KPMG

cutting through complexity

Legacy System Replacement Alternatives and Recommendations

Deliverable 1.5

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Table of Contents

Revision History

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Glossary

AASIS	Arkansas Administrative State-wide Information System
ADPICS	Advanced Purchasing and Inventory Control System
CHRO	Chief Human Resources Officer
COA	City of Atlanta
COTS	Commercial off the Shelf
DAS	Department of Administrative Services
DD&I	Design, Development & Implementation
DED	Deliverable Expectation Document
ERP	Enterprise Resource Planning
FTEs	Full-Time Equivalents
HCM	Human Capital Management
HR	Human Resources
HRIS	Human Resource Information System
IT	Information Technology
iPaaS	Integration Platform as a Service
LAUSD	Los Angeles Unified School District
LARS	Leave Accrual and Reporting System

MERIT	Marin Enterprise Resource Integrated Technology
M&O	Maintenance and Operations
MS	Microsoft
ODOT	Oregon Department of Transportation
OEBB	Oregon Educators Benefit Board
ORBITS	Oregon Budget Information Tracking System
ORPIN	Oregon Procurement Information
OSPA	Oregon State-wide Payroll Application
PICS	Position Information Control System
PEBB	Public Employees Benefit Board
PERS	Public Employees Retirement System
PPDB	Position and Personnel Database
PPPM	Project Portfolio Program Management
SaaS	Software as a Service
SAIF	State Accident Insurance Fund
SCIO	State Chief Information Officer
SFMA	State-wide Financial Management Application
SMP	Subject Matter Professional
SOW	Statement of Work

TBD	To Be Determined

1 Introduction and Background

1.1 Purpose and Background

The State of Oregon, like many states, is at a critical decision point regarding its legacy information technology (IT) systems. The State legacy systems lack the necessary functionality and flexibility for current operations and in some cases they are expensive and challenging to maintain. The current IT landscape is composed of disparate, non-integrated, point solutions that simply cannot provide this data efficiently. Oregon requires accurate, timely and consistent information for day-to-day decision-making and longer-term strategic planning.

Through a series of workshops and consultations with a multitude of State of Oregon agencies, the Department of Administrative Services (DAS) analyzed options and prioritized the replacement of two custom legacy mainframe applications. The Position and Personnel Database (PPDB) and Position Information Control System (PICS) were selected based on a number of criteria including end of life, user morale, process inefficiencies, implementation complexity, and risk exposure. While it is widely agreed that many enterprise applications need to be modernized, CHRO has undertaken the momentous role as the "first mover." As the first in what is expected to be a larger modernization effort, the HRIS project must explore how the Human Resource Information System (HRIS) fits into the larger enterprise modernization plan. To support the legacy system modernization initiative, the Department of Administrative Services (DAS), the Office of the Chief Human Resources Officer, together with the State Chief Information Officer (SCIO) asked KPMG to aid in the development of a modernization approach and roadmap.

The State is not planning to undertake a full state-wide ERP implementation at this point in time. However, the State is interested in understanding how a modular implementation, starting with human capital management could bolster the further modernization of the other legacy systems. Additionally, the CHRO and SCIO want to maximize the opportunity by supporting not only the modernization, but the integration of the HRIS with other state systems that are in production or with replacements for current systems. Due to these goals, enterprise considerations are important to the success. This Legacy System Replacement Alternatives and Recommendations Deliverable outlines potential modernization approaches, sourcing options, a roadmap for implementation, industry leading practices, and key decisions and considerations for DAS and the SCIO as they establish a plan for the future modernization of many of their legacy applications.

1.2 Executive Summary

1.2.1 Report Overview

The Legacy System Replacement Alternatives and Recommendations Deliverable provides the State of Oregon with a conceptual, but actionable, roadmap with key considerations as the State pushes forward with enterprise modernization. The report represents a foundational step taken by the HRIS project team and will assist the State in planning for the realization of its vision of a modernized integrated enterprise services delivery system.

1.2.2 Roadmap Development Process

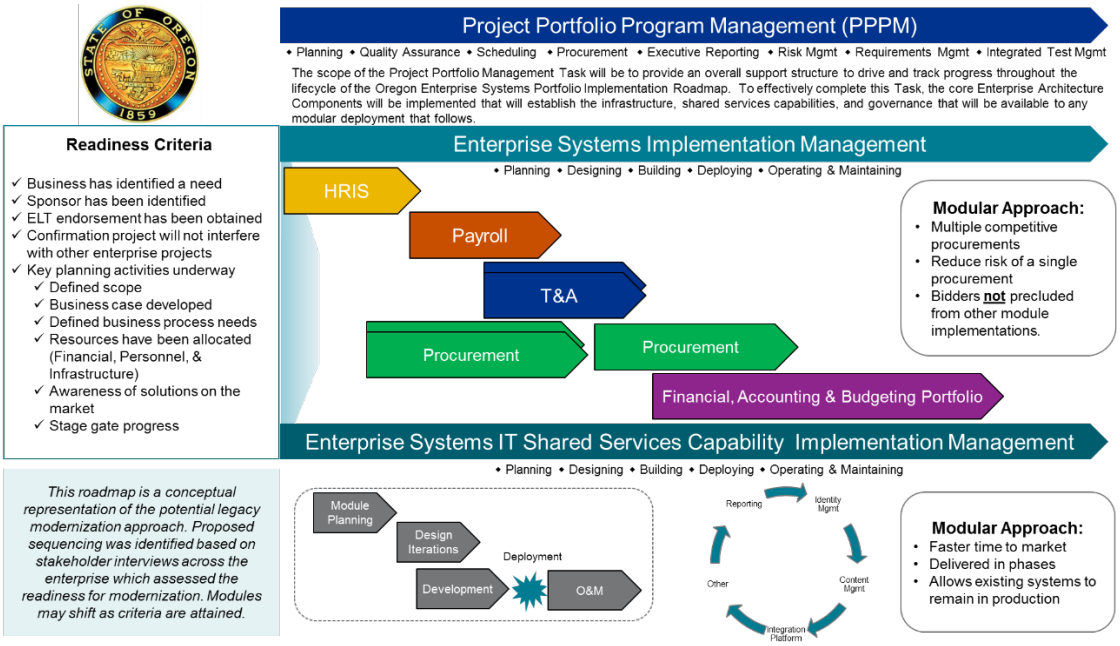
The KPMG team worked with various State stakeholders to develop a conceptual roadmap to aid in progressing the enterprise modernization initiative. The DAS, CHRO and SCIO are faced with numerous challenges including aging legacy systems which are becoming riskier and riskier to maintain. To help DAS meet imminent deadlines, KPMG had a little over a month to review existing legacy system documentation, perform numerous stakeholder interviews, and conduct a workshop with key enterprise stakeholders. These activities enabled the team to

identify a conceptual roadmap that identifies the potential sequencing of legacy system modernization as well as key considerations to be evaluated at each module's implementation.

1.2.3 Enterprise Systems Portfolio Implementation Roadmap

The implementation roadmap presents a conceptual representation of the work required to support an enterprise systems modernization portfolio (i.e., not just the HRIS implementation). The illustration depicts the proposed sequencing based on information gathered in key enterprise stakeholder interviews, industry leading practices, and an understanding of the enterprise readiness to implement a legacy system modernization. Each module of the modernization should be driven by establishing and meeting key predefined readiness milestones rather than date driven calendar-centric deadlines. Readiness criteria help ensure all the necessary resources, sponsorship, and key planning milestones have been attained prior to taking on a complex IT implementation.

Figure 1: Enterprise Systems Portfolio Implementation Roadmap



1.2.4 Implementation Considerations and Recommendations

Leading practices suggest that the enterprise systems modernization implementation plan be managed as a broad program, with ongoing governance, and enterprise-wide program management oversight over all interdependent initiatives. Program management should oversee integration architecture to ensure the design and standards are appropriate and integrated, ongoing communications and change management is consistent and managed to keep stakeholders informed and involved, and equipped to adopt the changes required for benefits to be realized. Based on the IT and business environment within the State and its agencies, current market place trends, and the magnitude of this endeavor, the following key principals are recommended:

- **Follow a milestone-based approach to module planning**
  - Establish readiness measures which will serve as entrance criteria for module initiation (as opposed to be driven by a calendar of planned commitments);
  - Move forward with the decision to start with HRIS; HRIS is a high need, lower risk entrance point for the portfolio of effort

- **Leverage Commercial off the Shelf (COTS) products**
  - Reduce implementation timelines and the associated risks by leveraging, where appropriate, COTS products
  - Provide options to seek proposals from both Systems Integrators and Software Vendors independently, which can potentially lower risk and increase competition

- **Standardize business process where possible**
  - By standardizing business processes, costly customization and configuration of software solutions can be reduced
  - Be realistic regarding the programs' ability and staff's desire to standardize (note: false commitments to standardize that are quickly replaced with customization is a leading cause of public sector system implementation challenges)

- **Consider the cloud**
  - Cloud offerings are expanding and bringing with them benefits of quicker implementations, reduced resource requirements for infrastructure and IT personnel, and can scale to meet business needs
  - Cloud offerings minimize the risk of state agencies maintaining and operating the systems by placing the risk on the service provider (note: recent trends in public sector projects reflect increasing confidence in cloud provider security practices over internal data center operations)

- **Be thorough in evaluation of cloud possibilities**
  - Choosing a cloud vendor increases complexity of integration models between on premise and cloud systems
  - Understand how your data will be converted into the cloud, but also, how and in what format it will be converted out if necessary
  - States that focus on data stewardship regardless of hosting model find greater success than ones who focus solely on the solution functionality.

- **Understand the enterprise shared service agenda**
  - Determine whether there is an interest and commitment for shared, re-useable services to lower cost and risks to future projects
  - States that share common infrastructure and services find lower risk, improved performance and reduced complexity in architecture that makes training and other investments more manageable;

- **Consider implementation timeline and budget factors**
  - Enterprise modernization will likely take multiple biennium sessions for planning and funding; as well as encounter funding influences from external forces
  - Manage the modernization initiative as a portfolio of projects and programs with ongoing governance (i.e. while considerable savings are achievable, sharing a portfolio requires significant coordination and agreement among involved parties)
  - Identify opportunities to realize value at each module rather than implementing a strategy where benefits are deferred until the implementation of multiple modules (i.e. every milestone step in fulfilling the roadmap must stand on its own as valuable).

2 Interview Attendees and Summary

To assist in the development of the enterprise modernization implementation roadmap, the State identified a number of stakeholders whom have valuable insight and could aid in providing a holistic view of the functional need, risks, and enterprise readiness. To approach these discussions efficiently, the interviews were given targeted themes that provided tactical information on which to base our assessment. The type of interviewee varied from core users, interface partners, fiscal partners, IT staff and others. The following table includes the names and roles of the individuals that participated in the small group interviews.

