One Washington
Program Blueprint version 3
Appendix Business Intelligence Current State

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1.0 Current State

This appendix summarizes the findings from the current state analysis and identifies challenges that must be addressed to achieve the BI objectives of the One Washington program. Information in this section is organized and documented according to the operational and execution elements of the EIM model described in Figure 1.1. Each EIM component has been evaluated across the dimensions of people, process and technology.
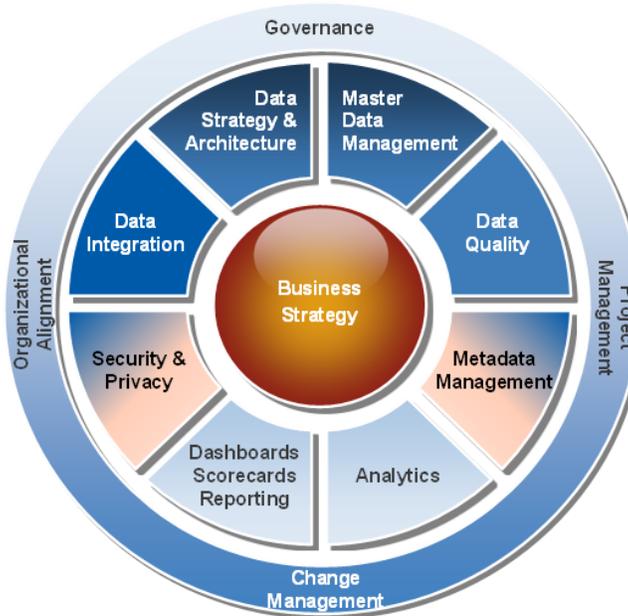
Figure 1.1: Enterprise Information Management (EIM) Model

1.1 Governance

This section summarizes the current state of governance mechanisms for business intelligence. Generally, there is no structured data governance mechanism in place to support enterprise business intelligence functionality. Data governance exists in some specific areas, such as some Budget functions, but it is not consistently leveraged across those specific areas or the state.

- People
  - There are Data Stewards identified in general government and in some other areas, but the role is not clearly or uniformly defined across the state. Our research has found that current state HR/Payroll functionality has its Data Steward govern data quality within HRMS. However, the scope of this role is not formally defined, documented, or understood across the state.
  - There is little to no training for business intelligence data governance processes, standards and toolsets.

- Process
  - Institutional knowledge regarding business intelligence data governance processes lies with individual staff members. This is a potential risk, as that institutional knowledge could be lost in the event of staffing turnover. For example, when an OFM staff member who was overseeing data quality in the Data Steward role departed, the role still exists, but the responsibilities are not formally documented

and have not been transitioned to anyone else. Without clear and consistent role definitions, it is easy to lose track of important institutional knowledge.

- o Current governance is generally focused on after-the-fact audit of data that has already been entered, rather than standards definition, front-end management, user alignment and automation.

- Technology

  - o Washington Workforce Analytics (WWA) and HRMS have data dictionaries, but they are incomplete and inconsistent across the state.
  - o There currently is no committee to oversee data usage, correction, quality, and consistency across the state's back office functionality.

1.2   Data Strategy and Architecture

This section presents a summary of findings related to the current Data Strategy and Architecture with respect to BI across the state. This also includes preparatory work for consistent data use across Finance, Procurement, Budget, and HR/Payroll within the new ERP system. Data architecture defines how data is stored, managed and used across the enterprise.

- People

  - o Currently, BI data and technology is maintained by WaTech and includes support from the OCIO.
  - o OFM and DES are the business owners of BI data. However, the actual processes and intelligence strategies for managing this data are underdeveloped and inconsistent across the state (see Governance section).
  - o There are limited data architecture roles (i.e. Data Stewards) to support the key enterprise business processes for BI. As mentioned above, current versions of these roles are not clearly defined and inconsistent across the key enterprise business processes.
  - o Protocols and communications for agencies and other data providers regarding what data is to be provided, how data is to be used, and what data is available are limited.
  - o Data reliability is a challenge for the state which requires manual and resource-intensive processes to fix. Staff members consistently stated that functional reporting and BI needs are fulfilled by the best available information given the limitations of the present data governance and technology environment.

- Process

  - o Data is siloed across Finance, Procurement, Budget and HR/Payroll. Data often has to be extracted from multiple sources to meet reporting needs. For example, there are currently 72 systems involved in Budget that contain data for functions such as the actual budget building or fund balancing. Data is not consistent across these sources, nor is it at the right level of detail. Thus, the process to extract, reconcile, cleanse, and prepare Budget data is extremely resource and time-intensive.
  - o Many functions and individual analysts have established manual processes to extract, cleanse, validate and compile data to address business needs. This requires a tremendous amount of time. For example, there are two Procurement resources who spend approximately 10 hours per week preparing consolidated Procurement reports from June through August. Their work includes preparing communications to each agency, requesting the information from the agencies, reviewing the information and compiling the information.
  - o Definition and classification of common business dimensions, such as location, accounting code, and program index, are not consistently defined and understood across the key business functions. A

"standards definition" session was held by the Procurement Readiness group to solve data inconsistency issues within Procurement. Similar sessions will be needed for Finance, Budget and HR/Payroll to establish common definitions.

- o Some enterprise-wide data standards, taxonomy, and definitions are documented. In 2016, the Chart of Accounts project worked with state agencies to standardize and simplify sub sub-objects.
- o There is not a clear strategy to address data lifecycle management or data quality.

