system to a vendor that has experience with pension systems. Development of PERIS will involve configuring an already-designed system to meet Montana's needs. There was also a need for project management and quality assurance as MPERA has limited resources in these areas. A vendor was contracted for these services as well. The duties of each vendor are outlined below:

- ◆ **Oversight Consultant.** The oversight consultant is responsible for providing project level monitoring and review, and monitoring vendors' compliance with project requirements. They review key project deliverables; the project schedule and budget, resources, issues and risks, and assist in the contract process for the other vendors described below.
- ◆ **Pension System Development Vendor.** This vendor is providing a base system that is already designed, plus configurations to meet Montana's needs, and training and support after implementation. They are responsible for overall project initiation, planning, execution, project monitoring, control and closure.
- ◆ **Data Cleansing Vendor.** This vendor is responsible for reviewing current system data (detecting errors and correcting them) and migrating data from the old systems to PERIS.

MPERA established a charter in the early phases of the project that outlines the roles and responsibilities of each party involved as well as expectations and a hierarchy of authority. While contractors have been enlisted to support the MPERAtiv project, the charter states that the executive sponsor, MPERA, is ultimately responsible for the success of the project. According to the charter, success of the project is creating happy customers, employers, and staff, as well as improving operating efficiencies and increasing data quality by implementing valuable information systems. Success is also identified as achieving all goals within scope on time while staying on budget.

MPERA System Development Life Cycle

There are multiple options for system development methodologies that have been proven to work. The development vendor for PERIS is following the IBM Rational Unified Process (RUP). This methodology is established within the industry and has been used since 2003. The vendor providing the development service has previously used this method to implement pension software for other states, including Colorado, North Dakota, and Kansas. This process is summarized in four main phases in Figure 1 (on page 7).



System Development Life Cycle Phases:

1. **Project Inception.** This phase identifies Montana's specific needs (commitments) of a pension system and defines how the project will be managed to ensure its success.
2. **Commitment Confirmation.** In this phase, the processes the system is expected to support are defined. A process for tracing the commitments from the contract is put in place so that no commitment is missed through development.
3. **Initial Infrastructure Acquisition and Installation.** The development vendor has a base system already designed, so this phase involves preparing MPERA and Montana networks for installing the base model and establishing test systems.
4. **Solution Installation.** In this phase, the base system is configured for Montana needs and made available to end users after thorough testing. MPERA is planning two releases in this phase that will include configuration, system testing, user training and testing, and system implementation.
 - a. Implementation of the pension system for MPERA staff and employers.
 - b. Implementation of a web-based self-service portal giving employees the ability to access their own information.

This audit focused on reviewing the processes in place to ensure the commitments stated in the contract are satisfied. The scope was narrowed to only the development of the base pension system for MPERA staff and employers and does not include the self-service portal. Since the base pension system is a large task to complete in one design process, it was broken in to three parts: 4A1, 4A2, and 4A3. Each part will go through the same design processes, but with different portions of the system. At the

time of the audit, the second part, 4A2, was being finished and the third part, 4A3 was just being started. 4A1 started in September 2012 and 4A3 is expected to finish in March 2015. The base pension system for MPERA staff and employers, consisting of these three parts, is scheduled to be implemented in June 2015.

Report Organization

The following chapters discuss our audit work, findings, and recommendations regarding PERIS system development:

- ◆ Chapter III provides recommendations for improving controls over the detailed processes used to ensure all commitments are being satisfied.
- ◆ Chapter IV discusses the importance of user acceptance testing and recommends improvements be made to ensure user acceptance testing is thorough and reduces risks of system implementation.

Chapter III – Process Controls

Introduction

Three areas were reviewed to obtain assurance over the Montana Public Employee Retirement Administration's (MPERA) controls and are outlined in this chapter. These areas were chosen to ensure that system controls were included in system expectations, to verify processes that ensure commitments are met by the system, and to validate changes to commitments are being documented. The following sections discuss audit work conducted, conclusions, and findings related to the management of commitments through the development of the Public Employee Retirement Information System (PERIS).

Commitment Review

Commitments are the expectations of the system and of the vendor stated in the contract. Each commitment addresses a single capability of the system or a task/activity expected from the vendor. MPERA staff worked with the oversight consultant to develop all commitments. Creating these expectations started with commitments already created in previous implementations of other retirement systems. From there, the oversight consultant worked with MPERA staff through every business process to add, delete and change commitments as needed. Any changes to commitments after being finalized in the contract will lead to potential budget, scope, and timeline changes, so ensuring these commitments include system controls is essential.

Controls Included in Commitments

To assess commitments for important controls, the final commitments were individually reviewed and categorized. The audit focused on specific categories suggested by industry standards to be in place before a system is implemented. The specific controls are outlined below.

