North Carolina GEAR ERP Planning Implementation Plan and Budget Estimate

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Preface

The North Carolina ERP Assessment is the result of a request from the General Assembly related to Session Law 2014-100, Senate Bill 744 Section 7.1(b). This section states:

"Funds appropriated to the Information Technology Fund for enterprise resource planning (ERP) shall be used by the State Chief Information Officer, in conjunction with the North Carolina Government Efficiency and Reform Initiative (NC GEAR) and the State Controller, to develop a strategic implementation plan for a statewide ERP. By December 15, 2014, the State Chief Information Officer shall submit the plan to the Joint Legislative Oversight Committee on Information Technology. At a minimum, the plan shall address all of the following:

  (1) Project management
  (2) Project scope
  (3) Specific project requirements
  (4) Time line
  (5) Cost by State fiscal year
  (6) Potential funding sources
  (7) Quality control
  (8) Change management
  (9) Risks associated with the project
  (10) Stakeholder management

From this, Deloitte and the Office of State Budget Management (OSBM) contracted to perform certain services identified in the State's NC GEAR initiative. The Statement of Work divided the effort into four areas summarized below to provide additional context to the reader:

- Project Management – Consists of the Project Charter and Governance, work plan, project team definition, and deliverable outlines.
- Implementation Components Definition – Consists of a review of existing relevant documents, conduct interviews with executive leadership, and functional and technical components workshops in order to define scope required for an ERP implementation in the state of North Carolina.
- Timeline and Approach – Timeline for the implementation and examples of potential approaches. The Timeline and Approach is the focus of this document and additional information from the Statement of Work is provided below.
- Implementation Plan and Budget Estimate – Consists of project management, stakeholder and change management requirements, and risk and quality management requirements for an ERP implementation. In addition, this deliverable includes additional ERP market data, state financing examples, and a work plan related to next steps leading up to an ERP implementation.

The Implementation Plan and Budget Estimate deliverable is the final deliverable related to the NC GEAR ERP Assessment project. This document uses the information provided in the previous deliverables (Implementation Component Definition and Timeline and Approach) to calculate a budget estimate for the realization of a statewide ERP solution. This document also includes a summary of the previous deliverables and was developed to support the legislative report required to the Legislative Oversight Committee on Information Technology.

1   Executive Summary

The State of North Carolina is currently challenged to operate its state government as efficiently and effectively as possible. While the state has managed to function and meet its financial reporting and other responsibilities (e.g., CAFR), it is doing so often with highly manual processes and data from multiple systems. The result is the inability to proactively manage and improve many of these core financial back office practices, provide the Governor and the General Assembly timely and accurate data, process high volume transactions efficiently and provide employees with the highest level of customer service.

Currently, North Carolina has distinct finance and administrative functional solutions with a low level of integration. The Financial system is a legacy system using 30 years old green screen technology and is mainframe based. The Human Resources system is client server software not using the full functionality that would improve the Human resource process. The Budget system is customized software implemented several years ago, and the Department of Transportation operates its own client server system for several financial and ancillary functions.

From a national perspective, North Carolina remains in a small minority of states that have not yet moved to an integrated Commercial-Off-the-Shelf (COTS) based ERP solution to support the state's financial and administrative management needs. Of the states in the South East, only Florida continues to operate their financial system from a non-COTS legacy solution. Florida, like North Carolina, is currently performing pre-planning efforts to shift to a statewide COTS based finance and administrative solution.

This report presents the implementation plan and budget estimates for a comprehensive ERP effort with a fully integrated system in response to the General Assembly's desire for the State to have a well- defined and structured plan to support any investments the State makes.

The remainder of this section summarizes the content of the Implementation Plan and Budget Estimates for the ERP in the following areas:

- Project Approach
- Project Management and Governance
- Scope
- Specific Project Requirements
- Timeline
- Cost by State fiscal year
- Potential funding sources
- Quality control
- Change management
- Risks associated with the project
- Next Steps

A. Project Approach

During the 12 week project, Deloitte Consulting applied tools, templates, and techniques from its Enterprise Value Delivery methodology that has been applied on hundreds of ERP planning and implementation efforts. In addition, Deloitte used its proprietary PEPs tool to conduct the initial budget estimate and then transferred the outputs to an Excel Workbook tailored for North Carolina.

Deloitte conducted 11 executive interviews, reviewed existing documentation and information on North Carolina's current environment, reviewed information and data collected as part of the NC GEAR project, and, conducted 17 business and technical work sessions with over 125 state participants. It also conducted additional third party research and market analysis to develop a plan that would be specifically aligned to North Carolina's environment. Per the Statement of Work, Deloitte engaged in these activities to develop this Implementation Plan and Budget Estimate with the assumption that the State would use

SAP as its integrated solution.

B. Project Management and Governance

The ERP Implementation Plan defines the need for a structured, disciplined project management and governance approach based on leading practices and supported by the tools and resources required for success. This is the single most important success factor for the State to address prior to implementing a State-wide solution. The governance structure is responsible for setting, enforcing, and monitoring project processes, as well as decision making and communications. The governance structure will provide support to the other critical success factors including Project Management, Adherence to COTS, Leadership Participation, and Change Management.

Section 4.1 of this document defines a proposed governance structure, protocol and mechanism for North Carolina to:

- Support effective operational service delivery, performance and employee engagement
- Facilitate effective decision-making, escalation and information sharing across the organization
- Enable smooth hand-offs and transitions within the state and among stakeholders
- Discuss and prioritize investments, projects, and resources across the state.

To support the planning for the governance structure and ongoing project management and oversight activities including risk and quality management, change and stakeholder management, and issue resolutions, the Implementation Plan includes the creation of a "Business Transformation Office" in section 4; the use of an Independent and Validation and Verification (IV&V) vendor; and a pre-ERP Implementation phase.

C. Scope

The processes and functions that are included as part of the ERP Implementation Plan were guided by the Statement of Work and Deloitte's expertise in planning for and implementing ERP systems. The scope for the Implementation Plan and Budget Estimate is defined to include:

- Agencies
- Business Functions
- Technical Components

The agencies included in the planning effort included all agencies currently using NCAS as noted below.

NC State Agency/Entity	
State Board of Elections	Department of Revenue
Council of State Agencies	Department of State Treasurer
Department of Administration	Department of the Secretary of State
Department of Agriculture and Consumer Services	Department of Transportation
Department of Commerce	Executive Branch
Department of Cultural Resources	Judicial Branch[1]
Department of Environment and Natural Resources	Legislative Branch[2]
Department of Health and Human Services	Office of Information Technology Services
Department of Insurance	Office of State Budget and Management
Department of Justice	Office of State Human Resources
Department of Labor	Office of the State Auditor
Department of Public Instruction	Office of the State Controller
Department of Public Safety	Board of Electrolysis Examiners

The Business Functions that were identified as a part of the ERP Implementation Planning effort were selected based on the standard functions included by other States for their ERPs to best support their Finance and Administration needs. These functions include:

Functional Area	Description
Finance	Manages the processing, recording, and maintaining financial accounting transactions within the enterprise including accounts payable, accounting, accounts receivable.
Human Resources	Manages functions from hiring an employee to separation from the organization including payroll functions.
Procurement	Supports the procurement functions occurring in day-to-day business operations
Grants Management	Manages the application, award, budget tracking, and closing of a grant and financial transactions related to grants received by the state.
Budget	Supports the creation, execution, and management of budgets
Asset Management	Supports the whole life management of the physical assets (including facilities) of an organization to aid in maximizing value
Fleet Management	Supports the management of fleet vehicles including maintenance and consumption
Inventory Management	Manages stocks of merchandise on a quantity and value basis and is used to plan, enter, and provide evidence of goods movements
Analytics and Reporting	Provides tools needed to retrieve data to make faster, more informed decisions

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[1] Estimates calculated for Finance function only
[2] Estimates calculated for Finance function only

The Technical components for the scope and budget estimates that were reviewed and included as part of the Implementation Plan include:

Technical Area	Description
Applications and Tools	Covers the areas of Enterprise Architecture, Future State Landscape, Environments, Systems and Clients, Applications needed to enable core functionality, Tools needed to enable operation of the ERP solution, Security aspects, and system decommissioning approach
Infrastructure	Covers the areas of OS/DB, Compute & Storage, Virtualization, Network, Software Change Management, Capacity Planning and Performance, System Administration & Development
Deployment options	Covers the areas of On Premise and Virtual Private Cloud deployment of ERP solution
Data & Integration	Covering the areas of Process/Data/Information integration, Analytical applications & tools, data conversion approach
User Experience/User Interface	Covers the areas of user interaction & interfaces, SAP roadmap alignment, and configuration & personalization

D. Specific Project Requirements

To support the estimates, some assumptions were made that became a requirement for the project and the budget estimates as presented in this document. Changes to any of these requirements may lead to significant changes in the budget estimates (up or down), the timeline, and risk factors. Project requirements were defined as what was needed at the project level, but not for a function or specific technical component. The more significant of these requirements included

- Integrated System
- Facilities
- Hiring of Independent Validation and Verification vendor
- Dedicated State Staff

a. Integrated System

The decision to implement a tightly integrated system using the same software application for all functions (e.g. financials, procurement, budgeting, and HR) over a "best-of-breed" solution (different applications for different functions) was made based on the current market trends, perceived business benefits to the state, and a lower long term cost of ownership. For both the Public Sector and Private Sector, there is a trend to move toward application "convergence" from an ERP perspective. As the specific software products continue to add functionality and capabilities, the discrepancies between the various solutions has been reduced. As such, the benefits around integration, application skill sets (both functional and technical), end user training, and overall system stability are being weighed as more critical.

Illustrated below is a functional view of the ERP transactional architecture that shows future state of integrated functions represented by SAP modules. A supporting technical architecture can be found in Section 5.2 of this document. It shows how the user will interact with the system, how the system will integrate with other systems, the analytical tools to support the system and standardized security and control protocols.

b. Facilities

North Carolina will need to secure temporary space for its vendors and dedicated State project staff to implement the statewide ERP. Other states have leased space for the specified time and have included sufficient meeting room space to conduct work sessions and other activities. While the iCenter and some other existing rooms can be used to supplement design meetings and some testing, a facility is needed for the full project team.

With the understanding that a Facility would be required, the budget estimates include a facility cost using State available data on a per square footage cost and assuming highest headcount at the peak of the project. Peak Headcount was calculated at 150 combined project team across State, Integrator, and IV&V resources. While the project team size may fluctuate year over year, we have assumed that the state would need to identify and lease sufficient space at the start of the project and carry that lease through project completion. The square foot requirements per Resource was estimated at 190 square feet.

c. Hiring of Independent Validation &Verification Vendor

Several States implementing a large scale statewide ERP solution have chosen to use Independent Validation and Verification (IV&V) services or an independent project management organization to assist with quality reviews and project monitoring. This role is typically handled by an external contractor that reports directly to the Governing body and is responsible for overseeing the performance of both the state and contractor from an execution and contract adherence perspective.

Although IV&V can be an ERP project, they can play a significant role by helping to reduce the overall project risk. A qualified IV&V partner should remain independent throughout the project and not just be

an extension of the state team. They should identify areas of weakness and strength for both the State and the integration partners. A qualified IV&V vendor should take an active role in helping to identify solutions as they are identified. If the role of the IV&V vendor is limited to status reporting, their value is significantly diminished. They should be measured on overall program success.

Note that some states have chosen to expand the services of the IV&V vendor to include assistance with the creation of the initial RFP.

d. Dedicated State Staff

While an integrator can provide the necessary product and implementation knowledge and experience, a dedicated state project team is critical to the success of an ERP implementation. While subject matter experts from the state will be leveraged throughout the implementation process, a core dedicated team is required from a knowledge and ownership perspective.

To facilitate knowledge sharing, project oversight, and joint ownership and accountability between the integrator and state, there are specific roles where it will be important for there to be a state counterpart for the project. Specifically, the project organization chart would align both an integrator and dedicated state resource with joint responsibility for execution of the specified function. Examples of roles suitable for this type of alignment include:

- Project Manager
- Integration Manager
- Information Management Team Lead
- Organizational Change Management Team Lead
- User Experience Team Lead
- Application Development Team Lead
- Data Quality Lead
- Process Team Lead
- Technical Infrastructure Team Lead
- Configuration Manager
- Implementation Lead
- Quality Manager
- Test Manager
- Security and Controls Team Lead
- Training Lead

While some of these roles have been combined by other states, each role does have a state resource assigned on a full-time or near full-time basis. The expected state staff hours and average FTE per fiscal year are shown below:

| Integration Team – State Staff							
Average FTE by Fiscal Year							
Dates	Jun - 16	Jun - 17	Jun - 18	Jun - 19	Jun - 20	Jun - 21	Jun - 22
State Hours	15,400	54,019	73,083	49,657	49,810	61,235	40,917
State FTEs	8	28	38	26	26	32	21

E. Timeline

The timeline, presented in Section 7, was developed after a series of work sessions to understand priorities, the most significant pain points, age of current systems and implementation concerns. The analysis of this information led to a timeline that was comprised of 5 focus areas, a functional implementation approach rather than big bang, and a set of smaller deployments within each functional implementation to allow for stabilization of the system and time for the State resources to adapt to the changes and reduce risk.

The proposed timeline incorporates key insights to provide a North Carolina specific implementation approach that aligns to specific needs. The timeline is segmented into five key focus areas based on the decisions and assumptions that were defined above. Each focus area is comprised of several phases, which are designed to deliver specific functionality and set the foundation for the end state processes.

- **Pre-ERP Focus Area**– Includes activities that cut across all ERP functions and are designated separately to include preparation activities. The Pre-ERP Focus area is primarily comprised of 3 key activities. Pre-ERP activities include: RFP Creation, Vendor Selection, and Business Process Rationalization. The length of this phase was driven by available financial and staff resources required to prepare for the ERP implementation.
- **Implementation Support Focus Area** – Includes activities for overall implementation support and realization of the end state vision.
- **Core Finance Focus Area** – Core Financials includes functions and capabilities that are part of standing up the core financials of an ERP and set the foundation for future functions. The core components are Finance, Procurement (exclusive of eProcurement which can be evaluated at a later time), Assets (Current Functionality excluding fleet), Budget Control, Inventory (Current Functionality), and Grant Accounting (often referred to as Grantee).
- **Enhanced Functionality Focus Area** – Includes capabilities and functions that extend the capabilities of the core financials and enable additional coverage for the state. This includes areas such as Fleet, extended Grantor, and potentially budget execution and preparation (subject to further analysis and dependent upon SAP enhanced budget capabilities).
- **Human Resources Focus Area** – Human Resources include enhancement of the existing HR solution (BEACON) as well as upgrades to take advantage of a centralized ERP platform and solution.

The Timeline also contains phases of implementation. Phases are time based and illustrate the start of implementation activities and the eventual go live. Phases are further broken down to include deployments. There may be more than one Focus area in a phase. Consideration was given to State resource availability and capacity as well as business needs and risks in defining each phase.

Section 7 of this document and the Timeline and Approach Deliverable provide greater detail regarding the rationale for the timelines structure, the different phases of implementation, the agency deployments as well as duration decisions based on risk, cost, and dependencies.
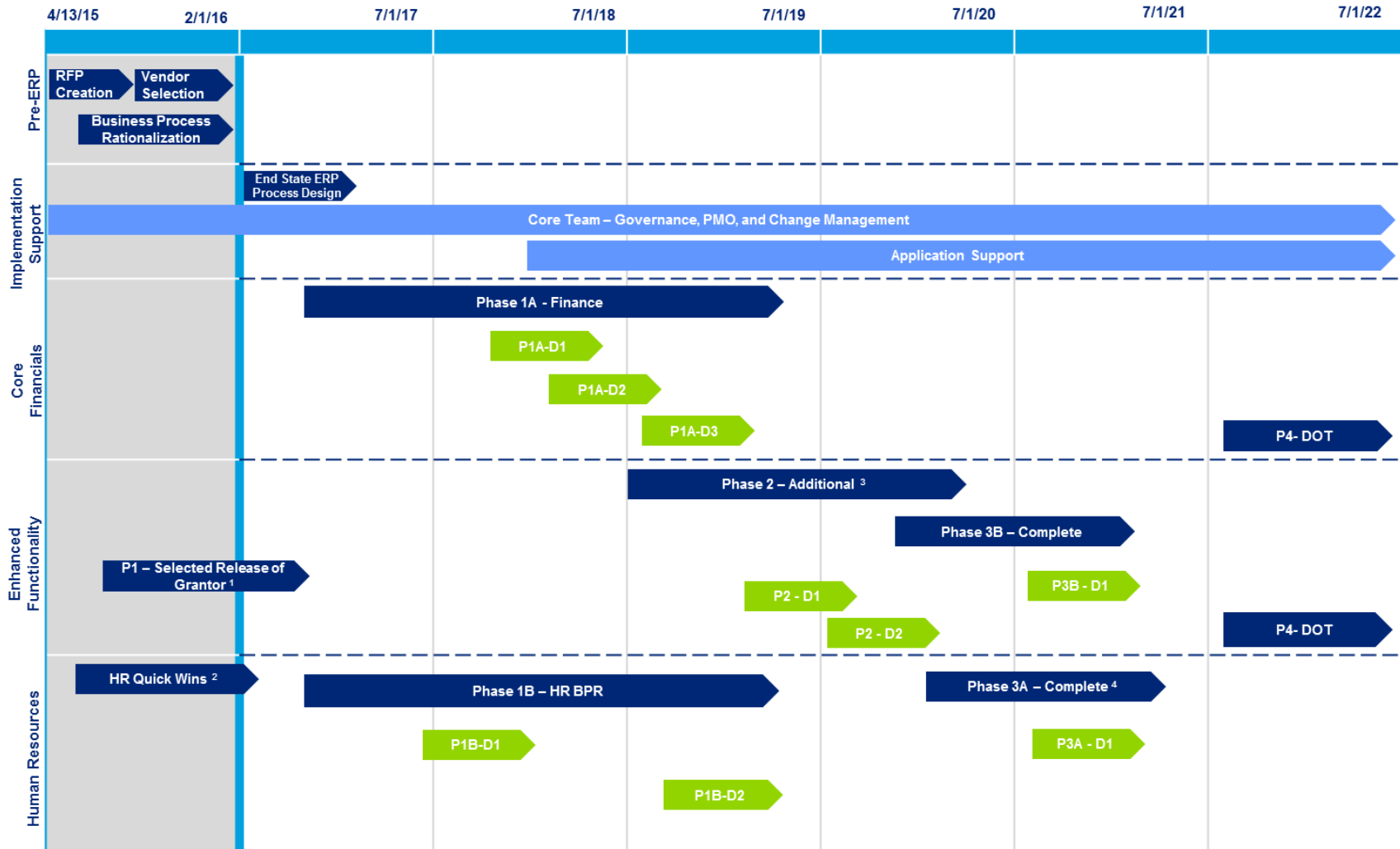
[1]Assuming the state will leverage existing DOT Grantor solution [2]Based on current Beacon Planned Updates and NC Gear identified items,
[3]Assuming availability of state staff to support overlapping activities [4]Implies SAP HR, but could be adjusted to account for non-SAP HR solution depending on state direction

F. Cost by State Fiscal Year

The full functionality and scope of the effort including ancillary costs such as facilities, contingency planning, operations and maintenance, hardware and software, implementation, oversight, planning, and state staff project team members for the 7 year time line as presented in the Timeline is estimated at approximately $301 million[3]. The summary of the costs by these different components by fiscal year is presented in Table E.1 below.

Description	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun -23	Totals
Implementation Team	$4,696	$21,297	$34,186	$23,832	$22,739	$33,459	$21,510	$ -	$161,719
Hardware	$ -	$537	$1,241	$2,534	$34	$135	$95	$ -	$4,576
Software	$11,557	$2,265	$2,265	$2,265	$2,265	$2,265	$2,265	$1,321	$26,468
IV&V	$1,042	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500	$1,459	$17,501
Facility	$115	$283	$292	$300	$309	$292	$356	$197	$2,144
Network	$230	$321	$ -	$ -	$ -	$ -	$ -	$ -	$551
PC	$157	$ 219	$ -	$ -	$ -	$ -	$ -	$ -	$376
Security	$292	$700	$700	$700	$700	$700	$700	$409	$4,901
O&M	$ -	$49	$5,342	$9,041	$11,013	$11,711	$12,968	$7,826	$57,950
Contingency	$1,628	$2,536	$4,188	$3,706	$3,561	$4,596	$3,636	$1,009	$24,860
Total	$19,717	$30,707	$50,714	$44,878	$43,121	$55,658	$44,030	$12,221	$301,046

Table E.1 Cost by Fiscal Year by cost category (000's)

The Implementation Team is comprised of both system integrator and state staff. As such, the implementation team costs are shown separately below for both the system integrator and state staff. These costs sum to the total implementation team cost shown above.

Description	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun -23	Totals
Integrator	$3,196	$15,877	$26,634	$18,546	$17,278	$26,544	$16,751	$ -	$124,826
State Staff	$1,500	$5,420	$7,552	$5,286	$5,461	$6,915	$4,759	$ -	$36,893

Table E.2 Cost by Fiscal Year by implementation team (000's)

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[3] Includes growth rate of 3%

The budget estimate provided in table E-1 above includes the anticipated cost for deploying the solution that is owned and operated by the state in their data centers (On-Premise). This cost includes in addition to the hardware cost the required system software licenses, network investment, and floor space cost in the existing data centers. An alternative that Deloitte was asked to calculate was the approximate cost of a cloud solution that would use third party hardware, facilities, and resources to manage. The table below outlines the total cost for seven years for both of these, providing an estimated savings amount for Virtual Private Cloud deployment option.

All numbers below are expressed in $000s.

Cost component	On-premise	Virtual Private Cloud
Hardware	$4,572	
System Software	$3,656	$8,138
Floor Space	$6,893	
Network	$550	$3,827
Totals	**$15,671**	**$11,965**
Potential savings		$3,707

A more detailed definition of all of the factors and variables that were calculated to make these estimates along with the tools, methodologies, and assumptions used for the estimation is in Section 8 of this document and the Excel Workbook. The key assumptions that are major levers for the estimates include:

- **Ratio of Contractor to State Employees**: for planning purposes this ratio was set to 60 percent contractor and 40 percent state employees based on other state experiences and our review of the available resources in North Carolina.

- **Work Completed in the United States –** for estimating purposes all work is based on delivery in the State of North Carolina. While options do exist for both on-shore delivery center based support (that would occur outside of North Carolina) and off-shore support (that would occur outside of the United States) that could result in additional cost reductions, this analysis assumed a local option all project work and support conducted within the state.

- **HANA Based Solution –** Both Hardware and Software costs assume the use of the SAP HANA solution. HANA represents the stated direction for the SAP solution and offers unique benefits from a performance, usability, and long term cost of ownership perspective.

- **Independent Validation and Verification (IV&V) –** For an implementation of this magnitude, estimates have been included to support a robust IV&V presence on the project. While this represents an additional cost to the state, independent monitoring of both the integrator and state responsibilities and execution can significantly reduce the risk of an ERP implementation.

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G. Potential Funding Sources

While the need for a State ERP system to help address critical business needs may be well supported by agencies and stakeholders, there is still a need to fund it. For those states that have already completed or are embarking on an ERP implementation, there is a trend towards a combination of traditional financing options. States have opted for combinations of appropriation, federal funding, and bonds in parallel with an agency chargeback model.

Section 10 provides more detail as to how other states have funded their state wide ERP efforts over the past decade. The different approaches that they have used include:

- **Appropriation** – legislative provisions that direct approved funds to be spent on specific projects for a specified period of time

- **Federal Funding** – Federal Government granted funds provided to State and Local Governments as established by law or via a competitive process
- **Bond** – specific government appropriation where the State bonding authority issues bonds to fund IT procurement. The State, in turn, issues bonds to investors with the promise to repay the debt
- **Agency Chargeback** – mechanism to distribute charges to state agencies/entities for services provided by another state agency/entity. While not a unique funding source, the agency chargeback model can be used in conjunction with other funding options or captured from existing agency operating or IT budgets.

H. Quality Control and Risk Management

Quality management will allow the state to ensure that all specific functionality and requirements needs are being met through the life of the project – this includes security and support for business process execution. Moreover, Quality management verifies that all requirements related to both regulation and security are actively addressed.

- Quality Plan
- Testing Strategy and Plan
- Requirements Traceability Matrix
- Quality Assurance Program
- Automated Testing
- Conversion Strategy and Plan

Risk Management will provide the state with a framework to anticipate, avoid, and minimize potential problems. Furthermore, consistent and active monitoring of risk will help the state stay aware of critical risk and issues while mitigating those issues without project delays.

- Risk Management Plan
- Risk Log
- Mitigation Strategies
- Risk Monitoring

I. Change Management

Change Management is one of five critical success factors for ERP Implementations identified in this Implementation Plan and by numerous third party resources. Complex IT projects with strong change management programs have been identified as having a higher rate of success meeting deadlines, project objectives, and budget estimates.   The Implementation Plan below details both the rationale for a comprehensive change management program as well as specifies the specific deliverables and activities that the State and a vendor should consider. Based on the assessment of available state resources, the implementation plan factors in the procurement of skilled ERP implementation Change management resources to support your staff through the effort,

- Change Management Plan
- Stakeholder Analysis
- Leadership Alignment
- Organizational Impact Assessment
- End User Readiness Assessments
- Communication Strategy and Plan

J. Risks Associated with the Project

Any large complex project will have risks. Increasing one's probability of mitigating these risks comes from careful planning, having the right skills assigned to the project, and sufficient resources. During the different work sessions, the participants from the different agencies were asked to identify the risks they felt North Carolina faced in implementing an ERP. These risks coupled with the risks that Deloitte Consulting and other third party vendors have documented and that could apply to North Carolina. These risks are detailed in Section 9 of this Plan and were categorized by the following areas:

Risk Area	How Applies to North Carolina
Business Imperative	Risks include stakeholder engagement, ownership and commitment of the project team members, and identification and measurability of business objectives. The key concern expressed by stakeholders from North Carolina was the need for executive level sponsorship of the project.
Technology	Hardware, software, and network risks both internal and external to the project. For North Carolina, a specific risk was around support of the legacy applications during an ERP implementation as there are certain key resources that would be required to support both.
People	Organizational change, communication, and team dynamic as well as resource scheduling, availability and succession planning risks. While there were several risks identified, the main concerns stemmed from the availability of staff and the need to account for both transition and backfill of project staff.
Project Management and Control	Project roles and responsibilities, schedule, standards and scope risks. A consistent message across workshops and interviews was the need for strong project governance. Process and data standardization will be critical to not only the implementation of the ERP solution, but the ongoing operation of the solution. There was consistent recognition around the need for management and controls to monitor and enforce standardization.
Process and Requirements	Standardization of processes, Stability of the requirements and risks associated with stakeholder understanding of the core system requirements. As the strategic direction is to minimize customization and adhere to standard COTS functionality, standardized business requirements must be defined that enable evaluation of the COTS options.
Design, Development, Test	Forward looking risks often documented during the project – risks can include areas of design complexity, difficult test scenarios, and constrained development resources for the scope (both people and technology) A general theme was around the need to not underestimate the complexities of an implementation. In particular, stakeholders expressed the need to focus on conversion of data to a standard format and the ability to meet the nuanced needs of the individual agencies.
Environment	Risks in the external environment, including physical space, legislative decisions, policy decisions, or budget constraints. The proper processes and capabilities must be in place to enable efficient changes to business rules and process based on external requirements or constraints.
Project Integration	Dependency risks associated with third-party project participants and overlapping agency initiatives. Dependency risks can include a constrained resource or a task-level dependency. While in general agreement around the concept of process standardization, conflicting requirements or direction are inevitable given the broad user base. The processes and governance must be in place to efficiently respond to conflicting business needs.

K. Next Steps

Given that the preparation activities for an ERP implementation require both internal staff and consulting support, this analysis included an overall estimate of the cost impact for pre-ERP activities. The cost of pre-ERP activities is approximately $4.3M to cover the activities listed below. These activities are detailed in Section 11 of the Plan and supported by a detailed Microsoft Project Plan that defines the dependencies and critical path for the activities that will need to occur between now and the formal start of the implementation of the Finance function for the state.
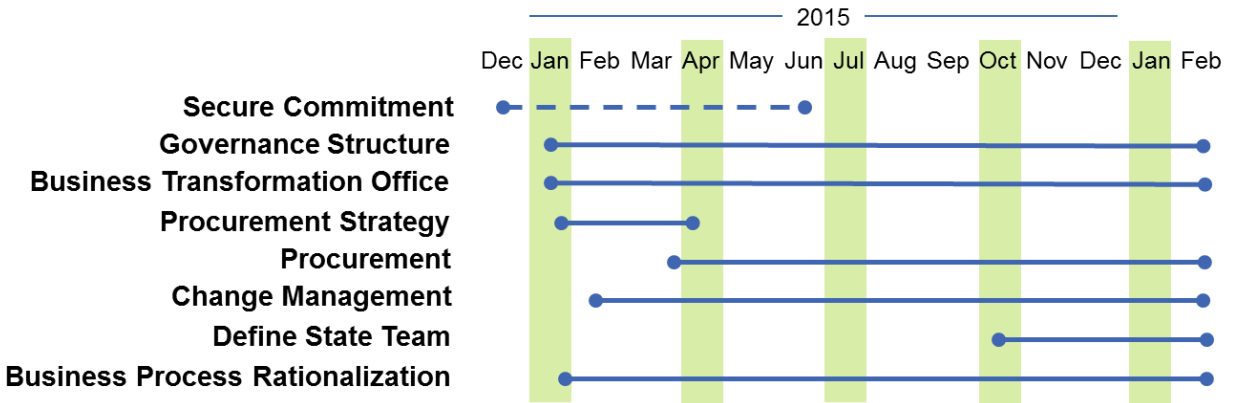
2   Current Business Challenges

There are currently many business challenges facing the State of North Carolina that could be addressed through an ERP implementation. Below are common themes resulting from data identified as part of the NC GEAR analysis, interviews with state Executive Leadership, and feedback from the 17 ERP Assessment workshops conducted.

Challenges	Examples
Need to Compensate for Lack of Available Data or Data Consistency	• Inconsistent reporting across state agencies. • Difficulty in accessing timely data for decision making. • Delays in responding to stakeholders requests on spend and allocation and funds.
"Work-arounds" due to lack of an integrated System	• Agencies operate "outside of the system" and manage significant portions of their business through paper processes • Staff must use a number of different systems to complete tasks which results in decreased efficiency and increased training complexity. • Lack of standardization introduces complexity in the business processes and introduces complexity in managing the end to end process. • Manual processes and lack of real time integration results in need for daily and time consuming reconciliations between systems and processes.
Limited Access to or Visibility of other Agency Information or Processes	• Lack of state wide visibility impacts purchasing power and replacement cycles. • Separate skill sets, technology, and support costs across agency solutions • Inability to leverage staff for cross-agency activities (both technical support and business process execution).
Limited or No Access to Analytical Tools or End-User Friendly Reporting Tools	• Non-standard reports need to be requested and require technical expertise (reducing turnaround time and impact data based decision making) • Inability to perform cross-agency research and analytics • Difficulty in implementing performance based metrics for evaluating the efficiency of the operations • Agencies typically have to choose between the volume of data requested and the speed in turnaround
Forced to Choose Between Limitations of Existing System or Creation Agency Specific Work-Arounds	• Creation of manual processes or "spreadsheet" based work around • Capabilities of the system dictate business practices • Divergent solutions across the state as each agencies attempts to overcome the challenges of the core financial system.

Below are several specific examples that support the current business challenges listed above. The items below were the result of the ERP Assessment and have been vetted through the NC Gear initiative as well.

- Grant Management is a highly paper driven, agency specific activity that does not provide an enterprise view on how agencies are performing with grants management and areas of risks and exposure to the State
- Inventory management that is managed in eight different systems across 14 different agencies resulting in the lack of transparency in common spend, inventory management, and costs for programs
- Asset management that is managed in 14 different systems and in some cases only on a spreadsheet resulting in a lack of visibility to the Governor, General Assembly, Controller, and Budget Director to more effectively and consistently manage assets – including decisions around their acquisition and disposal.
- There are six different systems being used by the state to manage fleet. In several instances, the systems being used cannot holistically manage the end-to-end management process including utilization, demand, maintenance, and costs.