- Technology
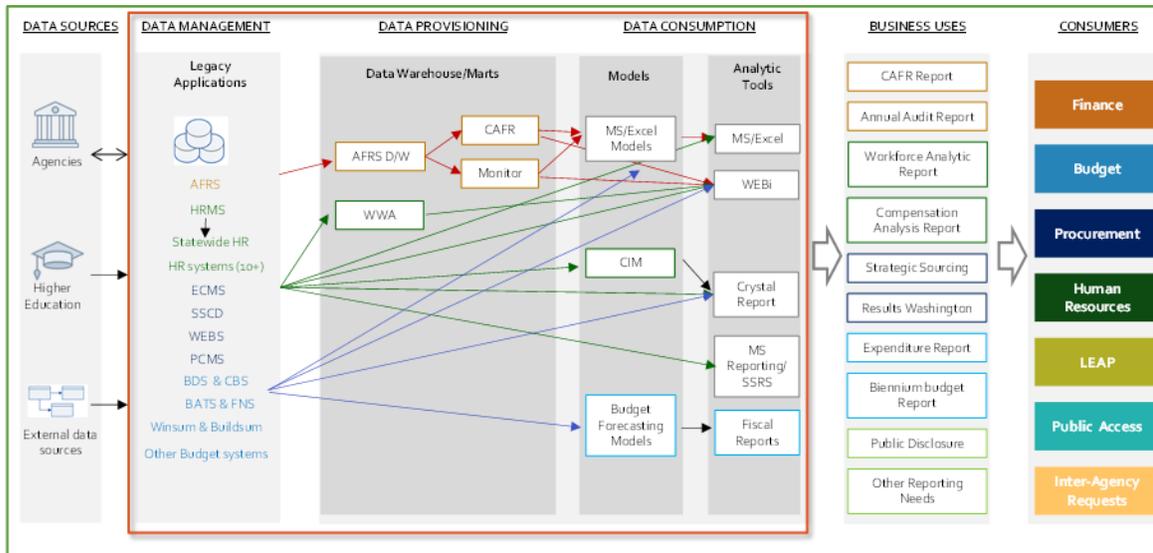
Figure 1.2 Current State Reference Architecture for BI

- o Presently, each of the four enterprise business functions source data required for operational, BI and analytical purposes from disparate systems. This includes data sources across state agencies, the state's higher education institutions, and internal data management platforms, such as the Agency Financial Reporting System (AFRS).
- o Storage and maintenance of the BI data environment is complex, redundant and lacks a single "version of truth." Data is stored on multiple databases and data warehouses. Data is managed within SQL Server, SharePoint and other types of internally managed databases which are all lacking sufficient metadata classification and dictionaries. These databases reside under individual business functions' operating environments. Further, the state's data management platform is not fully leveraged across the four business functions, though each function may need to access the same data for individual business purposes. Presently, there are few standards, processes, or policies documented to ensure consistency and governance of data capture and storage.
- o Multiple data integration needs and challenges were reported during interviews. These needs included manual efforts to prepare, integrate, and process data.
- o Data sourced for common enterprise business processes is centrally or locally managed depending on the application and function. While AFRS, the enterprise accounting and reporting system, provides financial information to all four business functions, other financial information is maintained in a combination of local servers and SharePoint. This inconsistent and disconnected web of financial data provides limited consistency regarding how data is set up and managed.
- o There are a few databases and or data marts created for specific business needs:
  - AFRS data warehouse for financial data

- Comprehensive Annual Financial Report (CAFR) database for CAFR reporting
- Monitor database for the Annual Single Audit Report
- WWA database for extracting data from HRMS and Workforce Analytics
- Asset management data mart to track assets
- The Payroll data mart for tracking time and leave

  - o The present system architecture places limits on the consistency of data integration and provisioning strategy
  - o In interviews, concerns were consistently raised by stakeholders about inconsistent data security and privacy policies and practices within the present database and application layers.
  - o Data is primarily used on a transactional basis. Information is organized around the individual types of data records (e.g., contracts) and is typically captured, stored, and retrieved based on the application from which it was created. Data is used to meet daily operational reporting needs, legislator requests, agency requests and public data requests.
  - o There are limited tools available for analyzing cross-business function information. Users can extract data from a variety of sources, databases and warehouses using the SAP and Enterprise Reporting tools. Users then prepare data for use by applying individual analytical models, often in Microsoft Excel, that require considerable technical skill. Modern reporting tools such as Tableau and Power BI are being piloted or used for some specialized business functions outside of the One Washington program, by agencies such as WaTech.
  - o Data is typically organized from an application perspective as opposed to an end-user business need perspective. This becomes a limiting factor when end users need to extract, cleanse, massage, prepare, and analyze data to fulfill operational and analytical needs.

1.3   Data Quality

Data quality refers to the availability and quality of data required to support business needs. Quality data is required to ensure users are confident in the data-driven decisions they make. This section provides summary findings and identifies gaps related to data quality.

- People

  - o End users are not held responsible for maintaining data standards because of a lack of enforcement from front-line management. This lack of enforcements is a result of inconsistent ownership and accountability with respect to data across the state.
  - o In some situations, staff are trained to maintain data quality standards (e.g., the usage of various chart of account codes). However, this knowledge degrades over time as individuals' duties evolve, or they leave the organization without a clear transition.

- Process

  - o Both report creators and data users clean, validate and consolidate data manually based on their own unique needs.
  - o Rules governing how data should be entered and transformed are not consistently documented, formalized, shared or enforced across key business processes and agencies.
  - o Timeliness, availability, granularity, and reliability of historical data, along with data retention compliance policies were identified as critical needs across all business processes. For example, Procurement needs historical data for a minimum of six years post contract close. HR/Payroll needs historical data for multiple reporting and analysis needs, such as employee lifecycle management.

- Technology

  o Work performed to check data quality is done manually. There are no tools in place to support these efforts.
  o Operational systems have minimal validation routines built in beyond changing fields to drop-down lists and making them required. In certain systems this cannot be done, so many fields are free text.

1.4 Analytics

This section summarizes the findings related to the ability of the organization to get actionable insights from data and to use them to facilitate decision making.

- People

  o Current staff will need to be trained in the skills required for future-leaning analysis (e.g., model development, advanced analysis, data mining, etc.), reporting, and governance.
  o Current staff dedicate most of their efforts to building models rather than supporting strategic decision-making activities.
  o In some cases, the knowledge of a subject matter expert is required to correctly interpret the data.

