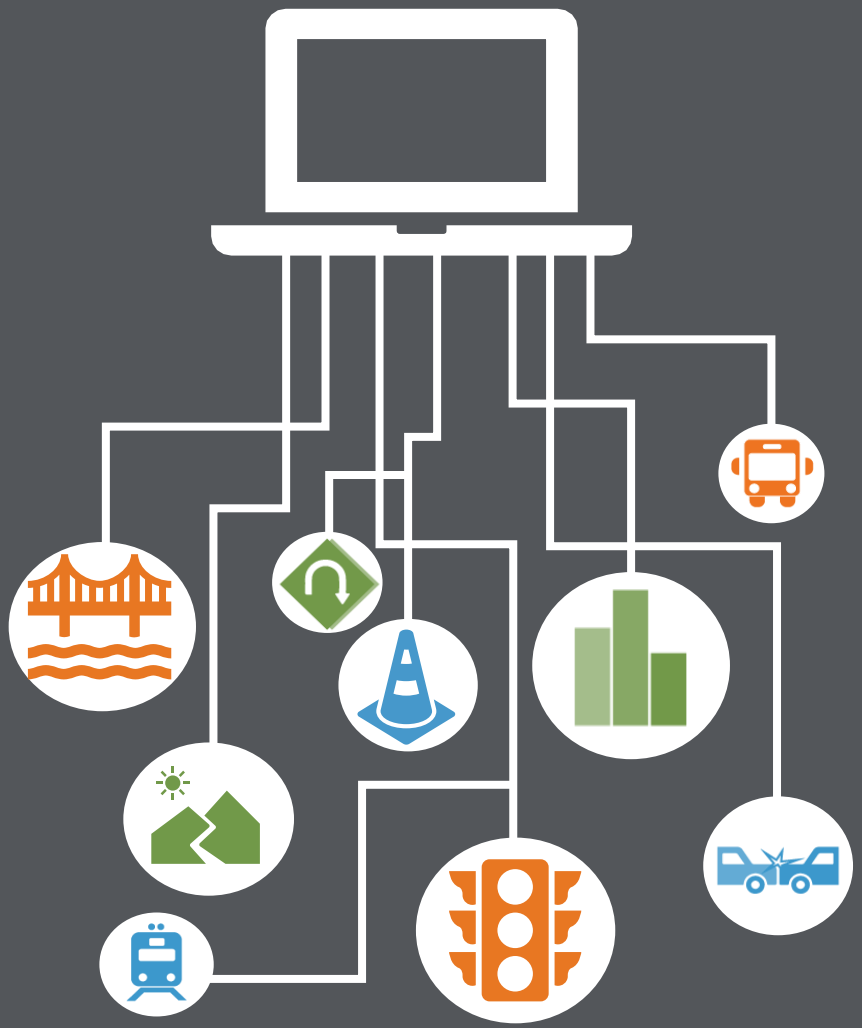

Strategic Data Business Plan
Executive Summary

June 2020

01 Introduction

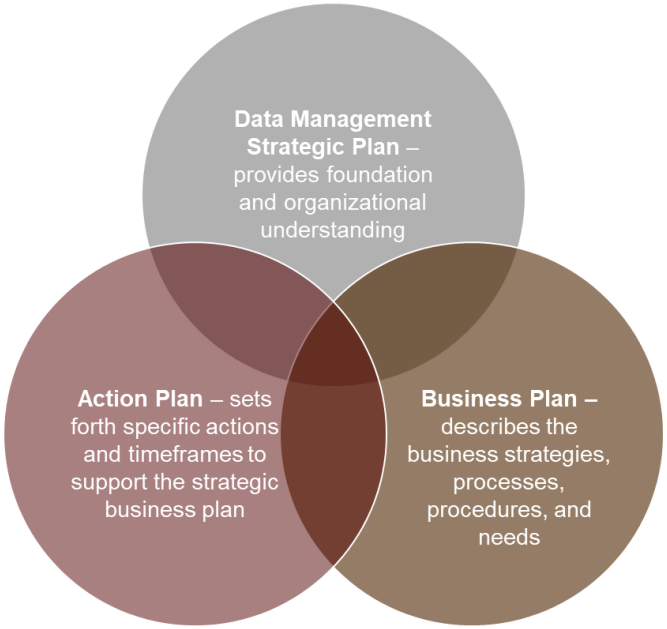

Figure ES1. *Iowa DOT Data Management Plans*

Overview

The Iowa Department of Transportation (DOT) gathers, stores, analyzes, and relies on a wide range of data and information to support business functions across the Agency. The diverse data types acquired and produced by the Agency enable it to make critical decisions about management strategies, expenditures, and resource allocations every day. As the Agency becomes more reliant on data for daily functions, it has recognized the need for quality and consistent data and its importance for business activities across different Divisions, Bureaus, and data domains. The Agency recognizes that data is a key component in improving and strengthening the existing systems and activities within the business.