3   Market Place View

The advancement of technology in recent years has created significant opportunities within the Public Sector. With governments challenged to do "more with less", these advancements have offered increase operating efficiency, availability of data and decision making tools, and increase transparency for constituents. As the expectations of key stakeholders and constituents have increased, many states have turned to technology to enable process standardization and automation, data availability, and increased transparency. In particular, most states have looked to Enterprise Commercial Off the Shelf (COTS) packages to enable finance transformation.

Approximately 85% of states have engaged in financial system revitalization by adopting an enterprise resource planning (ERP) tool. It might involve combining multiple ERP systems into a single, integrated system or it might involve implementing a new global application that makes it easier to consolidate financials from a variety of business units and data sources. The States' selection of ERP solutions has highlighted market leaders in this arena including CGI, Oracle, and SAP. Technology serves as a key enabler for change within the finance function and is critical to sustained improvement.

Financial System By State
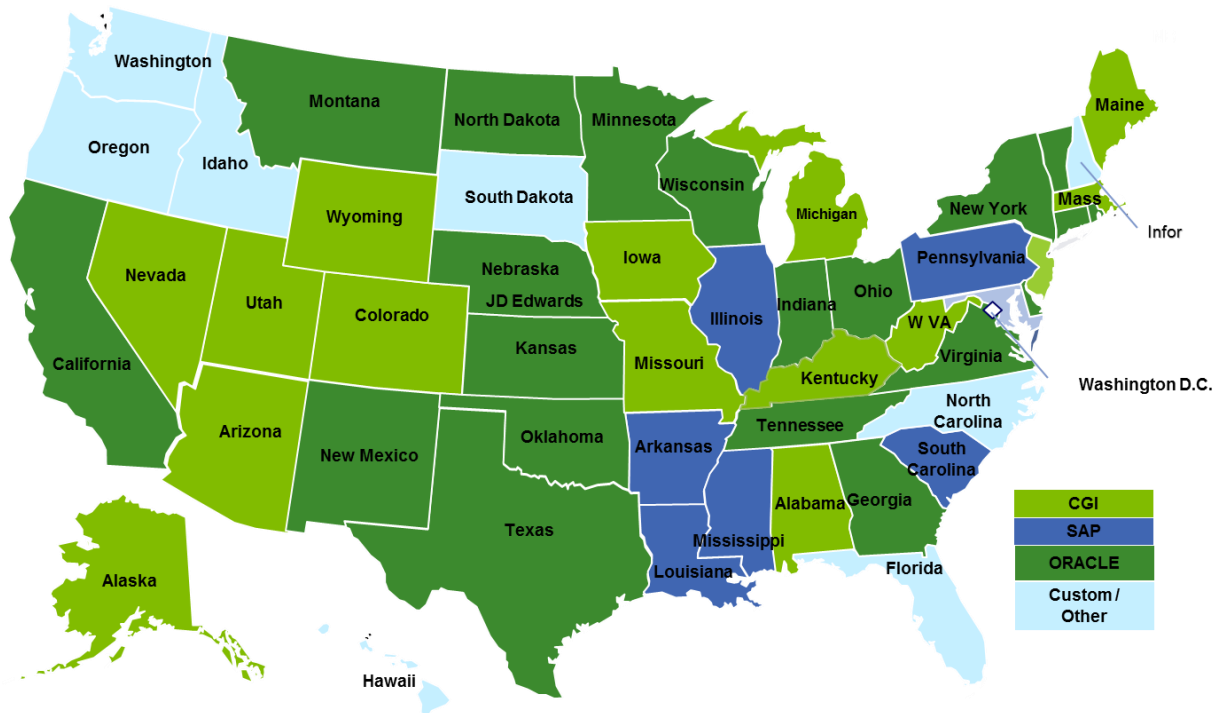
Accompanying the trend in finance transformation is human resources transformation. Approximately 75% of states have engaged in human resources transformation by adopting a Human Resources ERP tool. The trend forming is to transition human resources from a function of "service delivery" to a driver of strategic talent and business outcomes. In conjunction with finance transformation, human resources transformation likewise has engaged with market leading technology solutions consisting of CGI, Oracle, SAP, and Workday. Technology has become a key enabler in human resources transformation as it creates an integrated experience for the human resources customer. Accompanying the trend in finance transformation is human resources transformation.

HR / Payroll Systems by State
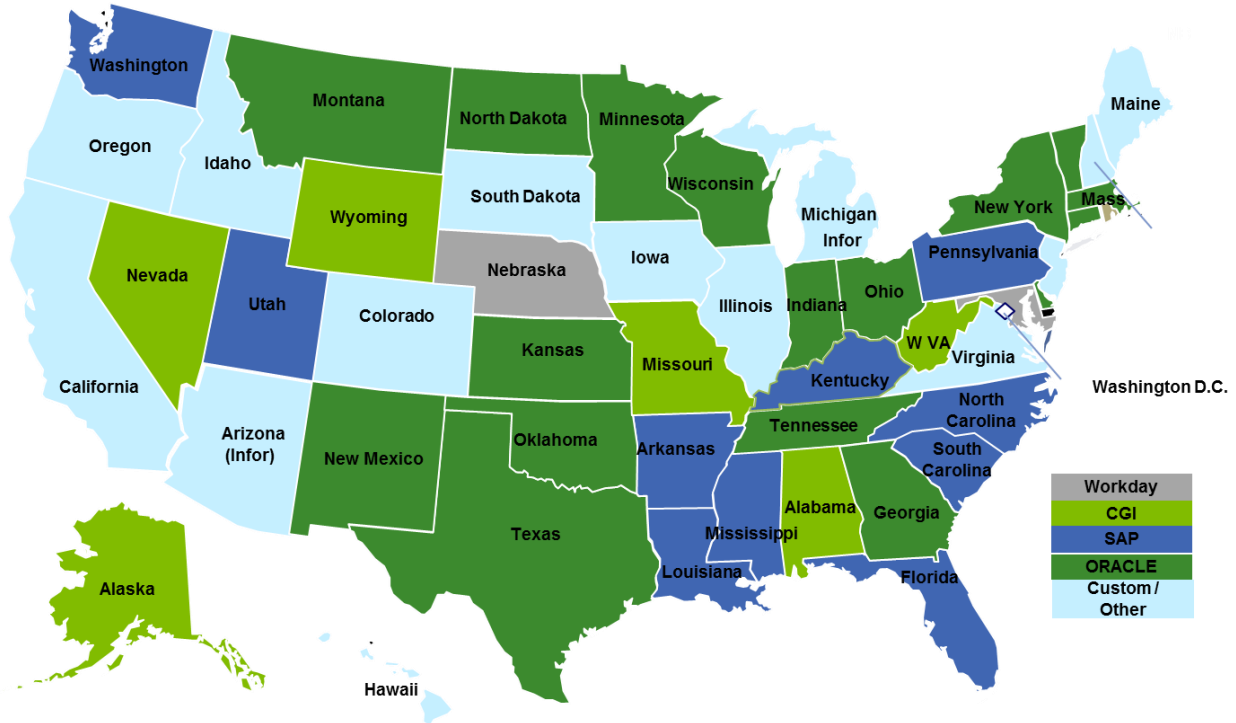
3.1   State Comparison

In selecting states to compare, several components were taken into consideration.

- Understand the relative size of the state in relation to North Carolina in terms of budget and population.
- Look at states that were planning to move to an integrated ERP model either choosing a single software solution or a "Best-of-Breed" approach, but still seeking to define and implement all functions over a defined period of time.
- Implemented or commenced within the past ten years.
- Cost and core scope of the implementation.

Below is a current snapshot of which software has been selected by the referenced state for core financials, the status of the implementation, implementation approach, and module approach.

Software	States	Status	Implementation Approach Type	Module Approach
SAP	Pennsylvania	Fully Implemented	Functional	All
	South Carolina	Fully Implemented	Agency	All
	Illinois	RFP for SI, Not Started	Functional	All
Oracle PeopleSoft	Wisconsin	In Process	Functional	All
	New York	Fully Implemented	Functional	BoB
	Ohio	Fully Implemented	Functional	All
	Virginia	In Process	Agency	
CGI	Michigan	Recently Started	Functional	All
	West Virginia	Partially Implemented	Functional	All
	Colorado	Fully Implemented	Functional	BoB

Implementation Approach Type – The chart above shows two different implementation approaches:

- Functional - Under a functional implementation approach a state planned, designed, configured, and deployed into production a specific function (e.g. Finance) across the majority of its agencies, then moved on to another function. Some states did overlap phases of implementation for functions where design and configuration of the next function commenced while another function was in deployment or stabilization. Many states of similar size and complexity have implemented based on a functional approach.
- Agency – An agency approach is where the complete scope of functionality is delivered for a single agency or group of agencies. Once those agencies are fully deployed, the implementation moves to the next agency or set of agencies. This is more common in states that have stand-alone financial systems or ERP functionality at each agency. For North Carolina, the core financial capabilities are already standardized on the central NCAS system.

Module Approach – The chart above show two different approaches to implementation of functional modules within the ERP:
- All – All indicates HR, Financials, and Support Modules such as Fleet, Inventory, and Assets. It may or may not include budgeting. Budgeting was included for CGI states, Illinois, and Wisconsin.
- Best of Breed (BoB) - Some states have adopted a "Best of Breed" approach, which interfaces multiple systems that were selected independent of one another; those states are labeled as BoB. States that have gone this path have done so for a variety of reasons including budget constraints, legislative mandates to "fix" a particular issue, disparate operating units, requirement fit, or timing.

Several of these states are now expanding their initial implementation to include or integrate additional functional components using the same or different software packages. An example of what some of these states are doing is provided below:
- New York – PeopleSoft Financials, PeopleSoft Payroll, Legacy Budget
- Florida – SAP HR/Payroll, Legacy Financials
- Washington State – SAP HR/Payroll
- Kentucky – SAP HR/Payroll, CGI Financials, Procurement, and Budgeting
- Maryland – Workday HR

Estimated state implementation costs for system integrator services to get to implementation vary significantly based on scope and available state resources. Statewide ERP implementation in a large state such as Ohio, Pennsylvania, and New York has historically been $100M or more in system integrator related costs.

3.2   Previous State ERP Request for Proposals and Responses

For reference purposes, the following request for proposals (RFPs) and proposal responses have been provided. These are to illustrate the considerations, approaches, and partnerships other states are employing for their ERP implementations. The RFP and related responses listed below are available as public documents and have been provided to the State project team for reference.

Michigan RFP
Michigan sought to acquire and implement an ERP system for the executive, legislative, and judicial branches of the state. This, also, included seeking Hosting Services, a Disaster Recovery site, and Disaster Recovery Services as part of the overall effort.

Michigan Proposal Response(s)	
Accenture	Accenture proposed a solution using Oracle's PeopleSoft ERP software combined with Oracle's Hyperion product for budget preparation, enhanced by Accenture's Enterprise Services for Government (AESG) platform.
CGI	CGI Advantage is the proposed solution for Michigan's ERP solution. The CGI Advantage solution addresses the complexities of implementing varied state agencies, including complex federal reporting, federal grants management, CMIA, federal, state and local funding sources, Federal Highway Administration billing, federal and state fiscal years, and complex cost accounting needs all out of the box and fully integrated.
Deloitte	Deloitte presented a solution based on capabilities from SAP for the Enterprise Resource Planning (ERP) software and Secure-24 for hosting and managed services. The proposed SAP ERP solution encompassed both the required in-scope functionality and the optional HR/payroll functionality.
IBM	IBM's solution included Oracle PeopleSoft (Financials), Oracle Hyperion (Budgeting), Kronos Workforce Central (Time and Leave), and IBM TRIRIGA (Fleet Management, Facilities Management, Inventory, and Real Estate). The solution proposed utilizes a "best-of-breed" approach.

West Virginia RFP
West Virginia solicited proposals to provide software and services required to implement and support an Enterprise Resource Planning (ERP) System for the State. The State of West Virginia has more complex governance requirements for its statewide ERP Project -- primarily because the State has three Constitutional Officers, the Governor, the State Auditor and the State Treasurer, with key responsibilities for much of the business functionality that was considered to be within project scope.

West Virginia Proposal Responses	
Deloitte	Deloitte selected products that provide functionality "out-of-the-box" and all work together. The solution included Oracle, AgileAssets, and Kronos; all of which provide software products for state government ERP implementations. This approach reduces the solution complexity and long-term maintenance costs.

Illinois RFP
The State of Illinois sought to identify two System Integrators to develop and implement a Tier-1 Enterprise Resource Planning Solution ("ERP Solution") capable of helping Illinois standardize its back-office business processes statewide. A Tier-1 ERP solution was solicited as it is designed to serve large, global businesses and public sector entities, and requires more complicated hardware and more highly skilled Information Technology ("IT") professionals than does a lower tier ERP Software Package.

Additional responses and RFPs can be requested directly through states. Illinois' proposal review is in progress, but a state to state request can be initiated.

4   Critical Success Factors for an ERP Implementation

The critical success factors for an ERP implementation are Overall Project Governance, Leadership Participation, Change Management, Adherence to COTS (Commercial Off The Shelf) functionality, and Project Management. Governance establishes the foundation for the implementation by creating standards and guidelines. Leadership Participation is used to further align the vision of the ERP with the organization and create organizational buy in. Change Management is responsible for aligning stakeholder and end user business needs and expectations and driving adoption of the solution. Adherence to COTS functionality confirms that unnecessary developed is being undertaken (which reduces the overall risk and complexity of the implementation). Lastly, an ERP implementation must have the necessary project management methodologies, processes, and oversight in place to effectively manage the day to day implementation activities.

The success of an ERP implementation is dependent on several moving pieces, but at the base level there are a few critical success factors that must be actively monitored and adjusted to provide a strong foundation for the ERP. While state ERP implementations offer their own unique set of challenges due to size and scope, the critical success factors for a large scale ERP implementation are shared across the public and private sector. The success factors listed below are based on experience with hundreds of large scale COTS implementations project across public and private sector and validated against previous state implementation experience including Texas, Michigan, Illinois and West Virginia. Specifically, these critical success factors are rooted in Governance, Leadership Participation, Change Management, and Adherence to COTS functionality.
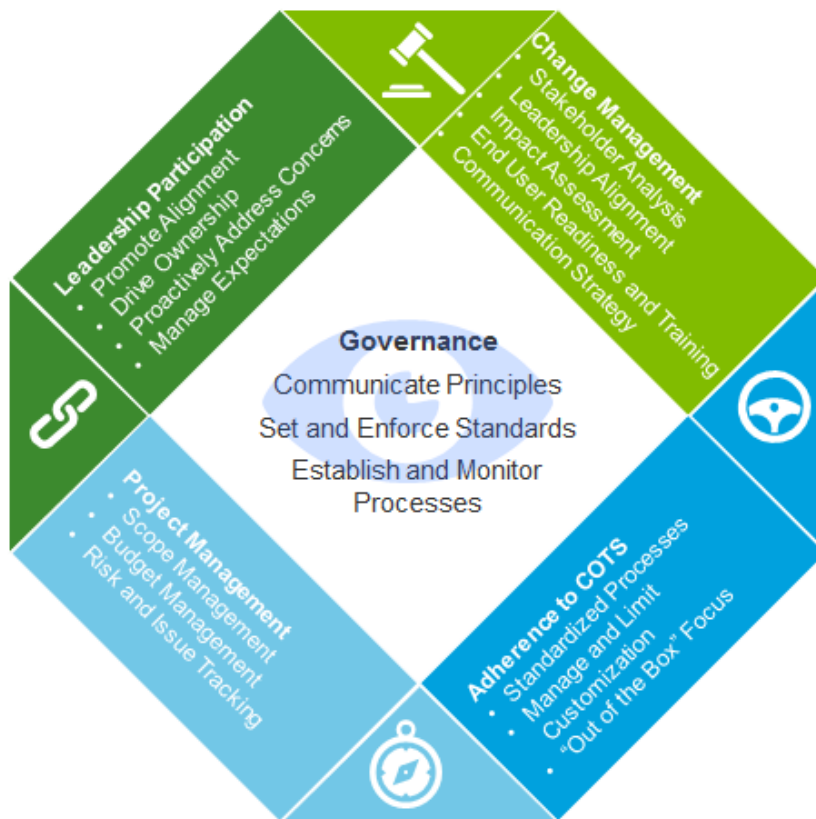
For North Carolina, we suggest that these critical areas be combined under the umbrella of a Business Transformation Office. As the implementation of a North Carolina ERP is primarily driven from key business challenges, it is important that the project remain focused on business transformation and success measured in terms of achieving the desired business outcomes. Branding the critical success factors under a Business Transformation Office can help to re-enforce the key messages of the project,

align the expectations and desired outcome, and assist with setting the foundation and early decisions for the project.

In order to confirm alignment of the critical success factors to the Business Transformation Office (BTO), the BTO should consist of the following:

- PMO Lead

- Governance Committee

- Executive Leadership

- Change Lead

4.1   Governance

Governance is an important mechanism by which oversight and decision making transpire during the ERP implementation. Establishing robust Governance provides the structure, protocols, and mechanisms to:

- Enable effective operational service delivery, performance and state staff engagement
- Facilitate effective decision-making, escalation and information sharing across the organization
- Enable smooth hand-offs and transitions within the state and among stakeholders
- Discuss and prioritize investments, projects, and resources

A successful Governance model is built on several components: Guiding Principles, Governance Responsibilities, Governance Structure, Decision Rights, and Governance Processes. If correctly applied these components help confirm a tight execution.

Guiding Principles

- Guiding Principles are used to Align to ERP Strategy, Empower Professionals, Adhere to Established Standards, Understand Shard Accountability, Cooperate and Partner with Each Other, Escalate Issues When Needed

Governance Responsibilities

- Strategy and Oversight Team: Provides oversight and guidance and determines the strategy and priorities for the ERP operating model
- Operations Team: Ensures going operations excellence and provides consistency of process execution
- Relationship Team: Manages the relationship with business and monitors feedback

Governance Structure

- The governance structure enables the organization to provide a centralized process for establishing roles and approvals for agencies through committees and meetings

Decision Rights

- For the ERP implementation, there are several decision making models that can facilitate active decision making: Consultative, Representative, Democratic, and RACI.

- Core ERP governance processes encompass: Escalation, Change Control, Issue/Risk, and Performance Management

Governance Processes

Guiding Principles: Guiding principles set the foundation for the ERP implementation. Specifically, the guiding principles should align to the strategic direction of the state and be supported by metrics – once established the guiding principles are communicated to the project team to provide direction and enable decision making. Example high level guiding principles are represented below:

Governance guiding principles should:

- Empower stakeholders to be engaged in the implementation and commit to the project
- Define standard processes related to both change and release of functionality.
- Establish decision points and milestones that can be monitored and assessed throughout the project lifecycle.

Governance Responsibilities: Governance responsibilities outline key teams and their respective roles. Successful governance models traditionally have a Strategy and Oversight Team, Operations Team, and Relationship Team. The Strategy and Oversight Team takes a holistic look at the ERP implementation and provides guidance; the Operations Team takes control of the day to day activities throughout the implementation; and the Relationship Team coordinates and manages communication with the end user. In terms of staffing, the governance model can utilize a fixed or hybrid model:

Staffing Model			
Fixed		**Hybrid**	
A fixed model identifies specific roles and assigns fixed leads throughout the project lifecycle.		A hybrid model utilizes both fixed and changing leads. For the fixed role positions the leads stay consistent for the project. For the changing roles the leads are rotated periodically.	
Benefits	**Risk**	**Benefits**	**Risk**
A fixed model establishes consistency in vision for the ERP implementation. As a result of consistent team structure, the governing body can establish uniform standards for the implementation to follow.	As a result of fixed leadership, the governing body may become prone to group think and lack diversity in practice and perception.	The hybrid model allows for new members of the governing body to potentially contribute fresh perspectives.	The changing structure of the hybrid model may result in revisiting confirmed decisions or courses of action. In addition, it may become difficult to maintain a consistent vision for the implementation given lead changes in the governing body.

Governance can be separated into two categories business and technology. In the business section, business process and data are covered. Within the technology section, solution and security are addressed. In addition, within overall governance funding and measuring success are critical factors. Given the agency structure of the state, funding allocation for the ERP implementation must be identified early on. The funding breakdown can determine the portion of the costs that relevant agencies are responsible for. In terms of measuring success, measures and metrics for success create checkpoints throughout the project lifecycle to validate that requirements and goals are being met. Moreover, talent is an essential ingredient for a seamless ERP integration – the state must take the necessary steps to provide adequate resource support for the ERP implementation.
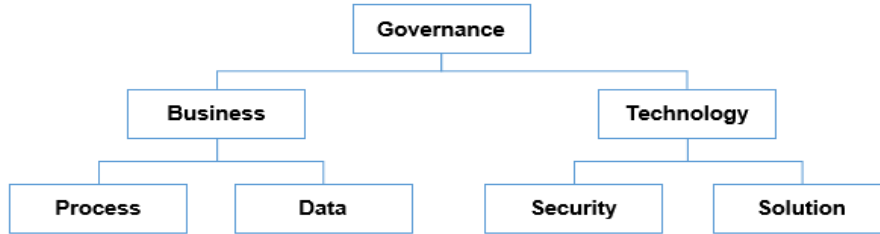
The graphic above gives a high level overview of an example structure that is common in the marketplace. The state may determine to apply a different structure. The table below details each governance area.

Governance Area	Description
Business	
Business Process	Business Process ownership establishes leads for specific business process. Assigning ownership provides the implementation with structure. Ownership should be assigned for all key business process areas such as: Fleet, Grants, Assets, Inventory, Financials, Budget, and other relevant functions.
Data	Data Governance is traditionally overseen by a board of selected members. At a lower level, there should be separate data streams with respective leads. Data owners exist at the same level as business process owners - data owners help manage master data related to their functional area. Although data ownership can be a part of business process responsibility, there is a market trend towards separating the responsibility and focus. Data maintenance and management through the project life cycle are used to limit downstream risk and issue development. Specifically, periodic data cleaning sessions are established to validate data requirements and quality of information.

Governance Area	Description
Technology	
Solution	ERP solution governance establishes protocol to verify that specific functionality performs as configured. If business requirements are not being met solution governance provides guidelines for further development and configuration.
Security	Security is critical area for the ERP and precautionary measures and protocols must be developed to confirm system integrity on an ongoing basis. Furthermore, security covers privileges, access, and control.

Governance Structure: For the ERP, governance oversight must be set with a clear organizational structure for both approval and activities that require escalation. Moreover, a transparent governance structure can require clarity of roles, empower business to serve as strategic advisors to agencies, and enable stakeholders to receive direction from an oversight board.

Decision Rights: Within governance there are several different types of decision making models that can be used: Consultative, Representative, Democratic, and RACI (Responsible, Accountable, Consulted, Informed).

- The consultative style of group decision-making refers to a situation where the leader seeks input and advice from the group before making a decision for the group, which is usually the final decision.
- The representative style of group decision-making is the process where the larger group forms sub-groups to gather and make a decision.
- The democratic style of decision-making is the process where all parties involved are presented with the available options and asked to vote.
- Decision making can become a challenging and daunting process that many organizations spend a lot of time and money trying to make more effective. Applying the RACI framework helps assign "roles" to each decision making authority thereby establishing a structure to the decision making process.

Governance Processes: Escalation, change control, issue/risk management, and performance management processes enable the overall governance.

- Escalation processes raise topics for discussion to various levels of decision makers. The escalation process must enable multi-level escalation with the governing body as the top level. Furthermore, there must a standard classification system for the identified escalation topics. A sample escalation level table is listed below:

Escalation Level	Level Description	Severity Scores
Level 1	Governing Board, executive leadership	High
Level 2	Project sponsor, project director, project operations committee	Medium to High
Level 3	Project manager or team lead	Low to Medium

The graphic below represents the different layers of escalation that maybe applied for standard escalation procedures.

- Change control is used to: identify, approve, and implement changes that are critical for the ERP implementation. Specifically, change control processes are used to: develop change standards, policies and procedures; manage and coordinate changes to the project; monitor the impacts on the project's go-live dates; and coordinate work activities associated with a Change Request (CR). The change control process should utilize a systematic approach that leverages a Change Control Board (CCB). The CCB can exist at different levels within the project: at the top level with the overall governing board or at the business process level. A high level change control process is outlined below.
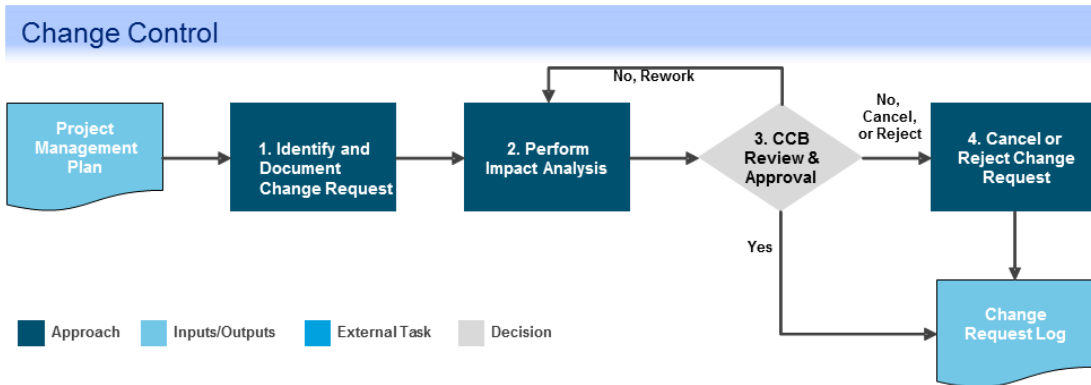
- Issue and risk management proactively identify and mitigate risk that might affect or impact the successful delivery of the ERP.

  o Issues that result from all projects require a comprehensive and collaborative issue management methodology to handle significant changes. Issues with project plans, budget, scope, resources, policies, objectives, and designs are almost inevitable on complex transformation projects. Effective issue resolution leads to a better solution or an improved business case. However, if issues and resolutions are allowed to occur in an unregulated manner, they can lead to project disruption due to challenges managing the impact on scope, resources, cost, and schedules. For this reason, it is necessary to have clear and efficient issue tracking, escalation and resolution management processes.

  o The detailed process regulating issue escalation should be determined during project start up, driven by the core principles that there should be a clear and open process for identifying issues, an open and collaborative approach to solving any issues within the core operational team, and a clear escalation path for any issues that cannot be resolved.

- Performance management collects, compiles, validates, and reports performance results to support issue identification and ongoing decision making throughout the implementation. Moreover, performance management defines key metrics that need to be monitored periodically throughout the life the project. Budget, time, and requirements are three critical performance management areas. Budget levels can be measured at intervals determined by the state to confirm that there is not premature utilization of state resources. Furthermore, milestones and deliverables can be used to provide context on the pace of the implementation relative to forecasted timelines. Lastly, it will be essential to validate that all functional requirements are being met, and this can be done through several rounds of performance testing and verification processes.

4.2   Leadership Participation

The success of an ERP implementation starts from the top and the level of commitment to the project is set by leadership. Moreover, leaders are critical influencers as state staff determine whether to adopt new behaviors during a business transformation.

Leaders
State Agency
Leads

Change Champions
Agency Managers that will
support behavioral changes

Groups of Support
Partner groups that support the technical and
behavioral changes

Leadership participation activities are used to:

- **Promote Alignment:** Establish a process for involving key leaders that build sustained understanding, commitment, and sponsorship to align with the project's goals and priorities
- **Drive Ownership:** Build an active, visible network of leaders to champion the ERP Implementation and drive supporting behaviors within the rest the state staff members
- **Proactively Address Concerns:** Identify and address potential concerns or challenges before issues or resistance arises
- **Manage Expectations:** Communicate what the ERP Implementation will and will not do, as well as anticipate timing, clearly and accurately. Be clear about expected productivity during the transition period

Strong leadership support can actively create buy in from key stakeholders and support for the ERP implementation. According to Deloitte's annual CIO survey, "72% of respondents indicated Leadership Sponsorship was a key barrier" for organization-wide transformations.

Successful Leadership Behaviors – Lessons Learned
• Demonstrate strong, unified sponsorship that is sustained beyond their formal agreement
• Establish and communicate the business context and rationale
• Establish a climate of genuine openness to concerns and eliminate the "right to veto"
• Develop cascading sponsorship throughout the levels of the organization
• Make the commitment, stay the course and make the hard decisions
• Understand the impact of the organization's culture and create a climate for change
• Support and encourage recognition

4.3   Change Management

The Change Management function should assess the nature and magnitude of the change as a result of the implementation and who it may affect. In parallel, the change management measures how ready people are for the change in the form of a change readiness assessment. As an output of the change readiness assessments, any areas of the organization that look to be particularly resistant to change, or are facing a significant volume of change can be given specific focus. Readiness to change can be measured across the project lifecycle. Change management support activities are used to:

- Establish a structured framework to help state staff members adapt to new processes and updated systems
- Confirm that state staff members are capable and confident using the new processes as part of their business responsibilities
- Provide state staff members with opportunities to get involved with the implementation, demonstrate leadership and serve as an advocate for change among their peers
- Achieve maximum levels of ownership and action across all levels of the organization in response to the implementation

Successful change management strategies typically include a change management plan, stakeholder analysis, leadership alignment for change, an organizational impact assessment, training, end user readiness assessment, and a stakeholder communication plan. The specific requirements and description for each activity are provided in section 6.2 of this document.

4.4   Adherence to COTS Functionality

An initial analysis of COTS (Commercial off the Shelf) functionality should be performed to confirm that all relevant functions are being utilized before the development of custom solutions. Leveraging existing tools from COTS or integrating application can create substantial time and cost savings and limit excess resource utilization. Specifically, adherence to COTS functionality:

- Creates baseline processes for core functionality needs
- Provides pre-configured solutions for rapid deployment to all relevant stakeholders
- Allows for quick market deployment with limited risk as a result of prior testing and validation processes
- Establishes a standard set of processes for core functionality across state agencies and minimizes post go-live support

The initial business process re-engineering and blueprint effort can play a significant role in realizing this success factor. The business process re-engineering effort must focus on aligning existing processes to the capabilities and leading practices that exist within the COTS solution. Likewise, this will mean leveraging the embedded processes of the software to standardize processes across the participating

agencies. Leveraging the embedded processes and conducting the business process re-engineering effort can reduce the likelihood of forcing existing processes in to the COTS solution (i.e. "paving the cow path").

The state must thoroughly understand the time, cost, resource use, and risk associated with custom development. Deviating from the COTS processes through customization can impact the future costs of maintenance and upgrades, negatively impact ongoing application support, and reduce the ability to take advantage of future enhancements offered by the software vendor.

4.5   Project Management

The complexities of an ERP implementation require a strong adherence to Project Management principles and processes. While the specific requirements are provided in section 6.1 of this document, the overarching concept that is a project of this scale and scope must be actively managed from a project perspective. While system integrators can provide the nuances of their particular implementation methodology, there are common threads that run across most approaches. These include areas such as creation and monitoring of the project plan, status reporting, risk and issue management, and scope management. These standard project management processes are necessary to effectively managing a statewide ERP implementation.

5   ERP for North Carolina

As directed by the Statement of Work (SOW) and discussions with State Business Experts, the scope for the ERP assessment included all state entities using the North Carolina Accounting System (NCAS) including the Executive Branch and Council of State Agencies (excluding Universities and Community Colleges).

NC State Agency/Entity	
State Board of Elections	Department of Revenue
Council of State Agencies	Department of State Treasurer
Department of Administration	Department of the Secretary of State
Department of Agriculture and Consumer Services	Department of Transportation
Department of Commerce	Executive Branch
Department of Cultural Resources	Judicial Branch*
Department of Environment and Natural Resources	Legislative Branch*
Department of Health and Human Services	Office of Information Technology Services
Department of Insurance	Office of State Budget and Management
Department of Justice	Office of State Human Resources
Department of Labor	Office of the State Auditor
Department of Public Instruction	Office of the State Controller
Department of Public Safety	Board of Electrolysis Examiners

*Estimates calculated for Finance functions only

The process of defining the functional and technical areas in scope for the North Carolina ERP implementation began with a review of existing documentation available through either the State or under the NC GEAR initiative This included functional and technical documentation including system specific information and related costs. In addition, the team conducted a series of 11 executive interviews designed to identify existing concerns, future expectations, and key metrics for consideration of an ERP implementation. A series of 16 functional and technical workshops were conducted to gain greater insight into the current state, future state expectations, and discuss potential risks and strategies to mitigate those potential risks.