- Process

  o Data analysis tends to focus on what happened, with forecasts and budgeting based on previous data, rather than more comprehensive scenario planning activities.
  o For areas where forward-looking analysis is performed (e.g., budget forecasts), there is limited connectivity of this data to other areas within or across the functions.
  o Most team members who perform analytic work in the four business functions are burdened with manually extracting, cleansing and compiling data.
  o There are limited ways to reconcile data across operational systems, requiring employees to maintain cross-reference spreadsheets and databases. The lack of consistency of matching identifiers greatly interferes with the ability to search for required information and analyze information across the enterprise or lifecycles. Users often must reach out to agencies for clarification.
  o Little focus is placed on building competency or defining a path forward for how analytics might be used in the organization.
  o Issues with data integrity and synchronization create mistrust of certain types of data. This causes users to spend additional time verifying information.

- Technology

  o The analytic tools used to meet operational reporting needs and basic BI reporting needs are MS Excel, WEBI, SAP and Crystal Reports. MS Excel appears to be the de facto standard for data analysis within the key business functions in the Program.
  o A few analytic models exist, such as the Compensation Impact Model (CIM), the Budget Forecasting model, and MS Excel models built for CAFR and audit reports. However, most of the models are managed manually.
  o There are advanced analytic needs, such as predictive analysis, scenario analysis, and geospatial analysis.

1.5   Dashboards, Scorecards, and Reporting

This section presents a summary of findings related to the process of converting transaction or production information into useful knowledge via available reporting tools for real-time dashboard, snapshot, scorecard, and detailed data display reporting.

- People

    - There are groups (e.g., State HR Analytics team, WaTech BI team) that manage certain aspects of reporting within the four business functions.
    - Users create reports for use across the organization with limited control over how the information is extracted, aggregated, or presented. This sometimes leads to incorrect conclusions.
    - Business leaders must rely on technology experts to provide required reports due to a lack reporting capabilities and tools.

- Process

    - Data is available but scattered throughout many systems, which are very difficult to access.
    - Data aggregation and presentation processes are manual. Once data is found, many report creators need to perform manual aggregation and cross-reference data to compile reports. Due to different data codes used in different systems, the manual data aggregation sometimes takes longer before executing report analysis.
    - Reports that require additional data granularity or detail must be recreated multiple times with different data.
    - Cycle time to deliver reports varies depending on where the data resides and how many data sources must be aggregated and integrated to compile the desired report.

- Technology

    - There are very limited dashboards or scorecards available for use.
    - Ad hoc and "what if" reporting is not readily available.
    - Dashboards and scorecards that do exist were developed for singular use or are inconsistently used across the enterprise. For example, a few BI toolkits (e.g., Tableau, Power BI) are being used in isolated instances to support more robust reporting capabilities.
    - State HR has a dashboard published on public-facing sites, but the data presented is calculated, summarized and integrated manually. If new items or details need to be added, the State HR analytics team must rebuild the dashboard, which takes significant effort and time. Additionally, there are limited functionalities, like the ability to drill down to details. The stakeholders from State HR shared that the current HRMS BI solution does not have the capability to produce and maintain dashboards, scorecards, automated reporting, or advanced analytics. As a result, State HR must use tools such as Power BI outside of HRMS to complete these desired functions.

1.6   Organization Alignment

Organizational alignment is a common challenge in building any BI solution. While the enterprise strives to achieve an overarching common set of performance goals, the processes and data used may vary greatly by area. This subsection focuses on capturing the organizational data perspectives and their supporting processes to evaluate future organizational change management efforts.

- People

  - Due to past reorganizations and restructurings, the business and technology teams are not aligned. This results in limited accountability for strategic or even tactical resolution of data and BI-related challenges.
  - There is a large amount of undocumented institutional knowledge which has been gained by resources in key roles across the four business functions. This could pose a risk if those resources were to leave the organization.
  - There is no executive committee at the enterprise level to oversee data governance, coordinate available resources and needs, or identify potential gaps across the four business functions.

- Process

  - It is difficult to ensure data is used for its designated purposed because of limited visibility or control over upstream or downstream use of data across the four business functions.
  - All users understood the data needs and analytical processes specific to their role and business unit. However, these users had limited understanding whether the same data was being used for a different purpose.
  - Existing processes and procedures duplicate efforts by using various functions to check each other's efforts. There appears to be minimal alignment across functions around the scope of these efforts.

- Technology

  - Multiple systems reside in different agencies creating disparate data sources. This lack of common systems and processes inhibits program-wide collaboration, such as sharing data or providing cross-functional reports that involve multiple subject areas.
  - Analytic functions are siloed by business area, so BI skillsets and key resources are spread over different functions and teams.

1.7   Change Management

The One Washington Change Management Strategy is being developed as part of the Program Blueprint. The One Washington team understands the importance of change management and has integrated BI capabilities into the change management strategy for the Program. At this time, there are no BI-specific challenges related to change management across the state.

1.8   Program Management

The Program Blueprint is inclusive of project management for the BI Strategy execution.

1.9   Other Areas

The following four areas were not specifically addressed during the current state assessment. However, they are important to the success of the BI strategy. As such, these BI-related initiatives are also being considered and acknowledged in the Program Blueprint.

- Metadata Management

  - Currently, there is little knowledge regarding metadata management across the four business functions. The state does have a metadata management tool, Embarcadero, which is used by WaTech to marry budget and accounting data. This information is not documented.

- Security and Privacy
  - o As this topic is primarily covered in the Program Blueprint, security and privacy were only evaluated from a BI perspective. Stakeholders interviewed as part of the current state assessment relayed security concerns and needs for the future state related to policies, procedures, people, and technology to protect Category 3 and 4 data.

- Master Data Management (MDM)
  - o Currently, the state struggles across all four business functions because of inconsistent data. The One Washington program includes a MDM strategy which considers the current state of MDM with regard to BI.