In support of a formal data management approach, the Agency has developed a Strategic Data Business Plan (SDBP), which includes three documents outlining its strategic, operational, and tactical approach for managing one of the Agency's most critical assets—data. These three documents interact with each other to achieve the Agency's data management goals. The purpose of this document is to present key information from each plan.

Iowa DOT Data Management Goals

- Strengthen data governance
- Formalize data life cycle and management
- Improve data architecture and integration
- Improve data collaboration
- Improve data quality

Target Audience

The three plans focus on providing varying levels of detail regarding data management practices as depicted in **Figure ES1**. The target audience of each plan is as follows:

- ***Strategic Plan***: Executive level managers (Strategic)
- ***Business Plan***: Data Domain Trustees (Tactical)
- ***Action Plan***: Data Stewards (Operational)

Improving Data Quality

The need for readily available, consistent, quality data has been recognized by both strategic and tactical efforts undertaken throughout the Agency. In the Agency's 2018–2020 Strategic Plan, five key initiatives—*Performance Management*, *Data Integration*, *Portfolio and Project Management*, *Organizational Communication*, and *Workforce and Knowledge*—were identified as crucial to furthering the Agency's mission and vision. A second effort, the 2016 Enterprise Architecture Plan, also identified the need for a strong data practice within the Agency. Based on a series of consensus building workshops, the plan recommended improvements to applications architecture, data architecture, technical architecture, and information technology organization and governance. Data integration/data architecture were considered important initiatives in both plans, as depicted in **Figure ES2,** making formal data management an essential process for the Agency.

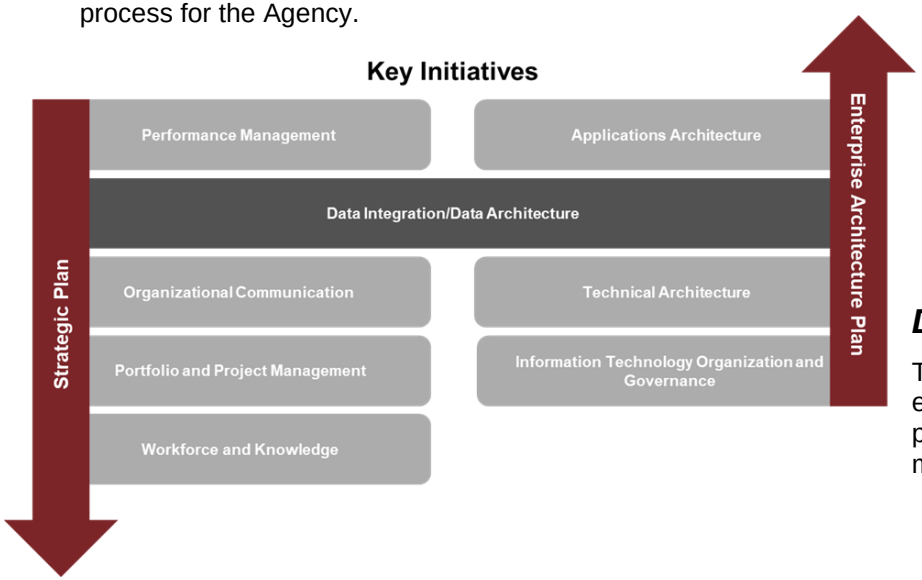

Figure ES2. *Relationship between Iowa DOT Strategic Plan, Enterprise Architecture Plan, and data management*

Data Challenges

While data remains a crucial asset to the Agency, without a robust data management framework in place, data collection, access, analysis, and sharing can prove to be a difficult process. Challenges include:

- **Data Underutilization**: Data collected is not fully used because of limitations related to data definitions, data quality, awareness or access, or lack of proper use cases.
- **Data Duplication**: Data exists in multiple locations.
- **Inefficient Integration Strategies**: Data is not properly linked to other data due to a lack of collaboration.
- **Unaddressed Data Needs**: Critical or useful data is not being collected or made available.
- **Underappreciated Data Value**: The value of data in terms of money, time, and people is underestimated.
- **Inefficient Use of Resources**: Datasets are not easily accessible or able to be analyzed, or unnecessary acquisition or duplication occurs.
- **Inconsistent Results**: When datasets or data analysis tools exist for the same data types, but the datasets or tools are not the same, results differ.
- **Gaps in Skill Sets**: The Agency has limited staff bandwidth and gaps in technical capabilities for advanced data science and analytics.

Data Management Strategy

The Agency's data management strategy is made up of five core elements—state of practice, governance, vision, mission, and principles—which provide an integrated approach to instituting the data management strategy as depicted in **Figure ES3**.

Figure ES3. *Data management strategy core elements*

02 Data Management and Data Governance Overview

Data Management

One of the most effective measures in addressing data-related challenges is better organization, management, and governance of data. *Data management* refers to "the development, execution, and supervision of plans policies, programs, and practices that control, protect, deliver, and enhance the value of data and information assets."[1] As depicted in **Figure ES4**, data management focuses on the actionable items of a plan and the ultimate implementation of strategies. Such actions help to enhance data lifecycle management by enabling collected or created data to be preserved, integrated, and analyzed.