The in-scope functional and technical areas resulting from this collaborative effort are summarized below. The functional section contains the high level capabilities that are included within the scope of the estimates. The technical section provides an overview of the technical architecture necessary to support the desired functionality.

5.1 Functional

The functional implementation components set the business scope for the implementation and serve as a critical input to the estimating model. The functional scope influences estimates for configuration, development, training, testing, change management, and overall project management and governance. As such, it is important to identify the areas of the COTS product that must be enabled to support the needs and expected outcomes of an ERP implementation for North Carolina. For definitional purposes, it is understood that Core Finance includes Finance, Procurement (excluding eProcurement), Fixed Assets (excluding fleet), Budget Control, Inventory, and Grant Accounting (Grantee).

Functional Area	Description
Finance	Manages the processing, recording, and maintaining financial accounting transactions within the enterprise
Human Resources	Manages functions from hiring a state staff member to final separation from the organization
Procurement	Supports the procurement and inventory functions occurring in day-to-day business operations
Grants Management	Manages the application, award, budget tracking, and closing of a grant
Budget	Supports the creation, execution, and management of budgets
Asset Management	Supports the whole life management of the physical assets (including facilities) of an organization to aid in maximizing value
Fleet Management	Supports the management of fleet vehicles including maintenance and consumption
Inventory Management	Manages stocks of merchandise on a quantity and value basis and is used to plan, enter, and provide evidence of goods movements
Analytics and Reporting	Provides tools needed to retrieve data to make faster, more informed decisions

5.2 Technical

The technical implementation components set the scope of the ERP implementation from a technical perspective. This includes the inputs necessary to design and estimate the technical solution to support the business needs and end user expectations, the long term maintenance of the solution, and additional areas to include performance, security, and stability. With a COTS based solution, it is particularly important to define the technical architecture and support capabilities in a way that leverages the inherent strengths of the solution.

Technical Area	Description
Applications and Tools	Covers the areas of Enterprise Architecture, Future State Landscape, Environments, Systems and Clients, Applications needed to enable core functionality, Tools needed to enable operation of the ERP solution, Security aspects, and system decommissioning approach
Infrastructure	Covers the areas of OS/DB, Compute & Storage, Virtualization, Network, Software Change Management, Capacity Planning and Performance, System Administration & Development
Deployment options	Covers the areas of On Premise and Virtual Private Cloud deployment of ERP solution
Data & Integration	Covering the areas of Process/Data/Information integration, Analytical applications & tools, data conversion approach
User Experience/User Interface	Covers the areas of user interaction & interfaces, SAP roadmap alignment, and configuration & personalization

5.3 Technical Architecture

The high level technical architecture has the following objectives:

- Use of technical standards, specifically open standards, to improve the cost effectiveness, data consistency, and integration of commercial off-the-shelf (COTS) solutions. This results in lower development costs and risks and a lower longer term total cost of ownership.

- Protection of data privacy and the integrity of the information managed by the statewide ERP system
- Reuse of statewide ERP system components
- Interoperability and integration using open architecture standards
- Adaptability and responsiveness to changing business needs and rapidly evolving information technologies
- Transformation of raw data into meaningful information to provide insight and value to users

5.3.1 High Level Architecture View

The high-level technical architecture is represented by a model that decomposes the statewide ERP system into distinct layers, which is depicted in more detail in the following diagram. The layers combine together to provide a complete solution and the model describes how each layer addresses a business role and solution capability. It provides a summary foundation from which the various conceptual components can be analyzed and decomposed further. The components depicted in the high level architecture view were used as input for the budget.

The to-be SAP centric statewide ERP system architecture has been defined in a business, application, and infrastructure context depicted in the following illustration.
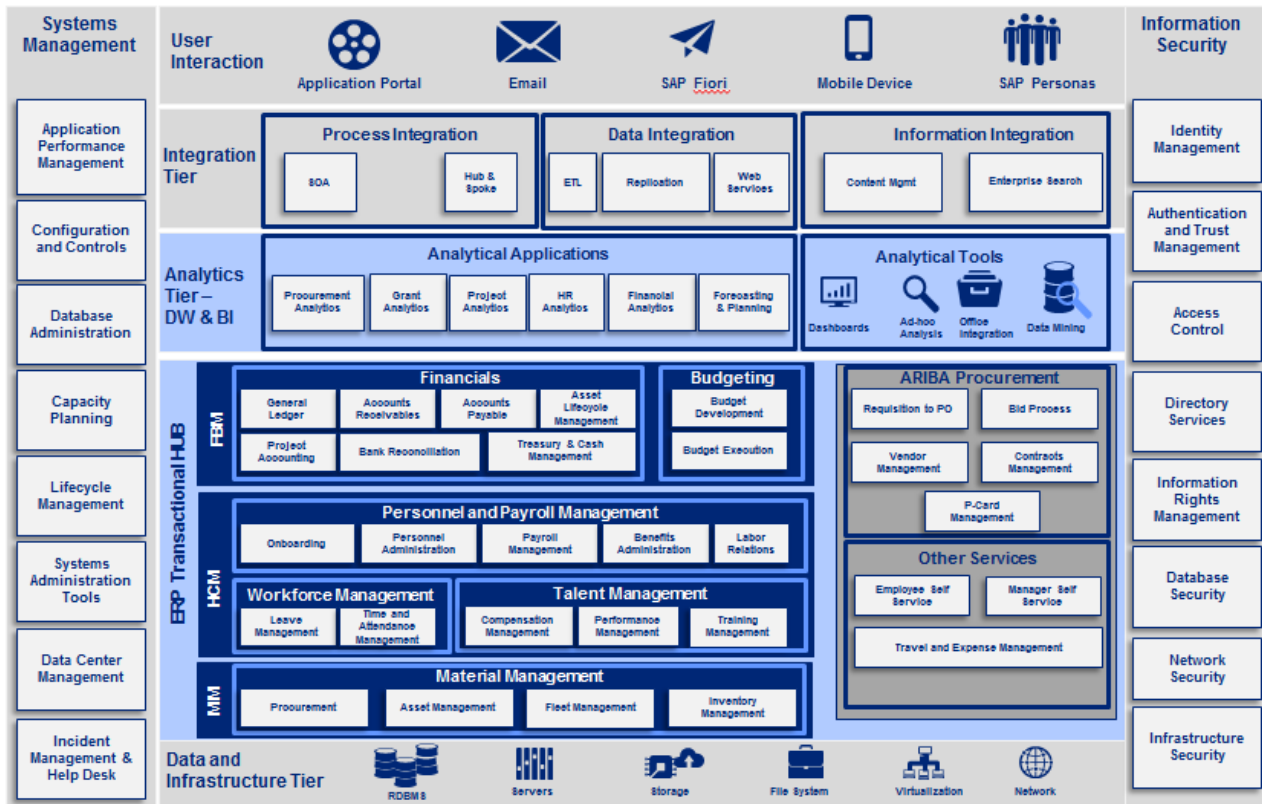
The envisioned statewide ERP system architecture consists of:
- **Tier-1 ERP transactional backbone:** An end-to-end ERP Solution that is the transactional backbone for all administrative functions, including, but not limited to, financials, budgeting, personnel and payroll management, workforce management, talent management, and material management. The package could potentially be supplemented by a minimal number of point solutions, where necessary, should the ERP backbone fail to provide the required functionality for specific and critical functional components (*e.g.,* budget book publishing).
- **Fully-integrated functional modules in ERP Solution:** The ERP Solution can be fully integrated across all modules. In other words, the ERP Solution can be built on a unified code

base across major functional domains, such as Financial Business Management (FBM), Human Capital Management (HCM), and Materials Management (MM). It can be fully-integrated to deliver seamless data integration across functional modules (*e.g.,* integration between procurement, accounts receivable, and accounts payable to enable inter-agency transfers), as well as to facilitate automated, non-disruptive technical and functional upgrades at the State's discretion in the future.

The decision to move to a fully integrated functional ERP solution is complex. While there are certainly benefits that surround reduced integration and complexity, a single support organization, and a common and standard infrastructure, there are likewise potential costs and process impacts. This is especially true when considering bringing an existing implementation (such as the Department of Transportation SAP solution) on to a unified instance. While unification is certainly an emerging trend in the ERP space, there are states that have made the decision to keep specific agencies on separate instances. For budget purposes, the cost estimates included in this report have assumed the move of DOT into a unified solution so that the potential cost is fully captured. However, further analysis may be required during the ERP implementation to make the final decision and move forward with a unification strategy.

- **System of record:** The ERP Solution can serve as the system of record for all financial, human capital management and procurement-related data, such as, but not limited to, master data (*e.g.,* chart of accounts, employees, positions, job classifications), transactional data (*e.g.,* journal entries, invoices, time cards, payroll transactions, purchasing documents), and reporting/analytical data.
- **Integrated analytics:** The State-selected ERP Software Package should include pre-built analytical applications that are fully integrated with the ERP transactional hub and that include capabilities for analytical reporting, and measuring and tracking key performance indicators across FBM, HCM and MM. Additionally, the ERP Solution can include tools for performance dashboards, ad-hoc analysis, data-mining, as well as bi-directional integration with Microsoft Office tools such as MS Excel.
- **Integration framework:** A robust integration framework is required at the core of the ERP Solution and can encompass capabilities and tools for data integration (*e.g.,* ETL, web services, data quality, data profiling, replication, and change data capture), process integration (*e.g.,* SOA, Hub & Spoke), and information integration (*e.g.,* content management, and enterprise search) to enable a seamless information exchange between the ERP backbone and other applications.
- **Information security:** Security and controls across the data, application and infrastructure tiers are critical features of the envisioned ERP Solution. Since the ERP Solution will contain highly sensitive and confidential data, robust information security, data protection and governance are required, including encryption, firewalls, identity and access management, role-based access control, privileged user access control (*i.e.,* to prevent system and application administrators from unauthorized access to confidential information), digital rights management, at all tiers of the ERP Solution (*i.e.,* from user interface to disk). Additionally, security provisions need to protect the ERP Solution from malicious code, unauthorized access, hackers, and intrusion. Security provisions of the ERP Solution need to be in compliance with State security regulations.
- **Hosted solution:** In accordance with guiding principles provided by the State for the NC GEAR ERP assessment the statewide ERP system should either be hosted on premise in State owned data center facilities with system management functions provided by State staff or hosted by a Third Party using a Virtual Private Cloud (VPC) model with system management functions provided by the Third Party hosting provider.

6   Project Level Requirements

Per the Statement of Work, four areas were identified around project level requirements. These areas included Project Management, Stakeholder and Change Management, and Quality and Risk Management. While these areas are typical across any large scale IT project, they are particularly important when embarking on a statewide ERP implementation (as the scope and scale are larger compared to other IT initiatives). Project Management occurs at the highest level and provides oversight throughout the implementation. Stakeholder & Change Management is used to manage and communicate changes that will impact identified stakeholders. Quality Management is an essential process that validates that all requirements are being met to full specifications. Risk Management is used to identify risk and mitigate potential risk factors.

Baseline Project, Stakeholder & Change, Quality, and Risk Management requirements were established as a result of input from SMA (Subject Matter Advisors) guidance, Deloitte Methodology, and past project experience from other ERP projects including Michigan, Illinois, and West Virginia. The requirements were presented to the state team for further validation.

A qualified integrator should have specific methodologies, tools, and processes for each of the areas listed below and should provide additional detail as part of an RFP process.

6.1   Project Management Requirements

Project Management is used to provide oversight throughout the implementation process. Specifically, project management confirms that all stakeholders are actively performing their duties through key activities such as maintenance of the project plan, governance protocols, status reporting, and scope management.

- **Project Plan Management:** The statewide ERP implementation must have a well-constructed project plan established. The project plan component can be used to validate that all the requirements from the RFP are broken down into clear and actionable work streams and that the processes and procedures for execution are agreed to and documented. The implementation partner is expected to provide guidance on necessary skills and staffing requirements.
- **PMO:** The statewide ERP implementation must include a project management office (PMO). The PMO is expected to staff adequately to support a project of this size and complexity. In addition, the PMO is expected to provide the necessary tools, workflows, and processes to enable transparency and accountability during the implementation.
- **Status Reporting & Meetings:** The statewide ERP implementation must have a series of regular status meetings and comprehensive status reports. Timely scheduled meetings and status reporting sessions provide the medium to allow for all stakeholders to be informed on a continuing basis.
- **Governance and Executive Steering Committee:** The statewide ERP implementation must have a defined project governance structure that includes an actively engaged steering committee. Governance is a critical component that provides structure for the implementation and confirms that all initiatives are approved by the steering committee.
- **Issue Management and Resolution:** The statewide ERP implementation must have an accessible issue and resolution management system. The issue management and resolution system is expected to create protocol for early issue identification and resolution processes. The implementation partner is expected to provide necessary tools and processes related to issue management.
- **Scope and Change Control Processes:** The scope for the statewide ERP must be established early on. The scope and change control effort must standardize the change control process, provide policies, and monitor change impacts for the implementation.

6.2   Stakeholder & Change Management Requirements:

A successful transformation effort relies only in part on the quality of the technology solution. Users must understand and fully adopt the technology to maximize the intended benefits of the ERP solution and the

solution needs to meet stakeholder and end users business needs and expectations. Complete adoption relies on developing and executing a plan to effectively address and manage the impact of the solution on all stakeholders. It is about developing a clear vision of the end results, acknowledging the fear and anxiety that this scope of change places on the users, and creating a strategy—beginning day one—that allows all users to become familiar and comfortable with the new solution and anticipating its benefits.

Change and stakeholder management creates ownership and commitment for the implementation through engagement, communication, and training. Moreover, creating standard change and stakeholder processes early on in the implementation can help avoid implementation delays by avoiding custom solutions to standard problems.

- Change Management Plan – The statewide ERP implementation must include a change management plan that identifies not only how change will be managed for the project, but the specific areas of responsibility around the execution of that plan as well. This plan would include additional details around each of the areas below (stakeholder analysis, leadership alignment, organization impact assessment, training, and end user readiness assessment, and stakeholder communication plan).
- **Stakeholder Analysis**: The statewide ERP implementation must include a stakeholder analysis to identify the internal and external stakeholders and their current needs, perspective, and level of commitment. The stakeholder analysis can be used to provide strategic change management focus areas within the organization. This analysis is key to understanding who will be impacted by the ERP implementation.
- **Leadership Alignment:** The statewide ERP implementation must establish leadership alignment through leadership working sessions, coaching, and engagement monitoring. Leadership alignment activities are designed to create guiding principles and action plans to address potential risk areas. Following leadership interviews, the implementation partner must develop actionable engagement plans for priority leaders.
- **Organizational Impact Assessment:** The statewide ERP implementation must include an organizational impact assessment to identify change impacts resulting from process, policy, technology, performance management, and agency structure changes. The assessment must highlight major change impacts, gain consensus on change impacts, and identify key benefits and risks. In addition, the implementation partner should be tasked with role mapping, gap analysis for key roles, and training. Output from this assessment can provide requirement input for focus in training and communications.
- **Training:** The statewide ERP implementation must include trainings for new processes and systems. The implementation partner must work with both functional and technical teams to create materials for training around software and tools.
- **End User Readiness Assessment:** The statewide ERP implementation must include end user readiness assessments. The implementation partner is expected to conduct these assessments for each phase and produce a deliverable that documents the findings.
- **Stakeholder Communication Plan:** The statewide ERP implementation must include a stakeholder communication plan. The communication plan is intended to be the blueprint for how internal and external stakeholder should be educated on the project vision, objectives, and achievements.

6.3   Quality Management Requirements

Quality management can allow the state to confirm that all specific functionality and requirements needs are being met through the life of the project – this includes security and support for business process execution. Moreover, Quality management verifies that all requirements related to both regulation and security are actively addressed.

- **Quality Plan:** The statewide ERP implementation must include a quality plan that confirms that all requirements for the implementation are not only met but also communicated clearly throughout the organization. This plan should include alignment of the controls and techniques to specific activities to anticipate needs and identify potential errors or deviations from the quality

processes. In addition, any regulatory, security, functional, and technical requirement changes need to be addressed and communicated early on.

- **Testing:** The statewide ERP implementation must include protocol and processes for testing. Specifically, changes are expected at a minimum to go through both unit and integration testing prior to deployment in the production environment. Testing phases must include: Unit, System, Integration, UAT, Regression, Security, Capacity, Performance, and Failover (as required). Furthermore, the statewide ERP implementation must include tools that can be used to monitor defects, issues, and changes through the lifecycle of the project.
- **Requirements Traceability Matrix:** The statewide ERP implementation must include a centrally accessible requirements traceability matrix (RTM) – the matrix can be used as part of the process of managing requirements. The RTM must capture data to record information about the system/project requirements throughout the project life cycle to confirm that each approved requirement is identified, designed into the solution, verified as met/tested, and available in implementation.
- **Quality Assurance Program:** The statewide ERP implementation must include a specific quality assurance process. The quality assurance process can be used to further proof changes prior to deployment into production. In addition, data quality must consistently be reviewed for accuracy for reporting purposes.
- **Automated Testing:** The statewide ERP implementation should include automated testing processes. An automated testing system can standardize testing procedures and facilitate the test execution and regression testing process for appropriate business processes. The implementation partner should make use of state tools currently in place.

6.4   Risk Management Requirements

Risk Management should provide the state with a framework to anticipate, avoid, and minimize potential problems. Furthermore, consistent and active monitoring of risk can help the state stay aware of critical risk and issues while mitigating those issues without project delays.

- **Risk Management Plan:** The statewide ERP implementation must include a risk management plan. The risk management plan can serve as the framework for risk mitigation and set procedures in place to identify risk components early on the life cycle of the project. The Risk Management Plan would also include the initial assessment of risks and creation of the baseline risk log.
- **Risk Log:** The statewide ERP implementation is expected to include a risk log. The risk log can be used for identification, analysis, and response planning of project related risks. In addition, a calculated risk indicator process must be established to categorize risk based on likelihood and impact.
- **Mitigation Strategies:** The statewide ERP implementation should include strategic mitigation strategies. These strategies need to be developed to provide timely resolution of known risk/issues and escalation protocol for risks with high criticality.
- **Risk Monitoring:** The statewide ERP implementation should include a risk monitoring platform that can be used to monitor and communicate risk based on the risk management plan.

7   Timeline

The timeline was created based on leading practices and Subject Matter Advisors input combined with feedback from the executive interviews, workshops, and direction from the ERP Provision Oversight Committee. The timeline below represents the output from those sessions and is the basis of the estimating process.

The proposed timeline incorporates key insights to provide a North Carolina specific implementation approach that aligns to specific needs. The timeline is segmented into five key focus areas based on the decisions and assumptions that were defined above. Each focus area is comprised of several phases, which are designed to deliver specific functionality and set the foundation for the end state processes.

- Pre-ERP Focus Area– Includes activities that cut across all ERP functions and are designated separately to include preparation activities.
- Implementation Support Focus Area – Includes activities for overall implementation support and realization of the end state vision.
- Core Finance Focus Area – Core Financials includes functions and capabilities that are part of standing up the core financials of an ERP and set the foundation for future functions.
- Enhanced Functionality Focus Area – Includes capabilities and functions that extend the capabilities of the core financials and enable additional coverage for the state. This includes areas such as Fleet, extended Grantor, and potentially budget execution and preparation (subject to further analysis and dependent upon SAP enhanced budget capabilities).
- Human Resources Focus Area – Human Resources include enhancement of the existing HR solution as well as upgrades to take advantage of a centralized ERP platform and solution.

7.1　High Level Timeline Overview
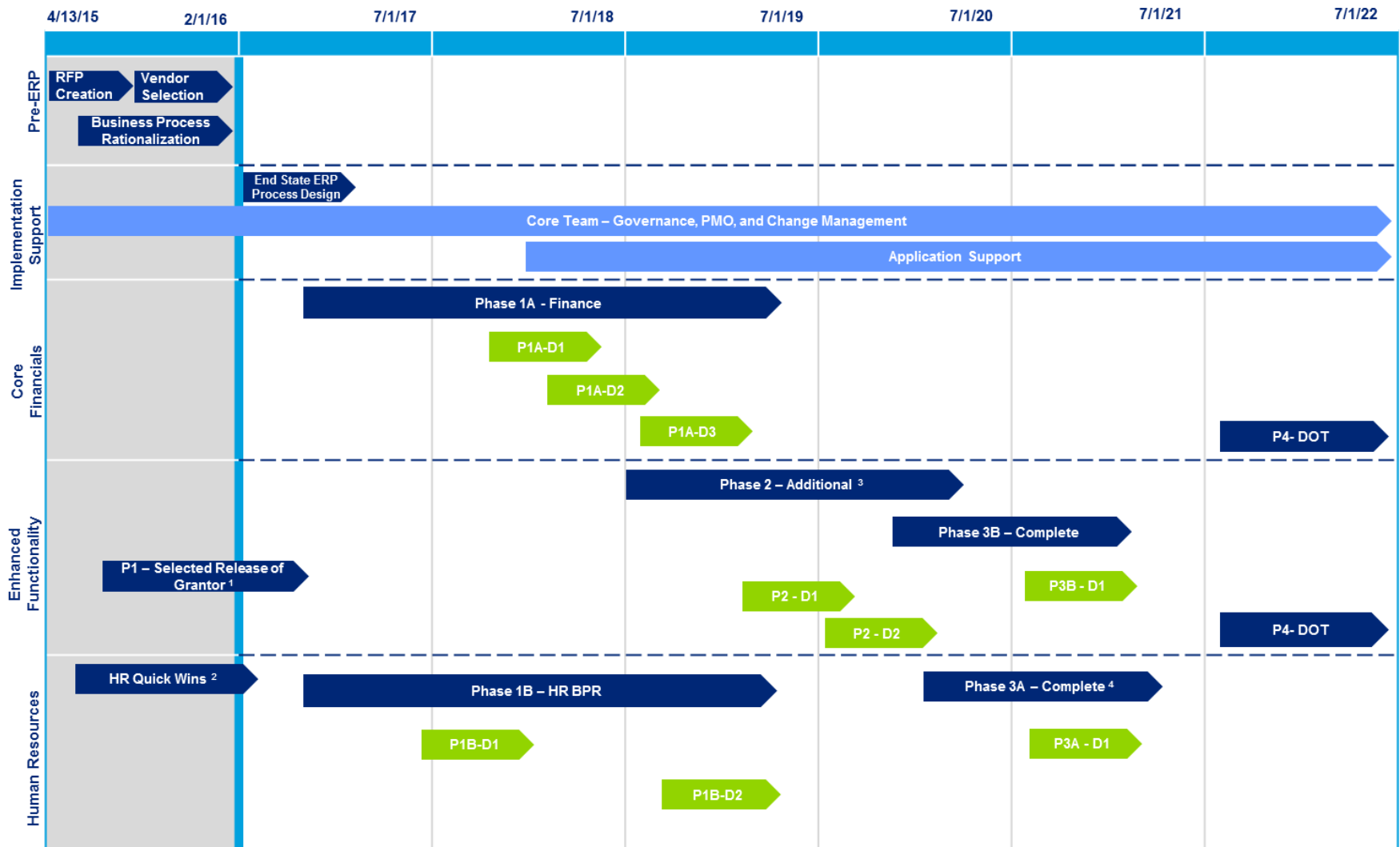
[1]Assuming the state will leverage existing DOT Grantor solution　[2]Based on current Beacon Planned Updates and NC Gear identified items,
[3]Assuming availability of state staff to support overlapping activities　[4]Implies SAP HR, but could be adjusted to account for non-SAP HR solution
depending on state direction

7.2 Pre-ERP Focus Area

The Pre-ERP Focus area is primarily comprised of 3 key activities. Pre-ERP activities includes: RFP Creation, Vendor Selection, and Business Process Rationalization. The activities listed below are necessary to move from the decision to implement an ERP to the actual start of an implementation project.

RFP Creation: During the Pre-ERP period, the RFPs/RFIs for selecting the ERP Software Solution[4] and Integration Partner must be developed. The RFP creation defines scope and key approach items for the ERP implementation. Furthermore, the development of the RFP should be an iterative process that allows for additional agency input and creates stakeholder investment in the future state.

Vendor Evaluation and Selection: Once the RFP is created, the vendor evaluation and selection process takes place. The vendor selection may include a single effort or be divided to include separate software and implementation partner evaluations and selections. Identifying an implementation partner early on supports clear future state identification and provides the necessary resources to holistically support the ERP effort. Furthermore, COTS software and implementation partners are necessary to move forward to the End State ERP Process Design.

Business Process Rationalization: During the Pre-ERP period and ahead of RFP, the state should initiate an effort to begin rationalization of key business processes (examples provided below). These are activities that can be initiated and completed ahead of the selection of an ERP solution or an integrator. From experience, conducting these activities ahead of a project start reduces the overall burden on the state team during the implementation, allows for a better understanding of core state processes and direction, and reduces the overall risk for areas such as data quality.
Potential areas for consideration during the Business Process Rationalization activities include:
- Master Data Governance and Standardization – Includes vendors, inventory and asset designations, grantees, work schedules, and chart of accounts (including DOT).
- Workflow Standardization – Includes approvals for expenditures, time and expense, and inventory usage.
- Process – Includes grants, fleet maintenance, and asset and inventory recording.

7.3 Implementation Support Focus Area

The Implementation Support Focus area is comprised of: Core Team, End State Process Design, and Application Support. These activities support the overall execution of the end state vision.

Core Team – Governance, PMO, and Change Management: Establishing the Core Team is a critical factor for the ERP implementation and its design and approach should be established during the Implementation Support focus area. The Core Team should provide leadership and visibility early in the ERP process limiting potential issues and providing processes for risk mitigation. In addition, the Core Team establishes expectations and sets up governance that can empower teams to succeed.

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[4] While the budget estimates assume that SAP is the selected software based on the agreed statement of work and scope, the State has indicated that it wants the flexibility to consider other software vendors provided they can work within the proposed budget and timeline estimates.

End State ERP Process Design: The design effort for the end state including all relevant functions and agencies should take place as one of the first activities during the ERP Implementation period. The End State ERP Process Design sets the foundation of an ERP and enforces an overall vision for the project. Developing a consistent End State vision reduces downstream design risk.

Application Support: The application support effort should take place following the completion of the initial deployment (represented as Phase 1A – Deployment 1 in section 7.7). Application support will then be an ongoing effort throughout the remaining project lifecycle.

7.4   Core Financials Focus Area

The core financials focus area highlights the need to establish the foundation of the ERP solution by delivering the functions that are necessary to support financial standardization, reporting, and centralization of financial functions. The core components are Finance, Procurement (exclusive of eProcurement which can be evaluated at a later time), Assets (Current Functionality excluding fleet), Budget Control, Inventory (Current Functionality), and Grant Accounting (often referred to as Grantee). This phase should include any necessary interim integration to existing system and capabilities to support the core finance functions.

7.5   Enhanced Functionality Focus Area

The enhanced functionality focus area includes the following components: Selected Grantor Functionality, Assets (New Functionality), Inventory (New Functionality), Fleet & Plant Management, Budget Development, and Budget Execution and Preparation. This phase builds on the foundation provided by the core financial focus area and provides critical business capabilities to the state while not unduly taxing limited resources or increasing the overall risk of the initial phase.

7.6   Human Resources Focus Area

The human resources focus area includes the following components: Human Resources Quick Wins, NeoGov Integration, Work Schedule, Organization/Permissions, and an update of the SAP HR implementation to optimize the impact of the statewide ERP and potentially move the solution on to a common architectural platform. Moving to a single platform reduces the long term cost of ownership, reduces ongoing complexity, and provides tighter integration between the HR and Financial functions.

7.7   Phases

Specifically, the focus areas: Core Financials, Enhanced Functionality, and Human resources are broken down into phases. Phases are time based and illustrate the start of implementation activities and the eventual go live. Phases are further broken down to include deployments that occur within the phase timeline.

7.7.1   Phase 1

Phase 1 is estimated at approximately 2.5 years in duration. Phase 1 contains activities from 3 focus areas: Core Finance, Enhanced Functionality, and Human Resources.
Focus Area: Core Financials

Phase 1A – Core Finance: Phase 1A sets the foundation for the statewide ERP by delivering the core financial capabilities. This includes finance, procurement (exclusive of eProcurement), Grantee, existing Assets and Inventory, Budget Control, and related reporting capabilities. These functions feed the core financial capabilities of an ERP and are integral to enabling the finance business processes. Each of the functions identified above have a direct impact to financial

execution and monitoring and must be in place to support the core financial capabilities of the solution. Based on previous experience and market analysis, it is critical that the finance capabilities be in place and stabilized before extending to other functions. This reduces the overall risk of the implementation and potential impact to staff from a change management and training perspective.

Deployment 1.1 (P1A-D1): The first deployment was designed to deliver functionality to a small subset of the agencies to reduce risk and allow time for process stabilization. Based on lessons learned from other similar implementations, it is important the initial agencies represent a cross section of the agencies from a size and complexity standpoint. This diversity allows for a broad perspective when designing the business processes. To accomplish diversity in the initial implementation, one large and complex agency was identified as well as two moderate and one smaller agency. In order to provide consistency and allow time for end-user adoption of the solution, the agencies included in the initial deployment of core financials should be the same agencies in the initial deployment for enhanced functionality (including fleet and grants).

While there are options for which agencies are included within the first implementation, four candidates were selected for the basis of this assessment. The Office of State Controller was selected as this agency represents the core knowledge base for financials in the state. As such, it is imperative that OSC be included in the initial deployment and set the foundation for the future state of the ERP solution. The remaining agencies (DPS, DPI, and DOA) were selected based on both the diversity of their size and complexity and a defined business need for additional ERP related functionality. Most notably, including these agencies in the initial implementation group should allow them to receive the enhanced functionality around Fleet and Grantor Management ahead of other agencies.

Deployment 1.2 (P1A-D2): The second deployment can include half the remaining agencies that are set to transition off of NCAS. While the first deployment should allow for process stabilization and incorporation of "lessons learned", the second deployment can provide the core financials functions to additional agencies in the state.
The direction to split the remaining agencies between a second and third deployment is based on risk and the capacity for state and integrator personnel to effective manage and coordinate both the implementation tasks and the change impact to the agencies.

Deployment 1.3 (P1A-D3): The third deployment should include the final half of the remaining agencies that are set to transition off of NCAS. Staggering the finance rollout into three deployments should allow the state to continue applying additional "lessons learned" from the initial deployments and establish confidence and staff acceptance of the solution.

Focus Area: Enhanced Functionality

P1 – Grantor: Partial Grantor functionality is provide as part of an "early" implementation to address critical business needs ahead of core financials. This will include interim interfaces to the existing NCAS system and leverage the DOT Grantor instance. This approach can enable the deployment of Grantor capability to DPS and potentially other agencies with the business need, funding, and capacity without increasing the complexity of the core financial implementation.
An early implementation of DPS Grantor functionality on the DOT solution would be contingent on a decision to move forward with an SAP based ERP implementation. If the state were to migrate DPS Grantor to DOT and then select a non-SAP based solution, it would mean either re-implementing DPS on the new solution (which would require additional / duplicate implementation

costs and impact business end users) or maintaining a separate Grantor solution outside of the statewide ERP (which would negate the fundamental goal of a single statewide solution).

Focus Area: Human Resources

Phase 1B – HR BPR: This phase should leverage outcomes of the end state blueprint and should focus on business process re-engineering and functions that can put in place in parallel to the core financials implementation. This is expected to include integration with NeoGov, rationalization of work schedules, and changes to organization and permissions. Additional process improvements may be identified during the BRP effort as well and are accounted for in the budget estimates (included as part of the Implementation Plan Deliverable). This allows the state to realize additional business benefits several years ahead of the full update of the HR solution.

7.7.2 Phase 2

Phase 2 is estimated at approximately 1.5 to 2 years in duration. Phase 2 contains activities from 1 focus area: Enhanced Functionality.
Focus Area: Enhanced Functionality

Phase 2 – Additional: The functions included in Phase 2 are Assets (New Functionality), Inventory (New Functionality), Fleet & Plant Management, Full Grantor, and Budget Execution. This phase should further expand the functionality of the core financials and will have two deployments as the functionality included has less impact from an agency implementation perspective and not all functionality is relevant to all agencies.

Deployment 1 (P2 - D1): The first deployment was designed to deliver functionality to a small subset of the agencies in order to reduce risk and allow time for process stabilization. The agencies selected for inclusion in the first deployment are DPS, DOA, DPI, and OSC. These agencies represent a cross section of agency sizes, processes, business needs, and diversity. The agencies selected for the initial deployment of Phase 2 are consistent with agencies selected for initial deployment of Phase 1. This allows sufficient time for the Phase 1 deployment to stabilize and for business users to accept and adapt to the business processes before introducing additional change (in the way of new functionality).