Figure 2: Interview Overview

OR HRIS Individual and Small Group Interviews	
Interviewee Name(s)	**Interviewee Role(s)**
Scott Harra	Chief Administrative Officer with the Oregon State Treasurer
Bob Cummings; Sean McSpaden	Principal Legislative (IT) Analysts
Kathleen Loretz; Ali Hassoun	Interim PEBB/OEBB Administrator; PEBB Director of Operations
David Moon; John Fagan; Terrie Chandler	Judicial Department Business and Fiscal Services Division Director; Judicial Department Business and Fiscal Services Division Budget Manager; Judicial Department HR Director
George Naughton; Brian Deforest	Department of Administrative Services Chief Financial Officer; Department of Administrative Services Deputy Chief Financial Officer
Jeremy Emerson; Shawn Jacobsen	Department of Human Services Deputy Chief Operating Officer; Department of Human Services Office of Financial Services Controller
Jeff Morgan	Secretary of State, Business Services Division Director
Heidi Zinsmann	Strategic Technology Officer State CIO Office
Tony Black	Chief Technology Officer and Administrator, Enterprise Technology Services
Alex Pettit	State Chief Information Officer
Bret West	DAS Administrator of Enterprise Goods and Services
Jason Stanley Yvette S. Elledge Kyle J. Knoll Jordan Masanga Mary Dunn	PERS Chief Risk Officer PERS Administrator, Customer Services Division PERS Administrator, Financial and Administrative Services Division PERS Technology Officer PERS Senior Policy Director of Operations

In addition to individual and small group interviews, a workshop was facilitated with the Enterprise IT Governance Committee members and the Human Resource Information System Steering Committee members. The objective of the workshop was to better understand how the HRIS system fits into the larger IT modernization strategy and enterprise architecture.

The team captured many perspectives from thoughtful, committed state employees. There were many important nuances that were captured throughout this process that have and will continue to inform the work of the HRIS team as well as KPMG. For example, the aesthetics of aging systems is a real issue, creating the perception of antiquated and inefficient operations that conjures notions of stagnating innovation in a commercial and social world where technology is becoming ever more pervasive.

The central recurring topics in the interview sessions and workshop were not just about the aesthetics, but rather about the real capability and flexibility of core enterprise systems. The Oregon personnel interviewed consistently spoke with a sense of pride and purpose around their work, specifically in making Oregon a better place for people to live and work. A central theme of the responses focused on how critical services, those performed by each department to function effectively, are keeping up with the pace of operational innovation. Unfortunately, the feedback consistently revealed that the State's previous incomplete efforts to replace or modernize enterprise systems resulted in a continually widening gap between where the State's operational leadership and staff believe Oregon should be and where the systems supporting them today enable their processing of basic services.

The interviews confirmed the HRIS portfolio as the logical and likely first phase for the State, but then opened the door for more informal input on the broader ecosystem of enterprise systems to calibrate the relative priority of users and possible sequencing. The interviews confirmed, with virtually no meaningful argument, that the HR systems – both PPDB and PICS – are clear examples where a very wide gap exists between current capability and the operational staff needs. After these systems, interviewees responded with a range of alternative next steps that can be summarized as:

A. Payroll processing – an often cited system that is aging, not meeting business objectives, and difficult to work with, technically. It is likely that there was some additional bias for payroll as many interviewees who had already confirmed the priority of PPDB and PICS replacement viewed Payroll as an allied function that would be well aligned as a next step.
B. Time and attendance entry and reporting – similar to Payroll, this was viewed as a natural follow-on to the PPDB and PICS replacement, especially if Payroll was also advanced in the roadmap. However, time and attendance systems are less universal across government entities. This means that more effort may be required to fully assess and develop a constructive plan that accommodates the common and unique needs of organizations.
C. Procurement – while completely independent of the broader HR portfolio, the satisfaction with current procurement automation is very low among user authorities, agencies and departments. Similar to time and attendance, procurement variations are not insignificant across entities. Oregon is currently using an enterprise procurement system, however, it ranks highly among prioritized systems for modernization. Currently there is an initiative underway to procure a modern procurement system, but at this point in time, it is not being considered as an enterprise replacement. The stakeholders contend the vision is that the new system ultimately replaces the legacy system instead of creating an additional shadow system to be maintained within the existing environment.
D. The financial, accounting, and budgeting systems portfolio – there is clearly long term interest in modernizing the portfolio, but there is also relatively specific feedback about what is needed within this portfolio. Feedback included a desire for additional capability (e.g., business intelligence or document management). Feedback did not necessarily indicate there was a need to change to current capability (though multiple comments were made that an aesthetic "facelift" may make the dated user interfaces a little more appealing).

3 Current State

The following section describes the current state in terms of high level business processes, current systems, current organizational structure, capabilities and governance (people, processes, technologies) as outlined in the HRIS Business Case and further explored during stakeholder interviews.

The DAS CHRO leads the Oregon Human Resource operations using multiple systems which manage employee and position data for all state agencies. PPDB serves as the official record of employment and the state-wide source of employee information. PPDB contains historical and summarized employment history. Oregon state agencies are required to use PPDB as the central repository for human resource related data.

PICS is a sub-system of PPDB, although treated functionally as a separate application. PICS is designed to perform position control, including position budgeting, forecasting and reporting. PICS has an automated interface to the Oregon Budget Information Tracking System (ORBITS) and is the single source of unique position-related data such as the position number itself, Salary Eligibility Date, and salary range. PPDB and PICS are used to track approximately 45,000 permanent and seasonal positions, which equates to almost 38,000 full-time equivalents (FTEs). Both the FTE and position counts exclude the University System, Oregon Health Sciences University, State Lottery, SAIF Corporation and their associated Boards and Commissions.

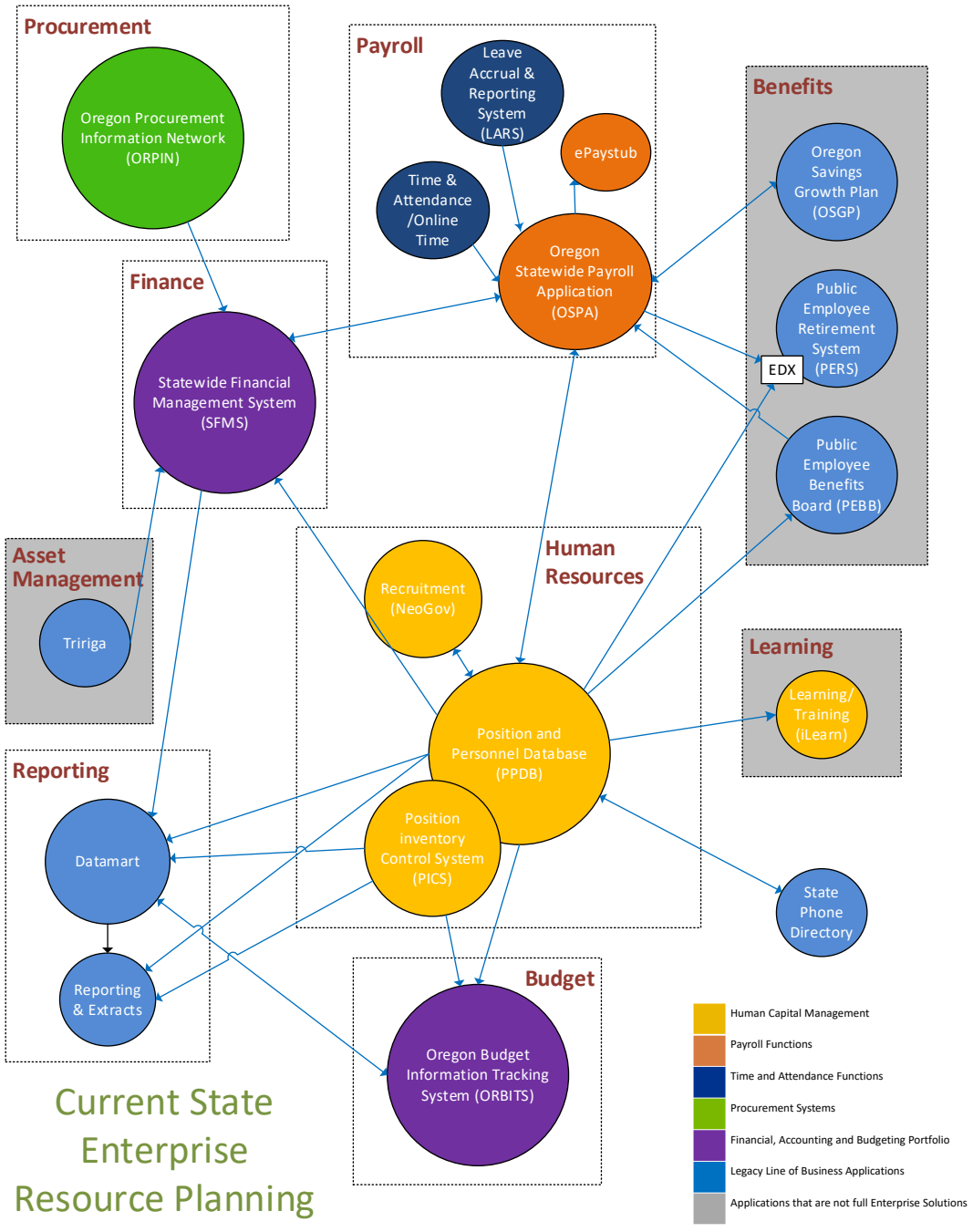
The PPDB and PICS systems support some basic HR functions but lack the full functionality and integration capability needed to address all of today's essential HR business processes and analytical capabilities. PPDB and PICS lack the needed functionality, flexibility, and integration to adequately support state policy and procedures and federal law requirements. To remedy the shortcomings, agencies throughout the State use either manual paper-based processes or some form of shadow system.

When legislative or regulatory agencies mandate changes to business processes or procedures, it is difficult to modify PPDB and PICS. Coupled with the number of customizations made to these systems over the years, they are increasingly difficult and expensive to maintain and operate.

Systems

The Oregon state employee workforce is managed, paid and budgeted for through a number of computer systems. Within the suite of systems that Oregon currently maintains there are the four pillars or foundational systems that include the HRIS system (PPDB and PICS) which was developed in 1991 and is 24 years in production; the accounting system (RSTARS) 19 years in production; payroll (OSPA) which is 28 years in production; and budget (ORBITS), the youngest, at 12 years in production. In addition to these four systems, there are activities currently underway in Oregon that address other tasks or functions consistent with resource planning, but not at a large scale "enterprise resource planning" (ERP) level, including current eProcurement and Time and Attendance projects at various stages of pursuit. The figure that follows, figure 3, identifies the systems present in the Oregon IT enterprise environment and the interaction between these systems. The figure also groups these legacy systems into functional categories which map to modern systems or enterprise modules found in current marketplace and referenced throughout this document.