Overall System Objectives:

- ◆ **Availability.** The amount of time the system is expected to function properly should be defined. Once this is established, the impact of redundancy, failures, and backup processing should be formulated as well.
- ◆ **Data Integrity.** System functionality available to ensure data is complete and accurate should be noted in commitments.

Specificity of System Features:

- ◆ **Input.** Commitments should specify the input validation method so that only valid data and transactions are processed. Where errors are detected, notifications and the ability to correct them should be provided.

- ◆ **Processing.** Commitments should include validation checks capable of detecting data that has been corrupted by processing errors and should describe the sequence of programs and the steps to be taken in case of a processing failure.
- ◆ **Output.** Commitments for output validation are determined so that accuracy and completeness can be verified.
- ◆ **Interfaces.** The definition of interfaces should be defined in commitments.
- ◆ **Environments.** The environment the system is expected to function in should be defined in commitments.

Security:

- ◆ **System Security.** Commitments should ensure compliance with the security policy of the state.
- ◆ **Profiles (User and Security).** Profiles for users and security roles should be defined in commitments, and developed and tested through design. Procedures for maintaining profiles should also be developed prior to implementation.

Audit work identified 122 commitments relative to these controls, and showed that important system controls were included in the commitments stated in the contract.

User Involvement

It is essential for users to be involved in system development. Industry standards suggest users be involved for better understanding of system processes and expectations and to increase the use of the new system when it is implemented. Users of PERIS include employers and MPERA staff. Plan members' data is managed by the system and employers provide the retirement and payroll data for the system. City, county, school district, and state employers from across the state will use PERIS, making the employer list over 500. Having employers involved in the development process prepares them for the changes they will have to undergo when the new system is implemented as well as identifies potential issues at an earlier time.

MPERA staff identified the following steps taken to involve employers in the development of PERIS.

1. **Newsletter communication.** Updates on development and what is expected of employers in the near future.
2. **Employer Consulting Group.** Advisory group of major employers working closely with MPERA to define the contact between employers and PERIS.
3. **Workshops/Webinars.** Presentations and discussion about the new system.
4. **Implementation Plan.** MPERA indicated there will be a process to ensure all employers are ready for implementation and that all employers must be approved before the system can be used.

Audit staff also created a survey for employers in the Employer Consulting Group. This survey was conducted to gather information about the relationship between employers and MPERA throughout this project. The survey was sent to 21 individuals with 8 responses received. The responses showed overall satisfaction with MPERA's process to involve the employers, with a few noting concerns with the changes that need to be made to implement the system on their side. Additional discussion with MPERA showed they were aware of these issues and have a plan to resolve them before the system is implemented. Further work was done to contact smaller employers throughout the state with the same results. Employers were aware of the new system and are working with a payroll and reporting vendor that MPERA has been in contact with about system updates.

Other State Implementations

Other states and organizations were contacted to gather information about their process to create commitments. We contacted organizations that implemented the same base system, utilizing the same oversight consultant and pension system developers. These organizations successfully implemented the project and were pleased with the vendors work to ensure the commitments were thorough.

Audit work verified a process that created commitments with key system controls, such as those listed on page 9, was in place. Audit work also identified employers, the main users of the system are involved and aware of the project's progress, and MPERA has developed a plan to resolve any issues with employers before the system is implemented.

CONCLUSION

Montana Public Employee Retirement Administration included important system controls over security, user profiles, data integrity, and specific system features when it compiled system expectations with the oversight consultant, and are including employers in the development process.

Commitment Assurance

Once commitments are defined, they follow a path through system development from creation to testing. This is done to ensure the system satisfies each commitment. For MPERA's established methodology, the path starts with the commitment being mapped to a system process. These system processes are called Use Case Scenarios (UCSs). Each UCS identifies the commitment(s) it satisfies and specifically how it satisfies each one. Test cases, specific scenarios to be carried out by a tester, are created to imitate each process in the UCS and verify the processes work as expected without

defect. Different levels of testing are executed. Since user acceptance testing is not scheduled until 2015, we focused on system testing. System testing is conducted by an Information Technology (IT) staff member as opposed to user acceptance testing, which is done by a system user. These levels of testing help ensure the system is ready to operate as expected and agreed upon in the contract at the time of implementation.