- Data Integration
  - o Currently, there is limited cross-functional integration of data across the state with respect to BI reporting and analytics. Users often deploy manual processes and tools to integrate the data on an as-needed basis. One Washington is identifying integration-related needs with respect to BI as part of the Program Blueprint.

1.10 Current Barriers

- Sierra Systems did a similar technology assessment in 2011, which produced the, "Master Plan to Enhance Business Intelligence Capabilities." The summary of the key challenges identified within the report are as follows:
  - o People
    - There has been a significant loss of staff with critical business knowledge.
    - There is a lack of appropriate and sufficient training to enable BI users to respond to changing analytic and information demands.
    - Desired changes to BI capability were difficult to attain.
    - The analytical skills and capacity are not at the level required to respond to BI demands.
  - o Process
    - There is a lack of data stewardship.
    - There is inconsistent commitment to address the quality of data.
    - Data ownership and defined decision making for data-related decisions are lacking, creating data governance issues.
    - Standards need to be established for sharing data.
    - Central and common processes and procedures are not established to bring consistency of the BI reporting process.
  - o Technology and Data
    - The state of Washington needs self-service reporting capability.
    - Data needed for use by the BI solution is not consistent and complete across data providers.
    - Security for non-structure data needs to be enhanced.
    - Development, test, quality assurance production and production environments need to be established.
    - Additional storage space (SAN space, Das-D) is highly desired by OFM technical staff to allow for future growth (may not apply in the current/future state due to potential technology update).

- Many of the challenges highlighted within the 2011 report are still pervasive barriers to BI today. Further, some of the barriers from this report have even become more aggravated due to an increase in business demand.

- One Washington's Current State analysis for BI has identified the following potential barriers for BI:
  - OFM and DES are the business owners of the Finance and Procurement data respectively. However, following recent reorganizations, the business and IT teams have yet to establish new management processes for data and intelligence strategies to support current and future Finance and Procurement needs.
  - Some recommendations provided in the 2011 assessment were not well implemented. As mentioned in Section 1.1, Governance, the Data Steward role was identified as a need across functions. However, this role has not been widely and consistently deployed across all the four business functions. As a result, there are significant data quality inconsistencies. The OCIO created the Open Data policy for standardizing data sharing, but it is not designed as a governing model for data quality.
  - Since the production of the 2011 report, the state has known it needs to eliminate inconsistencies in the same data that exist across the four business functions, yet this challenge still exists today. This need for a "single version of truth" poses a great barrier to the state's ability to meet its dynamic reporting needs.
  - There are limited dedicated resources or executive governance committee(s) tasked with consistently and strategically meeting ongoing business challenges related to BI.
  - The culture is inconsistent across the state to support and encourage individuals to embrace challenges, learn from setbacks, and thrive in changing environment.
  - There are some dedicated resources for BI in WaTech. However, these current resources will not be sufficient to support an enterprise-wide BI initiative. This includes a lack of resources (financial and personnel), adequate technological infrastructure, and tools used to generate BI reports or dashboards.

- These barriers pose a risk to the successful implementation of an enterprise-wide BI solution. It will be imperative for One Washington to consider these barriers while executing the Action Plan included in this deliverable to ensure a seamless and successful transition into One Washington's proposed future state for BI.

2.0   Future State

The future state conceptual model for BI is represented in Figure 2.1. It was designed to achieve the goals of the One Washington program and reflects the anticipated ERP transformation across the four enterprise processes of Finance, Procurement, Budget and HR/Payroll. The design supports one or multiple ERP solutions. Integration is expected to be accomplished within a data integration layer. The data integration layer would also be utilized to integrate information from legacy applications and historical data on an as-needed basis.

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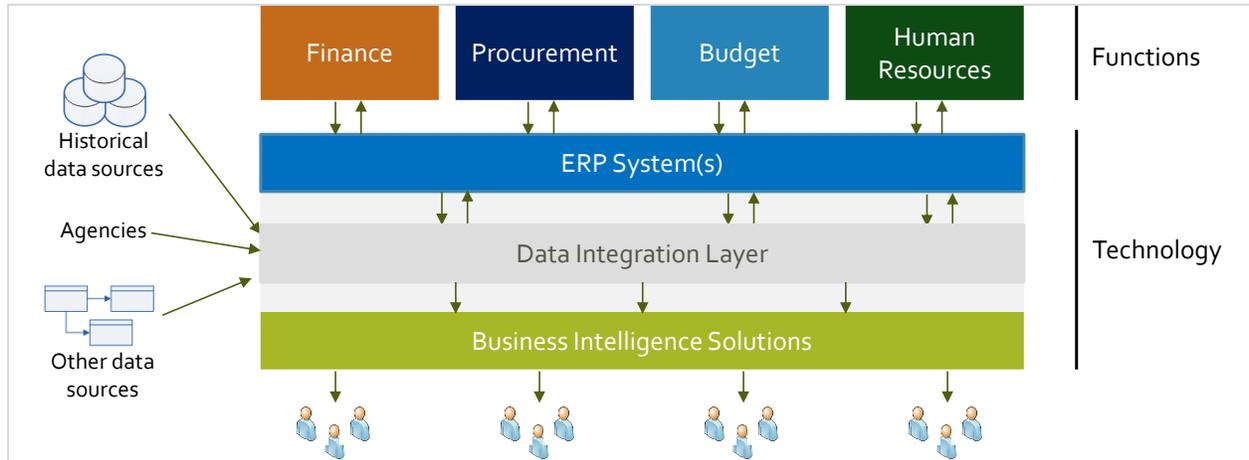
Figure 2.1: Future State Conceptual Model for BI

2.1 Business Strategy

BI must be part of the organization's strategy for the outcomes to be achieved. The One Washington program has already demonstrated a commitment to BI in the development of this BI Strategy. To build on the work done to date, the following future state activities should be completed to further align the Program's BI Strategy with One Washington program vision:

- Determine specific business needs and outcomes of the common enterprise processes that are both in scope for the One Washington program and need to be addressed with BI initiatives.
- Identify accountable business owners to align BI initiatives with the enterprise's business strategy, goals, and Key Performance Indicators (KPIs).
- Develop a plan that considers the larger goals of the BI initiative, but breaks them up into small, easily achievable parts. Organize and fund these BI efforts as a series of related efforts that build upon each other. Develop foundational BI capabilities with limited scope, adopt those foundational capabilities, and prioritize incremental capabilities and scope via additional manageable projects.
- Develop the mindset and culture of growing organizational maturity that is focused on transforming core business functions beyond executing basic operations.