Figure 3: The Oregon Enterprise System Landscape



Since PPBD and PICS were developed significant software and technology advances have occurred. Additionally, the marketplace landscape has changed and new opportunities are available currently that did not exist in the 1990's. Today, improvements are rapidly designed, developed, and deployed, making improved Human Resources (HR) processes and opportunities available faster and on a broader scale and incorporating other Human Capital

Management (HCM) functionalities. The marketplace has also evolved which will enable clients to select from a much more varied approach to ERP systems than was available 20 years ago.

The State of Oregon's HR business needs have far outpaced the current legacy systems' ability to support them. Key problems with the existing legacy applications include cumbersome, slow navigation, and the absence of any capability to produce necessary metrics for use in management decisions or reports. Staff are forced to collect vital information manually, on an ad-hoc basis. This undermines strategic decision-making and is an inefficient use of valuable staff time and resources. These two systems are inflexible and difficult to maintain, upgrade and support. According to the Dye Management Study that the DAS CHRO commissioned, this current state of the dilemma forces the "State into a choice between two unacceptable choices: using inefficient, time consuming manual processes or, alternatively, to develop costly supplemental systems to support basic business needs."

The Dye Management Study determined that the most compelling indication of the current state dilemma is that the Oregon staff have grown accustomed to the inadequacies of these systems and instead of approaching the issue with an enterprise approach, the various agencies have internally developed work around activities to capture the current state of position inventory, sometimes even going to the legislature for a change as opposed to trying to do an internal system change. There has arisen a series of "shadow systems" for information storage and retrieval. The stakeholders unanimously acknowledged that the systems in place fail to provide the information that the legislature and the agency leaders require in a timely and accurate manner. The agencies have a difficult time capturing accurate information from a "single source of truth" or the "system of record" to provide a consistent current picture across the entire state personnel landscape, all of which denies the legislature and the governor the ability to capture current and future state data and issues necessary for budget analysis and preparation.

All domains of the Oregon IT Enterprise are in need of modernization and additional modernization plans addressing the remaining domains may be forthcoming. The HRIS application closely impacts the Oregon State employees. It interfaces with the budgeting and control of the staff aligned to agencies; it provides critical data into the benefits and Public Employee Retirement System (PERS); and others equally significant to staffing all state agencies. Starting here addresses the most urgent requirements for business support and system maintainability. The State will be able to realize the greatest amount of business utilization once legacy systems are modernized. The gradual migration of existing systems into modern designs and technology makes it increasingly possible for the State to provide cost-effective maintainability and supportability while realizing new and improved services.

As the Figure 3 above illustrates, the other systems do interact amongst each other. A brief synopsis follows:

State-wide Financial Management Application (SFMA) serves as the centralized accounting system. SFMA consists of two modules: the Relational State-wide Accounting and Reporting System (R*STARS) and the Advanced Purchasing and Inventory Control System (ADPICS). Approximately 85 state agencies with 1400 users utilize the financial system which is highly configurable for each agency's unique program structures and requirements. This includes recording both receipts and expenditures that are controlled at both the budget and cash level.

SFMA Reconcile Program is a stand-alone program that matches transfers and selected deposits for the state-wide General Fund reconciliation.

R*STARS and ADPICS are mainframe systems written primarily in COBOL and COBOL CICS. They interface with many other DAS Enterprise systems. Any modernization plan will need to include the support of the existing interfaces, or alternatively, eventually address that functionality. The current interfaces are:

- Oregon State Payroll Application (OSPA) – Bi-directional interface
- Oregon Budget Information Technology System (ORBITS) – data is sent to it.
- DAS Datamart – data is sent to it.

- Treasury - Bi-directional interface
- Oregon Procurement Information Network (ORPIN)
- Approximately 89 agency specific interfaces

Oregon State-wide Payroll Application (OSPA) serves as the centralized payroll system for Oregon State Government. The system pays approximately 38,000 employees each month with many different benefit packages and representation contracts.

Leave Accrual and Reporting System (LARS) sub-system maintains employee's leave usage, accrual and balances for accruable time.

The Time and Attendance sub-system collects and reports the hours worked and labor costing for each employee.

The Online Time project is currently being implemented. The functionality being rolled out across the enterprise will provide a web-time capture application for use by state employees with functionality equivalent to that of the existing mainframe based time entry application in use today, along with a middleware solution that allows agencies to integrate their time capture applications with the Oregon State Payroll Application using Service Oriented Architecture (SOA) techniques.

The ePayStub sub-system allows employees to electronically view their pay stub information. The ePayStub project was approved in 2012 and was implemented in 2013.

The core benefit delivered by this project is accessibility of employees to their payroll data for the prior 13 months. This system is ancillary to the mainframe-based legacy payroll system and its future use/replacement will depend on the decision to modernize OSPS. This system is used by all state employees based on self-enrollment.

Reliability of existing systems

R*STARS and ADPICS have been in use since 1995. The reliability of the systems is high and they are seldom unavailable. They are currently sound and not in imminent threat of crashing, however they do not track the costs to the level that Oregon Department of Transportation (ODOT) requires. ODOT financial reporting requirements must be more detailed for federal billing purposes. ODOT uses a financial system called TEAMS which was a predecessor to R*STARS. It was in place prior to the State implementing the SFMA. At that time, ODOT elected to continue utilizing TEAMS due to the need to track costs at the level of detail required as well as allowing for multiple coding elements per transaction. ODOT is reported as the only agency granted an exception to abstain from participation in use of the SFMA as the system of record. ODOT interfaces summary level accounting information to SFMA.

OSPA has been in production since 1986. It is reported to be stable and not in imminent threat of significant failure and has not been reported to have missed a payroll deadline, paying employees based on the information collected by the system. It supports negotiated union labor contracts with 32 separate collective bargaining agreements, in addition to labor requirements for Management Service, Legislative, Judicial and Semi-Independent entities. Additionally, it supports annual complex employee benefit changes. However, the system is heavily influenced by the Position and Personnel Database (PPDB) system (as it provides all of the employee position related information), which has not remained current with the business needs for greater granularity in class and representation granularity that OSPA can accommodate and needs to reduce the amount of system support.

Oregon Budget Information Tracking System (ORBITS) provides a common system for budget development and presentation. It provides alternative levels of detail and summarization reporting of expenditures, funding, revenue, and change package information based on the users' needs. All agencies are required to use this system. PICS updates ORBITS automatically with budgeted position-related expenses.

eRecruit (NeoGov) was acquired in 2009 as a replacement for the mainframe system. At implementation the enterprise decided not to convert data. Instead they began using the system without any legacy data and entered only new data from that point forward. The exception was ODOT, who hired temporary employees to enter data in to the new system. eRecruit supports a full self-service application process complete with workflow, self-scheduling, a scoring plan, and classifications specific to Oregon. Users can ask to get emails on job openings in specific categories. eRecruit has PA Processing capability also but there was a plan to wait for that functionality in a new HRIS system.

The problems with eRecruit have been identified as the level of service from NeoGov. Recent enhancements received by Oregon have reportedly encountered issues. NeoGov has been viewed as not doing thorough regression testing. Contract administrators are reported as attempting to improve this by instituting service level agreements (SLAs) around defects. Production operational time has also been an issue.

Organizational Structure and Governance

The HR structure consists of HR staff throughout the various agencies who receive and input information into the PPDB and PICS systems. That information (data) occasionally contains errors, which results in data cleansing – staff reviewing data entry and then updating, revising, consolidating and deleting various data entries into the system.

While a good number of the systems are enterprise resources, many of the systems are not uniformly used across agencies, data varies between systems and shadow systems and although there is an Enterprise Information Technology Governance Committee, there is yet to be a structured application to governance of all data. During some stakeholder discussions program staff identified distinct differences in naming conventions for various data elements or duplicate, yet inconsistent, data between systems (e.g. addresses or names).

Summary

The current situation for IT systems, is bleak. There is a need for modernization across a number of systems. The shadow systems that have arisen out of necessity create additional work for staff. Absent a planned approach to modernization, the State could be in this situation repeatedly. Current industry standards are not being met by the systems in place which lack complete integration, governance and are placing the State at risk for excessive cost and potential loss of information as system support diminishes and ultimately disappears from the marketplace.

4 Considerations and Assumptions

The following considerations and assumptions were employed during the development of the enterprise systems modernization roadmap. The information that follows highlight key business, functionality and enterprise technology considerations to be assessed by the enterprise as they evolve and execute the enterprise modernization implementation plan.

4.1 Business and Functionality Scope Considerations

Start the Legacy Modernization with HR

The Department of Administrative Services, Office of the Chief Human Resources Officer, together with the State Chief Information Officer have decided that the legacy HR system(s) will be the first legacy system to be modernized. This decision was made for a number of reasons including, significant functionality gaps, inability to hire technology professionals with necessary skills to maintain the existing system, and agreement by the business community that the HR functionality is the greatest priority at this point in time. To that end, the legacy system replacement alternatives and recommendations identifies a roadmap that builds on the initial decision and highlights lessons learned that validate or identifies risks resulting from that decision to be noted and mitigated by the project team where applicable.

Shift from Custom Towards Commercial off the Shelf (COTS)

The nature of software development is changing in both the public and private sectors. Where traditionally, basic public sector business processes were met by existing products in the marketplace (e.g. email services, word-processing, collaboration sites, etc.), many of the core services delivered by the public sector had unique needs and requirements requiring custom built solutions. Custom solutions allow for greater control over how requirements are met, insight into development practices and quality, and flexibility for changing requirements. However, public sector agencies and their IT departments are finding that building their own IT applications and housing them on agency premises is becoming harder to justify. The time commitment and cost associated with developing a custom solution, coupled with the expansion of COTS products and their offerings, has resulted in a shift towards COTS-based applications.

Standardization of Business Processes

Closely related to the shift away from custom development towards COTS solutions is the shift towards standardized business processes. By moving away from unique business processes, the enterprise benefits from greater consistency and efficiency. Additionally, standardizing business processes, where possible, reduces software customization and configuration which can reduce cost, time, and complexity of implementation. The HRIS project team identified that business processes are reasonably standard across the State and the processes that are not standard are a deviation resulting from lack of functionality in the current HR IT systems. This information coupled with the CHRO executive guidance to limit creating unique business process will be key criteria to consider when selecting a solution choice. As each subsequent module is initiated, a similar assessment will be performed to understand the business's existing practices and appetite to move towards standardized processes.