Deployment 2 (P2 - D2): The second deployment should include the remaining agencies. While the first deployment allows for process stabilization and incorporation of "lessons learned", the second deployment provides the majority of functionality required by agencies in order to fully leverage the capabilities of an ERP.

7.7.3 Phase 3

Phase 3 is estimated at approximately 1.5 years in duration. Phase 3 contains activities from 2 focus areas: Enhanced Functionality and Human Resources.

Focus Area: Enhanced Functionality

Phase 3B – Complete: This includes eProcurement and Budget preparation. While additional analysis around the replacement of the eProcurement solution and newly deployed Budget Preparation solution may be necessary in light of future functionality offered by the SAP solution, these areas were included in the timeline and budget estimates for completeness. A detailed analysis should be completed after the BPR effort to confirm the cost / benefit of migrating both eProcurement and Budget to the ERP platform.

Focus Area: Human Resources

> **Phase 3A – Complete:** Phase 3A includes an update of the existing HR system to leverage the centralized ERP solution and provide further enhancements to the HR solution. In addition, this phase includes convergence of the HR and ERP architecture. Creating a single architecture platform lowers the long term cost of ownership and increases the level of integration between the HR and Finance solutions. This phase is expected to have a single release to all impacted agencies.

7.7.4   Phase 4

Phase 4 is estimated at approximately 1 year in duration. Phase 4 contains activities from 2 focus areas: Core Financials and Enhanced Functionality.

Focus Areas: Core Financials and Enhanced Functionality

> **Phase 4-DOT:** All DOT functions – including Core Financials, Business Capabilities – are planned for implementation after full deployment of all ERP functions to other agencies. As stated above, placing the ERP solution on a single instance can reduce the long term cost of ownership of the solution and increase the level of integration. However, as DOT currently operates a fully functioning SAP Finance solution, additional analysis will be required to determine the potential costs and benefits of consolidating DOT to the centralized ERP solution. The state may find that the proper level of integration can be achieved through integration without incurring the costs of shifting to a single platform. However, both the timeline and estimates assume a shift to a single platform for completeness.

8 Budget

8.1 Overview

The cost estimation process leveraged a combination of past project experience, proprietary Deloitte parametric estimating tools, and Subject Matter Advisor (SMA) guidance. Baseline scope was first established from the detailed study of the necessary implementation components required for the NC ERP implementation. The implementation components were then aligned to the overall timeline from a budget and spend perspective. Along with the timeline, we used our internal Project Estimator and Planning Suite (PE&PS) tool to isolate and forecast key cost factors against required project activities. After completing the estimation process, SMAs were again leveraged to confirm output and estimates against industry and market experience.

Based on the project scope, required functions, and timeline provided above the following annual estimates have been provided for budget purposes. The project costs represented below are based on fiscal year end and expressed in $000s.

Description	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun -23	Totals
Implementation Team	$4,696	$21,297	$34,186	$23,832	$22,739	$33,459	$21,510	$ -	**$161,719**
Hardware	$ -	$537	$1,241	$2,534	$34	$135	$95	$ -	**$4,576**
Software	$11,557	$2,265	$2,265	$2,265	$2,265	$2,265	$2,265	$1,321	**$26,468**
IV&V	$1,042	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500	$1,459	**$17,501**
Facility	$115	$283	$292	$300	$309	$292	$356	$197	**$2,144**
Network	$230	$321	$ -	$ -	$ -	$ -	$ -	**$ -**	**$551**
PC	$157	$ 219	$ -	$ -	$ -	$ -	$ -	**$ -**	**$376**
Security	$292	$700	$700	$700	$700	$700	$700	$409	**$4,901**
O&M	$ -	$49	$5,342	$9,041	$11,013	$11,711	$12,968	$7,826	**$57,950**
Contingency	$1,628	$2,536	$4,188	$3,706	$3,561	$4,596	$3,636	$1,009	**$24,860**
Total	$19,717	$30,707	$50,714	$44,878	$43,121	$55,658	$44,030	$12,221	**$301,046**

The cost to the state could be reduced further based on the availability of federal matching funds for the implementation and ongoing support.

8.2 Implementation Team

The costs associated with the implementation team are represented below. Note that the implementation team includes both integrator services (personnel) and state project team members. The implementation team costs represented below are based on fiscal year end and expressed in $000s.

Description	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun -23	Totals
Implementation Team	$4,696	$21,297	$34,186	$23,832	$22,739	$33,459	$21,510	$ -	$161,719

The Implementation Team and related cost estimates above are comprised of both system integrator and state staff. These costs are separated below to show the specific costs for integrator and state staff and are shown in 000s.

Description	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun -23	Totals
Integrator	$3,196	$15,877	$26,634	$18,546	$17,278	$26,544	$16,751	$ -	$124,826
State Staff	$1,500	$5,420	$7,552	$5,286	$5,461	$6,915	$4,759	$ -	$36,893

The implementation cost estimate components consists of development objects, resources, and task deliverables representative of the work product of an implementation of this size and complexity. The overall implementation resource alignment can be broken down in to the following disciples:

- **Project Management** - provides the approaches and assets for effective project planning and management. It aligns with the Project Management Institute's Project Management Body of Knowledge (PMBOK) and embeds best practices and standards
- **Quality Management** - includes tasks to plan and monitor for quality, verify and validate deliverables, and assess project processes and assets against organizational standards
- **Process and Application** - addresses requirements management, business event analysis, business process design, process controls, and package configuration
- **Information Management** - addresses the value, usefulness, accessibility, and security of an organization's data and information assets. It includes tasks related to data and information requirements, standards, management, and security and controls
- **Development** - addresses the tasks for designing, developing, and testing the custom components of the software applications
- **Deployment** - addresses the transition to the new applications. It includes planning tasks related to business deployment, readiness testing, system deployment, and support preparation and stabilization
- **Technology** - defines the approach to design, develop, test, and operate the infrastructure and software components required for the system applications
- **Organizational Change Management** - addresses adoption and sustainability of the change initiatives. It encompasses an integrated approach to communications, stakeholder engagement and preparation, training, and organizational alignment and transition

These components combine to provide an estimated level of effort from which an estimated budget were derived.

8.2.1 Development Objects

Development Objects are the custom built items of a system often referred to as RICEFW in ERP projects. For definitional purposes, RICEFW refers to report, interface, conversion, enhancement, form, and workflow.

Report	Reports contain information organized in a narrative, graphic, or tabular form, prepared on ad hoc, periodic, recurring, regular, or as required basis and may refer to specific periods, events, occurrences, or subjects. Reports are divided in to BI (Business Intelligence) and non-BI depending on whether they are sourced from the data warehouse or the transactional system.
Interface	Application software connecting two applications together, and allowing for the transmission of data between the two systems.
Conversion	Data that is required to be moved from legacy sources to a new solution in a business ready state.
Enhancement	Additional/ modified functionality to SAP's standard business applications done through user exits, customer exits, BADI's and enhancement frameworks.
Form	Highly structured printed output created in SAP using tools such as Adobe Acrobat that is used as a turn-around document by the end-user.
Workflow	Electronic message (e-mail) that requires the recipient to acknowledge, authorize or process a specific task.

The following items were identified for inclusion in the cost estimates. The total are based on existing NC state document and assessments, counts and estimates from states of similar size and scope, and input from subject matter advisors with over 130 years of cumulative experience. In addition, the counts and related estimates below represent the strategy of adherence to the capabilities of the COTS product.

Development Object	Simple	Medium	Complex	Very Complex
Reports – BI	227	126	18	11
Reports Non-BI	5	14	0	7
Interfaces	0	162	5	4
Conversions	25	39	32	42
Enhancements	3	8	6	55
Forms	8	5	1	0
Workflows	8	15	8	9

8.2.2 Resources

Experience has shown that people are what make the difference between implementation success and failure. A complex implementation such as this requires a true team approach. It is critical to understand what resources will be needed, how they will be needed, and when they will be needed in order effectively manage to success. The following table outlines some of the key project roles required during the implementation of a statewide ERP and describes their involvement in the project. Note that this is a representative list of roles and is included to provide context to the types of resources and skill sets that are typically required throughout the project lifecycle. As project roles are typically aligned to an integrators implementation methodology, the specific role titles and areas of responsibility may fluctuate between integrators.

Role	Description
Project Manager	The Project Manager has overall responsibility for the successful completion and delivery of the project by overseeing project teams, work streams, quality management, financial management, and the methods, standards and guidelines for the project. The Project Manager is a liaison between the system integrator and the State of NC. In addition, there may be "peer" project manager or managers assigned from the State to share project manager duties. The Project Manager can delegate or assign responsibilities; however, the project manager must clearly define the project responsibilities and level of authority for each role.
Integration Manager	The Integration Manager has overall responsibility for the successful integration of business and technical designs and coordinates all testing activities. The Integration Manager works with the Project Manager to establish overall quality, design management, testing, and cutover approaches for the project. The integration manager role is typically filled by a senior resource with deep business process transformation experience.
Team Lead	The Team Lead is responsible for a subset of the overall project team and is accountable for managing staff and producing high-quality work products. The Team Lead helps the Project Manager plan, monitor, and control the project work, and is responsible for many aspects of his or her respective project team. Additionally, there is typically a State Team Lead and a consulting Team Lead.
Information Management (IM) Team Lead	The role of the IM team lead is to leverage the expertise of the specialists and developers on the team to assure that quality deliverables are produced within a planned time frame and cost. The IM Team Lead is an experienced resource with significant exposure to previous information management projects that enables the individual to apply best practices and knowledge to the State's needs.
Organizational Change Management (OCM) Team Lead	The OCM team lead is responsible for leading the organizational change management focused project activities and for integrating organizational change management tasks with other project work plan tasks.
User Experience (UX)Team Lead	The UX team lead is responsible for leading the development of the user interface work stream and adhering to design standards and consistency and maintaining vision/creative direction of the project. The UX team lead is highly knowledgeable about all aspects of user experiences and how they integrate with the technical aspects of the software application modules to be implemented.
Application Development Team Lead	The Application Development lead is responsible for leading the development (F) RICEW work stream on a project. The Application Development lead is highly knowledgeable about the technical aspects of the software and typically has a State counterpart assigned to share responsibility.
Data Quality Lead	The Data Quality lead has significant experience establishing, improving, and monitoring data quality processes and programs.
Process Team Lead	Process team leads are responsible for major functional process areas such as finance, order to cash, manufacturing, procurement, scheduling, HR and payroll, and are highly knowledgeable about the specific software product functions to be implemented and their related business processes. Typically, there are State counterparts, which are experts in the State of NC's business functions.
Technical Infrastructure Team Lead	The Technical Infrastructure team lead is responsible for defining and managing the technical scope of the project. This includes collaboration with the Project Management Office regarding technical objectives and tools. This role should be undertaken jointly by a consulting and a State resource, unless the State is already familiar with the application software.
Configuration Manager	The Configuration Manager is responsible for planning, implementing, and maintaining the project's overall Configuration Management (CM) infrastructure and environment.
Implementation Lead	The Implementation Lead is responsible for planning and managing the deployment phase of a project for the purposes of implementing a completed application or COTS product.
Quality Manager	The Quality Manager is responsible for planning, establishing, and facilitating the project's overall approach for managing project quality.
Test Manager	The Test Manager is responsible for planning, managing, directing, and coordinating the test phase of the project.
Security and Controls Team Lead	The Security and Controls Team Lead is responsible for defining and managing the security and controls teams scope of the project including the Project Management Office regarding security and controls objectives and tools.
Training Lead	The Training Lead brings specific knowledge and expertise in the areas of learning program design, development, and delivery. The Training Lead is typically complemented by a State resource.

The actual breakdown of state and integrator hours by fiscal year is shown in the chart below. While an average FTE has been included, the project team size will fluctuate over time depending on the current activities and parallel work streams.

Total Project								
Total Project Hours by State & Integrator								
FY Ending	**Jun-16**	**Jun-17**	**Jun-18**	**Jun-19**	**Jun-20**	**Jun-21**	**Jun-22**	**Totals**
Year	1	2	3	4	5	6	7	
State Hours	15,400	54,019	73,083	49,657	49,810	61,235	40,917	344,121
Integrator Hours	18,260	88,080	143,455	96,982	87,720	130,840	80,160	645,498
State FTEs	8	28	38	26	26	32	21	
Integrator FTEs	10	46	75	51	46	68	42	

8.2.3   Assumptions

Implementation Costs Assumptions:

- State and contractor split – 60% state employees and 40% contractor

- Hourly Rates – State employee $49, Contractor $170, and Integrator $175 (fully loaded including expenses)

- Annual Cost of Living (COL) adjustment – 3%

8.2.4   Task Deliverables

According to the Project Management Body of Knowledge (PMBOK), a deliverable is any unique and verifiable product, result or capability to perform a service that is required to be produced to complete a process, phase, or project. Deliverables are typically tangible components completed to meet the project objectives. (Project Management Institute, 2013)

Provided below is a representative, not all-inclusive, list of 280 task deliverables that should be beneficial for an ERP implementation project organized by discipline (high level grouping of related tasks). This list illustrates the breadth of services included within the overall estimates and represents the type of effort that may be included within an ERP implementation. Note that the actual deliverables and documentation are typically tightly coupled with an integrators methodology. As such, there can be fluctuation in deliverables and content across different integrators.

Descriptions of each task deliverable are included in Appendix A – Task Deliverable Descriptions. While deliverables may be consolidated by the integrator, it is important that the implied scope is delivered for a successful ERP implementation.

Project Management (PM)

- Action Items Log
- Budget and Cost Tracking
- Change Requests Log
- Decisions Log
- Deliverable Acceptance Form
- Deliverables Log
- Issues Log
- Kick-off Deck
- Master Plan
- Phase-end Review Report
- Project Charter
- Project Closure Report
- Project Management Plan
- Project Staff Support Materials
- Project Status Report
- Project Team Training Log
- Project Tools
- Project Tools Strategy
- Resource Plan
- Risks Log
- Supplier Agreement
- Work Plan

Quality Management (QM)

- Baseline Form
- Confidential Information Management Plan
- Configuration Management Assessment Checklist
- Configuration Management Plan
- Non-Compliance Tracking Log
- Quality Management Plan
- Specialist Support Report
- Tailoring Log

Process and Application (PP)

- Baseline Configuration
- Batch Job Schedule
- Batch Jobs Definition
- Business Continuity Process
- Business Events and Event Conditions
- Business Process Controls Framework
- Business Process Controls Verification Tracker
- Business Process Procedures
- Business Role Definition
- Configuration Control Values
- Configuration Design
- Configuration Plan
- Configuration Unit Test Approach
- Configuration Unit Test Cases
- Configuration Unit Test Data
- Configuration Unit Test Plan
- Configuration Unit Test Results
- Enterprise Structure
- Final Configuration
- Package Functional Scope Statement
- Process Scope Statement
- Process Vision
- Prototype Approach
- Prototype Results
- Prototype Scenario
- Requirements Management Plan
- Requirements Trace Matrix
- Security, Privacy, and Controls Approach
- Security, Privacy, and Controls Governance Approach
- Security, Privacy, and Controls Risk Assessment
- Segregation of Duties and Sensitive Access Matrix
- Segregation of Duties Tracker
- String Test Approach
- String Test Cases
- String Test Data
- String Test Plan
- String Test Results
- To-Be Process Design
- To-Be Process Group Design
- To-Be Subprocess Design

Information Management (IM)

- Business Information Model
- Business Intelligence Approach
- Business Intelligence Data Architecture
- Business Intelligence Data Modeling Standards and Guiding Principles
- Business Intelligence Development Standards
- Business Intelligence Reports
- Conceptual Data Model
- Data Analysis Report
- Data Architecture Design
- Data Cleansing Approach
- Data Cleansing Plan
- Data Cleansing Rules
- Data Integration and Conversion Programs(Data StoreObject)
- Data Integration Approach
- Data Sourcing Approach
- Enterprise Data Scope
- Enterprise Master Data Solution
- Information Capabilities Assessment
- Information Governance Policies
- In-scope Privacy Requirement Sources
- Logical Data Model(SAP BW)
- Master Data Management Approach
- Master Data Object Scope
- Metadata Glossary
- Physical Data Model
- Privacy Business Process Gap Analysis
- Privacy Data Flow Maps
- Privacy Governance Gap Analysis
- Privacy Requirements and Control Activity Framework
- Privacy Roadmap
- Privacy System Gap Analysis
- Semantic Layer Technical Design
- Semantic Layer
- To-Be Master Data Design

Development (DV)

- As-Is Application Landscape
- Data Conversion Approach
- Functional Object Test Approach
- Functional Object Test Cases
- Functional Object Test Data
- Functional Object Test Environment
- Functional Object Test Plan
- Interface and Data Conversion Control Techniques
- Mock Conversion Results
- Portal Approach
- Portal Solution Design
- Portal Technical Setup
- Software Code
- Technical Specifications
- Technical Unit Test Approach
- Technical Unit Test Cases
- Technical Unit Test Data
- Technical Unit Test Environment
- Technical Unit Test Plan
- Technical Unit Test Results
- User Persona
- User Research
- Visual Design
- Wireframes

- Functional Object Test Results
- Functional Specifications
- Integration Exception and Error-Handling Mechanism
- Interface and Data Conversion Control Framework
- Interface and Data Conversion Control Strategy

- Software Development Architecture
- Software Development Scope
- Software Development Standards
- Software Development Strategy
- Technical Infrastructure Scope Statement
- Technical Procedures

- To-Be Application Landscape
- User Experience Approach
- User Experience Guidelines
- User Experience Use Cases
- User Interface Information Architecture

Deployment (DP)			

- Business Freeze Approach
- Cutover Plan
- Cutover Strategy
- Deployment Plan
- Deployment Strategy
- Dress Rehearsal Results
- Final Cutover Results
- Geographic Scope Statement
- Go-Live Contingency Approach
- Integration Test Approach
- Integration Test Cases
- Integration Test Data
- Integration Test Plan
- Integration Test Results

- Legacy System Decommissioning Strategy
- Organization Scope Statement
- Parallel Test Approach
- Parallel Test Cases
- Parallel Test Data
- Parallel Test Plan
- Parallel Test Results
- Post Implementation and Evaluation Report
- Regression Test Approach
- Regression Test Cases
- Regression Test Data
- Regression Test Plan
- Regression Test Results
- Release Go/No-Go Criteria

- Service Catalog
- Service Delivery Access Request Log
- Service Delivery Approach
- Service Delivery Framework Assessment
- Service Delivery Governance
- Service Delivery Incident Log
- Service Delivery Infrastructure and Tools
- Service Delivery Knowledge Transfer Application Understanding Document (AUD)
- Service Delivery Knowledge Transfer Plan
- Service Delivery Procedures
- Service Delivery Process Design
- Service Delivery Staffing Approach
- Service Delivery Transition Criteria
- Service Delivery Transition Exit Criteria

- Service Delivery Transition Plan
- Service Levels
- Site Readiness Checklist
- Software Build and Migration Plan
- System Outage and Restart Procedures
- System Stabilization Metrics
- Test Strategy
- Test Traceability Matrix
- User-Acceptance Test Approach
- User-Acceptance Test Cases
- User-Acceptance Test Data
- User-Acceptance Test Plan
- User-Acceptance Test Results

Technology (TE)			

- Built System
- Existing Security Environment Summary
- General Information Technology Control Framework
- General Information Technology Control Standard Operating Procedures
- Identity and Access Management Configuration Tracker
- Identity and Access Management Current Environment Assessment
- Identity and Access Management Operations Manual
- Identity and Access Management Roadmap Document
- Identity and Access Management Solution Configuration
- Identity and Access Management Solution Design Document
- Identity and Access Management Test Results
- Infrastructure Operation Report

- Logical Infrastructure Design
- Performance and Stress Test Approach
- Performance and Stress Test Cases
- Performance and Stress Test Data
- Performance and Stress Test Environment
- Performance and Stress Test Plan
- Performance and Stress Test Results
- Physical Infrastructure Design
- Physical Infrastructure Test Approach
- Physical Infrastructure Test Cases
- Physical Infrastructure Test Data
- Physical Infrastructure Test Environment

- Physical Infrastructure Test Plan
- Physical Infrastructure Test Results
- Production Security Configuration Checklist
- Production Support Security Role Design
- Production Support Security Roles
- Production User Accounts
- Project Team Application Security Role Design
- Project Team Application Security Roles
- Security Access Procedures
- Security Access Process
- Security Base Role Design
- Security Base Roles

- Security Job Role Design
- Security Job Roles
- Security Unit Test Approach
- Security Unit Test Cases
- Security Unit Test Data
- Security Unit Test Environment
- Security Unit Test Plan
- Security Unit Test Results

Organizational Change Management			

- Change Impact Assessment Approach
- Change Impact Assessment Report
- Change Readiness Approach
- Change Readiness Assessment Report
- Communications Approach
- Communications Materials
- Communications Plan
- Detailed Organization Design
- End-User Training Assessments - Executive Summary
- End-User Training Curriculum
- End-User Training Evaluation Report
- End-User Training Strategy

- Go-Live Transition Guides
- Go-Live Transition Workshop Materials
- High-Level Organization Design
- Instructor-Led Training Courseware
- Job Profiles
- Leadership Alignment Plan
- Organization Assessment Results
- Organization Operating Model
- Organization Transition Approach
- Organizational Change Management Strategy
- Project Team Capability Approach
- Project Team Capability Plan

- Project Team Capability Program Launch Materials
- Role-Mapping Approach
- Role-Mapping Results
- Stakeholder Assessment Report
- Stakeholder Engagement Plan
- Stakeholder Program Launch Materials
- Trainer Preparation Materials
- Training Developer Onboarding Materials
- Training Development Guidelines
- Training Development Plan
- Training Outlines
- Training Storyboards

- Train-the-Trainer Program Evaluation Report

8.3 Hardware Costs

The hardware costs represented below are based on fiscal year end and expressed in $000s.

Description	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun -23	Totals
Hardware	$ -	$537	$1,241	$2,534	$34	$135	$95	$ -	**$4,576**

The hardware costs are based on the on-premise deployment model for the physical infrastructure architecture which is derived from the solution architecture that describes the capabilities and applications needed for the statewide ERP system. The capabilities and applications were determined based on executive interviews, functional/technical workshops and industry leading practices.

In order to determine the correct sizing of the physical systems, the following assumptions are made:

8.3.1 Operating System

- Red Hat Enterprise Linux for SAP HANA based platform systems
- Red Hat Enterprise Linux for non-SAP HANA based platform systems

8.3.2 Database & Platform

- SAP HANA for ECC, CRM, BW (including standalone Enterprise Data Warehouse), and MDG
- IBM DB2 for the components that will not run in memory
- Sybase IQ for near-line storage (NLS)
- All platforms are virtualized with the exception of production SAP HANA appliances

For the SAP components that will not run in memory, SAP HANA Smart Data Access allows the connectivity to heterogeneous data sources. Special drivers in SAP HANA establish a connection to the external data store using ODBC as depicted in the figure below:
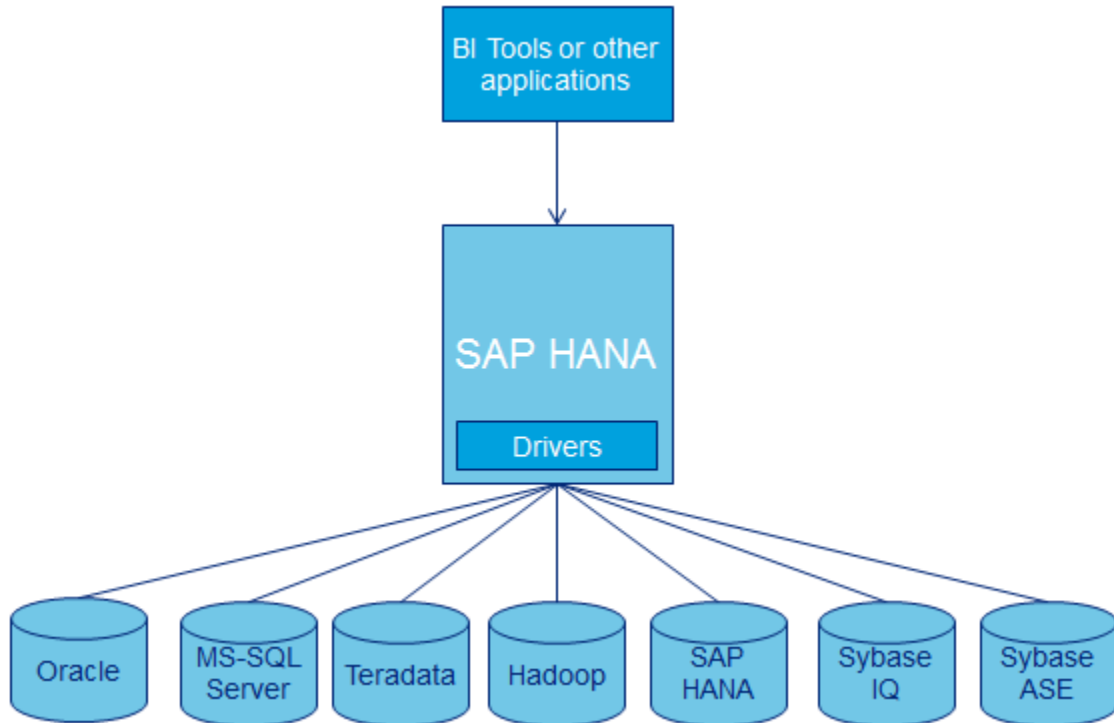
The agreed approach is to run the innovative focused applications on SAP HANA and those that do not require in memory computing or are not yet available on SAP HANA on IBM DB2 due to its familiarity within the State.

Using Sybase IQ for near-line storage provides a good balance between cost and performance as Sybase IQ can access data located in HANA, and vice versa, through this high-speed query federation technology built in to both Sybase IQ and HANA known as smart data access referenced above. These components will run on a NetWeaver platform.

8.3.3   Content Management

- OpenText Suite as certified content management system for SAP

8.3.4   Testing Suite

- SAP TAO for test automation
- SAP TDMS for test data extraction and masking of test data
- HP Quality Center for test management
- HP Performance Center for Performance Testing

8.3.5   SAP Components

The following SAP components form part of the solution:

In Memory	Not In Memory
SAP Business Suite (ECC)[1]	SAP Solution Manager and connector for HP QC[2]
FICO	SAP GRC[4]
MM	SAP Business Objects BI Suite[2]
HCM	SAP Data Services[2]
MDM	SAP Information Steward[3]
IS – Public Sector	Sybase IQ[3]
SAP Constituent Services for Public Sector	SAP Process Orchestration[3]
SAP Program Management for Public Sector	SAP Redwood Scheduler (CPS) [3]
SAP CRM[1]	SAP Fiori[2]
SAP Business Warehouse[2]	SAP Screen Personas[2]
SAP Enterprise HANA (Data Mart/Enterprise Data Warehouse)[3]	
SAP Master Data Management[1]	SAP Workforce Performance Builder[2]
SAP Master Data Governance[3]	
	SAP Enterprise Portal[2]
	SAP Public Budget Formulation (PBF) [3]
	SAP System Landscape Transformation (SLT)[3]
	Open Text Content Management[2]
	SAP TAO[2]
	SAP TDMS[2]
	SAP Solution Manager[2]
	SAPRouter/Web Dispatcher[2]
	SAP Identity Management[3]
	SAP Single Sign-On[3]
	SAP Application Interface Framwork[3]
	HP Quality Center (QC) [3]
	HP Performance Center[3]

[1] Software license already owned by State running on Oracle/DB2 database. Additional investment needed to convert all existing license to SAP HANA platform as outlined in section 8.4 Software Costs.

[2] Software license already owned by State.

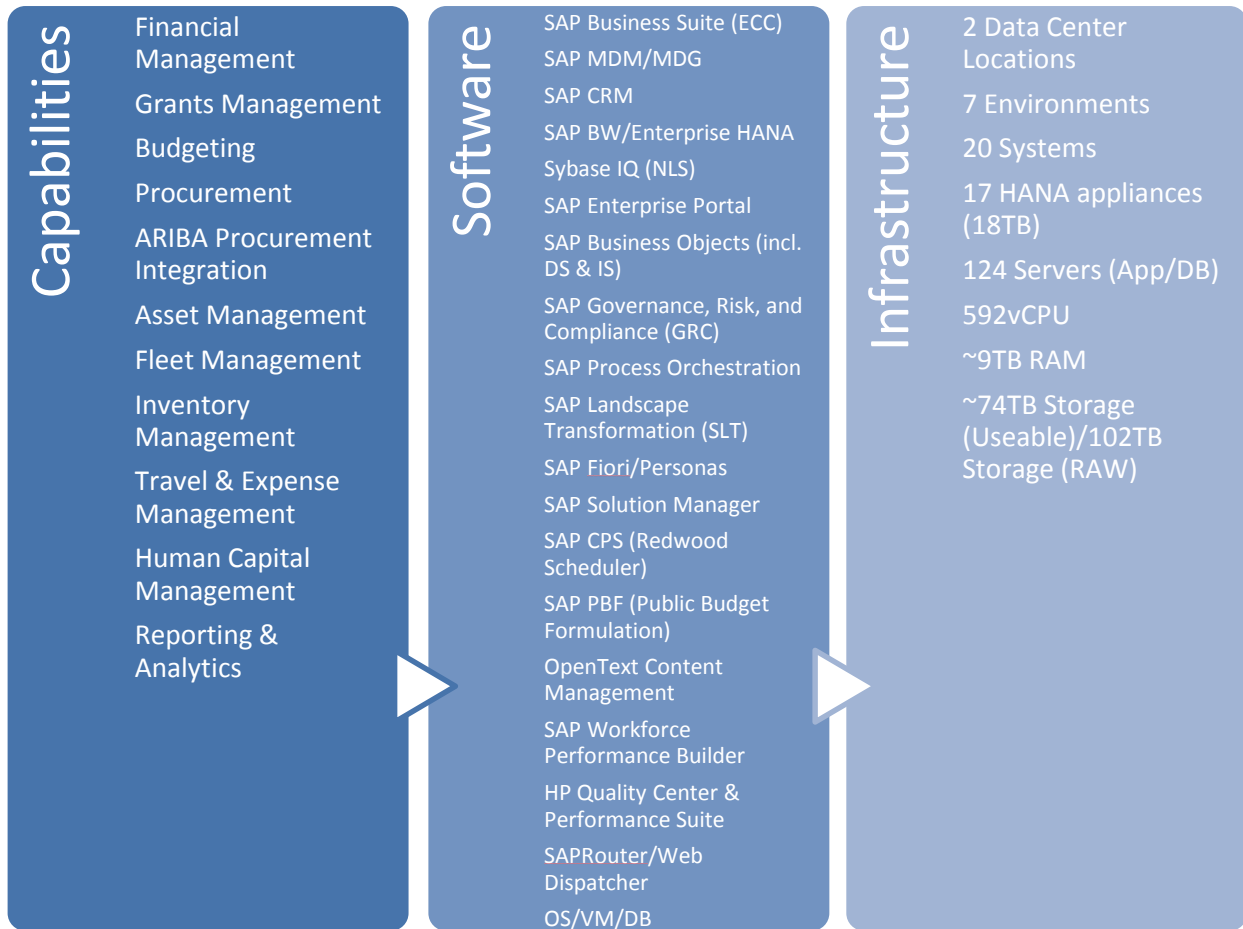[3] Additional investment in software licenses needed as outlined in section 8.4 Software Costs.

[4] Software license already owned by State for SAP GRC Access Control component. Additional software licenses for SAP GRC Process Control and Risk Management needed as outlined in section 8.4 Software Costs.

8.3.6 Physical Architecture Design

The physical architecture includes the following design considerations:

- **Hosting (Primary Data Center)**: Houses the production environments and all its systems and appliances
- **Hosting (Secondary Data Center)**: Houses the non-production environments such as Sandbox, Development, Quality Assurance, Training, and the production support environments (Development and Quality Assurance). The Quality Assurance environment is a mirror of the production environment in regards to compute and storage and is used as a production environment in case of a disaster.
- **In Memory**: Use of SAP HANA in-memory platform for SAP applications identified as business critical.
- **High Availability**: Combining software with industry standard hardware to minimize downtime.
- **Fault Tolerant:** The ability to detect a hardware fault and immediately switch to a redundant hardware component.
- **Scalable:** The ability to cater for growth.
- **No Single Point of Failure:** Redundancy is included for each component of the physical infrastructure. As such, there is no single point of failure within the suggested architecture.