2.2 Governance

- A comprehensive BI governance model is required to support One Washington's vision of available, timely and accurate data. A robust and effective governance model will:
  o Enable better decision making
  o Improve adherence to internal and external compliance business capabilities and technical specifications
  o Reduce costs, and increase effectiveness through coordination of efforts
  o Identify and promote tangible return of information technology investments
  o Protect and sustain the needs of BI stakeholders
  o Build standard and repeatable processes
  o Ensure transparency
  o Enable data owners and users for effective job performance

- To achieve these objectives, a well-defined governance structure and operating model with escalation paths and committees is essential. There are four elements in a healthy BI governance model. Each element is discussed further in detail below:
  - o **Organization**: This element refers to the structure for oversight and control. The BI governance structure should be aligned with the whole organization to appropriately govern BI solutions, capabilities and data, and strategically meet current as well as future cross-functional BI needs.
  - o **Policies and standards**: This element refers to enterprise-wide rules and guidelines to ensure convergence in BI and data management disciplines. It will govern data access and data use by external and non-enterprise entities following State OCIO driven data privacy and open data policies.
  - o **Processes and procedures**: This element refers to the BI operating model and demand management framework that are needed to accommodate changing business needs and facilitate operational decision making.
  - o **Metrics and compliance**: This element refers to the measurement of compliance with established governance standards and KPIs.

2.3 Organization

- The BI governance structure should be comprised of the BI Steering Committee, the BI Business Team, and the BI Delivery Team (see Figure 2.2). This model accommodates for the complexity of the One Washington program and considers BI best practices. Key organization components are further discussed below:
  - o **BI Steering Committee**: This cross-organizational team of stakeholders provides strategic oversight, guidance, and prioritizes BI business needs.
  - o **BI Business Team**: This team of business function experts oversees the day-to-day activities pertaining to the implementation and management the BI solution. This group articulates business capabilities and technical specifications, supports implementation, reports issues and receives BI reports as business function users.
  - o **BI Delivery Team**: The Delivery Team is responsible for obtaining and reporting on complex analysis and insights based on data related to and from the new BI solution.

The interaction between the *Steering Committee* and the *BI Team* drives supply, approvals for new staffing, head count, and coordination on strategy.

The interaction among the *BI Steering Committee* with input from the *Business* and *IT Teams* drives project funding and prioritization.

The interaction between the BI *Steering Committee* and the BI *Business Team* drives demand, new metrics, reports/power user/self service initiatives, and input on strategy.

The interaction between the *BI Team* and the *Business Team* drives project delivery and support for self-service/power users and front-end design specifications.

Figure 2.2 BI Governance Structure

- One Washington will implement the BI solution in close synchronization with the ERP deployments as outlined in earlier sections of the Blueprint. As such, the BI governance model must change in accordance with the ERP deployment waves. Additional members should be added to the BI Steering Committee and the BI Business Team as the Program moves into the Budget and HR/Payroll implementation phases.

  o Policies and Standards
    - Governance policies and standards will allow enterprise-wide rules and guidelines to ensure convergence of BI and data management disciplines such as data quality.

  o Processes and Procedures
    - One Washington must enforce a simple but structured set of standards, policies, processes and controls to govern BI-related data quality, consistency, accuracy and availability. Figure 2.3 provides an example of a typical Process and Procedure model with the potential interactions between the Steering Committee, Business Team and Delivery Team.
    - This sample is not meant to be illustrative of the exact design of the Process and Procedure model for One Washington. Development of the One Washington Process and Procedure model will be done as part of a governance initiative outlined within the Action Plan.
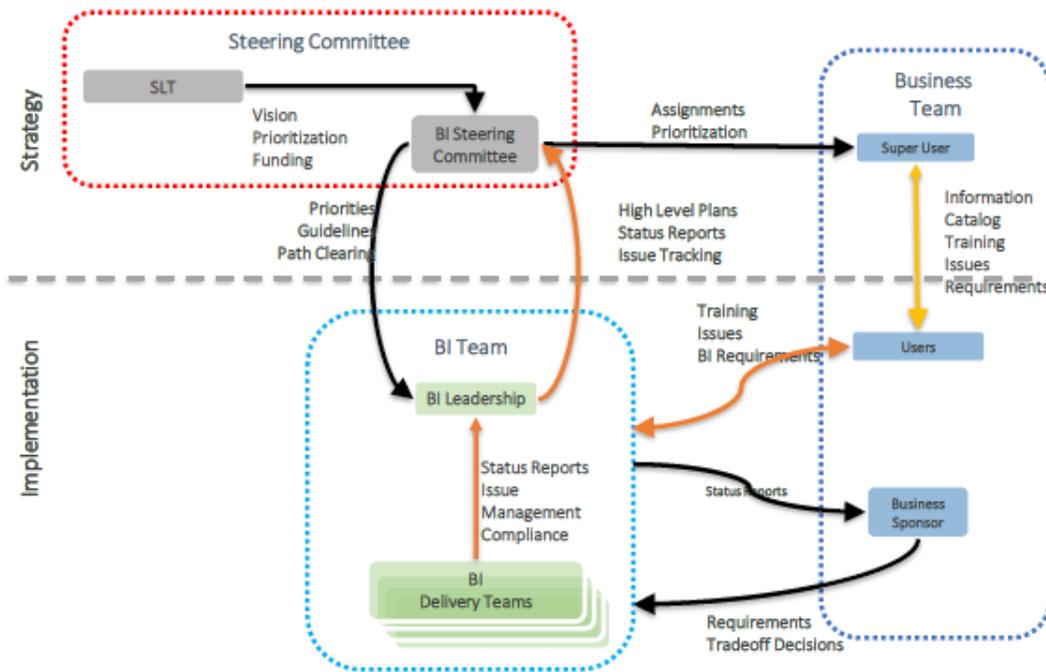
Figure 2.3 BI Governance Process and Procedure Model

  o Metrics and Compliance
    - A measurable, metrics-based, ongoing feedback, and improvement program is key to an effective and sustainable governance program. Metrics should measure efficiency, effectiveness, and compliance. A set of KPIs should be defined to measure the BI initiatives (e.g., has data quality