Industry Shift from On-premise to Cloud

On-premise systems (those that are housed at the facility owned by a program, business or agency) can be associated with high maintenance costs and expensive upgrades. As such, organizations are looking to alternative delivery models. The shift towards cloud and Software as a Service (SaaS) based investments are driven by potential advantages including faster implementations, improved user experience, quicker and easier access to

production improvements and lower upfront costs. However, clients considering these technologies must also anticipate some complexities that accompany the move to the cloud. Understanding the technical environment and readiness is paramount as integration between on premise and cloud increase integration model complexity. Additionally, moving data which was formally held onsite to data centers held under a vendor's control may require review and updates to data governance strategies and policies.

The SaaS ERP Marketplace

As organizations prepare to shift legacy systems off-premise, ERP vendors are readying their suite of services to prepare for this shift as well. Solutions considered 'traditional' ERP solutions, such as Microsoft, Oracle, and SAP have actively identifying opportunities to take advantage of this trend and currently provide at least hybrid solutions as they work towards proving themselves as full cloud ERP providers. While complete SaaS ERP solutions have been implemented, to date, within the public sector it has only been executed in smaller agencies and/or counties and not yet as an statewide initiative. The ERP Marketplace is also maturing through consolidation allowing solution providers to expand their core services, alternative sourcing options, and bolster existing functionality. For example, Microsoft's acquisition of Great Plains Software allowed Microsoft to offer a complete ERP solution for medium sized enterprises already familiar with Microsoft technology. Leveraging the newly acquired financial management functionality coupled with the familiarity of Microsoft's products and investments in cloud infrastructure, quickly established a potential competitor for the traditional' ERP vendors. Establishing a flexible approach to modernization allows the State to take advantage of the maturing marketplace and the potential partnerships, innovations, and best practices that result over the course of the multi-year modernization initiative.

4.2 Enterprise Technology Considerations

Readiness of IT Staff

Replacing a collection of legacy systems requires significant input and support from both the program and the supporting IT resources. Often, the program (agency business) initiates the change and is best positioned to define, identify, and receive the return on investment. Additionally, the program understands the need to identify business users to support the system replacement initiative. However, the program also needs to consider the IT professionals' availability, skillset, and existing workload when assessing potential IT solutions and timing of system modernization. Enterprise legacy systems which are based on applications that utilize custom code may not lend themselves to the same skillset required or number of required resources for assisting with the implementation or supporting maintenance and operations of a modern IT solution.

The Shared Service Agenda

Modernizing the legacy enterprise systems will provide the State the opportunity to review the legacy IT infrastructure. In many cases, government agencies accumulate business applications and IT assets over decades and throughout the years continue to build more infrastructure. Often, as the technology evolved, government IT shops do not consolidate their asset base. In parallel with the legacy system replacement roadmap, a shared services strategy could also be established. Oregon should evaluate potential solutions' abilities to advance the shared service agenda by establishing services that are reusable and scalable with the aim of lowering cost and mitigating risk to future projects.

Implementation Timeline and Budget Considerations

As Oregon procures software and decides on a sourcing strategy, it is important to consider implementation timelines for the initial HR module and the complete enterprise modernization as a whole. Public sector entities implementing multiyear projects face unique challenges including funding tied to the larger economic stability of the State, constant change in Governor and his/her appointees who are often sponsors of enterprise initiatives, and staff inexperienced in large IT implementations. Understanding these constraints as well as the risks and rewards of different solutions and sourcing strategies will help guide the project teams' solution selection. The

project will need to determine if it has the executive consistency, budget stability and a staff prepared to take on the entire portfolio as a single large implementation or mitigate the risk associated with such a large implementation and magnitude by taking a modular approach to implementation.

This document represents a point in time assessment of the enterprise readiness, priorities and IT marketplace. It is likely over the course of the multi-phase, multi-year enterprise modernization initiative that the priorities of the business will change, trends in IT will shift, and enterprise readiness may be influenced by internal and external factors. During the lifecycle of implementation of a portfolio of projects, sponsors and stakeholders should revisit the considerations and assumptions to confirm they are still valid and where applicable update the roadmap and strategy.

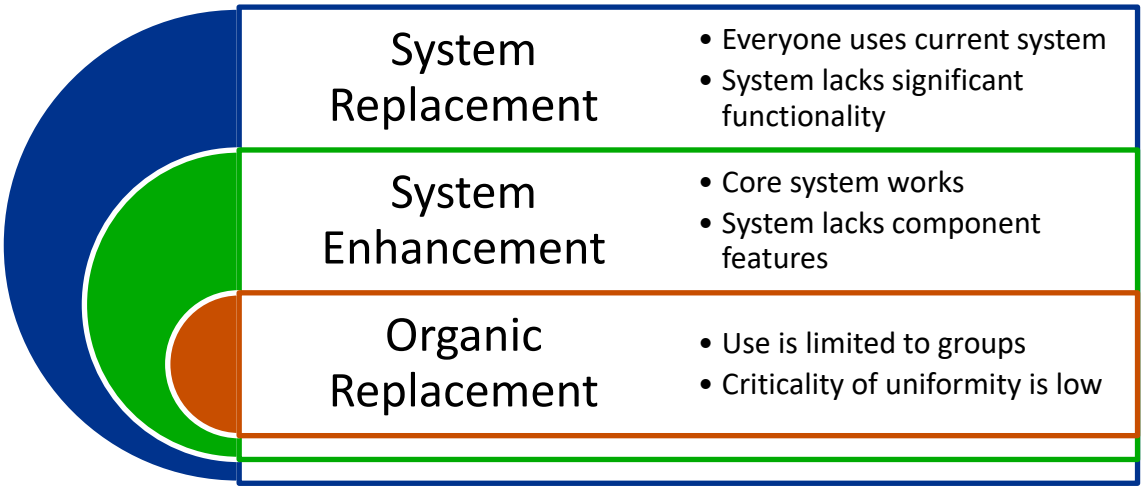
5 Implementation and Deployment Options

The State of Oregon, like many similar government organizations, is challenged with aging IT applications that do not have the required functionality to meet the business needs. Stakeholder interviews and an inventory of existing systems confirmed that the existing applications are decades old, developed in antiquated code and not serving the needs of the business. As such, the legacy system replacement strategy should take a holistic approach to assessing the enterprise applications and identify modernization strategies that take into account the business needs, appetite for risk, and other key considerations unique to the State of Oregon.

5.1 To Replace, Enhance, or Support Organic Replacement

There are a number of modernization strategies that can be employed for individual applications – replacement, enhancement or organic replacement. The merits and suitability may vary depending on a variety of factors. The suitability of each strategy may change over time, whereas there may be a clear advantage to enhance. New legislative or federal requirements may result in the functional gap being too large to bridge with system enhancements. Sponsors of the enterprise modernization portfolio, must assess and determine a strategy for each of the applications within the portfolio, but leave enough flexibility to adjust the strategy as the needs of the business adjust.

Figure 4: Modernization strategies



System Replacement

System replacement is a strategy employed by organizations when the legacy system cannot meet the needs of the business and the functionality gaps are significant. Initiating a legacy system replacement is a resource intensive process and requires careful management of organizational change to encourage adoption of the new system.

System Enhancement

System enhancement is a strategy employed when the legacy system's core functionality is achieving the objectives of the business, but additional or complementary features would further enhance the outputs or user experience. System enhancement will vary depending on the limitations of the legacy system, but could include replatforming the existing application, updating the user interface, or adding additional functionality such as

reporting or data analytics. If the functionality gaps can be addressed via enhancements, this strategy can realize significant return on investment without the risk and cost of a full legacy replacement.

Organic Replacement

Organic replacement is a strategy employed when criticality of uniform business processes across the organization is low and the use of a system is limited to groups of users. For this strategy, the enterprise should identify the enterprise needs that fit the criteria and make a decision to allow for organic replacement by individual agencies or groups of agencies as the need arises. Employing this strategy reduces the efficiencies that would be realized by selecting an enterprise solution, but could still prove valuable for scenarios where there already multiple legacy systems being used and maintained. This option should be employed as a deliberative strategy for pre-identified business processes/legacy applications or the organization risks moving away from enterprise solutions towards even further siloed disparate IT systems.

5.2 Integrated Solution or Solution Portfolio

Assessing the legacy application modernization plan, the State must weigh the options of an end state made up of an integrated solution or solution portfolio each of which come with significant benefits. Upon identifying and selecting the strategy, both the strengths and weaknesses of the chosen approach should be communicated to the larger stakeholder group. It is important to garner buy-in for both aspects to help ensure the entire organization acknowledges the ramifications of the decision.

Integrated Solution

An integrated enterprise solution tends to be what people traditionally think of when hearing the term “Enterprise Resource Planning” or “ERP”. The benefits of an integrated suite utilizing a common set of IT includes process automation and efficiencies resulting from one contracting and procurement stream, a single streamlined roadmap and implementation plans, and ability to leverage economies of scale for both IT and human resources. The disadvantages of this type of monolithic ERP solution includes the challenge in maintaining these large systems, limited choices for business functionality, the lengthy duration and long term commitment with a single software vendor, and often benefits are not realized until multiple modules have been implemented. Additionally, the integrated enterprise solution tends to face the most challenges with user adoption as modules tend to vary in capabilities and user experience resulting in compromise by the end users. In other words, some modules of these monolithic ERP solutions may have strengths while other modules were companion modules which are not as robust or beneficial. The result is that the ERP may have very good functionality in one area with mediocre functionality in another area.

Solution Portfolio

Approaching the legacy system modernization as a modernization of an enterprise solution portfolio would mean the enterprise acknowledges one technology solution may not be the best fit for the organization and instead is planning to identify two or more solutions to meet the business needs. The benefits of approaching the modernization as a solution portfolio include being able to procure solutions that better fit the needs of the business and allows for flexibility in the implementation plan. Another advantage is benefits are not deferred or contingent upon later module implementations. Some disadvantages of using a solution portfolio strategy include potential cost increase as implementation services, software costs/licensing and other aspects of implementation do not benefit from economies of scale. Additionally, the enterprise must track and manage multiple component lifecycles and recognize increased complexity of integration amongst systems.

If pursuing a solution portfolio approach, better practices dictate it is critical for the organization to keep in mind the goal of the portfolio is to meet the needs of the business without sacrificing the tangential goal of having an

integrated group of systems. In order to do this, the State should aim to have no more than three to four core systems making up the solution portfolio. This should allow for options in functionality, yet minimize the risk of replacing legacy silo'd systems with modern silo'd systems. There are numerous ways this can be achieved including establishing scoring criteria within procurements which provide preference for solutions that have functionality that meet the business requirements and are solutions currently in the portfolio (e.g. weighted scoring criteria for integration complexity). Additionally, the State can pursue procurement strategies in which the State evaluate existing software offerings for new functionality by incumbent solutions prior to going to market. This can greatly reduce the level of effort for procurement planning and shorten procurement timelines.