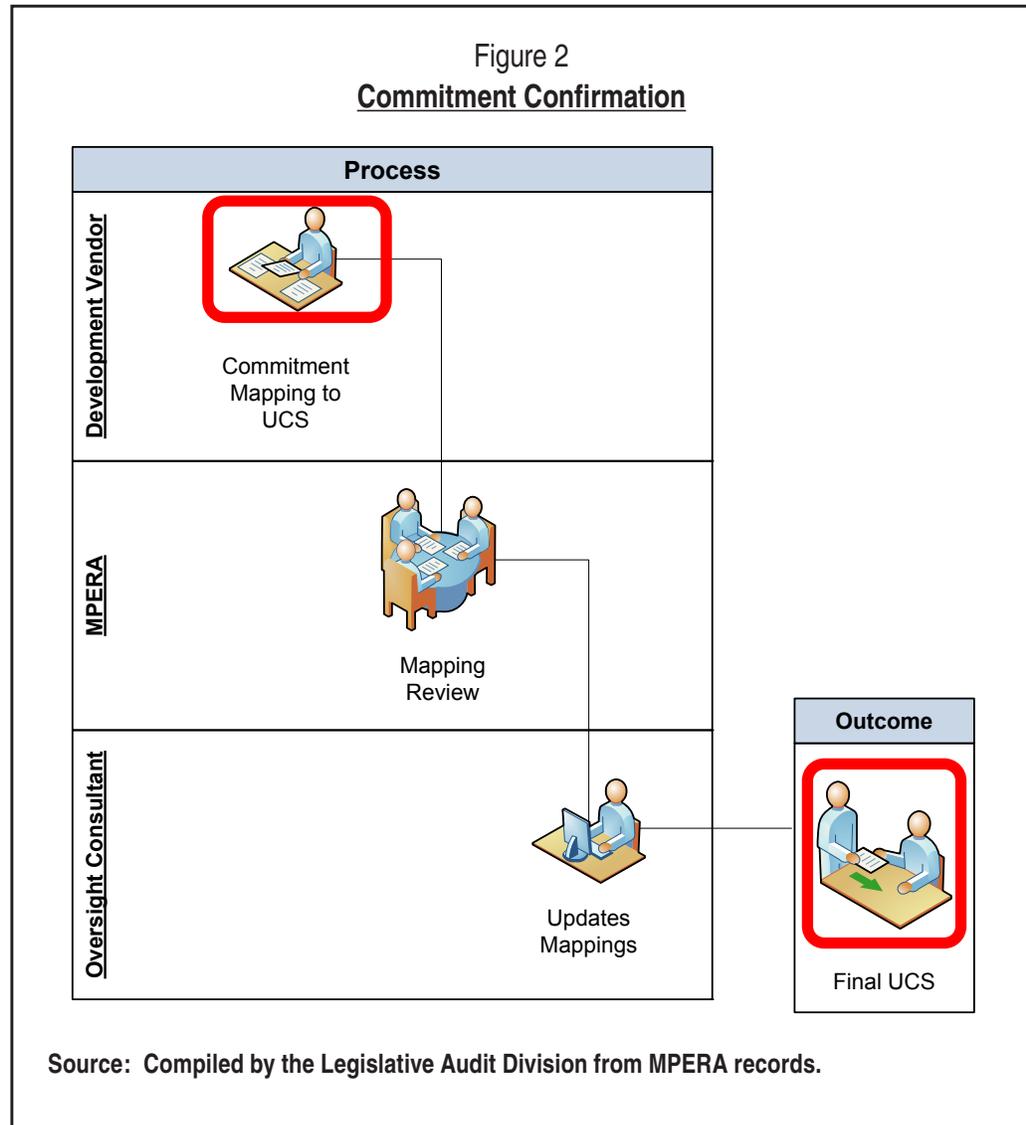
Commitment Sample Definition

During the audit, a sample of 100 commitments from the contract population of 1,347 was used in testing. Twenty were chosen specifically from those identified when we reviewed commitments for key system controls. These 20 commitments relate to industry standard suggested controls such as security, user profiles, and data integrity, and were chosen to gain assurance that the controls were being implemented. The other 80 commitments were chosen at random from the population.

Once we identified our sample, we reviewed the commitment path to gain assurance the commitment would be satisfied. To determine whether the commitment path was adhered to and ensure testing is done to prove the commitment is satisfied, three points in the commitment path were reviewed.

Commitment Mapping Review

The first review was conducted to determine whether the sample of commitments were mapped to a UCS defining how the commitment would be met. The second review was conducted to determine whether the UCS referenced back to the commitment and defined specific business rules or processes to satisfy the commitment. These two reviews are highlighted in Figure 2 (on page 13).



The third review was conducted to ensure the business rules or processes defined in the UCS are represented in a test case. The following sections discuss the results of these three specific points of review and present recommendations to help ensure commitments are met and MPERA receives a system that meets its expectations.

The Oversight Consultant manages a tool to trace commitments and document mappings to UCSs. A report of these mappings was provided by the consultant. This report was compared to the commitment sample to test the mapping process. Audit work identified 88 commitments that were successfully mapped to a UCS, while ten were mapped to a deliverable within the project that would satisfy the commitment. A deliverable, other than a UCS, is a documented plan or action that satisfies the commitment, such as a security plan or plan to provide training to MPERA staff before system implementation. Two sample items were not on the report provided by

the Oversight Consultant, meaning the commitment was not mapped to a UCS. These two commitments were noted as being purged and no longer needed to be mapped to a UCS.