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improved since last quarter?). The aggregate scores of these KPIs will be used to determine opportunities for improvement of BI. Specifically, three sets of metrics should be established:

- **Efficiency Metrics**: How well integrated is data management within the existing business and IT processes?

- **Effectiveness Metrics**: To what degree are standards implemented?

- **Compliance Metrics**: How much of the BI solution and BI governance structure guidelines has the state adopted?

2.4 Data Strategy and Architecture

- In the future state, multiple analytics repositories, redundant and siloed data transition to a unified, consistent, enterprise-wide data source. The future state BI solution will produce analytics with common architecture, applications, data, process control, and information management. One Washington should adhere to the following design principles to implement a robust and diverse BI data strategy and architecture that supports this future state solution:
  o Ensure the strategy serves multiple use cases and styles of users across the common business processes of the One Washington program.
  o Design BI data strategy and architecture to achieve specific business outcomes and decisions provided by the key business stakeholders across the common business processes.
  o Provide a single, consistent, shared, cross-functional platform or location for businesses to self-service data required for BI, analytics, dashboard, and reporting purposes in a seamless manner.
  o Implement a process to integrate siloed data from all legacy enterprise business process systems and agencies.
  o Reduce turnaround times to accommodate changes in legislative needs.
  o Implement secured access control measures so data is only available on an as-needed basis, while accounting for any privacy restrictions with Category 3 and 4 data.

- The One Washington program must determine compatibility between future state ERP and BI solution architectures during procurement activities and design. Figure 2.4 represents a well-managed BI reference model (i.e. meets the needs of reporting and analytics use cases across the four business functions). A similar model should be designed and deployed to support One Washington's BI functionality.
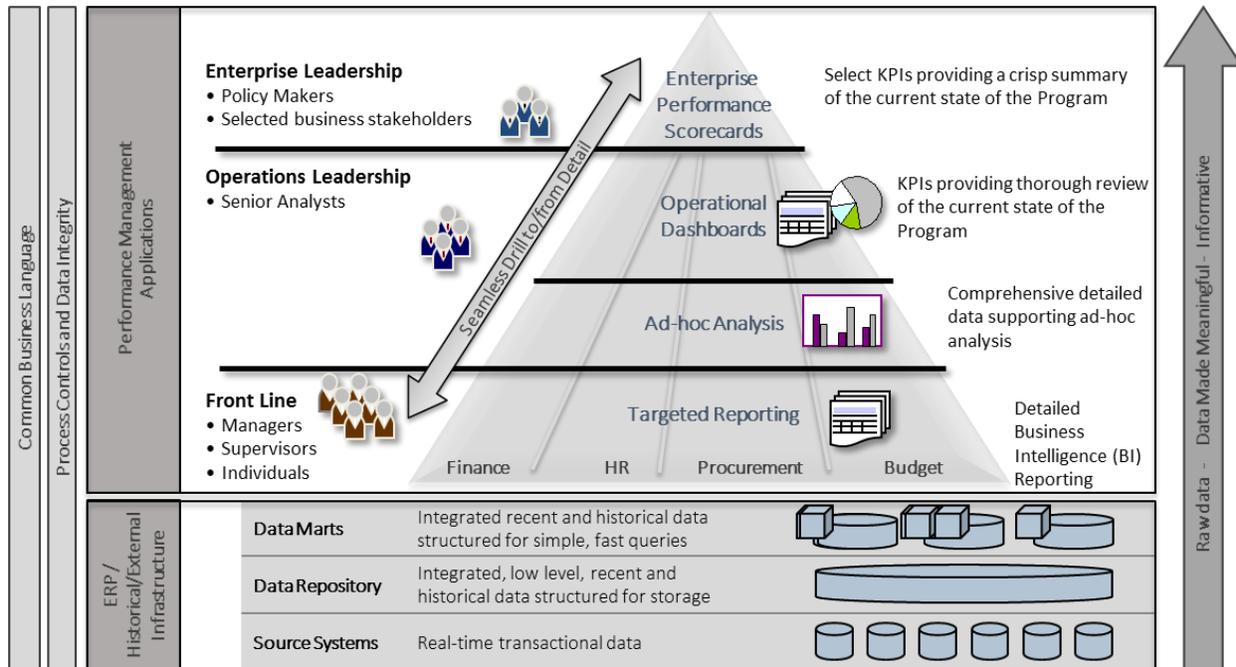
Figure 2.4 Well-Managed Future State BI Reference Model

- Master Data Management
  o Future state MDM for BI is outlined within Section 2.6 of the Blueprint.

- Data Quality
  o Data quality is driven by effective BI governance and should establish data quality measures that help One Washington:

    • Establish trust and confidence in data at all levels. Data comparison and validation exercises are minimal. Analysts will spend more time analyzing data rather than cleaning, preparing and fact checking.
    • Document and enforce required data quality and design standards with internal and external vendors prior to contract execution.
    • Establish and monitor adherence to service level agreements for timely availability of data that meets the state's business needs.

  o Best practice data quality standards should be implemented across all enterprise data management processes, and key performance measures should be reviewed on a regular basis to ensure continued improvement.

  o The Process Continuum shown in Figure 2.5 displays industry best-practice for the management and control of data quality throughout the data lifecycle.