The following figure provides a summary of the physical infrastructure components in regards to compute and storage based on identified capability and software using prior and similar client setups.

Capabilities	Software	Infrastructure
Financial Management	SAP Business Suite (ECC)	2 Data Center Locations
Grants Management	SAP MDM/MDG	7 Environments
Budgeting	SAP CRM	20 Systems
Procurement	SAP BW/Enterprise HANA	17 HANA appliances (18TB)
ARIBA Procurement Integration	Sybase IQ (NLS)	124 Servers (App/DB)
Asset Management	SAP Enterprise Portal	592vCPU
Fleet Management	SAP Business Objects (incl. DS & IS)	~9TB RAM
Inventory Management	SAP Governance, Risk, and Compliance (GRC)	~74TB Storage (Useable)/102TB Storage (RAW)
Travel & Expense Management	SAP Process Orchestration	
Human Capital Management	SAP Landscape Transformation (SLT)	
Reporting & Analytics	SAP Fiori/Personas	
	SAP Solution Manager	
	SAP CPS (Redwood Scheduler)	
	SAP PBF (Public Budget Formulation)	
	OpenText Content Management	
	SAP Workforce Performance Builder	
	HP Quality Center & Performance Suite	
	SAPRouter/Web Dispatcher	
	OS/VM/DB	

The following table provides an overview of the installed environments that should be made available as part of the ERP system.

Environment	Definition
Sandbox/Demo/ User Playground (SBX)	Sandbox is a "playground" environment used for testing of software patches and proof of concepts. There is no direct path of promotion of software code or configuration from the sandbox. environment The sandbox environment is refreshed, customarily from the development environment, on an as needed basis
Development (DEV)	Development environment is used by the development teams to customize and extend the solution as per business requirements. For systems that are not part of the SBX environment it is also used for prototyping design. It is the source of all configuration and application development activity which is transported throughout the landscape.
Production Support Development (DEV2)	This environment is used by the development teams for bug fixing and production support activities starting with Phase 2. Changes to objects that originated in the development environment and have been transported to production are performed as repairs and transported to the Production QA environment for testing. Repairs on objects performed in this environment are also manually performed in the development environment to confirm systems of both environments are in sync before the next release cycle starts.
Testing/QA (QAS)	Testing/QA environment is used for various testing cycles of the configuration and development objects before promoting those objects to production. This environment is part of the transport route and receives configuration and development objects from the development environment.
Production QA (QAS2)	This environment is used to test repairs performed in the production support development environment before promoting those objects to production. Systems that are part of the production support development environment are also part of this environment. The Testing/QA environment and Production QA environment are synchronized using a system refresh before each release cycle. The Production QA environment should be identical to the production environment in in all regards including capacity.
Training (TRN)	The training environment is used to support the effort to train end users on the States SAP solution. All transports are loaded in a controlled fashion to confirm that training materials and training data do not become obsolete during execution of training. Training consists of a golden client, which contains both configuration and data that should be used as a starting point for each training course. Additional clients should be established for each concurrent training course, and refreshed from the golden client at the end of each course, to prepare for the next set of courses. This environment provides Training Sandbox clients to allow end users to become familiar with the business functions after a training course ended.
Production (PRD)	Production environment contains "live" business configurations, policies, workflows, and reports, where "live" production data is available. It is accessed by end users to execute business functions. This environment is part of the transport route and receives configuration and development objects from the Testing/QA and Production QA environment.

The following figure provides the physical deployment model of the infrastructure which is applicable regardless of on-premise or Virtual Private Cloud deployment.

The primary data center houses the production environment and the secondary data center houses all the non-productive environments. The non-production environments consist of Sandbox, Development, Quality Assurance, Training, and production support environments (Development and Quality Assurance).

- Each system is listed with the respective hardware components within each environment.
- Icons are used to illustrate hardware servers/appliances used by a system.
- Icons with a blue frame within one system indicate SAP HANA based appliances with more than one per system constituting a failover appliance.
- Icons with a blue frame across multiple systems indicate a virtualized SAP HANA based appliance shared utilized by multiple systems.
- Icons with a blue frame across multiple environments indicate a system that is shared by multiple environments.

SAP Solution Physical Deployment

8.3.7 On-premise

On-premise deployment of the statewide ERP system infrastructure has been included as the basis for estimation and determining a projected budget. Following is a list of benefit relevant to an on-premise deployment strategy for the statewide ERP infrastructure.

- The State will have sole control over their systems and data
- The IT department is responsible for the maintenance and support of the SAP systems (this will be a skills requirement)
- The State is responsible for providing Operating System and Virtualization licenses
- The infrastructure is deployed in State owned data centers
- The State is responsible for support of the actual hardware, network, and shared data center components including the support and maintenance of the system software (Operating System and Virtualization).
- Simpler integration with legacy and Third Party applications
- Higher level of confidence in business availability and security capabilities
- Investment in the infrastructure is a capital expense (capex)

8.3.7.1 Assumptions

The following lists the assumptions for the on-premise deployment option:

- Solution utilizes existing network bandwidth capabilities of 10Gbps dedicated network links for replication of data between the primary and secondary data center
- Includes 30 days of file system backup for all HANA devices & non-HANA servers.
- Two existing F5 load balancer instances in each data center
- HANA appliance server sizing is based on virtual servers
- Tier 1 or 2 storage should be used for all non-HANA servers
- File system backup for non-DB servers.
- File system and DB backup for DB servers.
- Full database backup should be performed three times per week
- Full file system backup frequency is once per week
- SAP restricts virtualization for production Suite on HANA and production BW on HANA to one virtualized node
- Production Servers have an SLA of 99.9%. All other environments have an SLA of 99.0%

The estimated hardware cost for the on-premise deployed physical infrastructure includes the compute & storage resources with a five year refresh cycle included and is based on a 5% CPU growth rate and 20% storage growth rate.

The computer hardware components are bare metal with HW vendor support included.

8.3.7.2 Virtual Private Cloud (VPC)

The State requested to investigate other deployment options that can reduce the overall cost of the statewide ERP infrastructure. Appendix B – On-Premise vs Virtual Private Cloud Deployment Approach provides details on the additional deployment option as well as a side by side cost comparison.

The comparison of On-Premise to Virtual Private Cloud is not based on one dimensional factor such as hardware but includes software, network, labor, and floor space in the cost comparison to enable comparison based on equal components and features.

The table below outlines the potential savings to the State over a seven year period by deploying the statewide ERP system in a Virtual Private Cloud provided by a major service provider.

Potential savings with Virtual Private Cloud	
Component	**Savings in (000s)**
Total savings	$3,707

Additional financial cost benefits may be realized by using various financial payment options available by major Virtual Private Cloud providers. This would be based on negotiations around actual compute and storage resource use (resource pooling) and efficient scaling options (cloud bursting). In addition, VPC providers may be able to provide technical architecture support resources at a more competitive rate.

8.4   Software Costs

The total Software Costs represented below are based on fiscal year end and expressed in $000s.

Description	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun -23	Totals
Software	$11,557	$2,265	$2,265	$2,265	$2,265	$2,265	$2,265	$1,321	**$26,468**

As part of this analysis, Deloitte reviewed the existing software licenses and available products that could be leveraged by the state as part of the statewide ERP implementation. While a vast majority of the products are currently owned by the state, there are specific software modules that would need to be procured under separate licensing agreement to support the implementation.

Additional licenses for the SAP based ERP system were identified using the following approach:
- Mapping of SAP based ERP system identified capabilities and scope (from executive interviews and workshops) to software providing these capabilities
- Reviewing of licenses and quantitites owned by the State (according to information provided by the State)
- Reviewing of licenses and quantities from recent Public Sector bids for similar sized scope
- Identifiying and listing any gaps resulting from analysis of licenses needed for identified capabilities, State owned licenses, and licenses and quantities from recent Public Sector bids.

The list of SAP software modules, description of their purpose, quantity and initial cost are listed below:

Per standard licensing arrangements between SAP and the State (indicated in SAP Purchase Order Form #1 from September 30th, 2013), a 22% annual maintenance fee is included in the cost estimates as a recurring cost. The initial cost reflects a discount rate of 88%, which the State indicated is applicable for new SAP product purchases.

The majority of software costs required for SAP under this analysis are related to the HANA solution. The HANA related licenses below allows the state to move from the current database licensing structure to HANA for both the ERP application and the data warehouse capability. Note that SAP currently does not extend pre-negotiated discounts to the HANA solution.

Component		Quantity	Initial Cost[1]	Service Fee[2]
SAP HANA, Limited Runtime edition for Application – Install Base – SAP Maintenance Base Value (SMBV)	SAP HANA, Runtime edition for SAP applications covered by the existing license agreement	1	2,869,394[3]	4,418,867
SAP HANA, Limited Runtime edition for Application – New/Subsequent – SAP Maintenance Base Value (SMBV)	SAP HANA, Runtime edition for SAP applications as part of new license agreement	1	599,890	923,830
SAP Public Budget Formulation	$10 billion is the maximum license quantity for this product. Budget in excess of this quantity is licensed at no extra charge. PBF is licensed based on the TOTAL budget being managed by the State in billions of dollars. The maximum number of units that SAP bases PBF licensing on is capped well below the State's current budget, so there would be no additional charges for PBF regardless of how much the State's total budget may increase over time. SAP Application Professional User licenses or SAP Application Business Expert licenses are required to use the PBF software. The only possible additional licensing would be for additional Users, if needed.		1,000,000	1,500,000
SAP Master Data Governance – number of suppliers	This component enables integration of the master data components between SAP and legacy solutions not being replaced. This specifically addresses Supplier Data and keeping it in sync. A Supplier Object is a vendor. Supplier data objects are active supplier objects (vendors) stored in the "Master Data Governance for Supplier" system. 135,000 Supplier Objects is the maximum license quantity for this product. Supplier Objects in excess of this quantity are licensed at no extra charge.	135,000	364,501	561,332
SAP HANA, Enterprise edition – increments of 64GB of memory	SAP HANA, Enterprise edition provides the database/platform license for standalone data mart and/or (enterprise) data warehouse integrating SAP and non-SAP data sources. License is provided for productive use; all other usage is free in increments of 65GB of memory provided by the HANA appliance.	20	3,000,000[3]	4,620,000
SAP NetWeaver Process Orchestration – number of cores	SAP NetWeaver Process Orchestration includes three tools of which SAP Process Integration (PI) should be the primary tool for the State. The other two are: SAP Business Process Management (BPM) and SAP Business Rules Management (BRM). PI is your main interface tool between SAP and non-SAP applications. The number of cores required is an estimate based on the number of	8	36,001	55,442

Component		Quantity	Initial Cost[1]	Service Fee[2]
	interfaces identified combined with the types of interface, such as SOA vs. a flat file. We then put the information in our sizing tool for an accurate estimate. This amount also provides some room for growth as well, as interface needs increased. The consequence of not having enough cores in production can be slower performance. Additional cores can be purchased with a minimum quantity of two cores.			
SAP Central Processing Scheduler by Redwood – number of process servers	The Redwood CPS Process Scheduler is a cockpit based tool used to schedule interfaces, batch processes and other technical activities. This tool is integrated to the SAP Solution Manager. Process Servers are defined as each server (real or virtual) where scheduled jobs are to be managed. A process server is required for every single connected application, server, or operating system (OS) instance (virtual or physical) with a unique identification on which processes are executed that need to be monitored, managed, and controlled. If performance requires additional process servers they can be purchased in quantities of one or more. The minimum number is one.	10	108,001	166,332
SAP IQ Enterprise Edition – number of cores	SAP Sybase IQ database software is used for extreme-scale data warehousing, advanced analytics, and business intelligence applications. It uses an innovative approach based on a column-oriented, grid-based massively parallel processing architecture. As a result, it can scale out to handle massive workloads for large numbers of users with performance up to 100 times faster than other systems. It should be utilized as a Near-Line Storage solution in combination with SAP HANA based system0073. Integration of Sybase IQ makes it possible to separate data that is accessed frequently from data that is accessed rarely, thus making less demands on the resources in the BW system. The near-line data is stored in compressed form and needs to be backed up less frequently.	1	8,641	13,307
SAP IQ Enterprise Edition, Multiplex Grid Option – number of servers		1	6,031	9,288
SAP IQ Enterprise Edition, Very Large Database Management Option - DB size in TB		10	38,251	58,907
SAP Application Interface Framework – licensed users (unit of 500)	The SAP Application Interface Framework enables the efficient development and monitoring of interfaces as well as execution of error handling in a single framework residing in the SAP backend system. SAP Application Interface Framework enables the State to: • Do functional instead of technical monitoring • Restrict interface data and error monitor access by flexible authorization rules • Enforce interface implementation guidelines	5	67,501	103,952

Component		Quantity	Initial Cost[1]	Service Fee[2]
SAP Landscape Transformation Replication Server – number of cores	SAP LT Replication Server (aka 'SLT') is a standard software to move data in real-time between different systems within the same network, wide area networks, or into the cloud to have the information at the right place at the right point of time. The software helps to feed analytical systems with up-to-date business information from the productive system landscape, support the acceleration of large volume transactions executed in SAP HANA, enables real-time reporting and minimizes transfer volume for SAP BW and enables the synchronization between different systems. SAP LT Replication Server is used to load and replicate data in scheduled or real-time mode from an ABAP or non-ABAP based source system into SAP HANA, SAP Data Services, SAP BW or any other ABAP based system.	2	18,001	27,722
SAP Information Steward – number of cores	SAP information steward software, provides a combination of data profiling and metadata management, with continuous insight into the quality of the States enterprise information – for enhanced operational, analytical, and governance initiatives.	8	90,001	138,602
SAP Process Control - number of users	SAP GRC Process Controls (PC) is a tool enabling the State to have a continuous view over their key compliance activities across all business processes to confirm a high level of compliance to internal controls. The tool serves as a central repository to the control framework. Within the PC tool it is also possible to alert control owners when controls need to be tested, store testing and sign-off evidence, create and delegate remediation plans, and keep an audit trail of changes to controls.	200	133,201	205,130
SAP Risk Management – number of users	SAP GRC Risk Management (RM) is a tool that brings risks and controls together by enhancing the integration with GRC Access Control and GRC Process Control into a single enterprise risk management platform. This platform provides summarized views representing the different organizational risks and related automated, manual, and security controls from a business process perspective.	150	72,901	112,268
SAP NetWeaver Identity Management – number of users (in blocks of 100)	SAP NetWeaver Identity Management has been added to be confident that an identity management solution is part of the ERP system in case the State has not decided on an approach that provides integration with an existing identity management solution for the ERP system. This application provides the following capabilities: • Unifies identity management in the SAP landscape • Supports the integration of non-SAP	60	37,801	58,214

Component		Quantity	Initial Cost[1]	Service Fee[2]
	systems into SAP-based identity management • Offers close integration of user identities from business processes with technical identities in different systems • Provides centralized management capabilities for a business process platform • Allows identity-related business processes to be executed smoothly • Reduces TCO through central management processes and a high degree of automation, bridging the gap between identity management on a business level and system level • Enables companies to leverage their existing SAP infrastructure (such as SAP ERP HCM) • Integrates with SAP Business Suite and SAP BusinessObjects Access Control (GRC) for end-to-end, compliant, role-based control			
SAP NetWeaver Single Sign-On - number of users	SAP NetWeaver Single Sign-On has been added to be confident that a single sign-on solution is part of the ERP system in case the State has not decided on an approach that provides integration with an existing solution for the ERP system. This application provides the following capabilities: • SAP NetWeaver Single Sign-On enables companies to eliminate the need for multiple passwords and user IDs. • Licensed per user that are individuals whose credentials and/or user information is managed by the functionality of the licensed Software.	6000	18,433	28,387
Total amount in U.S. dollars (rounded to 000s)			$8,469,000	$13,002,000

[1] All amounts specified above are in U.S. dollars

[1] Initial cost represents support base amount to calculate the annual service fee

[2] Service fee represents total service fee for seven (7) years

[3] SAP does not provide discount on SAP HANA

The list of non-SAP software modules, description of their purpose, quantity and initial cost are listed below:

The initial cost is a list price without any discount applied.

Component		Quantity	Initial Cost[1]	Service Fee[2]
Red Hat Enterprise Linux – 2 socket	Red Hat Enterprise Linux is the operating system for the SAP system based applications	53	855,420[3]	
VMWare Enterprise Edition	VMWare Enterprise Edition provides the virtualization platform capabilities for the SAP system components		1,015,000	1,785,000
HP Quality Center – number of users	HP Quality Center offers software quality assurance, including requirements management, test management and business process testing for IT and application environments. This number was determined in consultation with product experts and Deloitte staff. Additional bundles can be purchased in quantities of one or more.	50	200,000	373,333
SAP LoadRunner by HP, controller	Mandatory component with SAP LoadRunner by HP. Only one controller license is required per deployment.	1	21504	40,434
SAP LoadRunner by HP – virtual users	These are virtual users employed to mimic concurrent usage of the system for load testing purposes and is based on our understanding of the State's expectation of how many concurrent users they will experience during peak times. If additional virtual users are needed for load testing they can be purchased in blocks of either 250 or 1,000 virtual users.	2000	241,500	460,600
Total amount in U.S. dollars (rounded to 000s)			$2,334,000	$2,660,000

[1] All amounts specified above are in U.S. dollars

[2] Service fee represents total service fee for seven (7) years based on list price provided by software vendor

[3] Initial cost is for a seven (7) year subscription

8.4.1   Assumptions

Software Costs Assumptions:

- Initial Costs – Incurred within the first year.

- Service Fee – The service fees are spread over the life of the project.

- Timing – Software costs are assumed to be incurred at project start. However, based on the existing relationship with the software vendors it may be possible to delay portions of costs until later years.

- Discount – SAP software is assumed to be provided to the state at the previously negotiated 88% discount.

- Support – SAP support is calculated based off of 22% of total licensing cost and is assumed to remain constant over the term of the project.

- Subscription – Costs are based on a 7 year subscription timeframe.

- Supplies – Number of suppliers based on 135,000 vendors for Master Data Governance.

- Users – Based on 6,000 named users for the SAP Enterprise solution.

8.5   Independent Validation & Verification Vendor

The total Independent Validation & Verification (IV&V) Vendor related costs represented below are based on fiscal year end and expressed in $000s.

Description	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun -23	Totals
IV&V	$1,042	$2,500	$2,500	$2,500	$2,500	$2,500	$2,500	$1,459	**$17,501**

States implementing a large scale statewide ERP solution can sometimes choose to use IV&V services to assist with quality reviews and project monitoring. This role is typically handled by an external contractor that reports directly to the Governing body and is responsible for overseeing the performance of both the state and contractor from an execution and contract adherence perspective.

Although IV&V is a significant cost to an ERP project, they can play a significant role by helping to reduce the overall project risk. A qualified IV&V partner should remain independent throughout the project and not just be an extension of the state team. They should identify areas of weakness and strength for both the State and the integration partners. A qualified IV&V vendor should take an active role in helping to identify solutions as they are identified. If the role of the IV&V vendor is limited to status reporting, their value is significantly diminished. They should be measured on overall program success.

Note that some states have chosen to expand the services of the IV&V vendor to include assistance with the creation of the initial RFP.

Examples of state RFPs and representative contract award costs for IV&V have been provided to the State ERP Assessment project team and a summary is provided below.

Illinois Tollway RFP
The Illinois Tollway sought Advisory and Management Services to assist with the implementation of a Tier 1 Enterprise Resource Planning Solution. These services included RFP creation, requirements gathering, business process re-engineering, project management, and change management.

Illinois Tollway Costs
Illinois Tollway awarded **$6,044,250** over 4 years for advisory and management services for the implementation of a Tier 1 ERP Solution to replace the current disparate mainframe systems.

Illinois ERP PMO RFP
The Governor's Office of Management and Budget for Illinois sought professional services to assist in establishing and operating a Project Management Office that shall assist the State's executive leadership in managing and overseeing its effort to procure and implement Tier-1 enterprise resources planning software and systems integration services across the agencies responsible to the Governor.

Illinois ERP PMO Costs
Illinois ERP PMO awarded **$1,225,024** over 5 years for Phase 1 PMO services for Tier 1 software and systems integration.

Michigan ERP Consulting Services RFP
Michigan sought to obtain proposals for consulting services for the strategic replacement of the State's enterprise-wide financial system. In addition to consulting services, the selected vendor would provide independent verification and validation (IV&V) and related support services for the MAIN Replacement Project throughout the implementation effort. The IV&V is a critical component of the overall project governance structure and provides the State management team with detailed independent oversight of the application implementation/integration team.

Michigan ERP Consulting Services Costs
Michigan ERP awarded **$2,500,000** over 3 years for consulting services for the strategic replacement of the State's enterprise-wide financial system.

West Virginia Request for Quotation
West Virginia solicited expressions of interest for software engineering, consulting, and project management services for an ERP system. Services requested include needs assessment and planning, RFP preparation, proposal and system evaluations, ERP system contract negotiations, system acquisition, configuration, installation, and data conversion, and project advisory, quality assurance, and management oversight.

West Virginia Costs
West Virginia awarded **$8,138,987** over 3 years for consulting and project management services for the implementation of an ERP system for the State.

Additional quality control activities such as the quality plan, testing, the requirements traceability matrix updates and monitoring, the quality assurance program and automated testing are included within the implementation team effort and related costs.

Deloitte.

8.5.1 Assumptions

While there are many "models" available for IV&V services, given the expected size and complexity of the NC ERP implementation, cost estimates have been provided for services that include assistance with project oversight and management, advisory services, and quality assurance.

- IV&V cost estimates assume an expected senior advisory team of 6 – 8 resources throughout the life of the project.

8.6 Facility Costs

The total Facility related costs represented below are based on fiscal year end and expressed in $000s.

Description	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun -23	Totals
Facility	$115	$283	$292	$300	$309	$292	$356	$197	**$2,144**

For this type of implementation, the project team (State and Integrator) should be co-located in a single location. Co-location of the project team facilitates communication, improves timely decision making, and creates a stronger sense of "one team".

8.6.1 Assumptions

The Facilities cost is calculated based on the estimated headcount of the project team. The assumptions around space requirements and annual cost were provided through the NC GEAR Initiative.

Key Inputs

- Peak Headcount assumed at 150 combined project team across State and Integrator resources. While the project team size may fluctuate year over year, we have assumed that the state would need to identify and lease sufficient space at the start of the project and carry that lease through project completion.
- Square foot requirements per Resource estimated at 190 square feet.
- Cost Per Square Foot - $9.63 per square foot per annum

8.7 Network Costs

The total Network related costs represented below are based on fiscal year end and expressed in $000s.

Description	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun -23	Totals
Network	$230	$321	$ -	$ -	$ -	$ -	$ -	**$ -**	**$551**

An efficient SAP system has to communicate over the network, with adequate response times, with hundreds of SAP front end applications. SAP systems are typical client-server systems: a query is sent from the client; the result set is calculated and sent back by the server.

To satisfy availability and Service Level Agreement (SLA) policies, typical physical SAP servers have redundant network team-enabled cards built in.

The proposed physical infrastructure is based on a converged virtualized infrastructure (determined during technical workshops) which also includes the network infrastructure and its components.

The number of physical network components, and thus the necessity of implementing different team-enabled drivers for different operating systems, is reduced with VMware virtualization technology. With fewer physical servers attached to the network, fewer switches, ports, NICs, and cables are required to provide server connectivity for the corporate network. Apart from cost reduction and administrative simplification, one of the biggest benefits of virtualization for SAP projects is the ability to change the virtual network card connection to other defined virtual switches on the fly.

Capabilities are provided to clone complete SAP virtual machines for fallback, backup reasons, for the creation of a test system, or for freezing errors for reproduction during an upgrade. Due to identical hostnames and IP-addresses, the cloned virtual machine is redirected to an internal switch with no physical connection to the enterprise LAN. This switch reduces the risk of generating problems and errors in enterprise networks.

It also saves time and costs for management services, since changing hostnames in SAP environments requires adjustments in operating system environment variables, share or mount points, SAP profiles, and SAP tables.

8.7.1   Assumptions

The following assumptions were determined based on information gathered during technical workshops and interviews with State subject matter experts.

- Current bandwidth is sufficient for a statewide SAP based ERP system
- Network infrastructure procured by DOT for the DOT SAP Hosting Migration provides high degree of reusability for statewide SAP based ERP system (NCDOT IT Oversight report from November, 20th, 2014)
- F5 Networks procured Load Balancers can be re-used
- Data center network infrastructure indirectly used by statewide ERP system i.e. IPSEC Tunnels, SSL VPN, etc… can be re-used
- The current networking infrastructure is capable of supporting Fibre Channel over Ethernet (FCoE - an important component of a converged infrastructure) but requires additional investment in components and licensing

The upgrade cost to enable FCoE in the primary and secondary data centers as well as ensuring that all outlying network components (primarily agencies) are fit for purpose and requires investment of $550,000.

8.8   PC Costs

The total PC related costs represented below are based on fiscal year end and expressed in $000s.

Description	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun -23	Totals
PC	$157	$ 219	$ -	$ -	$ -	$ -	$ -	**$ -**	**$376**

The overall PC requirements for an SAP implementation are relatively light. The deployment to the user community is through a "thin client" which requires only that the end users have access to an internet browser. For developers or administrators, the requirement is more significant but still relatively light considering the capabilities of today's PCs.

Given the requirements below, there are no additional PC costs related to end users. In addition, the state may have the option to leverage existing PC inventory for the administrative and support roles.

- Requirements for Users – Windows IE8 or higher browser supported machines. This is the end user requirement and would need to be in place across the state.

- Requirements for Developers / Configurators – Dual Core Intel Pentium Processor with 2.00 GHz or equivalent with 2GB Memory and 250GB Hard Disk (plus VGA controller of 1024X768 or higher). This would not need to cover the user community, but a small subset of the project and support team.

As the project team represents "new headcount" and the intent is to execute the project in a new co-located facility, a budget estimate was included to supply project team members with PCs. While the state could assume that the integrator would bring their own PCs (or laptops), the typical model is for the integrator to operate off of the state PCs and network. This allows the state additional control over the security of the PCs, confirms adherence to state standards, and reduces the flow of information (such a project documents) outside of the state network.

8.8.1 Assumption

The following assumptions were used to compute the actual PC cost.

- Peak project headcount of 150

- PC cost per FTE for initial investment assumed at $2,500 per workstation.

- As a co-located team, both the State and Integrator would operate off of state machines.

- No PC refresh is assumed during the life of the project.

- While the cost estimates assume that PCs are purchased at the start of the project, there is an option to employ a "just in time" PC strategy based on state inventory and available machines. The state could also consider leasing a portion of these PC's which could further reduce the cost.

8.9 Security

The total Security related costs represented below are based on fiscal year end and expressed in $000s.

Description	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun -23	Totals
Security	$292	$700	$700	$700	$700	$700	$700	$409	**$4,901**

The State's privacy and security concerns are on the rise, and in accordance with several regulations and standards (e.g., PCI DSS, HIPAA, NIST 800-53), the State should conduct the appropriate due diligence to provide a secure yet flexible and extensible technology architecture. With recent news headlines showing data breach events on the rise, an efficient security and privacy capability becomes an organizational imperative.

In discussions with State subject matter expects it was determined that the preferred approach to information security and data privacy spans the lifecycle from design, development, integration, operations, and maintenance of the SAP solutions security solution. It is imperative to integrate application, data, infrastructure, and network security controls into the SAP solutions System Development Life Cycle (SDLC).

The SAP system security approach focuses on working with ERP Project teams to gather requirements for end users and support users, design security roles based on the requirements while taking into consideration regulatory and State specific security requirements, building roles, unit testing roles, including security roles into integration test scenarios for integration testing, and deploying the roles. To create and maintain the SAP security structure, a role-based security approach for the in-scope SAP processes and modules is the preferred method based on State input.

8.9.1 Assumptions

The following assumptions were determined based on information gathered during technical workshops and interviews with State subject matter experts.

- Role-Based Access Controls - Design of SAP Roles to streamline the user management processes including provisioning and de-provisioning of user access.

- Least Privileged Access - This approach requires the State to develop a granular and scalable security model that can provide users access to only the functionality they need to perform their daily job and which does not violate State defined segregation of duties rules. In addition, the implementation ERP Security team needs to be tightly integrated with other teams across the project, including Functional, Development, Test, and Training teams to obtain the specific user requirements for accessing application master data, transactions, reports, and data. This helps to reduce training time, makes navigation easier for the users, and helps to avoid audit and compliance related findings related to excessive access as users focus on only those menus and functions required to perform their job responsibilities.

- "Out-of-the-Box" Functionality - As a guiding principle it was determined to leverage SAP delivered functionality to the extent possible. This includes using ERP security administration tools and techniques to deliver the State's security model.

- Segregation of Duties - To the extent that State utilizes an existing set of Segregation of Duties rules or policies tied to legacy applications, the SAP implementation will require the State to update their Segregation of Duties rules to ERP functions. This should help the State to continue to monitor and track its Segregation of Duties compliance environment in the new SAP solution.

The identified security related costs for the ERP system implementation focuses on the security related implementation effort of the SAP solution as well as ongoing maintenance. The security costs do not include any hardware and software related investments as those are already covered in the hardware, networks, and software costs.

The security costs for the ERP system implementation as well as ongoing maintenance has been estimated based on information gathered from discussions with State subject matter experts and from previous engagements and bids of similar size and complexity.

8.10   Operations and Maintenance (O&M)

The total Operations and Maintenance cost represented below is based on fiscal year end and expressed in $000s.

Description	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun -23	Totals
O&M	$ -	$49	$5,342	$9,041	$11,013	$11,711	$12,968	$7,826	**$57,950**

For estimating purposes, this section includes the costs related to ongoing operations and maintenance of the installed ERP application. This estimate includes the necessary resources to support the ERP application once it is implemented and in production in the state from an application and infrastructure standpoint through the life of the project. Once the project is completed, the state would need to either continue the existing O&M contract or staff this function with state resources.

Application support includes the necessary resources to support the ERP software and delivered modules and related functionality. This includes both the functional application from a configuration and business process standpoint and the technical application for any necessary development (including non-standard report creation).

- Functional Application Support – COTS based ERP solutions are primarily a functional user supported system. However, the functional resources required for the support function are techno-functional in nature and have the knowledge and expertise to configure the application to meet the changing operational needs of the State. They provide break-fix resolution and root cause analysis support to address ERP application problems typically identified by business user or through application monitoring. This typically includes configuration activities or minor enhancements. In addition, the functional application support interacts directly with the business end user for both issue identification and recommended resolution.

- Technical Application Support - Technical support for ERP is a level 3-support function and is provided by resources with the knowledge and expertise to debug the underlying ERP code base. They provide break-fix resolution and root cause analysis support to address ERP application problems, which may require liaising with the ERP vendor to resolve. Technical Application Support may also include the application of patches or support for enhancements. In addition, the technical support team is also composed of the Business Intelligence and Business Warehouse (BI/BW) resources that support the non-ERP transactional reporting system and end user reporting related needs.

Infrastructure support includes support of the architecture and related HW. This includes support and monitoring of the physical servers, operating system, and ERP basis.

- Technical Hardware Support - Hardware support for ERP requires the maintenance and management of the servers on which the ERP solution is running. This includes administration and monitoring of the physical architecture and core technical software components such as the operating system and database administration.

- Floor Cost - The floor cost represents the cost to house and enable the architecture. This includes the allocation of costs for the physical space, air conditioning and handling, electricity, and physical security. This service is currently provided within the state by the Office of Information Technology Services under a shared service arrangement.

The ongoing maintenance costs of the solution post completion of the project are estimated at approximately $23M per year. This would include the maintenance team as well as hardware and software licensing, ongoing facilities costs, and floor space for the technical platform.

8.10.1 Assumptions

The following assumptions were determined based on information gathered during technical workshops and interviews with State subject matter experts, and experience with projects of similar size and complexity.

- Initial Transition - Application support does not begin until 1 month following the initial Finance implementation. While it is expected that warranty for the implemented solution will be 90 days, the 60 days of overlap provides ramp-up time for the maintenance team to ensure that the production hand-off is managed smoothly.