CONCLUSION

Montana Public Employee Retirement Administration developed and is following a process to ensure commitments are mapped to specific use case scenarios or deliverables which increases its ability to ensure the commitment will be satisfied.

UCS Reference Review

PERIS methodology states that each UCS contains a list of the commitments mapped to it and identifies specifically how the UCS satisfies that commitment, whether it is by a certain business rule the UCS follows or a process the UCS includes. This is the final outcome in the commitment confirmation stage, and is needed before any system testing can begin.

Each UCS was reviewed to ensure there was a reference back to that commitment and documentation of specific business rule or process that satisfied the commitment. Commitments were mapped to multiple UCSs, so of the 88 commitments that were mapped, 181 UCSs should have references to that mapping. From the 181 mappings reviewed, 89 were referenced in the corresponding UCS. Forty-nine mappings were to a UCS that has not been completed yet, and therefore could not be reviewed. The remaining mappings were exceptions discussed with MPERA staff. After further review of documentation, we identified the majority of these specific exceptions were due to the commitment being remapped and would not constitute an error. However, some of these mappings were still found to be in error and therefore, failed this review.

Table 2
UCS Reference Results

Reviewed	181*
Referenced	96
Remapped	27
Errors	9
Error Rate	4.97%

**Source: Compiled by the
Legislative Audit
Division from MPERA
records.**

*49 mappings were not reviewed
due to project timing.

Commitments not being referenced in the UCS are mapped in the Oversight Consultant's tool means there is no listed process or business rule to satisfy that commitment. This stops the documented path through system development and does not ensure that the commitment is satisfied by PERIS. Without knowing what satisfies the commitment, testing for the specific rule or process to ensure that commitment

was met could not be executed. This could result in a system that does not satisfy all commitments.

While MPERA is reviewing commitment references within the UCS, they are not reviewing what the Oversight Consultant's tool indicates should be mapped to the UCS. MPERA felt the consultant was managing this process. The Oversight Consultant is responsible for managing the tool; however, MPERA is ultimately responsible for the success of the project by ensuring the system meets their commitments outlined in the contract. Our audit work found commitments not represented in the UCS they were mapped to, supporting the need for MPERA to establish a process to ensure commitment mapping changes are addressed and commitments are represented in the corresponding UCS.

RECOMMENDATION #1

We recommend Montana Public Employee Retirement Administration establish process controls to ensure:

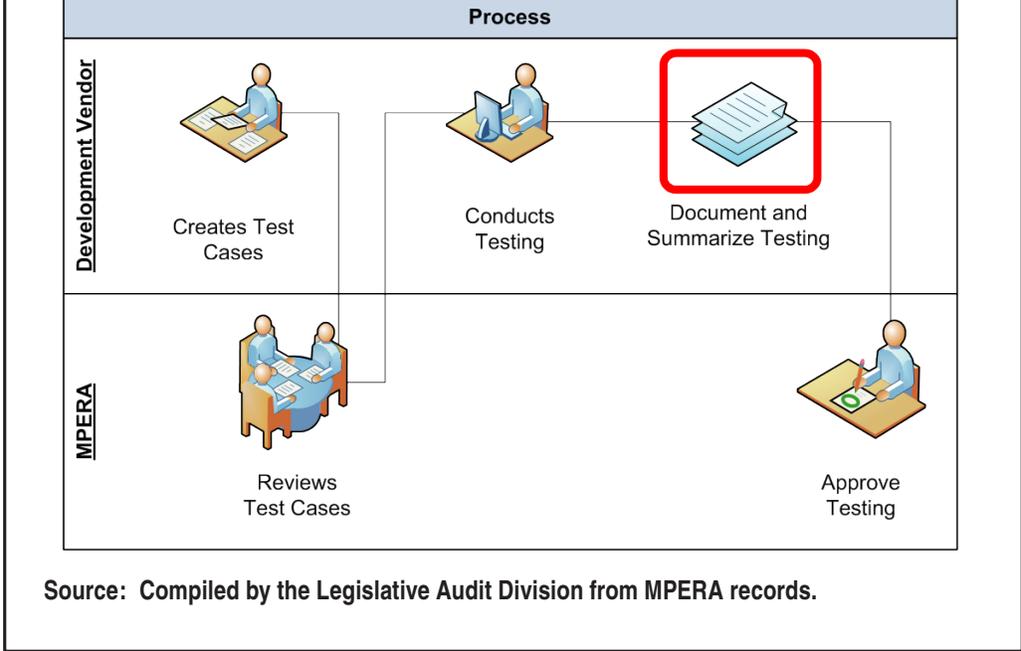
- A. *Commitment mapping changes are documented, executed and accurate, and*
 - B. *Mapped commitments are represented in the corresponding use case scenario as indicated by the Oversight Consultant tool.*
-

Test Case Reference Review

The final portion of the commitment path is the presence of the business rule or process that satisfies a commitment represented in a test case. According to PERIS methodology, test cases are created to verify the processes and business rules from the UCS are working properly in the system.