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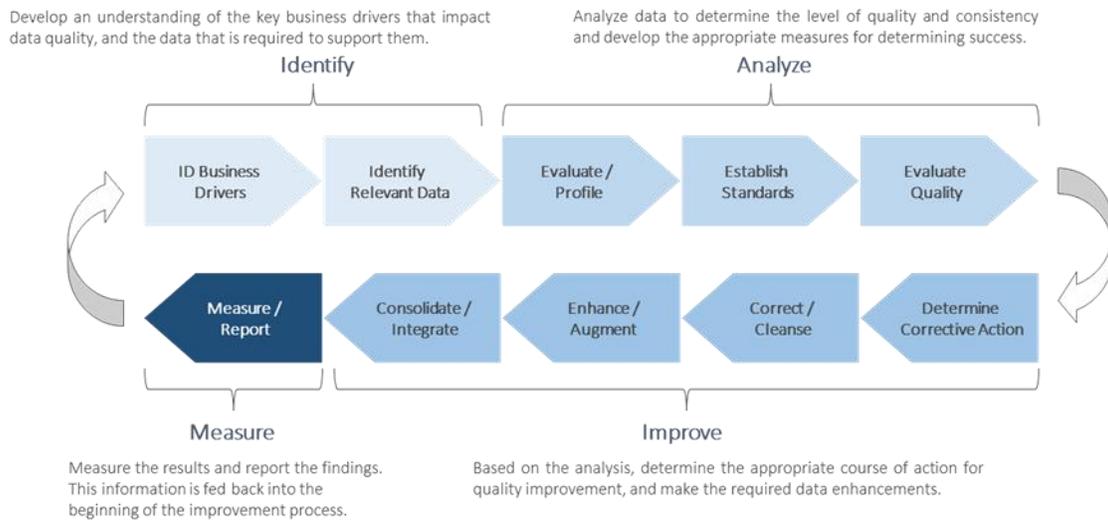
Figure 2.5 BI Data Quality Process Continuum

o One Washington must identify and establish a set of data quality and control metrics to measure the overall ability of data to support the business effectively. Relevant key performance indicators may include:

- Number of manual data corrections
- Costs of rework
- Accuracy and validity of data
- Consistency of data
- Amount of missing data and or information

2.5 Metadata Management

A centralized metadata management approach must be leveraged to support consistency and quality while providing business benefits to a wide variety of users. The future state needs for the State of Washington listed below are based on information collected via stakeholder group interviews and the Program Blueprint:

- Alignment of data, documents, and records definitions to statewide standards.
- Inventory of data to define how data is categorized and stored in current information systems.
- Determination of options and methods to access available data, and publish information about the data to make it readily available to consumers.
- Maintenance of data quality, currency, and relevance with respect to its need for updates to support data quality and overall data management efforts.
- Assessment and ongoing monitoring of whether data meets current business needs.
  - o Archive of data layout (i.e., alphanumeric vs. numeric vs. alpha data characters) for future use.

2.6 Data Integration

Most data in the future state BI system should flow through the ERP system and its integration layer. The process for this data integration is documented in Section 2.5 of the Program Blueprint. If data is required for BI but it not used by ERP, then there needs to be a process in place to cleanse, load, validate, and govern this data through the integration layer and into BI. This process will be formalized for ERP and should be replicated for any additional data needed for BI.

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2.7 Analytics

- The future state needs for the State of Washington listed below are based on information collected via stakeholder group interviews and the Program Blueprint:
  - o Enablement of key enterprise business processes and other consumers within the scope of One Washington to perform and consume analytics on shared and controlled access channels.
  - o Creation of advanced analytics capabilities with relevant skills, resources and tools.
  - o Establishment of cross-functional analytic capabilities including gap analysis, scenario analysis, predictive analysis, geospatial analysis and trend analysis that enable consistency, are easy to use, and can be maintained.
  - o Establishment of a single data source for all relevant variables to ensure consistency in analysis and reporting.

- One Washington stakeholders acknowledged the need for advanced analytics capabilities that aid in decision making and provide value to the organization in various scenarios. This value is presently not realized due to limitations of the current technology environment. The set of BI capabilities below provide an outline of the advanced analytical capabilities offered by solution providers:

Table 2.1 BI Value Stream Framework for Seamless Analytic Experience

Type	Purpose	Technique
Descriptive Analytics	Understand historical performance, alert to events, spot trends, monitor the performance of models and actions	Traditional BI and visualizations such as reports, dashboards, scorecards, pie charts, bar charts, line graphs, tables, generated narratives
Diagnostic Analytics	Visualize and interact with the data, discover relationships, explain outcomes, events, or trends	Query and analysis, drill-down, data discovery, data mining, correlations
Predictive Analytics	Answer questions about the future or determine the likelihood of unknown outcomes	Regression analysis, forecasting, multivariate statistics, pattern matching, predictive modeling, forecasting
Prescriptive Analytics	Optimize decisions, efficiently allocate resources	Optimization, statistics, what-if, scoring systems, simulation, complex event processing, neural networks, recommendation engines, heuristics, machine learning

2.8 Dashboards, Scorecards, and Reporting

- The future state needs for the State of Washington listed below are based on information collected via stakeholder group interviews and the Program Blueprint:
  - o Creation of consistent and reliable scorecards, standard dashboards, and reports that enable users to make strategic decisions and identify improvement opportunities.

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- o Implementation of adequate training for technology and business application users.
- o Presentation of information at the statewide level without the need for agencies to submit data and reports individually.
- o Provision of consistent oversight on end-to-end reporting and dashboards.
- o Provision of caseload estimation functionality and the ability to perform variable cost analysis.
- o Provide the capability to monitor if federal granted revenue matches federal expenses.
- o Provide self-service dashboards that offer relevant real-time information and allow users to drill down to detailed information.
- o Provide the ability to send alerts driven by specific business rules.