6 Legacy System Replacement Sourcing Options

As the State moves forward with the enterprise system modernization initiative, if they decide to pursue a system portfolio approach, the merits and disadvantages of on-premise vs. software as a service (SaaS) will need to be explored. On-premise systems are installed and run on the infrastructure maintained by the organization using the software. SaaS solutions are licensed, centrally hosted at the vendor's location, and delivered via the internet. Each option should be explored for each system or group of systems being modernized. If for a particular group of systems the strategy is to maintain the legacy software and enhance it with additional capabilities, the on-premise sourcing solution should be employed. However, if the modernization strategy is either replacement or organic replacement both on-premise and SaaS options can be considered.

On-Premise

Choosing an on-premise solution when modernizing a legacy application has many benefits including maximum control of the environment, customizations and update timing. Additionally, on-premise solutions allow for maximum control of the data, both where it is located, who has access to the data, and what is done with that data. Replacing a legacy system with an on-premise solution may also have disadvantages including high cost of infrastructure and hardware necessary to implement and maintain the solution, investment costs for staffing and/or training IT staff to maintain the new solution, and a longer implementation timeline.

Software as a Service

The SaaS market is continuing to grow adding services for public sector entities where historically only private sector entities were being served. Providers are focusing on the needs and concerns of public sector entities by addressing data and security concerns, establishing physical and network isolation, storing and employing staff onshore, and establishing rigorous security, privacy and identity management. Benefits of choosing a cloud sourcing strategy include lower upfront cost, shortened implementation timelines, and scalable services. Additionally, because the maintenance and operations is done primarily by the service provider, existing IT resources do not have to be retrained or replaced after attrition. Disadvantages of SaaS solutions include the organization has minimal opportunity to customize and little control on update schedules and release timing Organizations have sited the minimal opportunity to customize SaaS solutions as both an advantage and disadvantage. On one hand, it often requires the organization to update and reengineer business process and execute effective change management. Yet, on the other hand, organizations prone to 'overthinking' or 'over-designing' IT systems, find it to be an effective control in preventing extended design phases and costly change orders.

Lastly, SaaS options can introduce integration platform complexity. To that end, if Oregon does decide to move towards a SaaS offering for HRIS or any subsequent modules, it is important to establish an integration architecture that will support multiple sourcing options. In recent years the market for these types of services and platforms have matured significantly and can not only be built and maintained in-house, but can also be procured from companies such as Dell (Dell Boomi) or Microsoft (Microsoft Azure BizTalk), as an integration Platform as a Service (iPaaS). An iPaaS is a cloud integration service, enabling connectivity to SaaS and cloud services and providing a secure method of accessing on-premises applications behind a firewall. An iPaaS can prevent SaaS or cloud applications from becoming silo'd by providing organizations a way to integrate cloud-based services with each other as well as with on-premises enterprise applications in a hybrid integration model.

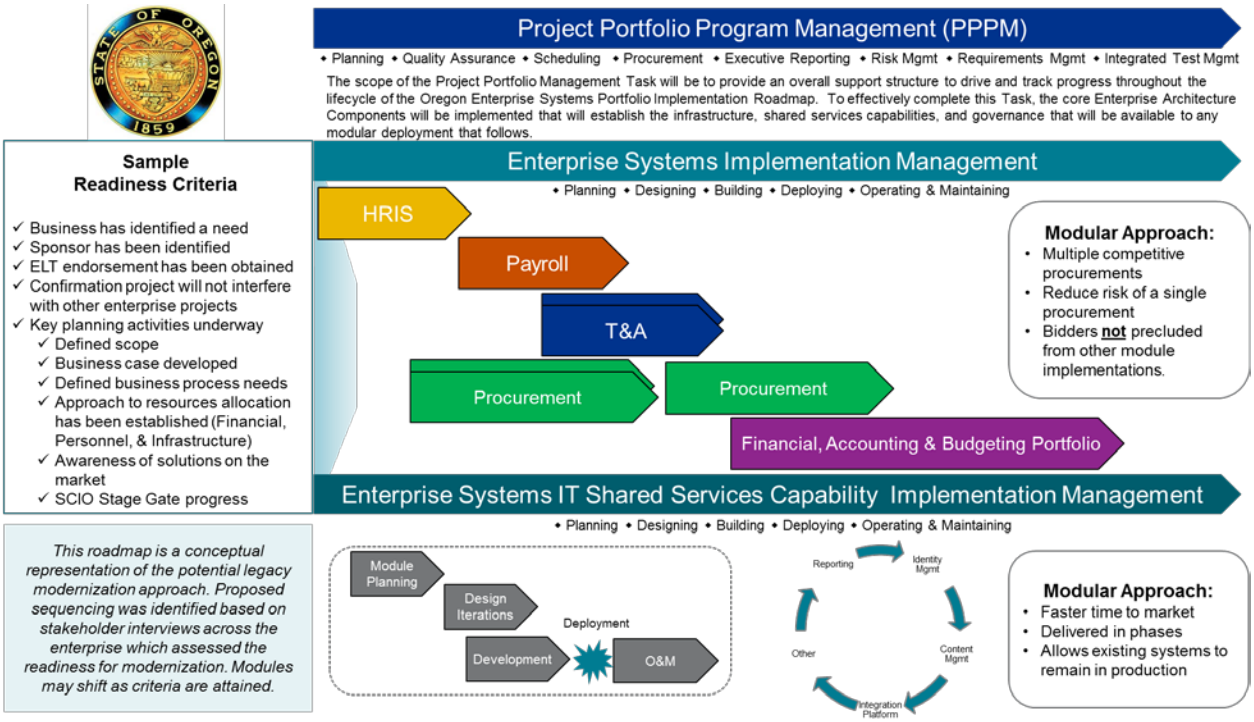
7 Legacy System Replacement Roadmap

The legacy system replacement roadmap illustrates the major initiatives in the State of Oregon's enterprise modernization. This roadmap employs the assumptions and considerations identified previously in this document as well as the current state of the enterprise which influences the modernization roadmap. This roadmap represents the culmination of the work of the HRIS team and Enterprise IT Governance committee to better understand how the HRIS system fits into the larger enterprise environment. This roadmap highlights key recommendations on planning, sequencing, and supporting shared service activities that may bolster the organization's ability to realize its vision.

7.1 Enterprise System Portfolio Implementation Roadmap

The legacy system replacement roadmap is a conceptual representation of the potential legacy modernization approach. It was developed using an approach that aimed to mitigate the risks inherent to public sector projects and highlighted in the proceeding sections. By establishing a governance structure supporting the enterprise modernization as a whole as well as taking a modular approach, the State will be able to realize value in incremental modules. The following sections highlight the proposed approach, the benefits that may be realized and the potential risks that may be mitigated.

Figure 5: Enterprise systems portfolio implementation roadmap



7.1.1 Project Portfolio Program Management

Spanning the top of the roadmap is a thread labeled Project Portfolio Program Management (PPPM). The scope of this activity includes providing an overall support structure to drive and track progress throughout the lifecycle of the Oregon Enterprise Systems Portfolio Implementation Roadmap. To effectively complete this task, the core enterprise architecture components will be implemented that will establish the infrastructure, shared services capabilities, and governance that will be available to any modular deployment that follows. This work stream is integral to the success of the overall modernization initiative as establishing a PPPM structure and the accompanying management processes will mitigate key risks inherent to modernizing programs of this size and scale. Such as:

- Provide continuity of vision and establish sponsorship for an initiative which will likely span multiple biennium
- Monitor and validate business needs and priorities driving module sequencing which may change due to new federal and legislative mandates or other external factors
- Leverage lessons learned in aspects of procurement, planning, and implementation as modules are initiated
- Provide enterprise wide communication to help ensure business, IT and architectural planning staff of agencies are aware of the modernization initiative and providing updates on changes
- Monitor readiness criteria for initiation of a legacy system modernization
- Establish and monitor a holistic budget and cost associated with the entire portfolio modernization
- Management of schedule and budget as key decisions are made on modernization and sourcing strategies.

7.2 Enterprise Systems Implementation Management

Enterprise Systems Implementation Management is the processes and activities included in the implementation of each system modernization. This includes the planning, designing, building, deployment, and operations and maintenance activities required to replace or modernize a legacy system. The roadmap highlights two key areas within the enterprise systems implementation management work stream: sequencing of modules and criteria on what drives module sequencing.

7.2.1 Readiness Criteria

The State is embarking on a portfolio of modernization projects which will span multiple biennium. This type of endeavor can be challenging for even the most experienced organization to undertake. Key to the success of each individual project and the portfolio as a whole is moving away from a schedule driven modernization and movement towards a progress or milestone based approach. The roadmap highlights sample criteria that may be used to determine whether the organization and the supporting business agency is ready to undertake a legacy system replacement. Criterion could include, but is not limited to:

- Business has identified a need
- Project sponsor has been identified
- Enterprise Leadership Team and Enterprise IT Governance Committee have communicated support
- Project Portfolio Program Management team has been consulted and confirmed initiative will not interfere or hinder any concurrent enterprise initiatives
- Key Planning activities are underway

    - Scope and business case developed
    - Review of existing business processes
    - Adequate IT and human resources have been identified
    - A solid funding plan for necessary resources has be established
    - Exploration of marketplace solutions is underway via RFI and vendor demos
    - Marketplace confirmation that subsequent module makes sense based on the current enterprise landscape
    - Project team is following required stage gate requirements
- Any required exit criteria from previous modules has been documented and delivered

By using a milestone approach to sequencing modules, the enterprise reduces its risks of not being able to secure the required resources, procuring a system or module that does not meet the business needs, or forces an implementation the enterprise is not ready to undertake.

7.2.2 Potential Legacy Modernization Approach

The roadmap also identifies the potential sequencing of each module within the enterprise systems implementation management activities lane. The sequencing identified was established based on the interviews and workshops and after reviewing inventory and documentation on the existing legacy systems. These inputs allowed KPMG's team to determine which readiness criteria had been met and which were still outstanding from a business case, sponsorship, or planning perspective. The team evaluated multiple options. The proposed approach is the most efficient based on the information available. The proposed sequencing can be influenced by a host of factors and should be refined over the course of the modernization initiative. The following sections outline the considerations for each module as well as any overarching themes.

Modular Approach

Assuming Oregon elects to undertake a solution portfolio sourcing strategy, a modular approach to implementation and contracting would allow for flexibility in the portfolio to prioritize the business needs, yet take advantage of economies of scale where possible. The State should consider establishing a procurement strategy which is flexible enough to allow multiple competitive procurements for the various functional systems that will comprise the Enterprise Systems Portfolio, reducing the potential for a single, high risk procurement and subsequent implementation. This can be done by establishing a contract vehicle that allows for incumbent vendors/software providers to have the first opportunity to demonstrate how their solution can expand to meet the requirements of the new functionality. Alternatively, vendor selection criteria can be weighted to favor solutions which have low complexity of integration thus setting a slight preference for solutions within the enterprise, yet continuing to encourage competitive procurement.