System test cases are created by the development vendor and then reviewed by MPERA staff. After review, the test cases are executed and documented by the development vendor. The results of testing are summarized and reviewed by MPERA for final approval. Figure 3 (on page 16) shows the process of system testing. The system testing step that was audited is highlighted in red: documented system test cases.

Figure 3
Solution Installation Testing
 System Testing



To conduct our review of test cases, we searched for test cases corresponding to the 89 references found in UCSs. Errors in this review were instances of a test case not including the business rule or process that was listed to satisfy a commitment. Our review found 24 instances that failed the review and are considered errors. Two of these instances were justified by documentation to defer testing until a later date. Table 3 shows the results of this review.

Table 3
Test Case Reference Results

Reviewed	89
Referenced	65
Deferred	2
Errors	22
Error Rate	24.72%

Source: Compiled by the Legislative Audit Division from MPERA records.

MPERA follows a process for approving testing completed by the development vendor; however, controls can be strengthened to ensure test cases include all business rules or processes that satisfy commitments in the UCS. With the complexity of the commitment path and ensuring they are in test cases, the amount of errors found in our sample are concerning considering our sample was small compared to the overall population.

While reviewing these system test cases, we also found instances of test cases that did not include all of the required information (i.e. expected results, predefined conditions, executable steps) and test cases that were not run or marked executed, however, these test cases had been reviewed and approved by MPERA staff. According to MPERA staff, this testing was done at the end of the build, so time was limited to update and complete the documentation of testing. MPERA staff indicated they are not concerned about these test cases being incomplete because of the expectation that later testing will catch anything not tested earlier.

If testing is not thorough and inclusive of all processes and business rules that satisfy commitments, there are two concerns: 1) issues could be missed, and 2) system functionality required in the commitments may be left out. Both of these effects may go unnoticed, or be uncovered in a later phases of the project when it is more costly to fix. This puts more pressure on user acceptance testing (the final layer) to uncover and resolve issues if earlier layers of testing are not thorough. By strengthening its controls over the test case approval process, MPERA would have increased assurance that the system they receive meets expectations.

RECOMMENDATION #2

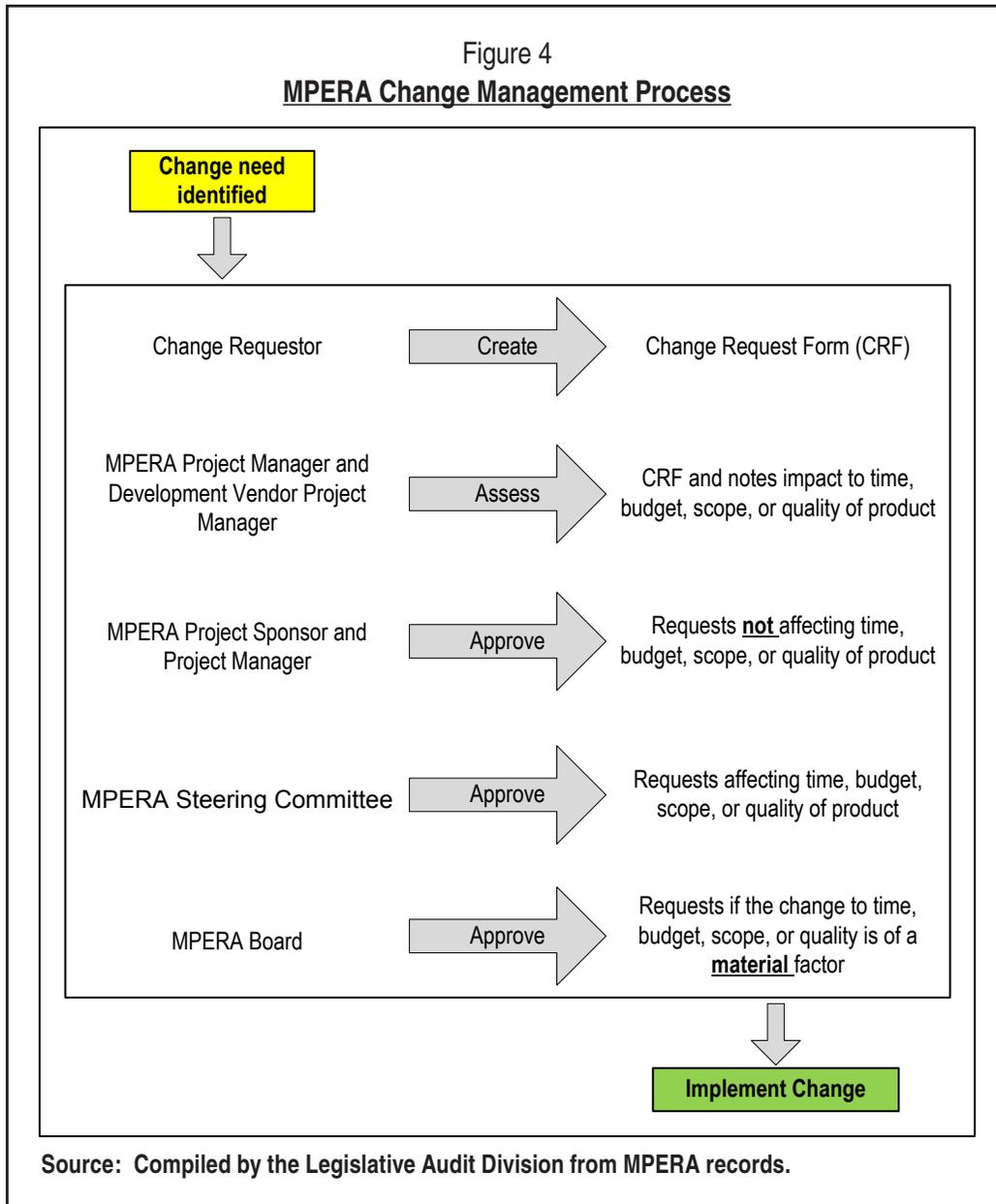
We recommend Montana Public Employee Retirement Administration strengthen controls over its test case approval process to ensure:

- A. *Test case documentation is complete, and*
 - B. *Test cases address all business rules and processes from the use case scenario that satisfy commitments.*
-

Change Management

Changes are expected throughout the development process. Projects usually span a lengthy timeline, and business goals and initiatives may change throughout. Changes may also be realized when ideas from the start of the project start to be implemented later on. What was a good thought may not work with other parts of the project, or a better way to do something may be discovered. To save time or money on the project, the work to implement the change is weighed against the benefits. For these reasons, a good development methodology will include a detailed process for change management. Managing these changes with a defined process is important to ensure that the likelihood of unauthorized alteration is minimized as well.

Change management follows a path from creation to implementation. First, the need for a change is identified. This need is then documented in a change request form if there is a potential change to time, budget, scope, or quality of product. MPERA staff and the development vendor both assess the impact of the change. If there is no impact, a lower level of approval from managers is required, but if there is an impact identified, then the MPERA steering committee approval is required. If the impact is determined to be of a material factor, the change must be approved by the MPERA Board. These steps can be seen in the figure below.



MPERAs Change Management Plan

The management of changes to commitments is important to ensure MPERA receives the system it requests in the identified timeframe. Our audit work identified a change management plan established early on in the project. We reviewed key points of the plan to ensure it aligned with industry standards and then reviewed documents supporting the process to verify the plan was being followed.

The PERIS change management plan includes:

- ◆ Clearly defined and documented procedure known by all parties.
- ◆ Formal approval by management after impact assessment (change to time, budget, scope, or quality of product).
- ◆ Change implemented after formal process is complete.

The plan is clearly defined and identifies authorities and roles throughout change management also. Audit work used the plan to verify processes were followed for every change to the PERIS project.

Required Formal Review of Change Requests

While reviewing change management processes and ensuring any changes were going through a documented process, eleven commitments that had been purged were identified. Purged commitments are a change to scope and should trigger the change management process, so we reviewed documentation created to support these changes known as change request forms (CRFs). Three of the commitments were purged upon the acceptance of the proposal from the development vendor, before a change management process had been established. This was noted in documentation reviewed by audit staff. The remaining eight purged commitments should have followed the established change management process; however, audit work showed that four of the eight purged commitments were found in a CRF with proper approvals and the remaining four commitments were noted in a decision log for the project, without formal documentation or approval.

We also reviewed all CRFs to determine whether appropriate documentation approval occurred prior to the change being implemented. While reviewing CRFs, audit staff found twelve change requests, with four of those being finalized. Of those four, one was cancelled and three were complete. Of the complete CRFs, one was found without all required approval signatures and one was missing documentation of the steering committee approval for affecting time, budget, scope or quality of product because it was determined that impact to scope would not be assessed at that time. Additionally, there was no documentation of materiality of the changes' impact and consideration if they should be escalated to the Board.

The goal of effective change management processes is to minimize the risk of unauthorized changes and enforce a formal process to assess impact of the change. Commitments being purged without documentation increases the risk that the change could have been implemented without all involved parties knowing, without executive approval, or without formal realization and documentation of the impact to the project.