- Resources per Module - A minimum two-person team rule was applied. As production support requires the available of experienced resources to handle critical operating issues when they arrive, it is impractical to assume that one resource can provide the expected service level objectives by him/herself. The two-person team concept only applies when cross training is not practical. The State should not expect a finance resource to be successfully cross-trained on human resources. It is recommended that the State work with the maintenance vendor to

recognize this "additional" resource bandwidth and offset the investment with "pre-paid" small project enhancement hours per month. Resources per module were increased where anticipated based on the ERP implementation timeline.

- Infrastructure - The hardware costs estimated in this section assume a hosted solution. For estimation purposes, the infrastructure will be housed in the state data center and costs allocated based on the OITS shared services model and published costs (per server, per container). Estimates were based on the published $1,201 per month per server charge and $429 per virtual instance charge. The servers and virtual instances ramp up over the course of the project and peak at 58 servers and 144 virtual instances.
- Resources - The resource costs estimated in this section assume a 100% on-site support model. The State is encouraged to discuss with the maintenance provider most cost effective solutions such as offshore or near-shore support models.
- Ongoing Maintenance - Estimates are based on a vendor rate of $132 per hour. At steady state (post full implementation), the support team headcount is estimated at 43 full time resources.

8.11 Contingency

The total suggested contingency represented below is based on fiscal year end and expressed in 000s.

Description	Jun-16	Jun-17	Jun-18	Jun-19	Jun-20	Jun-21	Jun-22	Jun -23	Totals
Contingency	$1,628	$2,536	$4,188	$3,706	$3,561	$4,596	$3,636	$1,009	**$24,860**

The cost estimates presented in this analysis are defined by the scope of the initiative. While the estimates include the allocation of contingency, that contingency is related to risks and challenges around the implementation of that defined scope. As such, it does not account for additional scope or changes that may be discovered during the business process re-engineering or implementation process. There are several drivers that could drive additional scope:

- New Requirements – During the business process re-engineering or implementation process, the state may discover additional requirements that were not previously documented or communicated to the integrator.
- New Capabilities- As software vendors are continuously improving the capabilities of their products, it is possible that over the course of the implementation time horizon additional capabilities may be introduced that the state would want to leverage.
- Changes in Technology – Given the time horizon of the project (approximately 7 years), it is possible (if not probably) that shifts may occur in the underlying technology of the solution. For example, the drive to enabling smart phone devices and tablets was in its infancy in 2007 (iPad was released in April, 2010).
- Changes in Implementation Timelines – Changes to the implementation timeline can have a significant impact to the implementation costs. Whether for business reasons or resource constraints, there are circumstances under which the timeline would need to be extended for the project.

For these reasons, we have included an additional state contingency of $24,000,000 within the budget estimates. The allocation to the timeline is based on complexity of the ongoing project activities and potential for fluctuation as a percentage of the project spend.

9   Risks

Risk management is a continuous process by which risks are identified, evaluated, analyzed, monitored, and controlled. We realize that for the NC ERP Project to be successful, risk management must be an ongoing process. Utilizing the Enterprise Value Delivery (EVD) for SAP methodology allows us to identify specific high risk components early in the life cycle to address and mitigate them before they impact the project.

Project risks can be identified by using one or more of the following techniques:

Technique	Description
Interviews	Interview relevant project stakeholders to identify their concerns, which may provide insight into real project risks.
Risk Brainstorming Workshops	Conduct risk brainstorming workshops with relevant project stakeholders to identify risks, including key risk influencers, risk levels, and possible impacts.
Process Reviews	Identify process-related risks by reviewing the various project management processes, tools, and techniques.
Client and Deloitte Knowledge Assets	Identify risks from previous projects of similar size and complexity, using available project data and lessons learned.

Understanding that not all risks are of the same type, our risk approach employed an investigative analysis of the following areas:

Risk Area	Description
Business Imperative	Risks include stakeholder engagement, ownership and commitment of the project team members, and identification and measurability of business objectives.
Technology	Hardware, software, and network risks both internal and external to the project.
People	Organizational change, communication, and team dynamic as well as resource scheduling, availability and succession planning risks.
Project Management and Control	Project roles and responsibilities, schedule, standards and scope risks.
Requirements	Stability of the requirements and risks associated with stakeholder understanding of the core system requirements.
Design, Development, Test	Forward looking risks often documented during the project – risks can include areas of design complexity, difficult test scenarios, and constrained development resources for the scope (both people and technology)
Environment	Risks in the external environment, including physical space, legislative decisions, policy decisions, or budget constraints.
Project Integration	Dependency risks associated with third-party project participants and overlapping agency initiatives. Dependency risks can include a constrained resource or a task-level dependency.

In the risk analysis portion of this assessment, Deloitte worked with State representatives to identify potential risks associated with implementing a Statewide ERP system based on the in-scope functional and technical areas. Prior to the functional and technical area workshops, the Deloitte team worked with the NC GEAR client team to identify potential risks, which were then expanded upon and analyzed by providing a description of each risk and identifying mitigation strategies. These potential risks were shared with the workshop participants who worked with Deloitte to identify potential mitigating strategies for specific risks.   In addition, workshop participants worked with Deloitte to identify additional risks related to an ERP implementation for North Carolina.

Below is an initial list of potential project related potential risks and associated mitigation strategies. This list is representative, however, not all-inclusive as the process of risk identification and mitigation is fluid and continuous throughout the implementation of a project of this magnitude and timeframe.

Risk Area	Potential Risk	Potential Risk Mitigation Strategies
Business Imperative	Inadequate sponsorship: If the project does not have proper sponsorship, then project may not be effective and achieve the State's vision	• Determine and clearly communicate who the project sponsor is to provide leadership visibility across the program • Identify other organizational leaders who need to support and understand the change to build a network of ERP implementation program champions • Put on a roadshow presentation for leaders to help them understand the ERP implementation program and their roles and responsibilities • Create leadership alignment plans to help confirm the sponsor and other organizational leaders have a common vision and set of objectives for the ERP implementation program • Proactively facilitate cross-functional sessions to provide a forum to address design integration across functional areas • Engage in sponsorship succession planning for potential executive leadership changes during the program to help confirm leadership continuity within the ERP implementation program
Technology	Integration between ERP transaction system and content management system: If the content management system does not support integration with the ERP system on process and data level it can lead to costly adjustments and a poor user experience	• Use of an ERP system certified content management system with out-of-the box connectors and integration capabilities that allow integration on the process and data level which should avoid costly adjustments and a poor user experience
	Data Center & Network: If current data center and network components are not fit for purpose for the ERP system it can lead to implementation delays and performance issues	• Conduct detailed data center (including network) assessment to understand if they are fit for purpose for the ERP system to avoid implementation delays due to capacity issues • Assess networks at agency level to determine if they are sufficient to meet the requirements of the ERP system to avoid performance and scalability issues • Confirm that ERP system infrastructure components are not moved midway during implementation between data centers as this may potentially impact implementation timeline • Budget estimates should include the appropriate level contingency to account for potential expansion of the hardware environment
	Interface maintenance: If interfaces are not properly maintained after go-live, then the accuracy of the data may be impacted	• Account for permanent and temporary interfaces as with a phased implementation approach it can be important to keep the ERP system integrated with legacy systems until all agencies and functions have been migrated • Include a large agency as part of Phase 1 so that the design can be sufficiently tested relative to the requirements of a large and complex agency
	Support of legacy systems during ERP implementation: If legacy systems are not supported during the ERP implementation, then there can be unanticipated scope and design implications	• Include representation from the ERP project team on the change control board or similar governing body for legacy systems to keep the ERP project informed of changes to legacy systems that may impact the design of the ERP system • Consolidate systems through phased implementation with emphasis of CoE support to take advantage of a structured approach to consolidate/retire systems and leverage the knowledge of staff expertise • Plan and execute a proper cutover to take into consideration the characteristics of each system and its usage
	Implementing in a live environment: If the complexities of implementing in a live environment are not taking in to consideration in planning the ERP implementation, then there may	• Establish additional environments to manage day-to-day support vs. new functionality to minimize the impact on the production systems • Leverage existing "promote to production" processes in developing the approaches managing a complex dual landscape • Pilot implementation to one large agency, one medium agency, and

Risk Area	Potential Risk	Potential Risk Mitigation Strategies
	be increased potential for disruption to the production environment	one small agency to have an understanding of the impact of the ERP implementation under multiple organizational scenarios • Establish a dedicated team and resources to manage pilot to provide a singular focus for those resources • Implement system change management processes around managing two systems during the go-live to provide effective management of production and non-production systems in the landscape • Implement hardware refresh to effectively align and utilize hardware to support the landscape
	No consistency in look & feel across various channels: As users use different channels to access ERP system functionality, they are exposed to the visual design, functionality, interactions, and overall look & feel. If there is no consistency amongst those disciplines regardless of channel then users may lose trust which can lead to decrease in adoption and productivity	• Work on a user experience strategy that encompasses visual consistency amongst all used channels to create reliability and trust which leads to higher adoption and productivity • Confirm that the solution follows a responsive web design approach for all custom developed applications to support multi-device adoption and seamless user experience
People	Understand the established business culture and historical response to change: If the established business culture and response to change is not understood and managed, then the organization may not be positioned to adopt and implement the changes being introduced	• Define and communicate the need for change to help promote adoption of changes resulting from the ERP system implementation • Articulate and endorse the vision to help State agencies and their users understand the imperative for change • Be clear on the budget and resources required for the project to help State agencies and their users understand the commitment required for a successful implementation of the ERP system
	Project team capabilities: If the state project team is not trained, then their ability to effectively fulfill their project roles may be impaired	• Provide additional training on new functionality to project team members to equip the team with the knowledge of the ERP software capabilities and the tools, methods, and processes to be used during the implementation project • Provide policy and process trainings, especially for managers, to provide knowledge of the polices and processes upon which the ERP design is based • Provide cross-training for power users to help build their understanding of upstream and downstream dependencies across the functional areas within the ERP system • Include supporting documentation and training as part of the implementation even for functionality with high degree of usability including mobile applications to avoid user frustration, low adoption, high number of help desk calls, and low productivity
	Resource availability: State resources will need to be fully committed with full-time availability	• Organize a plan to backfill critical roles • Build contingency into work plans • Work with agency project managers and leadership to confirm staff availability for critical activities • Establish communication channels for mitigating the impact of resource changes
	Project resource retention: The ability to retain resources that have knowledge and skills pertinent to the project will be critical	• Work to create an environment that people want to work in and support staff's needs for career growth • Establish a plan for backup or shadow resources for key roles and in critical areas of other roles • Provide cross-module knowledge transfer for critical areas, particularly those with common integration points
Project Management and Control	Lack of clarity around structure, activities, roles and responsibilities can result in confusion and	• Hold a project kick-off session to set and align expectations and clarify roles and responsibilities • Understand and leverage existing internal structures such as

Risk Area	Potential Risk	Potential Risk Mitigation Strategies
	resistance, making project execution extremely difficult: If there is not clarity around the project structure, activities, roles and responsibilities, then there may be confusion and resistance, making execution extremely difficult	communication vehicles and decision-making bodies to cascade communications within their organizations • Develop and enforce a clear issue and risk escalation process to help validate that issues and risks are raised and addressed • Periodically revisit and reinforce roles and responsibilities regularly as they may shift or evolve over time and to help confirm alignment with the different phases of the ERP implementation program
	Independent, uncoordinated efforts in different functions to keep pace with advances in analytics and technology.	• Confirm that timeline of implementation is communicated and well understood to avoid agencies work on parallel competing initiatives • Confirm that governing body is empowered to avoid duplication of effort and competing initiatives
	Underestimating the effort in regards to establishing good data quality guidelines and continuous monitoring capabilities	• Confirm that data quality and ownership is managed and measured on a real-time basis, and data definitions are integrated and understood across agencies and functions to enable data quality right from the beginning which leads to higher confidence in reported data and analytics • Provide incentives to keep data quality high as this should lead to higher adoption and trust
	Identify, deal with and defuse unanticipated impacts: If unanticipated impacts of the ERP implementation are not acknowledged and addressed when identified, then the organization may lose confidence in the project and system	• Manage expectations at go-live to help build confidence in the agencies and their users of the functionality being delivered, how they may be impacted, and how they should be supported • Provide clear feedback mechanisms back to the project team so that the project team understands how they can improve as representatives of their organizations and issues and concerns can be addressed in timely manner • Empower super users to deal with issues and determine solutions where appropriate to leverage the knowledge and experience of those closest to the areas of change impact • Identify areas for continuous improvement to allow the ERP system and related processes to continue to evolve with the organization
	Budget Development begins 12 months before FY start: If the State's schedule for budget development is not taken into consideration when planning ERP implementation timelines, then there may be adverse impacts on the organization and effectiveness of the implementation	• Use a phased implementation approach to take the budget development cycle into consideration • Use a short session prior to a long session to help inform the long-session implementation methodology
	Business Process standardization and consolidation: If the effort to standardize and consolidate business processes is not acknowledged and adequately planned for in the ERP implementation, then the degree of process design standardization envisioned by the State may be difficult to achieve	• Prioritize standardization based criticality to provide structure and focus to ERP business process design • Establish a governance model to aid in the adoption and enforcement of standardized processes • Enforce standardization through the implementation of business rules in the ERP system
Requirements	Requirements definition: If the State's ERP requirements are not properly defined with full articulation of the State's needs, then it may not be possible to properly evaluate a software vendor's or integrator's ability to meet the requirements	• Complete business process re-engineering efforts with requirements prior to moving to the next phase to provide clear vision and direction to the ERP system design
Design, Development, Test	One size does not fit all: If required process variations are not taken in to consideration in the functional area process designs, then the ERP	• Identification of business owner to drive and enforce standardization • Document process variations and the rationale for their existence to help determine which must be considered in the ERP design • Determine which process variations are high priority requirements

Risk Area	Potential Risk	Potential Risk Mitigation Strategies
	system may not meet users' needs	for inclusion in the ERP design
	Data conversion: If the data conversion effort is not properly planned and resourced, then there may be a negative impact on the Statewide ERP implementation and continuity of State operations	• Perform data cleansing and reconciliation prior to implementation to address early in the process and reduce strain on resources during implementation activities • Identify funded positions to own the data conversion process to provide the continuity and knowledge required for planning and executing conversion • Warehouse all non-critical historical data to preserve the data and focus conversion of data to the Statewide ERP on the critical data required for continuity of State operations
	Inadequate post go-live support: If there is inadequate post go-live support, then the initial usage and ongoing viability of the system may be negatively impacted	• Provide sufficient onsite support for at least the first few months after go-live to help confirm proper use of the ERP system and build user confidence • Prepare an implementation toolkit for managers/supervisors to provide them with information on what they can expect and what is expected of them at go-live • Schedule regular meetings with the support team and the project team to address issues in a timely manner
Environment	Rules changes must be made efficiently: If the Statewide ERP system does not have the flexibility to permit efficient administration of required rule changes, the rule maintenance processes may be viewed as cumbersome and limit adoption of the system	• Develop specific and well-articulated requirements for the ERP system for flexibility in the creation and maintenance of business rules • Develop an inventory of the types of legislative changes and impact on business rules that have been more challenging to implement in the existing systems to use a input in designing the business rule architecture in the new ERP system
	Security: If security policies currently enforced by the State are not optimized/adjusted for ERP system it can increase complexity, create unnecessary redundancy and impact implementation timeline	• Establish baseline security for selected ERP system based on industry best practices and reference architecture to avoid unnecessary complexity and processes
Project Integration	Conflicting/Competing requirements: If the existence of conflicting and competing requirements is not acknowledged, planned for, and managed throughout the ERP implementation, then it may be difficult for the State to achieve its envisioned level of standardization and change	• Define business workshops to include multiple agencies to help confirm competing requirements are identified and addressed and that those agencies have active involvement in design decisions • Determine priority and document pros/cons to provide a systematic approach to identifying conflicting requirements and developing standardized business processes
	Converged infrastructure: If the selected approach creates a single vendor lock in that eliminates competition and has higher upfront costs	• Use of State Convenience Contracts to address potential vendor protests • Use of converged infrastructure reference architecture that provides an overall blueprint to help the State build its own infrastructure with components from various vendors to avoid vendor lock in

10 Financing Examples

The benefits of a statewide ERP solution are apparent, however, the question of financing still remains. For those states that have already completed or are embarking on an ERP implementation, there is a trend towards a combination of traditional financing options. States have opted for combinations of appropriation, federal funding, and bonds in parallel with an agency chargeback model. .

Explanation of Funding Models:

- Appropriation – legislative provisions that direct approved funds to be spent on specific projects for a specified period of time
- Federal Funding – Federal Government granted funds provided to State and Local Governments as established by law or via a competitive process
- Bond – specific government appropriation where the State bonding authority issues bonds to fund IT procurement. The State, in turn, issues bonds to investors with the promise to repay the debt
- Agency Chargeback – mechanism to distribute charges to state agencies/entities for services provided by another state agency/entity. While not a unique funding source, the agency chargeback model can be used in conjunction with other funding options or captured from existing agency operating or IT budgets.

State	Appropriation	Federal Funding	Agency Chargeback	Bond
New York	✓			✓
Texas	✓			
Pennsylvania	✓		✓	✓
Virginia	✓		✓	
Ohio			✓	✓
Georgia	✓		✓	
Alabama	✓		✓	
Massachusetts				✓
Washington				✓
West Virginia		✓		

(Florida Department of Financial Services, 2014)

According to the National Association of State Chief Information Officers (NASCIO), states must consider the combination of traditional and innovative IT funding models in order for state technology modernizations to benefit its citizens during scarce economic times as well as prosperous times. Each funding model has its own benefits and challenges. The traditional models of funding via appropriation, agency chargeback, and federal funding are well known to the States, however, the benefits and challenges of the innovative options may not be as well known. Summarized below are some of the benefits and challenges related to the innovative IT funding models. (National Association of State Chief Information Officers, 2003) (National Association of State Chief information Officers, 2008)

Funding Model	Benefits	Challenges
Public-Private Partnership	• Initial funding from the state is limited • Creation of an incentive for the vendor to perform successfully by tying the vendor's profitability to the new revenue stream created by the IT project • Possible cost efficiencies created by obtaining expertise from outside the state as opposed to the potentially higher cost of retaining expertise in-house • Possible creation of a new revenue stream from which the vendor can recoup its initial investment and in which the state can share • Avoidance of spending taxpayer dollars to fund IT projects • Maximization of the vendor's performance in order to produce the greatest benefits possible for constituents	• Contracting with a third-party vendor to provide a technology solution • Creation of a revenue stream from which a vendor may recoup its initial investment • Possible legislative and regulatory changes to user-fees if these fees may be used to aid the vendor in recouping their initial investment • Requires strong state-vendor communications
Certificates of Participation	• The vendor receives payment up-front, while the state can pay for the IT project over a period of time • Improved access to capital investment markets • Certificates of Participation typically do not count against the state debt ceiling • Initial funding provided by investors, not by taxpayer dollars • Ability to improve citizen services via a mechanism that is not solely dependent upon the state general fund	• Potential need for legislative approval of the use of Certificates of Participation • Securing of key stakeholders, including a trustee and investors • Securing insurance to confirm that investors can be paid in-full and on-time • Repaying investors on their Certificates of Participation at a higher interest rate than general obligation bonds
Benefits Funding	• The vendor "front funds" the project using their working capital • New sources of revenue are developed by capturing tax dollars that "leaked" through the obsolete technology • The state's project risk is now shared by the business partners • There is a built-in incentive for the vendor to perform. If the project does not perform as planned, the vendor does not receive progress payments • Existing technology used on comparable projects in other public jurisdictions can be "transferred in," thus lowering total system development costs • The vendor has the option to use channels of distribution to source IT equipment that may be unavailable to the public sector, thereby lowering the cost of the project • Providing improved citizen services via benefits funding when sufficient legislative appropriations for such projects are unavailable	• Strong sponsorship of the project and funding model by the state governor and agency director • Clear, unambiguous legislative and executive authority to enter into public-private partnerships • Strong legislative support by legislative leaders and key legislative staff • Some knowledge of funding model mechanics by the governor's staff, the state's executive and legislative budget officers, chief state procurement official, and state procurement legal counsel • Technology project under consideration must be core and/or mission critical to the operation of state government • Independent assistance from technology vendor representatives in educating legislators and other stakeholders on the financial benefits to the state and improvements in service delivery from public-private partnerships • Multi-agency participation in the vendor evaluation process • A comprehensive communications plan to maintain open and continuous communications with state officials, consultants, vendors and stakeholders

(National Association of State Chief Information Officers, 2003)

10.1 Budgeting and Appropriation Strategies

While obtaining funding is critical to the success of a multi-year IT project, strategies to better utilize those funds are important as well. NASCIO suggests the following strategies as examples of ways to increase IT funding for states or to better utilize existing funds.

- Retaining technology funds that are unspent at the end of the budget year (as opposed to allowing them to revert back to the state general fund)

- Using uncommitted year-end funds for technology projects
- Reallocating savings realized from previously implemented technology projects to fund other technology projects
- Increasing in-house expertise to reduce the amount of budget dollars spent on outside consultants and optimize the return on IT funding

Implementing these strategies and realizing their benefits may not be without challenges. Some potential benefits and challenges to budgeting and appropriations strategies include the following:

Benefits	**Challenges**
• Having an additional source of funding to apply to new or existing projects • Bolstering the argument for the savings that technology projects produce by demonstrating how those savings can be reinvented in other beneficial technology projects • Building up the expertise of existing state IT staff by providing training and mentoring opportunities • Improving the quality of in-house staff by funding one or two positions that pay above civil service salaries • Reinvesting end-of-year funds or retained savings in order to provide services to citizens that, absent that avenue of funding, might not be possible • Increasing the state IT staff's expertise in providing improved citizen services through IT	• Securing buy-in from necessary stakeholders, which could include the state legislature and executive branch officials, to retain technology funds at the end of the year or reinvest funds saved on other technology-related projects • Process for documenting the success of technology projects funded by such strategies • To build in-house expertise, the ability to provide training and mentoring to permanent state IT staff • To obtain more qualified employees, the ability to fund one or two positions that pay above a civil service salary but below the rate that would be paid to a consultant

(National Association of State Chief Information Officers, 2003)

11   Next Steps

Per the Statement of Work, this section includes the "Next Steps" plan. This plan is designed to highlight the activities that would need to take place from the approval of the implementation plan to the beginning of an ERP implementation project. This section is divided in to three subsections that cover the following:

- Assumptions – Key assumptions necessary to create a draft plan. The assumptions are necessary to set the boundaries of the analysis and provide context to the reader.
- Decisions – There are critical decisions that must be taken along the path to starting an ERP implementation. Decisions with significant impact have been provided for early consideration by the state.
- Description and Timeline – This section provides a description of the key areas and tasks necessary to begin an ERP project. In addition to the description below more detailed Microsoft Project Plan (with activity duration and dependencies) has been provided as an attachment to this deliverable.

The preparation of the "Next Step" activities included the following process:

- Draft Next Steps – The Deloitte Project team leveraged information gathered from the various functional and technical workshops and interviews with the state, examples from other states implementations, information gathered through the NC GEAR initiatives, and input from Subject Matter Advisors (SMAs) to determine create an initial "straw model" for further discussion and refinement.
- Review with Deloitte SMAs – The "straw model" was reviewed with Deloitte SMAs to provide further feedback and refinement of assumptions, decisions, tasks, and timelines. The SMAs that assisted with the review provided a combined 130+ years of ERP experience. Based on their input, further refinements were made and materials prepared for a workshop with the state.
- Workshop with State Participants – Workshop included a review of the assumptions, decisions, and timeline and activities. During this workshop the state and Deloitte project team members further refined the "Next Step" plan and related content.

11.1   Assumptions

The assumptions below are necessary to prepare a high level timeline for the "Next Steps". Changes to these assumptions could have a material impact on both the timeline and activities presented as part of this analysis.

Area	Description
Funding	Assumes the availability of funding for the pre-ERP activities.
Staffing	Assumes staff will be available to support the efforts listed in the "Next Steps". It includes the potential use of State Employees, Contractors, or Vendors.
Leadership and Executive Support	Assumes Leadership and Executive Sponsorship must be in place. This is a critical success factor for the overall Governance structure of the project.
Vendor Selection	Assumes the RFP and Software selection process occur in parallel, even if ERP software and integrator are procured separately,
Bundling of IV&V and RFP Support Services	Assumes that IV&V and RFP support services will be procured under a single RFP. This is a typical approach in the marketplace and additional details of the benefits are provided under the activity description below.

11.2 Decisions

There are critical decisions that the state will need to make in order to execute the "Next Steps" plan. While assumptions around these decisions were taken in order to complete the plan, these areas remain somewhat variable and depending on the outcome could have a material impact on the timeline and activities.

Area	Description
Bundled or Parallel Software and Vendor RFP	There are several options available to state around procurement of an ERP solution. In particular, the state can choose to analyze and procure the software and implementation partner separately or request bids from vendors that include software and services. This is a decision that the state will need to make early in the procurement process.
SAP Checkpoint	There are two "decision points" included within the plan where the state can potentially decide to focus their procurement effort on an SAP based solution. While an early decision to move down the SAP path would reduce the overall timeline and costs related to the "Next Step" activities, it would mean forgoing the review and analysis of other software solutions.
RFI Process	While some states have decided to issue an RFI ahead of an RFP, it does come with increased time and expense for the state. Recent states have opted to forgo the RFI process and move directly to preparation of an RFP. To be conservative, the RFI process has been included within the timeline and activities of the "Next Steps".

11.3 Description and Timeline

This section includes the description of the focus areas for the "Next Steps", as well as the underlying activities and overall timeline. A more detailed project plan that includes the duration by activity and dependencies between tasks is included as an attachment to this document.

While a high level timeline has been provided below, a more detailed Microsoft Project Plan has been included as an attachment in Appendix C – Next Steps Project Plan.

Given that the preparation activities for an ERP implementation require both internal staff and consulting support, this analysis included an overall estimate of the cost impact for pre-ERP activities. The cost of pre-ERP activities is approximately $4.3M to cover the activities listed below.
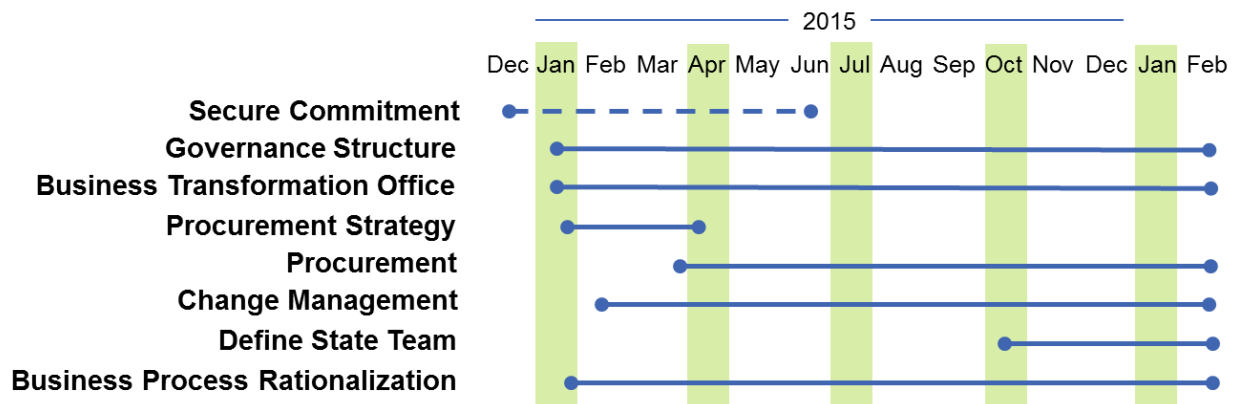
The following focus areas are covered in this section:

- Governance Structure
- Project Management / Business Transformation Office
- Procurement Strategy
- Procurement
- Business Process Rationalization
- Communications and Change Management
- Define State Project Team
- Business Process Rationalization

11.3.1 Governance

The Governance model is established to direct the activities of the related ERP initiatives, facilitate decision making, and confirm alignment to the overall project visions, objectives, and results. The Governance structure should be in place ahead of determining the procurement strategy. The following activities are included with the Governance area:

- Review Governance Options
- Establish Initial Governance Structure
- Define Decision Rules
- Establish Memorandums of Agreement
- Define Governance Charter
- Publish and Communicate Charter

11.3.2 Project Management / Business Transformation Office

The Project Management Office can be stood up in parallel to the Governance body. Where the Governance body provides the direction, strategy, and decision making for the project, the Project Management Office (PMO) oversees and coordinates the execution. During the pre-RFP effort, the PMO would be responsible for establishing the processes related to project management.

The PMO would likewise be responsible for the coordination and branding of the Business Transformation Office (BTO). It is important to set the tone for the overall implementation as a business lead transformation effort early in the process. While the BTO will consist of the Governance Committee, Change Lead, Executive Leadership, and PMO, the initial activities should be driven and coordinated through the PMO.

The following activities are included in the Project Management Office area:

- Establish Core Team
- Define Charter
- Create Project Plan
- PMO Processes
- Reporting Requirements
- Manage and Execute Plan

11.3.3 Procurement Strategy

There are several decisions that the state will need to make as part of the "Next Steps" plan. The majority of these are around the Procurement Strategy and include direction around the software selection and RFI process. It is important to note that these two decisions points could result in significant reductions in the overall timeline and adjustments to project plan for the next steps (especially in the case of an RFI process). A decision to forego the RFI process could either collapse the timeline or allow additional time for the remaining activities (such as the RFP process). The following activities are included in the Procurement Strategy area:

- Determine Procurement Strategy (Software Selection, RFI, IV&V)
- Procure and Select Vendor for RFP Development and Support (with option to extend to IV&V)
- Develop and Execute RFI (conditional if required)
    - Create RFI and Demo Packs
    - Release to Vendors
    - Vendor Preparation
    - Prepare Evaluation Templates
    - Conduct Demos
    - Evaluate Demos

11.3.4 Procurement

The procurement area presents the steps to evaluate and select the ERP software and integration partner. At this point, the state should have identified a vendor to assist with the preparation of the RFP and related evaluation process. The procurement activities will involve working with business owners from the various agencies to define or expand the detailed requirements as well as the execution of the evaluation and selection process to determine both the software vendor and integration partner. The following activities are included in the Procurement area:

- Draft RFP
    - Draft Requirements
    - Draft SOW
    - Coordinate with State Agencies (General Counsel and Procurement)
- Release RFP
- Vendors Prepare Responses
- Evaluate Proposals
- Evaluate Orals
- Conduct BAFO
- Negotiate Contract.

11.3.5 Change Management Preparation

It is critical during this phase of the effort that the state identifies stakeholders and begins communications with those stakeholders (both internal and external). Given the breadth and complexity of an ERP implementation, it is important that stakeholders be aware of activities and timelines and that expectation are appropriately set from a project inception. Even the act of creating a communication strategy and gaining approval of that plan from key stakeholders can set expectations around the frequency, vehicles, and recipients of project related communications. The following activities are included in the Change Management area:

- Prepare Communication Strategy
- Detail Stakeholder Analysis and Management Plan
- Conduct Initial Agency Briefing
- Execute Communication Plan

11.3.6 Define State Project Team

In preparation for the start of the ERP implementation, the core state project team must be established. This includes the team members that will participate as state subject matter experts on the project from both a functional and technical perspective. The core team typically represents full time project team members that are assigned directly to support of the project. It is important that the core team members include representatives from agencies that have both the institutional knowledge of the agency and a willingness to drive and accept change. As the resources identified and selected to participate in this type of project are typically the high performers within their respective agencies, it is important that agency

leadership have the appropriate time to account for both the backfill of personnel and transition of their existing duties. The following activities are included in the Define State Project Team activities.

- Prepare Positions
- Provide Advance Position Notice
- Publish Positions
- Review Applicants and Conduct Interviews
- Select Project Team
- Perform Role Shadowing
- Inmate Roll On Process

11.3.7 Business Process Rationalization

Many states have found significant value in a pre-ERP rationalization effort. This includes a review of existing processes that may benefit from additional standardization (such as grants and fleet) as well a review and clean-up of master data that might exist either within or between systems (such as vendor lists and inventory catalogues and SKUs). Performing business process rationalization ahead of the start of an ERP implementation can assist not only by identifying potential opportunities and performing necessary activities early, but also by setting the tone for true business process re-engineering. Business process rationalization becomes the first tangible step toward business transformation. The following activities are included in the Business Process Rationalization activities:

- Determine Focus Areas
- Analyze Gaps
- Organize Agency Participation
- Execute Rationalization
    - o Process and Workflow
    - o Master Data Review

12 Appendix A – Task Deliverable Descriptions

As referenced in the Implementation Team section, below are the descriptions of the task deliverables organized by discipline.