Human Resource Information System (HRIS) and Human Capital Management

The first module depicted in the enterprise systems portfolio implementation roadmap is the HRIS implementation. This decision has already been made by the organization and was reiterated as the clear choice during stakeholder interviews. While the chevron is labelled HRIS and the current scope of the HRIS project is to replace PICS and PPDB, it is expected that upon reviewing the offers of qualified bidders, the proposed products will have far more functionality than the legacy system. In order to maintain a truly enterprise approach and encourage adoption, the team should focus on replacing the functionality currently serviced by the enterprise legacy systems (PICS and PPBD), then look to enable and/or move to enterprise adoption of other functionality which would reduce the use of shadow systems and standardize processes in subsequent phases.

The State's decision to start with HR is not an unproven concept. While, some ERP providers tout 'financials first', this methodology is often a result of how their EPR suites were developed. The ERP marketplace has evolved

through the consolidation and expansion of individual technologies to develop ERP suites. This allows solution providers the ability to expand within their existing environments and address a growing number of enterprise functions. For example, PeopleSoft was established as pure a Human Resource Management System. Eventually the product grew to include a financial module followed by distribution and manufacturing modules. PeopleSoft established itself as a competitor for other ERP vendors (such as SAP), yet continued to implement its human resource module as a standalone application.

Payroll

Payroll is depicted as the next sequential module following HRIS. There are functionality gaps not being met by the current system and it is a complementary next step. Assuming all the necessary readiness criteria have been met, implementing payroll which will have core interfaces with the HRIS system as well as many legacy systems will require a the successful bidder or incumbent to clearly outline an integration model.

Procurement and Time and Attendance (T&A)

Similar to payroll, time and attendance functionality is closely coupled with HR functions. As such, it makes sense to follow HR and payroll in the module sequencing. It is often a sub-component of HRIS-like systems. Procurement, while completely independent of the broader HR portfolio, reportedly meets many of the readiness criteria established to prompt module initiation. There has been an organic modernization initiative moving forward to obtain a procurement solution and the initiative is the planning process. For that reason, procurement has been moved up on the roadmap so that it is being implemented concurrently with HRIS, however, we understand the procurement initiative currently is not planning to replace the existing enterprise procurement application. As such it is depicted with double chevrons that consolidate to one enterprise system. Time and attendance is also depicted as multiple chevrons, yet does not consolidate into one enterprise system. This is because time and attendance systems are less universal across government entities. This means that more effort may be required to fully assess and develop a constructive plan that accommodate the common and unique needs of organizations and moving to one enterprise system may not be the best strategy.

Financial, Accounting and Budgeting Portfolio

Stakeholders and interviewees expressed long-term interest in modernizing the financial, accounting, and budgeting systems portfolio, but also provided feedback that what is needed within this portfolio is likely additional capability (e.g., business intelligence), not necessarily a change to current capabilities. This portfolio may benefit further analysis on understanding functionality gaps and potentially be a candidate for an enhancement modernization strategy including re-platforming the existing code, updating the User Interface (UI), adding reporting or other capabilities, etc. The financial, accounting, and budgeting portfolio is currently depicted towards the end of the roadmap because stakeholders felt the portfolio was stable and for the most part meeting business needs, but even more so because the readiness criteria and planning activities required for a modernization of this magnitude would require a number of years in preparation.

7.2.3 Enterprise Systems IT Shared Services Capability Implementation Management

The final work stream depicted on the roadmap is the enterprise systems IT shared services capability implementation management. The scope of this activity includes identifying selected services, planning, designing, building, deploying, operating and maintaining those enterprise architecture services. For the scope of this modernization initiative, shared services could include capabilities that may be reusable for each module of enterprise modernization. Examples may included an integration platform, enterprise content management capabilities, identity and access management software and others. Using a modular implementation strategy for the implementation of shared services will enable faster and more reliable time to market. The enterprise services can potentially be delivered in phases which would enable the existing systems to continue to operate without significant disruption.

The implementation of these services can be done in a couple ways. The State can identify an entity within the enterprise (State CIO, DAS CIO, other) to build and maintain these services to be leveraged by each enterprise application as needed. Alternatively, each module could identify which enterprise services they will requirement to meet the needs of their business application, and incorporate those shared services in the design, development and implementation workstream of their project. Either way the shared services will need to be developed in order to have a successful enterprise application, by who (the State or vendor community) will depend on the State's capacity to do so and if it is the desired direction of the State to perform and maintain these shared services.

7.2.4 Cost Considerations for the Enterprise Systems Portfolio Implementation Roadmap

Establishing an exact budget for the entire enterprise system modernization will require multiple decisions to be made including modernization strategies, implementation timelines, software selection, hosting selection, and many other aspects that will influence price. To help understand the magnitude of enterprise systems modernization, a high-level estimate has been outlined in the following figure.

Figure 6: Ten year portfolio modernization estimate

High-level Estimated Cost for Enterprise Portfolio Modernization		
Thread	Phases	Estimated Cost
Portfolio Management/ Governance	N/A	$20-$30M
Design, Development & Implementation (DD&I)		
Human Capital Management	3	$40M
Enterprise Services	3-5	$15M
Payroll	1	$15-$25M
Time and Attendance	Multiple	$7-$10M
Procurement	Multiple	$3-$5M
Budgeting and Financials	3-5	$90M
High end estimate total:		**$190- $215M**
Maintenance and Operations (M&O)		
20%-30% of DD&I (beginning in year 1 throughout 10 year term)		$300M
Total: DD&I and M&O		**$490- $515M**

Note: High-level estimates are for demonstration and explanatory purposes only.

This figure assumes an estimated ten year modernization portfolio implementation timetable and affords some flexibility for the State in making many other decisions regarding implementation phases for each module as well as decisions on whether each system will be replaced rather than use a modernization strategy of enhancement. Ten years is likely an ambitious timeframe for a modernization initiative of this size and it is unlikely it could be done in a shorter period of time. Ten years was chosen as a representative number to help quantify the total potential cost in an interval which is understandable as a total sum, instead of being illustrated as a cost that will span multiple decades. As explained in earlier sections, by no means does the ten year number suggest a calendar-centric implementation for modernization. Instead, modules should be initiated as they meet the required readiness criteria which establishes the need and required planning milestones are in place to best positions the project for success.

This figure also assumes each system is replaced (as opposed to being modernized) and the entire portfolio is made up of three to four systems (as opposed to a single monolithic solution). The State could capitalize on economies of scale and reduced complexity of integration by choosing a single solution. This choice may reduce the overall cost, but would do so at the risk of deprioritizing the business needs. This budget also assumes, enterprise services (yet to be defined but could include items such as integration platform, enterprise content management, identity management software, etc.) will be required for the modernization initiative which are currently not in the legacy environment and have not yet been funded.

While the total cost is substantial, the qualitative benefits that will be realized should not be overlooked. Organizations who participated in legacy system modernization initiatives reported the following qualitative benefits:

- Reduced reliance on legacy skillsets
- Improved operational efficiencies
- Increased confidence in system output
- Increased flexibility in operations
- Retention of staff uninterested in working on outdated systems
- Renewed focus on core services and reduced administrative overhead

Additionally, it is important to note, the total cost highlighted in figure 6, does not take into consideration the offsetting costs that will result for the retirement and/or consolidation of the legacy systems. Currently the portfolio of legacy systems total approximately $13M in operations and maintenance per biennium.

Additional savings may be realized through operational efficiencies and reduction in FTEs, however, it is important to note that modernized technologies bring new functionality, data, and potentially require new skillsets. Often organizational benefits found through operational efficiencies are not always quantitative, but rather qualitative as workers' time is redirected to activities that better serve the needs of the organization.

As each project team, or the portfolio management team moves through the planning phases of each module, a more specific budget and schedule can be developed. An estimated number of phases was included in figure 6 to help the reader understand the potential duration and magnitude of each module. HCM, for example, may include the initial phase of replacing PICS and PPDB and continue with subsequent phases of recruiting and/or performance management.

8 Risk and Mitigation Strategies

During the stakeholder interviews and subsequent development of the Legacy System Replacement Alternatives and Recommendations deliverable, we had identified a number of risks that are of particular concern for the enterprise modernization initiative for the State of Oregon. These risk have been outlined in the following table.

Figure 7: Legacy System Modernization Risks and Mitigations

#	Risk	Mitigation Strategies
1	Timetable for implementing whole enterprise systems portfolio is long and the vision may change with change in leadership	Establish a strong governance structure through Project Portfolio Program Management. Governance model will enable smooth transitions and allow for succession planning. Executive sponsorship should be made up of business owners for the module being implemented at that point in time, but also those that are in different stages of planning and enterprise readiness. Establish a roadmap and plan which is flexible enough to adapt to changes in vision by ensuring each step realizes some measurable value. Leverage initial modules and software for later modules where possible to reduce cost, complexity and timelines associated with procurement and vendor 'ramp up'.
2	Timetable for implementing whole enterprise systems portfolio is long and deferred programs will continue to suffer from retirements and other attrition of knowledgeable resources	Include these departments in the Project Portfolio Program Management (PPPM) governance structure from the beginning enabling them to help shape the roadmap, own the decision to defer, and have continuous input into the process.
3	Total cost for implementing the whole enterprise portfolio may not be affordable in the eyes of the LFO / Legislature	Be transparent in potential costs and the benefits that will be realized as a result. Also, due to the modular implementation approach, pieces can be implemented when funding and other readiness factors are in place. The State should be able to rely on existing systems when readiness to modernize has not been established. Consider alternative funding sources such as vendor funding.

4	Total cost for ***not implementing*** the whole enterprise systems portfolio may not be accepted in the business case	Ensure the business case takes into account more factors than just cost: worker efficiency, alignment to the overall modernization roadmap, worker attrition and inbound worker skillset, value of providing enterprise shared services and reduced future costs as consumption of these services grow, risk of system obsolescence, creation of more shadow systems and widening gap of data reliability, etc.
5	State may not be able to adequately staff the implementation projects with knowledgeable business and IT staff members	Supplement state team with consultants and professionals with experience on projects of this size and scale Set clear expectations on system integrator roles when it comes to each phase of the implementation Investigate the usage of recently retired subject matter experts (retired annuitants).

9 Success Builders

In addition to identifying and mitigating risks, it is also important to understand and capitalize on activities and behaviors which can increase the likelihood of a successful implementation. The following sections identify observations made during the stakeholder interviews and the subsequent development of the Legacy System Replacement Alternatives and Recommendations deliverable. The State can use these observations to establish an approach and perform the required activities to capitalize on these potential success builders.