MPERA staff indicated they are reviewing and updated the change management process because at this point changes have been minimal, and as the project gets further in to design, more changes are occurring and process improvements are necessary. Audit work found an informal process that did not document impact assessments in some cases, so the materiality of the issue may not be identified, and therefore may not be communicated to the Board. A current example of how this is affecting the project is starting to take place. The development vendor is requesting just over \$100,000 additional funding to cover potential changes to the project. Purged commitments could offset these requests as they are a decrease in the scope of the project. However, there was no formal documentation completed to assess the impact to scope when the changes were implemented. Now MPERA staff are reviewing all of the change requests to determine the impact to the project.

While the four purged commitments without CRFs were documented on the decision log for the PERIS project, MPERA was using an informal process for changes to maintain vendor relations and not impact the project schedule. The informal process refers to staff using the decision log to “hold” change details so that the change can be implemented faster and they are not waiting for paperwork of the formal process to be finished. This informal process also meant that steering committee approvals and materiality decisions were not being documented in meeting minutes. By following its formal change management plan, MPERA will have better assurance that commitment changes only occur if impact to the project is understood and all required parties have approved the change.

RECOMMENDATION #3

We recommend Montana Public Employee Retirement Administration only initiate changes after they have gone through its formal change management process including:

- A. *Montana Public Employee Retirement Administration review of time, budget, scope, or quality of product and documentation supporting decision,*
 - B. *Document steering committee approval, and*
 - C. *Reviewing and documenting whether the change is material and should be escalated to the Montana Public Employee Retirement Administration Board.*
-

Chapter IV – User Acceptance Testing

Introduction

The final process in the development life cycle before implementation is user acceptance testing (UAT). Since UAT is not scheduled until January 2015, to this point, the report has discussed processes through system testing. While system testing is initial testing conducted by the development vendor, UAT is the last chance for the Montana Public Employee Retirement Administration (MPERA) to ensure the system meets expectations set by the contract.

The objective of UAT is to ensure system functionality performs in business scenarios, therefore, testing is completed by MPERA. UAT is also done to protect MPERA from the following potential risks after the system is implemented.

- ◆ **Legal Risk.** The potential for the system to not be in compliance with law.
- ◆ **Time Risk.** The potential for the system processes to not meet business deadlines.
- ◆ **Resource Risk.** The potential for issues after implementation requiring more resources to fix than available.
- ◆ **Reputation Risk.** The potential for external users, employers, state, and local government employees to perceive a problem with the system, which could be interpreted as a problem with the agency.

Industry standards state that all business scenarios, in this case Use Case Scenarios (UCSs), be successfully executed and documented in UAT. If MPERA implements the recommendations from this report, there will be increased assurance that all business scenarios (UCSs) will be documented and tested thoroughly in UAT. The assurance is vital with a complex system that could cost almost \$12 million to implement.

PERIS UAT Methodology

The process established in PERIS methodology for UAT follows industry standards and is similar to system testing, the difference being that UAT test cases are built and executed by MPERA staff instead of the development vendor. UAT has significant impact to the success of the project and mitigating the potential risks mentioned above. When commitments were created, the importance of UAT was identified in the contract, and a commitment requiring UAT timeframe be at least 10 percent of the total project time was created.

Pressure on User Acceptance Testing

As discussed in the previous chapter, we identified system test cases that were not run or were incomplete. MPERA staff stated they are relying on later testing to catch incomplete tests in system testing. By relying on later testing, MPERA could potentially be increasing the work needed to be done by its own staff in UAT. Additionally, when reviewing commitment assurance and change management, we found changes that shortened the UAT timeframe. After reviewing the impact of these changes, we identified that the UAT schedule went from 122 days to 90 days.

Shortening the amount of UAT on the actual system creates less time to ensure the system satisfies the contract. This is compounded by the fact that not all business rules and processes satisfying commitments are being tested in earlier layers of testing, creating additional work and pressure on UAT.

With the potential impacts to UAT, there is an increased risk that user acceptance testing will not provide assurance the system will meet expectations defined in the contract. If audit recommendations are implemented through the remainder of the development life cycle, this risk could be decreased, however; since UAT is not scheduled until 2015, we cannot assure that final UAT will include all tests necessary to confirm all commitments.

The duration for UAT has been decreased to the minimum required by the contract. While still compliant with the contract, MPERA has increased its risk of implementing a system that does not meet its expectations by adding work to the critical phase of UAT and shortening the amount of time allotted to carry out the testing. Therefore, we have no assurance that the amount of time scheduled is sufficient or that UAT will be thorough enough to confirm all commitments from the contract are being met by the system.

CONCLUSION

The heightened importance and reduced duration of user acceptance testing during PERIS development increases the risk of the system not meeting contractual commitments or the needs of its users.