Discipline	Task Deliverable	Task Deliverable Description
Organizational Change Management	Change Impact Assessment Approach	The Change Impact Assessment Approach establishes a clear vision for how change impacts will be captured and addressed by the project team. It provides an overview of the change impact assessment process, objectives, as well as how and when the work will get done.
	Change Impact Assessment Report	The Change Impact Assessment Report captures how identified changes will impact the State, including the severity of the changes (high, medium, or low), impacts to people, process, and technology, and risks and/or benefits associated with the changes.
	Change Readiness Approach	The Change Readiness Approach outlines the approach and plan for execution of the change readiness assessment. Tailored to meet the project's specific requirements, the approach defines the assessment objectives; the change dimensions to be assessed; the assessment population; the process, tools and protocols for conducting the assessment and reporting the results; the timing and frequency of the assessment based on the project deployment strategy; and key roles and responsibilities.
	Change Readiness Assessment Report	The Change Readiness Assessment (CRA) Report summarizes the results of the change readiness assessment. The report includes a summary of the assessment approach; participant demographics; the assessment findings organized by change dimension (as well as any trends); and recommended actions based on the results.
	Communications Approach	The Communications Approach provides overall direction for the communications for the project and describes how the project team will manage and deliver communications. It shapes the structure and focus areas for the Communication Plan.
	Communications Materials	Communications Materials are the products of the Communications Plan that convey information and key messages relevant to the project. Materials include executive memos, leadership talking points, e-mails, or any other means to convey project information to stakeholders.
	Communications Plan	The Communications Plan lists all key communications events that will occur over the lifecycle of the project, as well as the target audience, timing, delivery mechanism, key messages, and responsible parties.
	Detailed Organization Design	The Detailed Organization Design documents all levels of the new organization and the services offered below that level. It details the organizational structure, spans of control, and high level role and functional responsibilities summaries.
	End-User Training Assessments —- Executive Summary	The End-User Training Assessments - Executive Summary provides an executive summary of the State's training infrastructure and logistics environment, audience groups that will participate in the training program, and key demographics, characteristics, and training needs of the identified audience groups. This document will be a key input to the End-User Training Strategy
	End-User Training Curriculum	The End-User Training Curriculum provides a detailed framework for the training program, and it details course information (such as course objectives, delivery methods, duration, audience, and prerequisites) needed to develop the training courseware.
	End-User Training Evaluation Report	The End-User Training Evaluation Report documents the results of the end-user training program and contains the following components: a summary of course completion; an analysis of training program results, including participant reactions, knowledge gained, and trainer feedback; and recommendations for program improvements to address.

Discipline	Task Deliverable	Task Deliverable Description
	End-User Training Strategy	The End-User Training Strategy documents the following elements at a high level: overall scope and timing of end-user training, end-user training assessment results, the process and tools for training material design and development, the process and tools for training delivery (including logistics, trainer selection, and the evaluation process), assumptions and constraints, and resource requirements.
	Go-Live Transition Guides	Go-Live Transition Guides support end users during the critical transition period by providing key information in an easy-reference format. Information contained in the guides typically includes high level project information, functional area-specific change impacts and start/stop/continue details, go-live timelines, and support information. The Go-Live Transition Guides may also reference workforce transition details.
	Go-Live Transition Workshop Materials	Go-Live Transition Workshop Materials prepare managers to disseminate key project information to their business areas regarding what to expect in preparation for and during go-live. As part of the workshop material, Go-Live Transition Guides are delivered to participants and reviewed in detail.
	High-Level Organization Design	The High-Level Organization Design documents the first three levels of the new organization and the services offered below that level. It details the overall management structure, the high-level functional team structures, and the high level role and functional responsibilities summaries.
	Instructor-Led Training Courseware	The Instructor-Led Training Courseware includes the materials that support in-person and virtual instructor-led training.
	Job Profiles	The Job Profiles contain the details of all jobs in the future state organization.
	Leadership Alignment Plan	The Leadership Alignment Plan provides a structure for activities that will confirm the leadership team is aligned with the project vision and will show visible commitment to the project change. The Leadership Alignment Plan engages executives and other key leaders as visible project sponsors by clearly defining what is expected and when. Phase-specific plan updates help leaders focus on their engagement in the project and take appropriate actions.
	Organization Assessment Results	The Organization Assessment Results contain an overview of the current state of the State's people, process, and technology design.
	Organization Operating Model	The Organization Operating Model is a visual representation of how the to-be organization will provide service and execute business drivers.
	Organization Transition Approach	The Organization Transition Approach includes the deployment schedule, approach, and timeline, the design of various interim states and headcounts (sizing), and the workforce transition plan.
	Organizational Change Management Strategy	The Organizational Change Management (OCM) Strategy describes how change will be driven for the State to boost end-user adoption of new processes and overall project success.
	Project Team Capability Approach	The Project Team Capability Approach establishes the goals and objectives for the capability transfer program and provides a roadmap to support the deployment of the capability transfer.
	Project Team Capability Plan	The Project Team Capability Plan documents how and when the current capability owner (project team member) and future capability owner (State resource) plan to achieve their capability transfer objectives.
	Project Team Capability Program Launch Materials	The Project Team Capability Program Launch Materials supply selected project team members with detailed information about the capability transfer program and their role and responsibilities, how the program will operate, what templates to use, and a timeline of key milestones.
	Role-Mapping Approach	The Role-Mapping Approach provides the process for conducting role to position mapping and serves as a guideline for all role-mapping activities.

Discipline	Task Deliverable	Task Deliverable Description
	Role-Mapping Results	Role-Mapping Results are provided in a report that documents all role mappings.
	Stakeholder Assessment Report	The Stakeholder Assessment Report provides an overview of how project stakeholders are grouped and aligned to the overall project goals.
	Stakeholder Engagement Plan	The Stakeholder Engagement Plan provides a roadmap for engaging stakeholder groups across each project phase.
	Stakeholder Program Launch Materials	Stakeholder Program Launch Materials support launch activities for stakeholder programs (such as change network, super user, SME programs) and programs for other stakeholders groups that are supporting the project team throughout the engagement.
	Trainer Preparation Materials	Trainer Preparation Materials are used to prepare trainers to deliver end-user training. They are created in addition to end-user training courseware to build trainer awareness, facilitation skills, and knowledge.
	Training Developer Onboarding Materials	Training Developer Onboarding Materials are used to onboard new members of the training development team to the project and their responsibilities.
	Training Development Guidelines	The Training Development Guidelines is the primary reference for individuals developing end-user training courseware on a project, capturing all writing, editing and formatting guidelines, development tool procedures and processes, and the process for reviews, document naming and storage, and change controls.
	Training Development Plan	The Training Development Plan is a management tool that documents the information needed to plan, track, and report on training development activities.
	Training Outlines	Training Outlines present the detailed structure of each instructor-led training (ILT) and web-based training (WBT) course, including its learning objectives, training structure and flow, delivery methods, content outline, instructional strategies, media to be incorporated, and plan for conducting evaluations and managing progress.
	Training Storyboards	Training Storyboards are developed in PowerPoint or Word with reference to a PowerPoint file and provide a layout of the WBT course and each screen contained within the course.
	Train-the-Trainer Program Evaluation Report	The Train-the-Trainer Program Evaluation Report documents the effectiveness of the train-the-trainer program. Depending on the scope of the program and evaluation requirements, the report may include trainer reactions to feelings about the train-the-trainer program, trainer performance data (for example, how trainers scored on course tests, or how they performed during teach-backs), and/or attendance records.
Deployment	Business Freeze Approach	The Business Freeze Approach identifies legacy system transactions that must be temporarily stopped in preparation for production cutover. Since these transactions cannot be entered into the legacy system, alternative procedures must be created in order to allow the business to continue its operations.
	Cutover Plan	The Cutover Plan defines the detailed steps required to convert from a legacy system to a production system. This plan documents the required activities, any dependencies, the resources responsible for the cutover activities, and a schedule for the activities.
	Cutover Strategy	The Cutover Strategy defines the strategy for executing the system cutover from the legacy system to the new system. The Cutover Strategy is the foundation for determining the technical readiness of the new system
	Deployment Plan	The Deployment Plan is a plan that details the schedule of activities to prepare the end users for a successful implementation of the business processes, procedures and systems.
	Deployment Strategy	The Deployment Strategy is a report or presentation that details the approach and activities required to deploy the new system and processes to the State.

Discipline	Task Deliverable	Task Deliverable Description
	Dress Rehearsal Results	The Dress Rehearsal Results is to be used to document the outcome of performing the dress rehearsal. It details areas where issues were discovered and actions taken to resolve them
	Final Cutover Results	The Final Cutover Results document the outcome of performing the final cutover. It details areas where issues were discovered and actions taken to resolve them. Results of the final cutover should also be reflected in the updated version of the Cutover Plan.
	Geographic Scope Statement	The Geographic Scope Statement identifies the geographic regions that are in scope for the project.
	Go-Live Contingency Approach	The Go-Live Contingency Approach is created to mitigate risk during the cutover process.
	Integration Test Approach	The Integration Test Approach outlines the objectives, responsibilities, and testing timeline for integration testing.
	Integration Test Cases	The Integration Test Cases provide the steps for testing each component of the new system in a fully integrated testing environment.
	Integration Test Data	The Integration Test Data deliverable includes the detailed information regarding the identification of data to support integration testing.
	Integration Test Plan	The Integration Test Plan is used to define the schedule of integration testing.
	Integration Test Results	Integration Test Results report the results of the end-to-end business process tests to confirm that all the processes, development objects, converted data, and security integrate successfully.
	Legacy System Decommissioning Strategy	The strategy for legacy system decommissioning addresses the legacy systems to be decommissioned, the planned timeframe, and the approach for archiving and/or retiring data.
	Organization Scope Statement	The Organization Scope Statement establishes the high-level definitions of time, resource, and quality requirements that are included in and excluded from the project.
	Parallel Test Approach	The Parallel Test Approach defines how parallel testing is performed by outlining the objectives, responsibilities, and testing timeline.
	Parallel Test Cases	Parallel Test Cases are used to conduct the operational simulations (for example, entering time).
	Parallel Test Data	The Parallel Test Data deliverable includes the detailed information regarding the identification of data to support parallel testing.
	Parallel Test Plan	The Parallel Test Plan identifies the schedule of parallel testing.
	Parallel Test Results	The Parallel Test Results document the results of executing the Parallel Test Cases, which include the execution, actual results, confirmation, and sign-off of the Parallel Test Cases
	Post Implementation and Evaluation Report	The Post Implementation and Evaluation Report summarizes the post-implementation reviews completed by each of the teams against predefined system stabilization metrics
	Regression Test Approach	The Regression Test Approach defines how regression testing is performed by outlining the objectives, responsibilities, and testing timeline.
	Regression Test Cases	The Regression Test Cases provide the steps for testing each component that was changed after it passed initial testing.
	Regression Test Data	Regression Test Data includes the detailed information regarding the identification of data to support regression testing. Identified data includes the master and transactional data that is required to conduct the in-scope regression tests successfully; including legacy system data needed to test interfaces. Note that converted data should be used when possible.
	Regression Test Plan	The Regression Test Plan identifies the schedule of regression testing.
	Regression Test Results	The Regression Test Results document the results of executing the Regression Test Cases, which contain the execution, actual results, confirmation, and sign-off of the Regression Test Cases.

Discipline	Task Deliverable	Task Deliverable Description
	Release Go/No-Go Criteria	Release Go/No-Go Criteria is a list of criteria defined by project leadership and key State stakeholders that identifies if the system is ready for production and that the State is ready to accept and operate the new system.
	Service Catalog	The Service Catalog defines the scope of services to be delivered by the Service Delivery Organization.
	Service Delivery Access Request Log	The Service Delivery Access Request Log documents all requests to create, modify, or terminate business user and service delivery personnel system access.
	Service Delivery Approach	The Service Delivery Approach identifies the overall objectives, strategy, scope and model for the service delivery organization.
	Service Delivery Framework Assessment	The Service Delivery Framework Assessment documents the assessment results and identifies the changes required to the existing organization, process and tools (generally referred to as framework) to establish or improve the State's Service Delivery capabilities.
	Service Delivery Governance	The Service Delivery Governance includes the organization structure, procedures, standards, and controls required to govern the service delivery organization.
	Service Delivery Incident Log	The Service Delivery Incident Log entries include, but are not limited to the request type, request number, request description, related screenshots, documents, and email, request resolution, and transaction details (for example, request creation date, request assignment details, request close date).
	Service Delivery Infrastructure and Tools	The Service Delivery Infrastructure and Tools outcome is characterized by the completed set up and configuration of the required infrastructure and tools for service delivery operations.
	Service Delivery Knowledge Transfer Application Understanding Document (AUD)	The Service Delivery Knowledge Transfer Application Understanding Document provides the transition team with a single point of reference for self-study of the application or solution area.
	Service Delivery Knowledge Transfer Plan	The Service Delivery Knowledge Transfer Plan documents the approach and schedule to prepare the service delivery team to assume responsibility for the application scope from the existing State, project, and/or third party team.
	Service Delivery Procedures	The Service Delivery Procedures provide a detailed description of action steps, guidelines, tools, and deliverables for each procedure associated to a process.
	Service Delivery Process Design	The Service Delivery Process Design is the detailed documentation depicting the end-to-end process workflow steps including process participant roles, activities, decisions, and results.
	Service Delivery Staffing Approach	The Service Delivery Staffing Approach is a set of guiding principles that helps determine how resources and services that enable the service delivery mission will be sourced.
	Service Delivery Transition Criteria	The Service Delivery Transition Criteria consists of a list that reflects the requirements that must be met before the service delivery team will accept responsibility for the application.
	Service Delivery Transition Exit Criteria	The Service Delivery Transition Exit Criteria consists of the key deliverables of the service delivery solution outlined in the Service Delivery statement of work (SOW).
	Service Delivery Transition Plan	The Service Delivery Transition Plan consists of various transition activities that must occur in order to effectively establish a Service Delivery Organization.
	Service Levels	The Service Levels define the service level objectives (SLOs) and service level agreements (SLAS) that will be used by the service delivery organization to measure and report on the performance of services.
	Site Readiness Checklist	The Site Readiness Checklist is a list of procedures and tasks that must be completed and evaluated before the project is considered ready to go live.
	Software Build and Migration Plan	The Software Build and Migration Plan describe the plan for managing the build and migration activities.

Discipline	Task Deliverable	Task Deliverable Description
	System Outage and Restart Procedures	System Outage and Restart Procedures outline an alternative method for conducting business transactions when the system is not available as well as the procedures for restarting transactions that that temporarily stopped due to the outage.
	System Stabilization Metrics	System Stabilization Metrics are figures and measurements related to the system performance and the efficiency of system users.
	Test Strategy	The Test Strategy presents the test manager with a central artifact to govern the strategic approach to the test effort. It includes the methods, policies, and processes used to facilitate testing activities.
	Test Traceability Matrix	The Test Traceability Matrix maps each test case to a specific in-scope functional or non-functional requirement and provides a record of the requirements that have been captured and tested successfully.
	User-Acceptance Test Approach	The User-Acceptance Test Approach defines how user-acceptance testing is performed by outlining the objectives, responsibilities, and testing timeline.
	User-Acceptance Test Cases	The User-Acceptance Test Cases provide the steps for testing a situation within a test scenario.
	User-Acceptance Test Data	The User-Acceptance Test Data deliverable includes the detailed information regarding the identification of data to support user-acceptance testing.
	User-Acceptance Test Plan	The User-Acceptance Test Plan is used to define the schedule of user-acceptance testing.
	User-Acceptance Test Results	User-Acceptance Test Results contain the complete results of the user-driven process of testing the business functions and processes at a high level.
Development	As-Is Application Landscape	The As-Is Application Landscape is a visual representation of the current applications, including the comprehensive list of applications, application performance, company boundary applications and external entities integrated in the current solution. Details include a brief description, functionality, inputs and outputs, and disposition in the to-be (future state) application footprint.
	Data Conversion Approach	The Data Conversion Approach advises the project manager of the necessary preparation required for a successful migration of data. It defines the methodology that will be used to plan, prepare, and execute data migrations for the duration of the project. The data migration strategy objectives are to define the objectives, scope, and approach of the data migration, identify the processes, resources, and technology to be used within the data migration, describe a high-level schedule of data migration activities, identify potential risks and outline a contingency plan, and define the key assumptions and critical success factors for a successful conversion.
	Functional Object Test Approach	The Functional Object Test Approach defines the approach for testing the software development objects, including the hard-copy forms (if applicable), reports, interfaces, conversions, enhancements, workflows (RICEFW) and portal that were developed during software build, against the Functional Specifications. The Functional Object Test Approach further details the test approach that was documented in the Overall Test Strategy
	Functional Object Test Cases	Functional Object Test Cases document the steps required to test the development of each software development object, to confirm the Functional Specifications were properly coded.
	Functional Object Test Data	The Functional Object Test Data is the test data that is prepared to support the functional unit testing of the software development technical objects, including the hard-copy forms (if applicable), reports, interfaces, conversions, enhancements, workflows (RICEFW) and portal that were developed during the software build tasks.
	Functional Object Test Environment	The Functional Object Test Environment is the non-production environment that is configured and seeded with transactional data to support functional object testing.

Discipline	Task Deliverable	Task Deliverable Description
	Functional Object Test Plan	The Functional Object Test Plan is a detailed schedule that outlines scheduling and resource assignment of cases and steps. The Functional Object Test Plan provides an additional level of detail below the tasks identified in the Work Plan.
	Functional Object Test Results	The Functional Object Test Results ascertain the software development object was developed according to the Functional Specifications. The work product contains the recording and acceptance of the functional object test activities.
	Functional Specifications	The Functional Specifications document the functional design for each functional development object identified in the Software Development Scope. These work products are created from a functional (user) viewpoint rather than technical (developer) viewpoint.
	Integration Exception and Error-Handling Mechanism	The Integration Exception and Error-Handling Mechanism documents the technical and architectural details of all error-handling and reporting mechanisms set up to support the integrated systems.
	Interface and Data Conversion Control Framework	The Data Conversion Control Framework documents the data conversion control activities that are required to meet the data conversion control objectives.
	Interface and Data Conversion Control Strategy	The Interface and Data Conversion Control Strategy documents the guiding principles and assumptions for incorporating data conversion controls into the implementation.
	Interface and Data Conversion Control Techniques	Interface and Data Conversion Control Techniques are documented in the Interface and Data Conversion Control framework to meet the Interface and Data Conversion Control Objectives. There may be more than one technique for each control objective. The status of each of the Interface and Data Conversion Control Techniques is updated as the Interface and Data Conversion Control Framework gets further defined, developed, and implemented.
	Mock Conversion Results	The Mock Conversion Results shows the outcome of each cycle of mock conversion that is carried out prior to integration testing. The results includes information on the cycle, entity, sequence, duration etc.
	Portal Approach	The Portal Approach defines the approach for building the portal solution for the project.
	Portal Solution Design	The Portal Solution Design document provides the portal design details that include the system flow, system landscape and the underlying user administration model.
	Portal Technical Setup	The Portal Technical Setup includes the fully configured portal as well as a Portal Technical Setup document, which addresses the following configuration details: portal content directory (PCD) content development; user administration; search and indexes; PCD naming conventions.
	Software Code	Software Code is programming logic that conforms to the Technical Specifications and Software Development Standards and Guidelines.
	Software Development Architecture	The Software Development Architecture will identify the mapping between each functional object to one or more technical objects. This
	Software Development Scope	The Software Development Scope contains an inventory of functional development objects, including hard-copy forms, reports, interfaces, conversions, enhancements, workflows, portals, business intelligence objects, and data transformation objects that are initially identified in the Project Charter scope section and later refined during the business requirements, process design, and software gap analysis tasks.
	Software Development Standards	The Software Development Standards govern the software development approach and process.
	Software Development Strategy	Software Development Strategy outlines the business and technical objectives along with the high-level roles and responsibilities.
	Technical Infrastructure Scope Statement	The Technical Infrastructure Scope Statement defines the technology that has to be implemented and supported by the project team during the project.

Discipline	Task Deliverable	Task Deliverable Description
	Technical Procedures	The Technical Procedures defines the procedures that must be followed to operate and maintain the technical infrastructure.
	Technical Specifications	The Technical Specifications translate the Functional Specifications into the technical design.
	Technical Unit Test Approach	The Technical Unit Test Approach defines the approach for testing the software development objects, including the hard-copy forms (if applicable), reports, interfaces, conversions, enhancements, workflows (RICEFW) and portal that were developed during software build, against the Technical Specifications.
	Technical Unit Test Cases	The Technical Unit Test Cases document the scenarios and steps necessary to test that the Technical Specifications for each software development object were properly coded.
	Technical Unit Test Data	The Technical Unit Test Data is the test data that is prepared to support the technical unit testing of the software development technical objects including the hard-copy forms (if applicable), reports, interfaces, conversions, enhancements, workflows (RICEFW) and portal that were developed during the software build tasks.
	Technical Unit Test Environment	The Technical Unit Test Environment is the non-production environment that is configured and seeded with transactional data to support technical unit testing.
	Technical Unit Test Plan	The Technical Unit Test Plan is a detailed schedule that outlines scheduling and resource assignment of test cases and steps.
	Technical Unit Test Results	The Technical Unit Test Results confirm the technical effectiveness of the software development object development by comparing the actual results against the expected results documented in the Technical Unit Test Cases, and resolving discrepancies.
	To-Be Application Landscape	The To-Be Application Landscape is a visual representation of the proposed application footprint, company boundary applications and external entities that will be integrated in the future state solution.
	User Experience Approach	The User Experience Approach documents the high-level approach, timeline, deliverables and user-guidelines. It also includes details pertaining to the page flows, site maps and schedules.
	User Experience Guidelines	The User Experience Guidelines documents the functionality and visual design specifications for each focus area within the application.
	User Experience Use Cases	The User Experience Use Cases identifies all the processes and the corresponding use cases pertaining to user experience. The catalog should also include the roles, system, and owner for each use case.
	User Interface Information Architecture	The User Interface Information Architecture documents the site map and the sequence of screen flow that show which screens a user would navigate through to complete a process.
	User Persona	The User Persona provides a list of typical target users and describes how they will be using the system based on the compilation of information from the user research.
	User Research	The User Research document provides the details about the people that are interviewed, their job profile, key requirements, usage pattern and other functions they perform.
	Visual Design	The Visual Design documents the approved user interface details, screen headings and the corresponding description.
	Wireframes	The Wireframes will document the page layout and the location of content within the page, in the form of sketches. It should also include interface elements and navigational systems and how they work together.
Information Management	Business Information Model	The Business Information Model deliverable defines how business requirements are translated into a physical implementation. The model ties each business requirement and its information needs into smaller data elements and provides the construct for implementing and tracking conceptual, logical and physical data models.

Discipline	Task Deliverable	Task Deliverable Description
	Business Intelligence Approach	The Business Intelligence Approach defines the high-level development steps, roles and responsibilities and BI reporting solution components that meet the needs of the project.
	Business Intelligence Data Architecture	The Business Intelligence Data Architecture results from configuring the data extracts, transformations, and loads (ETLs) from the Data Architecture design.
	Business Intelligence Data Modeling Standards and Guiding Principles	The Business Intelligence Data Modeling Standards and Guiding Principles describe design considerations for data modeling that promote optimal performance, quality, and consistency.
	Business Intelligence Development Standards	The Business Intelligence Development Standards provide guidance for code development, configuration management, documentation, and naming. The standards should be developed for scorecard and dashboard, operational and management and external reporting types.
	Business Intelligence Reports	The Business Intelligence Reports are the actual information delivery interfaces through which the users retrieve the data specified in the scorecard and dashboard, operational and management and external reporting specifications.
	Conceptual Data Model	The Conceptual Data Model is an abstract-level data model diagram that illustrates the relationship between different data entities across the enterprise. The high-level entity-relationship diagram (ERD) identifies the distinct entities required to fulfill the data requirements for the project the relationships among the entities.
	Data Analysis Report	The Data Analysis Report provides a complete picture of the current quality of the source data. This report provides details about the data's completeness, accuracy, and integrity, which are used to help derive the cleansing rules for the data.
	Data Architecture Design	The Data Architecture Design documents the future enterprise data architecture and the high-level interaction of systems. This design is comprehensive and includes all enterprise information management components, for example, business intelligence, data warehousing, enterprise data management, and enterprise content management.
	Data Cleansing Approach	The Data Cleansing Approach is an estimation of how much data cleanup effort is required within the legacy system as well as a detailed approach to this effort. Each type of master data or transaction data that requires cleanup requires a strategy, which should include legacy system data elements (down to the field level), estimation of data cleanup effort and timeline, and identification of who will perform the data cleanup.
	Data Cleansing Plan	The Data Cleansing Plan describes the activities, resources, and schedule needed to perform a one-time cleanup of legacy data. It includes detailed tasks, resource estimate and timeline, and roles and responsibilities, and any steps taken to address data confidentiality or PII issues.
	Data Cleansing Rules	The Data Cleansing Rules document the rules to follow when fixing data quality issues.
	Data Integration and Conversion Programs(Data Store Object)	The Data Integration and Conversion Programs contain the data transformation logic that applies when data is moved from the source systems to the target data warehouse. They conform to the data integration and conversion Technical Specifications, development standards, and guidelines.
	Data Integration Approach	The Data Integration Approach provides a high-level description of the data integration solution that will meet the needs of the State. It defines standards for data integration development.
	Data Sourcing Approach	The Data Sourcing Approach documents how to identify the source systems of record for the various current and historical data elements. It also identifies the systems that will publish the enterprise data in the design.

Discipline	Task Deliverable	Task Deliverable Description
	Enterprise Data Scope	The Enterprise Data Scope describes the scope of enterprise data entities and defines which enterprise data attributes will be common across all legal entities and business units and which ones will be defined at the local level. This document includes identification and consideration of in-scope business units, geographical and functional locations, and business processes.
	Enterprise Master Data Solution	The Enterprise Master Data Solution provides a single source of reference information for each master data dimension as established in the implementation and design documents. It contains all the programs, workflows and processes for ongoing maintenance of master data solution.
	Information Capabilities Assessment	The Information Capabilities Assessment is a collection of several maturity models that are used to measure where the client is with respect to its information management environment overall or within a key area (for example, enterprise data management, enterprise content management, or business intelligence and data warehousing).
	Information Governance Policies	The Information Governance Policies document provides the overall design of governance policies to be applied for information governance across the State.
	In-scope Privacy Requirement Sources	The In-Scope Privacy Requirement Sources document provides a list of representative privacy requirement sources identified and prioritized by the State for the engagement.
	Logical Data Model(SAP BW)	The Logical Data Model is a detailed entity-relationship diagram that identifies the grouping of specific data into carefully reasoned entities, the relationships among those entities (primary key relationships), and additional relationships among the data themselves (foreign-key relationships).
	Master Data Management Approach	The Master Data Management Approach establishes the high level Master Data Management Approach (MDM) strategy and design, policies and procedures, roles and responsibilities, and scope of tracking and maintaining single versions of master data included in a project.
	Master Data Object Scope	The Master Data Object Scope lists all the master data objects that are in scope along with their business definition and historical data conversion needs.
	Metadata Glossary	The Metadata Glossary documents the business definitions, sources, and ownership for the metadata, particularly where gaps exist between the delivered BI solution and the State's requirements
	Physical Data Model	The Physical Data Model explicitly describes the physical structures that will hold project data: the database table names, column names, physical data types, referential integrity constraints, primary and foreign key constraints, and any characteristic of the solution that is physically manifested in a database.
	Privacy Business Process Gap Analysis	The Privacy Business Process Gap Analysis documents the identified gaps associated with the control objectives and the requirements of laws, policies, and regulations.
	Privacy Data Flow Maps	The Privacy Data Flow Maps is a visual representation that communicates how personal information is collected, stored, used, transferred, and destroyed. Data flow maps can also show associated control objective requirements within each stage of the data life cycle.
	Privacy Governance Gap Analysis	The Privacy Governance Gap Analysis report provides a snapshot of the privacy gaps identified as part of the privacy governance workshops. The deliverable provides a list of gaps, grouped into the privacy framework that was used for rationalization of requirements and development of controls, categorization of gaps, and optionally, examples of jurisdictions or interviews in which the gaps were noted.
	Privacy Requirements and Control Activity Framework	The Privacy Requirements and Controls Framework document provides a harmonized set of privacy requirements and outliers for State identified and prioritized representative privacy requirement sources, utilizing a consistent risk-based approach.

Discipline	Task Deliverable	Task Deliverable Description
	Privacy Roadmap	The Privacy Roadmap documents the approach for the State to establish and implement its privacy strategy and remediate enterprise privacy governance related gaps.
	Privacy System Gap Analysis	The Privacy System Gap Analysis deliverable summarizes the functional and technical recommendations for the seeded and custom objects analyzed for an enterprise application.
	Semantic Layer Technical Design	The Semantic Layer Technical Design provides the details necessary to build and implement the semantic layer application that satisfies the reporting requirements.
	Semantic Layer	The Semantic Layer is typically constructed in the business intelligence tool of choice. The semantic layer can consist of various layers including a physical layer that maps directly to the physical data store and a business layer that organizes the data using business terms and in logical groups recognizable by the business users. The Semantic Layer also includes data relationships, cardinality, and metadata.
	To-Be Master Data Design	The To-Be Master Data Design identifies all data entry fields required to support the master data creation and maintenance.
Project Management	Action Items Log	The Action Items Log is a spreadsheet used to log, evaluate, execute, monitor, control, and close project action items
	Budget and Cost Tracking	The Budget and Cost Tracking asset is a time-phased budgeting spreadsheet that is used to plan, track, and manage financial costs on a project.
	Change Requests Log	The Change Requests Log is a spreadsheet used to log, analyze, and manage project change requests through the project's defined change control process.
	Decisions Log	The Decisions Log is a spreadsheet used to capture, analyze, manage, monitor, and control day-to-day and formal project decisions
	Deliverable Acceptance Form	The Deliverable Acceptance Form is used to document formal deliverable acceptance from the State, or the reasons why the deliverable is not accepted.
	Deliverables Log	The Deliverables Log defines the complete list of deliverables signed off by the State for a project, and includes the plans for deliverable review, deliverable sign-off, and formal deliverable acceptance for each deliverable.
	Issues Log	The Issues Log is a spreadsheet used to log, evaluate, monitor, control, and close project issues.
	Kick-off Deck	The Kick-off Deck is the presentation reviewed at the project and phase kick-off meeting, intended to educate project stakeholders on the project objectives
	Master Plan	The Master Plan is the high-level schedule that defines the major releases and phases of a project, and includes major activities and milestones.
	Phase-end Review Report	The Phase-end Review Report documents milestone accomplishments, risks and issues impacting the next phase, metric trends, process improvements, lessons learned, and other key findings over the course of a project phase.
	Project Charter	The Project Charter documents the vision, goals and expected benefits of the project, as well as the project approach, end-product scope, project schedule, dependencies, assumptions, constraints, and other important information.
	Project Closure Report	The Project Closure Report summarizes project closure activities and provides the final internal document of record for a project.
	Project Management Plan	The Project Management Plan represents a vital project management document created during initial project planning and maintained throughout the life of the project. It is a comprehensive plan for how the project is organized and how it will be executed, monitored and controlled.