Executive Collaboration

States that approach planning and execution of major IT systems with a team concept, bringing in diverse executive participation, find greater success than implementations backed by more isolated, independent teams. Oregon can capitalize on this fact, by continuing outreach and communications to executive stakeholders and active participation of the State CIO, DAS leadership, and Department/Agency heads throughout the lifecycle of the modernization initiative.

Business Driven

Government IT system projects which are prioritized and sponsored by business/policy leaders with support of IT executives (as opposed to the inverse), trend more positively toward success. Capitalize on this observation by continuing to lead HRIS from a business perspective and continue to expand the IT support structure under the HRIS project from DAS CIO and State CIO offices.

Phased Implementation

States that develop and execute on a staggered or modular implementation plan are more likely to meet expectations and retain funding support through early phases of the lifecycle, which is the most risk laden in an enterprise systems implementation. Take advantage of this by continuing to share the potential roadmap for the broader modernization and maintaining a level of transparency on costs and the decision-making framework that will help stakeholders see continuity and stability in the portfolio.

Clear Vision

Public sector systems projects that include a clear, well shared vision for success and implementation decision-making outperform those where perceptions are that decisions are made either “as needed” or in a “situational” manner. Make use of this fact by continuing to share the potential roadmap for the broader modernization and maintain a level of transparency on costs and the decision-making framework that will help stakeholders see continuity and stability in the portfolio.

10 Lessons Learned and Leading Practices

There are many factors that drive the replacement or modernization of a legacy system and doing so does not come without risk. It is important that lessons learned are taken into account and leading practices adopted in order to help reduce the risk of an unsuccessful implementation. This section begins with a high-level overview of lessons learned and leading practices based on studies and past public sector implementations. This section then provides specific examples of public sector implementations and highlights their respective lessons learned and leading practices.

10.1 Lessons Learned and Leading Practices

This section and the table below provides a high-level overview of common Implementation lessons learned and leading practices.

Figure 8 – Public Sector Implementation Lessons Learned and Leading Practices

Implementations	
Lessons Learned	**Leading Practices**
Delayed Project Timelines due to: - Lack of a strong program management office - Lack of a detailed and enforced project plan or business case that drives decisions - Lack of a communications strategy - Excessive software customization - Chronic vendor and project leadership turnover - Existing system and business process complexity - Unclear contractual responsibilities - Insufficiently skilled employees - Inadequate testing timelines and testing documentation - Failure to resolve core system issues in a timely manner prior to implementation - Inadequate acceptance criteria and signoff processes	Prevent Delayed Project Timelines with: - A strong project management office - A detailed and well organized project plan, business case and enforced timeline - A detailed and formal communications strategy created and managed by change management specific resources - Limit software customization and focus on re-engineering existing business processes - A combination of extensive procurement processes, a strong project management office and detailed, enforced project plan - An as-is assessment - A detailed and extensive vendor contract - An as-is and to-be skills assessment and a strong change management team - A detailed testing plan that takes into account system complexity - A standard methodology for defect resolution - A detailed project plan and a standard methodology for acceptance criteria
Delayed Issue Resolution and System Failures due to: - Deferred value never realized by the business - Excessive defect resolution time and a lack of ownership of issues and defects	Prevent Delayed Issue Resolution and System Failures with: - Identify measurable objectives - Identify ways to realize measurable benefits at each step of the project

Implementations	
Lessons Learned	**Leading Practices**
- Inadequate testing timelines and testing procedures - Unreliable data from legacy system - Unclear contract responsibilities between vendor and the State - Minimal contract expectations regarding data conversion into the system and data extraction	- A standard methodology for assigning defect resolution - A detailed testing plan with timelines and procedures - An as-is system assessment prior to implementation that identifies current system gaps - An extensive procurement process as well as a specific and detailed contract
Limited User Acceptance and Understanding due to: - Limited change management resources and a lack of timely communication - Lack of interdepartmental communication - Lack of system procedure materials, end user training and training materials	Prevent Limited User Acceptance and Understanding with: - A strong change management team with specific roles and functions - A strong change management team to develop and implement a formal communications strategy - A change management team to develop training materials and system procedure manuals - Strong and consistent messaging about change benefits
Inadequate Resource and Staff Allocation due to: - Underestimation of costs associated with the implementation and total cost of ownership - Lack of knowledge regarding current skill levels - Inability to identify the skill sets necessary to support implementation	Prevent Inadequate Resource and Staff Allocation with: - An as-is and to-be assessment of the current system to determine project scope and feasibility - Skill set as-is assessments prior to implementation in order to identify current skills and gaps - Skill set to-be assessments prior to implementation in order to identify critical skills as well as a change management team to strategize hiring practices

10.2 Implementation Examples

This section details several specific public sector implementation projects and their respective lessons learned and leading practices.

The following public sector implementation projects will be outlined in this section:

- Marin County MERIT Project
- The City of Atlanta
- The State of Arkansas
- The State of California 21st Century Project
- The State of Maryland
- The State of Nebraska

10.2.1 Marin County

The following table provides an outline of Marin County's ERP implementation as well as its lessons learned and leading practices.

Figure 9 – Marin County's Lessons Learned and Best Practices

Project: Marin County - MERIT (Marin Enterprise Resource Integrated Technology) Project	
Project Description**:** In 2004 Marin County initiated the MERIT project with the goal of replacing their outdated and inconsistent financial management, human resources and payroll systems. Marin County contracted with a vendor to implement SAP's Public Sector ERP System. In 2006 and 2007 Release I and Release II went live and experienced cash reconciliation failures, financial posting issues, and general system failures. In response, Marin County fired their vendors and filed for over $30 million in damages, alleging fraud, misconduct, and misrepresentation. After an extensive legal battle, the vendor settled in 2013 with a $3.9 million implementation refund.	
Lessons Learned	Leading Practices
Delayed Project Timeline due to: - Unclear contractual responsibilities and details such as the skill level of vendor staff led to project delays.	Prevent Delayed Project Timelines with: - An extensive procurement process allows the State to fully grasp the experience of the vendor. Additionally, a specific and detailed contract that states the responsibilities of all parties limits gaps in implementation, time delays and litigation.
Extensive System Failures due to: - Inadequate project governance led to unclear approval requirements, system failures and testing gaps. - Inadequate acceptance criteria and signoff processes led to a faulty system that did not meet business needs. - Failure to test the system properly before go-live led to extensive system failures.	Prevent System Failures with: - A strong project management team and a detailed project schedule that states project responsibilities contributes to a well-informed project team. - A detailed project plan and a standard methodology for acceptance criteria and signoff processes support an organized and informed project team.

- Insufficiently skilled employees who were unable to navigate and maintain the new system.	- A detailed testing plan and a standard methodology for defect resolution allow the system to be thoroughly tested. - An as-is and to-be skills assessment to determine the skills required to maintain the new system. Additionally, a change management team to manage the organizational changes and the hiring processes to acquire the necessary skills.

10.2.2 The City of Atlanta

The following table provides an outline of the City of Atlanta's ERP Implementation as well as its lessons learned and leading practices.

Figure 10 – The City of Atlanta Lessons Learned and Leading Practices

Project: The City of Atlanta	
Project Description**:** In 2005 the City of Atlanta (the CoA) initiated the design and implementation of an enterprise-wide application solution to address the current and future needs of the CoA. The multi phased project ended in 2007 when the CoA severed its contract with partner IBM Global Services and established a broad based relationship with Oracle Consulting. After an initial assessment by Oracle Consulting, the CoA approved a revised scope of work that required increased funding and an extended implementation time frame.	
Lessons Learned	**Leading Practices**
Delayed Project Timeline due to: - The lack of a strong program management office led to inconsistent and ineffective project standards and a lack of project leadership. - The lack of a current up to date project plan with owner/resource documentation led to the inability to achieve remaining project goals in the allotted timeframes. - The lack of enforcement and communication of project plan completion dates resulted in missed deadlines and a delayed go live date.	Prevent Delayed Project Timeline with: - A strong program management office is vital to re-energize project team member. A PMO assists in managing risks as well as quality considerations, and promotes proactive communication of project and task status. - A detailed and well organized project plan that identifies task owner and resources. - Allocate change management resources to develop and implement a formal communications strategy to proactively communicate milestones, project status, and steering committee meeting outcomes.
Delayed Issue Resolution due to: - Excessive time to resolve critical defects. The extended time taken to resolving defects resulted in overall project delays. - A lack of overall ownership of issues and defects led to delayed defect resolution.	Prevent Delayed Issue Resolution with: - A standard methodology for assigning defect resolution and a strong testing timeline. This assists in a more timely and coordinated resolution effort.
Limited User Acceptance and Understanding due to: - Limited change management resources led to limited user acceptance of the new system.	Prevent Limited User Acceptance and Understanding with: - A strong change management team that develops a strategy to heighten the awareness, energy and excitement to the end user community. With change management plans, end users will more

- Inadequate training documentation and lack of timely communication reduced user understanding of the system.	easily accept the transition from their legacy procedures. - Refined and good quality training documentation and clear communication to support users and promote use of the system.

10.2.3 The State of Arkansas

The following table provides an outline of the State of Arkansas ERP implementation as well as its lessons learned and leading practices.

Figure 11 – The State of Arkansas Lessons Learned and Best Practices

Project: The State of Arkansas - Arkansas Administrative State-wide Information System (AASIS)	
Project Description**:** In 1999 the State of Arkansas initiated a state-wide ERP solution that includes all financial, human resources, and procurement modules with SAP as the vendor. The AASIS project established a goal of developing a fully integrated statewide ERP solution, as well as accommodating Performance-Based Budgeting and Activities-Based Costing. The first phase of the implementation went live on schedule, but experienced substantial operational problems associated with a shortage of trained staff to maintain and operate the system and inadequate preparation of agency personnel.	
Lessons Learned	Leading Practices
Operational Difficulties due to: - Unclear contractual responsibilities. The vendor consistently redefined the scope of work and transferred workloads to the State. - Underestimation of costs associated with the implementation by the vendor led to a lack of funding and a partially completed project. - Lack of end user training and training materials led to limited user knowledge of the new system and extensive user errors. - A shortage of staff to maintain and operate the system as needed led to ineffective testing, insufficient preparation, and operational delays.	Prevent Operational Difficulties with: - A specific and detailed contract that states the responsibilities of all parties limits gaps in implementation, time delays and litigation. - An as-is and to-be assessment of the current system to determine the feasibility of implementation and potential costs. - A change management team to develop training materials to effectively train staff on the new system and provide post-implementation support. - An as-is and to-be skills assessment to determine the skills required to maintain the new system. Additionally, a change management team to manage the organizational changes and the hiring processes to acquire the necessary skills.
Limited User Acceptance due to: - Lack of agency support and interdepartmental communication regarding project status led to inaccurate information and inadequate resources.	Prevent Limited User Acceptance with: - Change management resources that develop and implement a formal communications strategy to proactively communicate milestones, project status, and steering committee meeting outcomes.