MONTANA PUBLIC
EMPLOYEE RETIREMENT
ADMINISTRATION

ADMINISTRATION RESPONSE

MONTANA PUBLIC EMPLOYEE RETIREMENT ADMINISTRATION



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September 3, 2014

Tori Hunthausen, CPA, Legislative Auditor
Legislative Audit Division
State Capitol, Room 160
Helena, MT 59650



Dear Ms. Hunthausen:

We appreciate the opportunity to respond to the recommendations in the information systems audit of the Public Employee Retirement Information System (PERIS) Development Life Cycle. We understand there are three recommendations.

Recommendation #1

We recommend the Montana Public Employee Retirement Administration establish process controls to ensure:

- A. Commitment mapping changes are documented, executed and accurate, and**
- B. Mapped commitments are represented in the corresponding use case scenario as indicated by the Oversight Consultant Tool.**

Response

We concur.

A. Corrective action plan: Our Oversight Consultant vendor will monitor the CTS and report to MPERA weekly on project commitments in their Weekly Project Monitoring and Feedback Report. Their report will include commitment metrics, commitment changes and incorrectly mapped commitments. The MPERAtiv Program Manager will review this report weekly and work with the development vendor and our Oversight Consultant to resolve any discrepancies.

Timeline for implementation of recommendation: Implemented.

B. Corrective action plan: MPERA will include a review of the commitments tracked in the Commitment Tracking System (CTS) as part of the formal acceptance of each UCS. This review will confirm that all commitments mapped to the use case in CTS are addressed in the UCS and all commitments addressed in the UCS are also mapped correctly in CTS. Any discrepancies will be investigated and resolved prior to the acceptance of the use case.

Timeline for implementation of recommendation: Implemented.

Recommendation #2

We recommend the Montana Public Employee Retirement Administration strengthen controls over its test case approval process to ensure:

- A. Test case documentation is complete, and**
- B. Test cases address all business rules and processes from the use case scenario that satisfy commitments.**

Response

We concur and would like to differentiate between Unit test Case (UTC) and System Test Case (STC) reviews.

A. UTC are not formal deliverables to MPERA but are artifacts from the construction process. Acceptance of the UTC is not tied to formal acceptance of the completion of construction; MPERA reviews the UTC and marks them as reviewed prior to construction acceptance. It was determined that an in depth review of the UTC was not needed as the UTC involves the testing of individual components to ensure the system meets the use case specifications and is ready for system testing, the next level of testing. Our Embedded Staff would focus more time on their primary goal of training to develop and support PERIS when it goes live than on reviewing UTC.

STC documents are also not formal deliverables to MPERA. Our development vendor has a defined procedure for completing STC documents and strives for complete, thorough, quality testing, along with ensuring the STC documents completely reflects the test case, test steps, expected results, and actual results and the methods for documenting are clear (e.g. bullets, snippets).

Our review of the STC documentation is stringent and also includes a review of the System Test Phase summary documentation provided by our development vendor. This summary documentation details their review of the system test phase and includes overall statistics such as number executed, passed, failed, not applicable, deferred, or not testable.

Corrective action plan: We have established a test case review checklist which includes verification that all UTC and STC documentation is complete including all required information.

Timeline for implementation of recommendation: Implemented.

B. This recommendation is not applicable to UTC as the goal of unit testing is the testing of individual components to ensure the system meets the use case specifications and is ready for system testing.

Corrective action plan: We have established a test case review checklist which includes verification that each business rule or process that satisfies a commitment applicable to the use case has a corresponding STC.

Timeline for implementation of recommendation: Implemented.

MONTANA PUBLIC EMPLOYEE RETIREMENT ADMINISTRATION

A-3



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Recommendation #3

We recommend the Montana Public Employee Retirement Administration only initiate changes after they have gone through its formal change management process including:

- A. Montana Public Employee Retirement Administration review of time, budget, scope, or quality of product and documentation supporting decision,**
- B. Document steering committee approval, and**
- C. Reviewing and documenting whether the change is material and should be escalated to the Montana Public Employees Retirement Board.**

Response

We concur.

MPERA implemented an MPERativ Change Control Board (CCB) on July 15, 2014. The CCB reviews all project change request forms (CRF) and decision documents (DD) and recommends a disposition to the Project Sponsor and Executive Sponsor. The meeting minutes of the CCB are recorded and stored on SharePoint.

Corrective Action Plan: MPERA will ensure the CCB reviews all CRF and DD for impacts to time, budget, scope or quality and determines if the change is material and should be escalated to the Montana Public Employees' Retirement Board. This information will be recorded in the CCB meeting minutes.

Timeline for implementation of recommendation: Implemented.

We appreciate the time and effort expended to complete this information systems audit and the courtesy and consideration extended to MPERA during the audit.

Thank you for your assistance.

Sincerely,

A handwritten signature in blue ink that reads "Dore Schwinden".

Dore Schwinden
Executive Director