Discipline	Task Deliverable	Task Deliverable Description
	Project Staff Support Materials	Project Staff Support Materials provide documents that can be used to help onboard and off board project team members properly.
	Project Status Report	The Project Status Report provides a recommended PowerPoint template that can be used to report weekly project progress and performance.
	Project Team Training Log	The Project Team Training Log documents the training delivered on a project, following plans defined in the Training and Skills Acquisition table in the project's Project Management Plan.
	Project Tools	Project Tools represent the software and web-based tools the project will use to deliver a successful project, including all the tools used to design, build, test, and deliver the project solution.
	Project Tools Strategy	The Project Tools Strategy documents the analysis, strategy and detailed plans for the project tools selected by the project to support the development, deployment, and ongoing maintenance of the statewide solution.
	Resource Plan	The Resource Plan is used to plan and manage labor resources for the project.
	Risks Log	The Risks Log is a spreadsheet used to log, analyze, and manage project risks throughout the life of the project.
	Supplier Agreement	The Supplier Agreement represents the contractual agreement between the project and a 3rd-party vendor. The final Supplier Agreement should include the supplier scope of work (product specifications and requirements), deliverables, acceptance criteria, schedule, cost, and other terms and conditions for the agreement.
	Work Plan	The Work Plan is a deliverables-based execution plan showing the responsibilities, dependencies, schedule, and planned effort for a set of tasks.
Process and Application	Baseline Configuration	Baseline configuration includes sufficient configuration so that the development team can begin development unit testing.
	Batch Job Schedule	The Batch Job Schedule outlines the chronological execution of batch jobs taking into account the frequency, timing, and dependencies of all batch jobs to be run.
	Batch Jobs Definition	The Batch Jobs Definition identifies batch job requirements such as batch job name, characteristics, execution timing, frequency, run time, and dependencies. The Batch Jobs Definition is used to build the batch schedule.
	Business Continuity Process	The Business Continuity Process will outline the critical business functions that require a work around solution in the event of a system interruption. It further explains each work around design and how it will function when it is executed.
	Business Events and Event Conditions	The Business Events and Event Conditions provide input to the To-Be Process Design, ensuring that the process and sub process flows of the process groups (in a standard functional decomposition model) or end-to-end process scenarios (in an end-to-end model) account for all events and event conditions. A business event is an activity that occurs outside the scope of the project's business processes that triggers work within the project scope. Business events can be categorized as user-, time-, or system-based.
	Business Process Controls Framework	The Business Process Controls Framework documents business process controls objectives and controls techniques. It will consist of a controls matrix for business process controls objectives and business process controls techniques to help the client mitigate risks associated with the to-be processes. The design of the business process controls techniques must contain efficient, effective techniques that address business risks and meet the business process controls objectives, thereby mitigating the exposure to risk. Techniques should address the various State specific risks as identified in the Security, Privacy, and Controls Strategy. The objective of this deliverable is to design or re-align the control environment in the context of the system implementation and redesigned business processes.

Discipline	Task Deliverable	Task Deliverable Description
	Business Process Controls Verification Tracker	The Business Process Controls Verification tracker is used to document Business Process Controls verified during the realization-test phase of the Project.
	Business Process Procedures	Business Process Procedures outline post go-live maintenance and update procedures for the production instance.
	Business Role Definition	The Business Role Definition is the list of business roles defined during process design workshops. Business roles are grouped by functional area and are often written in object-action format (e.g. Goods Receiver or Invoice Approver).
	Configuration Control Values	The Configuration Control Values deliverable identifies control values for master data fields and describes how they support the overall design. This deliverable also provides a list of configuration recommendations and specific values for each control value type.
	Configuration Design	The Configuration Design outlines what will be configured for each sub process to enable the transactions to be executed according to the Requirements and To-Be Sub-process Design. In addition, it describes the rationale behind the design decisions. The Configuration Design is the input to configuration in the Build phase. The Configuration Design should provide sufficient information to be able to configure the system when used in conjunction with the Enterprise Structure and Configuration Control Values.
	Configuration Plan	The Configuration Plan outlines the activities needed to perform configuration taking into account the Configuration Design, dependencies, and the overall Project Plan.
	Configuration Unit Test Approach	The Configuration Unit Test Approach documents how to conduct configuration unit testing on a project. This plan captures an agreed-to process among the various project teams and describes configuration unit testing scope, role requirements, timeline, and testing logistics. Configuration unit testing only focuses on software configuration-related items (such as transactions and standard programs).
	Configuration Unit Test Cases	Configuration Unit Test Cases align with Requirements. These test cases will focus on testing the individual system components (transactions) to confirm they fulfill the configuration designs.
	Configuration Unit Test Data	The Configuration Unit Test Data includes the master and transactional data that is required, per the testing scope, to conduct the configuration unit test. Test data should be thought through in advance and be representative of common business data for this project to confirm adequate testing of relevant variables during unit testing.
	Configuration Unit Test Plan	The Configuration Unit Test Plan is used to identify the steps each team must follow when conducting configuration unit test cases. The plan assists the team scheduling configuration unit test cases within a specified time frame, using available resources, to meet performance and technical standards.
	Configuration Unit Test Results	The Configuration Unit Test Results provide confirmation that the individual functions within the system are configured correctly, and can be successfully performed. Unit testing is conducted for each system task within a To-Be Sub-process Design flow. This proves readiness for string testing and integration testing.
	Enterprise Structure	The Enterprise Structure maps the State's organizational units to the software's structural elements. The Enterprise Structure provides workshop materials, recommendations, naming standards, and a descriptive model of the enterprise's organizational units, including their hierarchical relationships
	Final Configuration	Final Configuration is the completion of the configuration of the software package according to the Configuration Design and To-Be Sub-process Designs.
	Package Functional Scope Statement	The Package Functional Scope Statement clearly defines the software functionality that is in scope for the project. On an ERP project, for example, this would include the modules to be implemented for the selected software and all third-party (or interfacing) components

Discipline	Task Deliverable	Task Deliverable Description
	Process Scope Statement	The Process Scope Statement establishes the high-level definitions of time, resource, and quality requirements that are included in and excluded from the project.
	Process Vision	The Process Vision includes the project background, current situation, vision themes, vision statement, preliminary conceptual design, building blocks, and targets.
	Prototype Approach	The Prototype Approach documents how, when, and where the prototype may be conducted. This approach captures an agreed-to process among the various process teams and describes the high-level scope, role requirements, timeline, and logistics.
	Prototype Results	The Prototype Results capture the information resulting from the conducted prototype. The Prototype Results include the scenario prototyped, logistics detailed, feedback, and approvals obtained.
	Prototype Scenario	The Prototype Scenario provides the exact details of how each prototype may be conducted, including business requirements, execution steps, system, transaction information, and data requirements.
	Requirements Management Plan	The Requirements Management Plan documents the processes for development and management of requirements throughout the life of the project.
	Requirements Trace Matrix	The Requirements Trace Matrix facilitates the effort required to design, build, test, and implement business processes. Requirements for each process and the supporting business rules or assumptions are defined.
	Security, Privacy, and Controls Approach	The Security, Privacy, and Controls Approach defines the how, what, when, and who of the business process controls implementation.
	Security, Privacy, and Controls Governance Approach	The Security, Privacy, and Controls Governance Approach outline how governance regarding how the business process controls and security environment may be maintained over time.
	Security, Privacy, and Controls Risk Assessment	The Security, Privacy, and Controls Risk Assessment provides a detailed analysis of the current security, privacy, and controls risk environment within these areas: Business Processes, existing Security and Controls, Information Technology (e.g., interfaces, data conversions), and Data Privacy.
	Segregation of Duties and Sensitive Access Matrix	The Segregation of Duties and Sensitive Access Matrix is created to track the agreed upon rules that may be applied to the system environment.
	Segregation of Duties Tracker	The Segregation of Duties (SOD) Tracker captures SOD conflicts, mitigating controls, and remediation techniques that result from the SOD assessment.
	String Test Approach	The String Test Approach documents how to conduct string testing on a project. The String Test Approach bridges unit testing and integration testing, during which the teams begin to integrate related pieces of functionality into a single test without testing the overall end-to-end process.
	String Test Cases	String Test Cases are the list of all the test cases that are going to be loaded in to the testing tool. Each test case represents a sub-process.
	String Test Data	The String Test Data includes the master and transactional data that is required, per the testing scope, to conduct the string tests.
	String Test Plan	The String Test Plan is used to define the schedule of string testing. This includes the creation of test sets, sequencing of test cases within a set, assignment of resources, and planned execution
	String Test Results	The String Test Results describe the execution, actual results, confirmation, and sign-off of the String Test Cases, which target a series of transactions and custom development within a specific process or sub-process (level 2 or level 3 within the business process model).

Discipline	Task Deliverable	Task Deliverable Description
	To-Be Process Design	The To-Be Process Design describes the process, inputs, outputs, and key integration points with other process groups and processes, technology components, organization components, associated policies, and performance measures.
	To-Be Process Group Design	The To-Be Process Group Design is the first of three levels of process flows. It describes the process group, key integration points with other process groups, technology components, organization components, and performance measures for the desired process environment. It also identifies process scope, detail leading industry practices, quick wins and long term opportunities so that to be processes and to be sub-processes can be designed.
	To-Be Sub-process Design	The To-Be Sub-process Design provides a detailed description of all the steps required to execute a sub-process. It includes system and non-system steps, supporting documents and reports, and authorization policies.
Quality Management	Baseline Form	The Baseline Form is used to identify and document the configuration items included in a project baseline and corresponding configuration management assessment. Baseline assessment plans are documented in the Configuration Management Plan.
	Confidential Information Management Plan	The Confidential Information Management Plan (CIMP) is a document that details the access requirements and characteristics for State confidential information, and the plans to safeguard that information. The CIMP serves as the standard operating procedures (SOPs) for the team on data elements, access procedures, storage, safeguards, onboarding, data retention, and so on.
	Configuration Management Assessment Checklist	The Configuration Management (CM) Assessment Checklist is a comprehensive assessment checklist designed to support all configuration management assessment types, including in-process comprehensive, in-process sampling, functional and physical CM assessments.
	Configuration Management Plan	The Configuration Management Plan defines the project's control environments and mechanisms for configurable items, as well as the processes and procedures to manage and maintain all project deliverable configuration items throughout the life of the project. The Configuration Management Plan may be completed and signed off during initial project planning, and can be updated and maintained throughout the life of the project.
	Non-Compliance Tracking Log	The Non-Compliance Tracking Log is used to record and manage project process and asset non-compliances identified during quality assessments performed as part of quality assurance activities.
	Quality Management Plan	The Quality Management Plan describes the project's quality program and objectives, as well as specific plans for how the program may be executed on the project
	Specialist Support Report	The Specialist Support Report documents the results of a specialist support visit.
	Tailoring Log	The Tailoring Log is used to document the specific processes and assets that have been tailored for the project.
Technology	Built System	The Built System is the installed and configured infrastructure (hardware, applications and software tools) along with the associated processes needed to manage it.
	Existing Security Environment Summary	The Existing Security Environment Summary document is created to identify any existing security controls\measures that are implemented in the as-is system. The Existing Security Environment Summary lists specific security design characteristics of the existing system that support the requirements gathering procedures of the Security and Controls team. Each of these characteristics are documented, tracked and incorporated into security requirement discussions (e.g., workshops) for the to-be security design.

Discipline	Task Deliverable	Task Deliverable Description
	General Information Technology Control Framework	The General Information Technology Control Framework documents the information technology control activities that are required to meet the information technology control objectives. There may be more than one activity for each control objective. The status of each of the information technology control activities is updated as the Information Technology Control Framework gets further defined, developed, and implemented.
	General Information Technology Control Standard Operating Procedures	The General Information Technology Control Standard Operating Procedures is a controls framework template that provides the implementation team with a detailed procedure on how to the approach designing and developing information technology controls and how to update and maintain the information technology controls.
	Identity and Access Management Configuration Tracker	The Identity and Access Management Configuration Tracker helps track the installed, configured, and operational IAM solution components. This includes the configuration files and log files.
	Identity and Access Management Current Environment Assessment	The Identity and Access Management Configuration Tracker helps track the installed, configured, and operational IAM solution components. This includes the configuration files and log files.
	Identity and Access Management Operations Manual	The Identity and Access Management Operations Manual provides operations and maintenance procedures for identity and access management administrators and others responsible for ongoing management and support of the Identity and Access Management solution.
	Identity and Access Management Roadmap Document	The Identity and Access Management Roadmap Document defines the IAM framework needed to align with the desired target state, and details the implementation plan of the IAM solution.
	Identity and Access Management Solution Configuration	The Identity and Access Management Solution Configuration contains the configurations and customizations to the identity and access management solution that address identified functional and technical requirements.
	Identity and Access Management Solution Design Document	The Identity and Access Management Architectural Views define the main functional components of the solution architecture, the interaction of these components with external entities, the information that is managed, stored, and presented, the hardware and software components, and the deployment environments.
	Identity and Access Management Test Results	Identity and Access Management Test Results record the findings of the test effort and subsequently calculate the different measures of testing, providing an assessment of the quality of the solution and the status of the test effort.
	Infrastructure Operation Report	The Infrastructure Operation Report contains data and corresponding data analysis of the operation of the systems
	Logical Infrastructure Design	The Logical Infrastructure Design documents how the technical infrastructure scope may be implemented and depicts the elements that comprise the infrastructure such as facilities, hardware, software, tools, applications, networks, availability, backup, and disaster recovery components.
	Performance and Stress Test Approach	The Performance and Stress Test Approach documents the test scope, preparation, key dependencies, exit criteria, testing process and timeline, and number of cycles.
	Performance and Stress Test Cases	Performance and Stress Test Cases document the detailed steps for executing the script, the data to be used for each step, and expected results for each step.
	Performance and Stress Test Data	The Performance and Stress Test Data includes the master and transactional data that is required to conduct the in-scope performance and stress tests successfully.
	Performance and Stress Test Environment	The Performance and Stress Test Environment enables the technical team to confirm that the performance of the to-be system meets requirements.
	Performance and Stress Test Plan	The Performance and Stress Test Plan identifies the steps each team must follow in order to execute performance and stress testing.

Discipline	Task Deliverable	Task Deliverable Description
	Performance and Stress Test Results	The Conduct Performance and Stress Test is the final step in the overall framework for performance and stress testing.
	Physical Infrastructure Design	The Physical Infrastructure Design contains implementation-level details for how the technical infrastructure can be built and identifies the physical elements that may be installed such as facilities, hardware, software, tools, applications, networks, availability, backup, and disaster recovery components.
	Physical Infrastructure Test Approach	The Physical Infrastructure Test Approach describes the process for executing physical infrastructure testing, identifies the scenarios that mayl be tested, and documents the other requirements for testing including cases, data, environment, and schedule needs
	Physical Infrastructure Test Cases	The Physical Infrastructure Test Cases document the detailed steps for executing the script, the data to be used for each step, and expected results for each step.
	Physical Infrastructure Test Data	The Physical Infrastructure Test Data includes the information required to execute testing and/or verify the results.
	Physical Infrastructure Test Environment	The Physical Infrastructure Test Environment is the collection of components, tools, settings, etc. that testing is to be performed upon.
	Physical Infrastructure Test Plan	The Physical Infrastructure Test Plan assigns responsibility for and schedules the execution of the physical infrastructure tests.
	Physical Infrastructure Test Results	The Physical Infrastructure Test Results are the evidence of test case execution.
	Production Security Configuration Checklist	The Production Security Configuration Checklist identifies required system security settings/parameters and a signoff field to indicate the individual responsible for the configuration and the date completed.
	Production Support Security Role Design	Production Support Role Design identifies requirements for security roles utilized by the appropriate security end-users to enable post go-live support activities.
	Production Support Security Roles	Production Support Security Roles include configured security roles to support post go-live production support activities.
	Production User Accounts	Production User Accounts are individual user application accounts that are mapped to the base security roles and configured in the production environment.
	Project Team Application Security Role Design	The Project Team Application Security Role Design is developed to provide a blueprint for the development of Project Team Application Security Roles used by project team members throughout the course of the implementation in non-production system environments.
	Project Team Application Security Roles	The Project Team Application Security Roles are made available to members of the project team assisting in the system responsibilities of the implementation.
	Security Access Procedures	The Security Access Procedures deliverable defines the approach for the provisioning of user access to the technology solution.
	Security Access Process	The Security Access Process details the post go-live user access process based on the Security Access Procedures document.
	Security Base Role Design	The Security Base Role Design identifies security roles that are aligned to the to-be process flows and contain the appropriate functional tasks for each role based on the business requirements identified in the design workshops.
	Security Base Roles	The Security Base Roles are the configured base security roles that are created by building the appropriate security objects for application security roles as defined in the Security Base Role Design
	Security Job Role Design	Security Job Role Design groups the individual Security Base Role Designs in business job roles or positions.
	Security Job Roles	Security Job Roles include configured security roles based on business job functions or positions
	Security Unit Test Approach	The Security Unit Test Approach documents the approach for testing the production application security.

Discipline	Task Deliverable	Task Deliverable Description
	Security Unit Test Cases	Security Unit Test Cases provide a detailed outline for the business process teams to perform unit testing on the proposed security roles gathered during design.
	Security Unit Test Data	The Security Unit Test Data documents test data identified by the functional teams that needs to be created in order to conduct application security testing in the test environment.
	Security Unit Test Environment	The Security Unit Test Environment documents all users, security roles, and additional functional team data that were used to setup the environment.
	Security Unit Test Plan	The Security Unit Test Plan documents the work plan for unit testing production application security.
	Security Unit Test Results	The Security Unit Test Results document details outcomes of the application security role unit testing, such as expected results, actual results, pass/fail determination, and tester and date test executed.

13   Appendix B – On-premise vs Virtual Private Cloud Deployment Approach

13.1   Deployment options

The following figure provides an overview of suitable deployment options for the statewide ERP system.

	Traditional On Premise	Private Cloud	Managed Private Cloud	Virtual Private Cloud
Managed by	Client	Client	Cloud Provider	Cloud Provider
CapEx/OpEx	CapEx	CapEx	CapEx/OpEx/Lease	OpEx
Facility site	Client Location	Client location	Client/3rd Party/ HP	Client Option
Elasticity	Client funded	Client funded	Client funded	Base and burst
SLAs	Internal client	Interal client	Negotiated	Standard & tiered
Security	Client defined	Client defined	Client defined	Standard w/ options
Order type	HW/SW PO	HW/SW PO	HW/SW PO	Managed service PO
Minimum unit	Product SKU	Product SKU	Product SKU/month	Base commit/monthly

Workloads

Enterprise Apps	✓	✓	✓	✓
New Apps	✓	✓	✓	✓
Development/Test	✓	✓	✓	✓
Burst capacity				✓

A cloud based solution (Platform as a Service - PaaS) is a consideration to host the physical infrastructure. There are variations to a PaaS offering which are as follows:

- Private Cloud (the hardware is owned by the Service Provider but can also be owned by the State);
- Managed Private Cloud (just like Private Cloud but includes all managed infrastructure and SAP BASIS services);
- Public Cloud (the hardware is owned by the Service Provider but is shared with multiple tenants); and
- Virtual Private Cloud via a consumption based PaaS model (the State is billed per usage of compute and storage and can include a managed services component)

13.2   VPC (Virtual Private Cloud)

There are different offerings/models as described above that are operational expenses (opex) with the following characteristics;

- Can include managed services component that covers infrastructure and SAP BASIS services;
- Service providers have to be HANA certified;
- Data Center Tier level is a requirement (for SAP HANA to be hosted, the minimum requirement is a Tier 4 data center);
- The contract offered will have a minimum legal bind;

- The State might not have the option to choose their own hardware and will have to accept the hardware that the Service Provider offers;
- The Service Provider needs to partner with a mature network provider to provide the required connectivity to the States' sites; and
- The Cloud offering has to include Disaster Recovery since there is a live replication requirement for DR with HANA

13.2.1   Assumptions

The following lists the assumptions for the Virtual Private Cloud deployment options:

- Solution includes 10Gbps dedicated redundant network links for replication of data between the primary and secondary data center
- Solution includes 10Mbps redundant internet bandwidth for end client personnel to access the environment
- Two site-to-site IPSec VPN connections, assuming one each for System Integrator and end client. System Integrator and end client need to have IPSec VPN termination device at their end.
- Includes 30 days of file system backup for all HANA devices & non-HANA servers.
- Two load balancer instances in each VPC data center
- HANA appliance server sizing is based on virtual servers
- Tier 1 or 2 storage to be used for all VPC non-HANA servers
- File system backup for non-DB servers.
- File system and DB backup for DB servers.
- Customer IP address to be included for HANA devices
- Full database backup to be performed three times per week
- Full file system backup frequency is once per week
- SAP restricts virtualization for production Suite on HANA and production BW on HANA to one virtualized node
- VPC Production Servers have an SLA of 99.9%. All other VPC environments have an SLA of 99.0%
- Software licenses for Operating System and Virtualization are included in the monthly hardware cost

The estimated cost for the VPC deployed physical infrastructure is based on the estimated deployment schedule and includes the compute & storage resources with a five year refresh cycle. In addition it includes all dedicated and shared data center and network infrastructure provided by the service provider including managed software for operating system, virtualization, security, logging, provisioning, etc…

VPC	
Year	Costs in (000s)
1	$31
2	$986
3	$2,381
4	$2,274
5	$2,172
6	$2,095
7	$2,029
Total	$ 11,965

In order to provide a comparison between the On-Premise and VPC option, there are a number of factors that must be considered outside of the pure hardware costs. As discussed above the VPC option includes not only the hardware required to support the system, but the administration and management up to the system software level as well. Note that all factors associated with deployment of the on-premise approach have been included in the summary budget estimates within section 8 of this document. The break out of costs detailed below is to present the overall costs for the on-premise and VPC options in a side by side comparison. The following factors are included as part of this side by side comparison:

- Hardware – While there is a "purchase" requirement under the on premise model with a high up front cost, under a VPC the service provider assumes responsibility for system service level agreements and performance based on defined system parameters (such as data traffic, number of users, and number of transactions. As such, the HW cost is "included" within the VPC estimates and charged as a monthly recurring cost.
- System Software – For the on-premise model, the state would need to purchase system operating and virtualization software to support the physical infrastructure. Under a VPC model, the cost of this software is included within the bundled estimates.
- Floor Space – The on-premise model would require a physical location to house the hardware and provide the required level of environmental and security needs. This includes items ranging from the cost of the physical space to air conditioning and electricity costs. In addition, as part of the OITS shared service model this includes base level service support up to the system software level. Again, under a VPC model, these costs are included within the bundled service cost.
- Network – While the on-premise model would require some degree of investment to upgrade the state's network, the VPC model would need a more significant investment. This is due to the need for higher levels of bandwidth as a result of interaction with the solution occurring in the "cloud" and need for redundant communication channels (MLPS and IPSEC VPN).
- Technical Support – Both deployment models include basic technical operations and maintenance support that includes data center, network, and hardware components up to the system software level. The States OITS shared service model provides these basic technical services in the on-premise deployment model while in the VPC deployment model the service provider is responsible. The cost for OITS shared service model has been included in the cost

factor used to calculate the floor space based on the estimated deployment schedule. The VPC model includes this cost within the bundled service cost.

13.3 Additional cost factors for on-premise

In order to accurately compare on-premise vs VPC the following additional cost factors for on-premise need to be considered.

In addition to the hardware cost an investment in software licenses for the Operating System (Red Hat Linux) and Virtualization (VMWare) is required in the on-premise deployment model.

System software license	
Component	**Costs in (000s)**
RedHat Enterprise Linux and	$ 3,656

This investment has been estimated for a total of seven years and is based on list price provided by software vendor. Additional details on the software license investment can be found in section 8.4 Software Costs.
It is anticipated that the State can procure the actual software licenses at a substantial discount. Operating system and virtualization software licenses are usually procured together with the hardware they are running on.

The floor space cost in the existing State owned data centers has been estimated based on information provided by the State. The cost model utilizes a cost factor per physical server as well as deployed virtual container and includes indirect cost such as electricity and cooling. Based on the deployed on-premise infrastructure the following cost was estimated.

Floor Space for deployed infrastructure	
Component	**Costs in (000s)**
Based on physical server and virtual container count	$ 6,893

The estimated total cost is for seven years and is based on estimated deployment schedule of the environments and systems.

13.4 Cost comparison

The total cost for the on-premise deployment of the infrastructure includes in addition to the hardware cost the required system software licenses, network investment, and floor space cost in the existing data centers. The table below outlines the total cost for seven years with a comparison to the Virtual Private Cloud deployment option.

All numbers below are expressed in $000s.

Cost component	On-premise	Virtual Private Cloud
Hardware	$4,572	
System Software	$3,656	$8,138
Floor Space	$6,893	
Network	$550	$3,827
Totals	**$15,671**	**$11,965**
Potential savings		$3,707

Labor cost for the technical operation and maintenance of the ERP systems hardware and software components has been estimated based on resources staffed onsite at State premises. In both deployment options the responsibility of the technical support team includes the databases and applications of the ERP system. Responsibility for the actual hardware, network, and shared data center components lies with the hosting provider (State operated or Virtual Private Cloud service provider) and includes the support and maintenance of the system software (Operating System and Virtualization). This responsibility is reflected in the cost estimated for the floor space in the on-premise model and included in the hardware cost of the Virtual Private Cloud model.

The table below outlines the estimated total cost for the project lifecycle for onsite resources for technical operational and maintenance support based on the estimated deployment schedule.

Component	Cost in (000s)
Labor cost for technical operational and maintenance support	$7,674

The responsibilities of the technical operational and maintenance support staff include but are not limited to:

- SAP Database installation and maintenance;
- SAP Database administration and security;
- SAP Application installation and maintenance;
- SAP Basis operations service;
- SAP Basis administration (Java and ABAP Stack);
- SAP Basis security management;
- SAP Platform administration;
- SAP Backup and Restore management;
- SAP Workload Management;
- SAP Job Scheduling; and
- SAP Operational Security Management

Significant cost savings could be anticipated if the technical operational and maintenance support is provided by offshore resources or by the Virtual Private Cloud provider.

14   Appendix C – Next Steps Project Plan

Next Steps
(Implementation Plan

15   Appendix D – Resources

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16   Appendix E – Consolidated Assumptions

Below is a list of consolidated assumptions related to this deliverable:

General

- Costs estimates were produced for budget purposes based on available information and defined scope of work. Additional refinement of requirements, implementation timeline or approach, scope of implementation, allocation of state resources, deployment strategy, included agencies, or ERP vendor selection would result in variations to the budget estimates.
- Vendor costs were based on market data and previous experience for projects of similar size and scope. While a conservative approach was taken for cost items (integrator, software, hardware, etc.), fluctuations can occur based on actual bids, contracting terms, and shifts in the market.

Implementation Costs:

- State and contractor split – 60% state employees and 40% contractor
- Hourly Rates – State employee $49, Contractor $170, and Integrator $175 (fully loaded including expenses)
- Annual Cost of Living (COL) adjustment – 3%

Hardware Costs – On Premise

- Solution utilizes existing network bandwidth capabilities of 10Gbps dedicated network links for replication of data between the primary and secondary data center
- Includes 30 days of file system backup for all HANA devices & non-HANA servers.
- Two existing F5 load balancer instances in each data center
- HANA appliance server sizing is based on virtual servers
- Tier 1 or 2 storage to be used for all non-HANA servers
- File system backup for non-DB servers.
- File system and DB backup for DB servers.
- Full database backup to be performed three times per week
- Full file system backup frequency is once per week
- SAP restricts virtualization for production Suite on HANA and production BW on HANA to one virtualized node
- Production Servers have an SLA of 99.9%. All other environments have an SLA of 99.0%

Hardware Costs – Virtual Private Cloud

- Includes managed services component covering infrastructure and SAP BASIS services
- Solution includes 10Gbps dedicated redundant network links for replication of data between the primary and secondary data center
- Solution includes 10Mbps redundant internet bandwidth for end client personnel to access the environment

- Two site-to-site IPSec VPN connections, assuming one each for System Integrator and end client. System Integrator and end client need to have IPSec VPN termination device at their end.
- Includes 30 days of file system backup for all HANA devices & non-HANA servers.
- Two load balancer instances in each VPC data center
- HANA appliance server sizing is based on virtual servers
- Tier 1 or 2 storage to be used for all VPC non-HANA servers
- File system backup for non-DB servers.
- File system and DB backup for DB servers.
- Customer IP address to be included for HANA devices
- Full database backup to be performed three times per week
- Full file system backup frequency is once per week
- SAP restricts virtualization for production Suite on HANA and production BW on HANA to one virtualized node
- VPC Production Servers have an SLA of 99.9%. All other VPC environments have an SLA of 99.0%

Software Costs

- Initial Costs – Incurred within the first year.
- Service Fee – The service fee to be spread over the life of the project.
- Timing – Software costs are assumed to be incurred at project start. However, based on the existing relationship with the software vendors it may be possible to delay portions of costs until later years.
- Discount – SAP software is assumed to be provided to the state at the previously negotiated 88% discount.
- Support – SAP support is calculated based off of 22% of total licensing cost and is assumed to remain constant over the term of the project.
- Subscription – Costs are based on a 7 year subscription timeframe.
- Supplies – Number of suppliers based on 135,000 vendors for Master Data Governance.
- Users – Based on 6,000 named users for the SAP Enterprise solution.

IV&V

- IV&V cost estimates assume an expected senior advisory team of 6 – 8 resources throughout the life of the project.

Facility Costs

- Peak Headcount assumed at 150 combined project team across State and Integrator resources. While the project team size may fluctuate year over year, we have assumed that the state would need to identify and lease sufficient space at the start of the project and carry that lease through project completion.
- Square foot requirements per Resource estimated at 190 square feet.
- Cost Per Square Foot - 9.63 per square foot per annum

Network Costs

- Current bandwidth is sufficient for a statewide SAP based ERP system
- Network infrastructure procured by DOT for the DOT SAP Hosting Migration provides high degree of reusability for statewide SAP based ERP system (NCDOT IT Oversight report from November, 20th, 2014)
- F5 Networks procured Load Balancers can be re-used
- Data center network infrastructure indirectly used by statewide ERP system i.e. IPSEC Tunnels, SSL VPN, etc… can be re-used
- The current networking infrastructure is capable of supporting Fibre Channel over Ethernet (FCoE - an important component of a converged infrastructure) but requires additional investment in components and licensing

PC Costs

- Peak project headcount of 150
- PC cost per FTE for initial investment assumed at $2,500 per workstation.
- As a co-located team, both the State and Integrator would operate off of state machines.
- No PC refresh is assumed during the life of the project.
- While the cost estimates assume that PCs are purchased at the start of the project, there is an option to employ a "just in time" PC strategy based on state inventory and available machines.

Security

- Role-Based Access Controls. Design of SAP Roles to streamline the user management processes including provisioning and de-provisioning of user access.
- Least Privileged Access. This approach requires the State to develop a granular and scalable security model that can provide users access to only the functionality they need to perform their daily job and which does not violate State defined segregation of duties rules. In addition, the implementation ERP Security team needs to be tightly integrated with other teams across the project, including Functional, Development, Test, and Training teams to obtain the specific user requirements for accessing application master data, transactions, reports, and data. This helps to reduce training time, makes navigation easier for the users, and helps to avoid audit and compliance related findings related to excessive access as users focus on only those menus and functions required to perform their job responsibilities.
- "Out-of-the-Box" Functionality. As a guiding principle it was determined to leverage SAP delivered functionality to the extent possible.
  This includes using ERP security administration tools and techniques to deliver the State's security model.
- Segregation of Duties. To the extent that State utilizes an existing set of Segregation of Duties rules or policies tied to legacy applications, the SAP implementation will require the State to update their Segregation of Duties rules to ERP functions. This may help the State to continue to monitor and track its Segregation of Duties compliance environment in the new SAP solution.

Operations and Maintenance

- Initial Transition - Application support does not begin until 1 month following the initial Finance implementation. While it is expected that warranty for the implemented solution will be 90 days,

the 60 days of overlap provides ramp-up time for the maintenance team to ensure that the production hand-off is managed smoothly.

- Resources per Module - A minimum two-person team rule was applied. As production support requires the available of experienced resources to handle critical operating issues when they arrive, it is impractical to assume that one resource can provide the expected service level objectives by him/herself. The two-person team concept only applies when cross training is not practical. The State should not expect a finance resource to be successfully cross-trained on human resources. It is recommended that the State work with the maintenance vendor to recognize this "additional" resource bandwidth and offset the investment with "pre-paid" small project enhancement hours per month. Resources per module were increased where anticipated based on the ERP implementation timeline.

- Infrastructure - The hardware costs estimated in this section assume a hosted solution. For estimation purposes, the infrastructure will be housed in the state data center and costs allocated based on the OITS shared services model and published costs (per server, per container). Estimates were based on the published $1,201 per month per server charge and $429 per virtual instance charge. The servers and virtual instances ramp up over the course of the project and peak at 58 servers and 144 virtual instances.

- Resources - The resource costs estimated in this section assume a 100% on-site support model. The State is encouraged to discuss with the maintenance provider most cost effective solutions such as offshore or near-shore support models.

- Ongoing Maintenance - Estimates are based on a vendor rate of $132 per hour. At steady state (post full implementation), the support team headcount is estimated at 43 full time resources.

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