10.2.4 The State of California

The following table provides an outline of the State of California's ERP implementation as well as its lessons learned and leading practices.

Figure 12 – The State of California's Lessons Learned and Best Practices

Project: The State of California - 21st Century Project (MyCalPAYS)	
Project Description**:** In 2003 the State of California initiated steps towards integration into a single ERP system in order to improve efficiency and reduce the cost of maintaining multiple systems. The system was designed to take over human resources and payroll responsibilities for over 240,000 state employees. After terminating a contract with an initial firm in 2009, the State of California's State Controller's Office began working with SAP to implement the first phase of a five-phase project. This pilot revealed a significant volume of payroll quality issues. After eight months of payroll runs with extensive material errors, the project had nearly tripled in cost and was years behind schedule. This led to the State terminating their contract with SAP and returning to their legacy system.	
Lessons Learned	Leading Practices
Delayed Project Timeline due to: - Chronic vendor and project leadership turnover led to little accountability and a lack of ownership for project timelines. - Extensive customization of off-the-shelf software led to time delays, unanticipated defects, and contract expansions. - Existing payroll complexity and a lack of well documented business processes led to employee role confusion and software that did not complement existing processes. - Unclear contractual responsibilities led to project ownership confusion and the State terminating two vendor contracts mid project.	Prevent Delayed Project Timelines with: - A strong project management team and a detailed project schedule that states project responsibilities contributes to a well-informed project team with deadlines and responsibilities. - Limit excessive customization of software by re-engineering business processes to fit software capabilities. This will aid in limiting defects and developing realistic project timelines. - An as-is analysis of existing business processes and system's functionality prior to implementation establishes knowledge of to-be system requirements. This allows the project management team to adequately plan for implementation. - An extensive procurement process allows the State to fully grasp the experience of the vendor. Additionally, a specific and detailed contract that states the responsibilities of all parties limits gaps in implementation, time delays and litigation.
Faulty Data Conversion due to: - Unreliable data from legacy system led to extensive data conversion issues and untrustworthy data in the new system. - Unclear contract responsibilities between vendor and the State regarding the ownership of data conversion led to delayed timelines and an additional contract being drawn up for a data conversion specialist.	Prevent Faulty Data Conversion with: - An as-is system assessment prior to implementation that identifies current gaps in the system and future project risks. This helps the project management team effectively strategize and establish a detailed project plan. - An extensive procurement process that allows the State to fully grasp the experience of the vendor. Additionally, a specific and detailed contract that states the responsibilities of the vendor in order to limit gaps in implementation, time delays and litigation.

Extensive System Failures due to: - Inadequate testing timelines and testing documentation led to extensive system defects and additional emergency releases post implementation. - Failure to resolve core system issues in a timely manner prior to implementation led to a backlog of system defects and extensive work post implementation.	Prevent Extensive System Failures with: - A detailed testing plan that takes into account system complexity and allows the system to be thoroughly tested. - A standard methodology for defect resolution helps resolve issues in a timely manner.
Limited User Acceptance and Understanding due to: - Lack of interdepartmental communication regarding project status led to false expectations and negative public perceptions. - Lack of end user training and training materials led to limited user knowledge of the new system and extensive user errors.	Prevent Limited User Acceptance and Understanding with: - Change management resources to develop and implement a formal communications strategy to proactively communicate milestones, project status, and steering committee meeting outcomes. - A change management team to develop training materials to effectively train staff on the new system and provide post-implementation support.

10.2.5 The State of Maryland

The following table provides an outline of the State of Maryland's Human Capital Management implementation as well as its lessons learned and leading practices.

Figure 13 – The State of Maryland's Lessons Learned and Best Practices

Project: The State of Maryland- Human Capital Management (HCM) Project	
Project Description: In May 2014 the State of Maryland selected Workday Human Capital Management (HCM), Workday Time Tracking, and Workday Benefits to replace and consolidate its legacy, on-premise software with one unified system. With Workday, Maryland intended to enable approximately 45,000 employees across 54 agencies to easily access and manage their personnel, time tracking, and benefits information in the cloud, while arming state leaders with a holistic view of the workforce, and agency management with better insight into their teams. Maryland successfully implemented Workday in less than eleven months and continue to leverage the workday product as they continue to modernize other legacy processes and systems.	
Lessons Learned	Leading Practices
Limit over customization: - Maryland understood the importance of modifying business processes where possible instead of attempting to customize the solution. They reported 95% of their requirements were met out of the box where the remaining 5% were achieve through updated business processes.	Prevent extensive customization with: - Establishing realistic expectations on the business' ability and willingness to standardize business processes by developing an advisory committee. - When standardization in possible, consider a solution which has limited customization (as Maryland did with Workday) which establishes predefined options for what can and can not be configured/customized.

Limit unnecessary/ timely data clean up activities due to: - Maryland worked with contractors prior to brining on a system vendor to understand, and transform their data into a format that could be easily loaded into the new system. This not only saved time in the planning and design phases of the project, but also reduced timely and expensive cleanup activities post implementation.	Avoid unnecessary/ timely data clean up activities with: - Start data cleansing and preparation for data conversion early as possible. - Identify critical data elements that must be converted vs data elements which are not absolutely necessary. Converting poor data will result in poor outputs in the new system. - Designing and implementing validations, warnings and errors during data entry for incomplete or incorrect data elements and formats.
Establish clear expectations and roles for implementation team members: - Maryland leveraged change management resources from the vendor ensuring accountability in the change management and training tracks of the implementation. - Maryland reported challenges integrating with legacy interface applications such as Payroll.	Establish clear expectations and roles for implementation team members : - Identifying State counterparts to participate in the organizational change management and provide subject matter expertise can further the success of the organization change initiative, but clear roles and responsibilities should be established. - Clearly document expectations for legacy system integration by identifying contractor deliverable documents, and/or diagrams as contract deliverables. Additionally, clearly document the party (contractor or State) responsible for developing the integration, maintaining integration platforms, and addressing issues.

10.2.6 The State of Nebraska

The following table provides an outline of the State of Nebraska's Software as a Service Human Capital Management implementation as well as its lessons learned and leading practices.

Figure 14 – The State of Nebraska's Lessons Learned and Best Practices

Project: The State of Nebraska Talent Management Project	
Project Description: In 2010 the State of Nebraska looked to the vendor market for a talent management solution. The State recognized the maturing marketplace and allowed the primary vendor to team with up to three vendors. The competitive procurement resulted in a winner response by Cornerstone OnDemand, teaming with subcontractors NeoGov and Workday. The fully SaaS Talent Management solution enabled approximately 18,000 employees across 80 agencies to streamline their HR processes on a system which was easy to use and operational within the constraints of the State IT resources on hand. Nebraska successfully implemented a suit of complementary SaaS solutions (Workday and NeoGov) to make up a full HCM suite to integrate with its newly built on –premise financial ERP system (JP Edwards).	
Lessons Learned	Leading Practices
One size or solution does not fit all:	Prevent forcing a solution fit by:

- Nebraska had implemented a COTS ERP system, but recognized the HR functionality of the solution did not meet their needs. As such, decided to pursue and integrate a separate SaaS talent management solution. - As the SaaS HCM marketplace was still expanding at this time of the procurement, the State allowed the primary vendor to partner with up to three subcontractors in order to provide the full solution they were looking to implement.	- Clearly define and establish the required requirements for any additional functionality. - Weigh the benefits of leveraging the existing solution with the potential limitations of the incumbent software. - Leverage request for information solicitations, vendor demos and customer surveys/interviews to understand the marketplace. - Look for solutions that are flexible and can integrate with complementary products and systems in the marketplace.
Understand the deep integrations between systems: - While the talent management solution vendors offered integration between proposed software platforms, the integration between the proposed system and legacy ERP system was also sizable. - Identify if the organization has the resources subject matter experts, and/or to assist with the integration.	Ease system integration by: - Clearly understanding the constraints of each interface (legacy and new procurement). - Establish who will be performing the integration. State IT resources with support from system implementation team, system implementation team with support from State IT resources, or a third outside party. - Include these resource costs in budget and timeline estimates.
Bring the right team to the table: - Nebraska identified agency representation to participate in reoccurring meetings which helped manage the organizational shift from decentralized business processes to standardized common practices. - Establishing a team of cross section agency leaders and representatives allowed the state to manage the multi-year implementation through changes in leadership, assisting in user adoption and agency buy-in.	Leverage available knowledge by: - Reviewing leaders, change agents and high performers within the organization and establishing roles within the implementation team that meet their schedules, career path, and availability. - Promote consistent and transparent communication regarding objectives and decisions on business processes and system constraints.

11 Conclusion

The Legacy System Replacement Alternative and Recommendations document outlines potential modernization approaches, sourcing options, a roadmap for implementation, industry leading practices, and key decisions and considerations for DAS and the SCIO as they establish a plan for the future modernization of many of their legacy applications. After interviews with key stakeholders, review of the current IT landscape, and evaluation of the State's readiness for the modernization initiative, it is recommended Oregon consider a Solution Portfolio approach to legacy system modernization. This approach to modernization allows change to be driven by the business, but looks to leverage integration and efficiencies between technology solutions and functional modules. By establishing a strategy of modular replacement, the State will be able to realize value as each functional module is implemented as well as reduce the risk associated with monolithic single solution ERP implementations. It is recommended that the legacy Human Resource Information Systems (PICS and PPDB) be replaced first as it is widely agreed that the current systems do not have the required functionality and flexibility. Additionally, the HRIS replacement initiative has the required sponsorship and is in advanced stages of project planning. It is recommended the following modules be initiated not based on calendar-centric events, but rather based on readiness criteria. This approach reduces the risk of the organization moving forward with a system implementation the organization is not ready to undertake. A legacy system replacement sequencing is proposed based on information gathered in key enterprise stakeholder interviews, industry leading practices, and an understanding of the enterprise readiness to implement a legacy system modernization. It is suggested the Payroll and Time and Attendance modules would follow the modernization of the legacy HR Systems. Concurrently, or as readiness criteria is established, the Procurement module would be introduced followed by the Financial, Accounting and Budgeting portfolio.

As the State moves forward with this substantial modernization initiative, it presents an opportunity to establish two key enterprise capabilities to oversee the modernization portfolio. Establishing a Project Portfolio Program Management organization will help establish governance over the entire modernization by providing an overall support structure to drive and track progress through the lifecycle of the Enterprise Systems Portfolio Implementation Roadmap. Similarly, identifying and establishing an organization to define and implement Enterprise Systems IT Shared Services Capabilities will enable Oregon to identify services that can be used by multiple enterprise modules as well as line of business applications throughout the State.

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