- To fulfill the future state BI dashboard needs of One Washington, a set of dashboard best practices based on interviews and experiences gained from various public sector and private sector experts is provided below:
  - o **Data considerations**: select the right data points to make the dashboard meaningful. A few examples are highlighted below:

    - Mandated reporting should determine if there are legal business requirements that must be met.
    - Dashboard metrics should tie back to organizational goals, objectives, and vision.
    - Compare current information with a baseline plan or budget at the beginning of the year, and measure for variance and progress.

  - o **Design considerations**: techniques to make information actionable and familiar. A few examples are highlighted below:

    - Action-oriented: Each dashboard element should be actionable and depict why a metric is performing like it is, how to fix it, who is responsible, and time to fix. The dashboard should be more than just a scorecard; it must enact change.
    - Easy to understand: To quickly understand and obtain value from the dashboard, there should be little to no learning curve. The dashboard should inherently highlight exceptions and opportunities, and outliers should be clearly distinguished.
    - Make it interactive: Most dashboards and scorecards are "flat"— they don't contain the multiple layers of information that users often need. Using a layered approach gives users self-service access to be able to click on the dashboard graphics and numbers for more detail and conforms to the way most prefer to interact with information to: monitor, analyze, and examine. Most business users first want to monitor key metrics for exceptions, then explore and analyze information that sheds light on those exceptions, and finally, examine detailed data and reports before acting.
    - Display mechanism: The presentation of dashboard information should depend on what best resonates with the audience. Using only charts and graphs may not tell the right story, but a page of ledgers and tables may appear too busy. Try to use a mixture of text and graphics to break up the information. Test the display on a variety of technologies, including mobile phones and tablets, to align with end user preferences.
    - Data visualization: The primary challenge of a good dashboard is that data only becomes information when it is processed and presented to decision-makers in a meaningful way. Data visualization is a method for information interpretation, a different way to look at and think about data that often exposes complex patterns or correlations. It does not just clarify data; it contextualizes it.

- Use of color: Use color sparingly. Highlighting should be done with bold colors, but a single hue should be used for all other elements across the dashboard. Consider a "hazard threat" coloring scheme with five levels over the three-level stop light approach. Know that red boxes are meant to receive executive attention.
- Layout: Headline reports do best at the top of a dashboard tab where they can provide a broad overview of performance. More complex reporting can be introduced further down the dashboard. Cut out any clutter that impedes users from understanding the key information, and leave some empty space on the dashboard. White space helps users concentrate on the most important information. Reiterate data definitions to ensure common meaning, and clearly present the "as-of" date for when the data was pulled.
- Number of metrics: When developing a dashboard, design with a one-page approach, but do not limit if it prohibits the user from communicating a complete set of critical metrics. Generally, there should not be more than six to eight frames per page. Frame size should vary to signal importance. Consider having a rotational metric for important items that do not need to be reported on each month or quarter.
- Tabs: Developing tabs on a dashboard can be a useful tool for strategically segmenting content. A "deep" dashboard demands excessive user scrolling, as users must scroll through a sea of reports with few tools to parse the information. A "shallow" dashboard tab extending slightly further than the fold may inspire a sense of surfing across a dashboard.

o **Development considerations**: techniques to ensure successful implementation and maintenance. A few relevant examples are highlighted below:

- Data availability, source and definition: It is imperative to reach agreement on the definition and meaning of each metric prior to releasing the dashboard to ensure it will be interpreted the same way by everyone. Make sure the data is readily available and attainable from a reputable source. The individuals using or referencing the report must be able to speak to the data confidently and articulate where it came from and how.
- Start small and grow: Develop in iterations, and introduce changes in small, manageable and agile chunks. This will allow users to easily adapt to the new system without being overwhelmed.
- Iterate: Design and development should be iterative. Mock up boxes or frames of how the pages will look before moving into development, and have review discussions with all management teams to gather feedback on metrics and review dashboards. Narrow down the final design to a few key metrics, and obtain clear alignment from all users.
- Automation: Try to get as automated as possible; manual compilation of data into intelligence reports is resource-intensive and prone to errors. A common practice is to have processes 90 percent automated and 10 percent manual. The 10 percent is driven by interest in information that is not easy to build into normal data feeds (e.g., to accommodate forecasting and analysis of specific scenarios that require external data sets).
- Timing: While most information is presented monthly, consider compiling and delivering the dashboard quarterly instead of monthly.

2.9   Security and Privacy

The future state needs for the State of Washington listed below are based on information collected via stakeholder group interviews and the Program Blueprint:

- Ensure appropriate access controls are in place. As a result, data from BI solutions will only be made available to users on a need basis, and accounts for any privacy restrictions for Category 3 and 4 data.

This can be done via a central authorization that pairs groups of users to groups of BI or data warehouse objects (e.g., tables, reports, cubes, etc.) using a best of breed solution.

- o Follow a standardized and consistent process for delegating authorities.
- o Ensure compliance with the most current standards for cloud-based data protection with appropriate role-based schemes and row and attribute level data restriction methods.

2.10 Organization Alignment

The BI strategy may result in changed roles and responsibilities of the individuals and teams currently in place. Organizational alignment focuses on understanding and defining those changes as   part of the organizational change management effort. The future state needs for the State of Washington listed below are based on information collected via stakeholder group interviews and the Program Blueprint:

- Define and implement organizational structures to execute BI governance and deliver BI governance projects.
- Determine an authority responsible for ensuring business data, functional data, and any additional BI-related needs are met on an ongoing basis.
- Provide clear definitions and expectations for BI governance roles and stakeholders.
- Define accountability and alignment of required skillsets to overcome current data quality challenges and meet advanced analytical needs.
- Establish initial BI development and training plans to ensure staff have the hard and soft skills to complete their duties in a quality manner.

2.11 Change Management

The change management strategy for implementing the BI initiatives will be covered in the One Washington program Change Management Strategy.

2.12 Program Management

Program management for the BI solution will be covered by the greater One Washington program management outlined within the Program Blueprint.