Data Governance

Whereas data management focuses on managing data through execution, data governance is focused on the oversight or the creation of a framework to make data management possible. The exercise focuses on formalized procedures for the creation, storage, and usage of data monitored by data officers across the Agency or simply a set of best data practices implemented in a single business unit or Bureau.

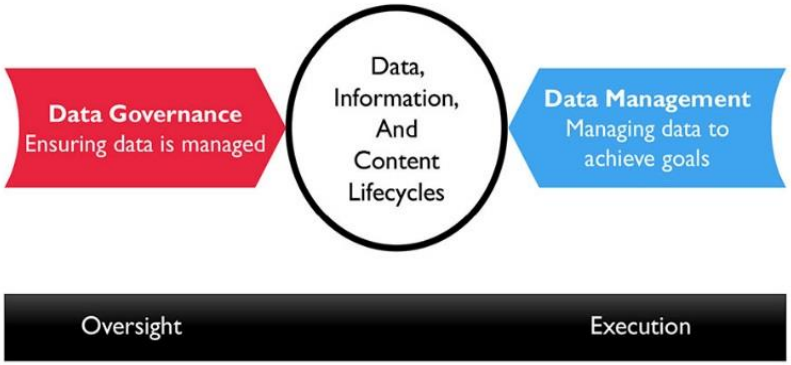

Figure ES4. *Relationship between data governance and management*[1]

Benefits of Data Management and Governance

Understanding and communicating the benefits of data management and governance can enable the Agency to create a rationale for data management and governance. Management and governance of data ensure better quality, increased efficiency, improved resource allocation, compliance with external policy, and reduced costs.[2] The Agency estimates potential savings in the order of $350 million to $500 million over a 10-year period pertaining to a reduction in data security-related issues, data quality-related challenges, data relevance and efficiency issues, and data accessibility issues. **Figure ES5** depicts the state of data with and without data management.

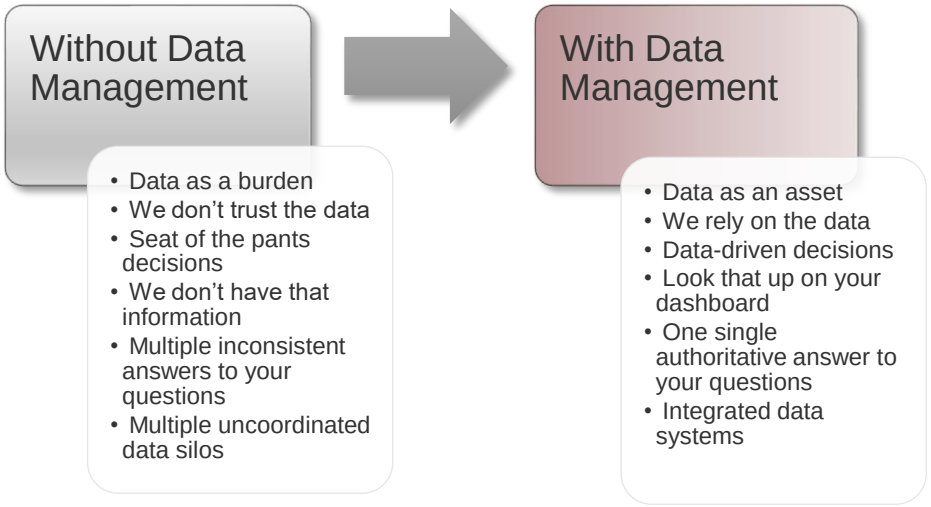

Figure ES5. *Data state with and without data management*[3]

[1] DAMA International. (2017). DAMA-DMBOK: Data Management Body of Knowledge. In DAMA-DMBOK: Data Management Body of Knowledge (2nd ed.). Technics Publications.

[2] Biskup, R. (2014). The Benefits of Integrating Governance, Risk, and Compliance. *The Wall Street Journal*. Retrieved from https://deloitte.wsj.com/riskandcompliance/2014/03/06/the-benefits-of-integrating-governance-risk-and-compliance/

[3] Harrison, F. D. (2015). *NCHRP Report 814: Data to Support Transportation Agency Business Needs: A Self-Assessment Guide.* Washington, D.C.: Transportation Research Board of the National Academies.

03 Assessment of Current State

To best understand gaps within the existing data management practice, an assessment of the current state of data management within the Agency was necessary. In July 2019, the Agency conducted a data maturity assessment, using the maturity assessment tools developed under the National Cooperative Highway Research Program (NCHRP) 814. The tools helped determine the baseline maturity for the agency-wide data management practice and assessed the value of data for pavement and bridge asset management activities. The Agency also used planning techniques such as the Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis to assess the current practices and to realize growth in the existing data management program.

Data management at the agency-level was assessed through the lens of the five key elements of agency-level data management— *data strategy and governance*, *data life cycle management*, *data architecture and integration*, *data collaboration*, and *data quality management* —as each enables a robust data management system. A summary of the key strengths and opportunities for improvement of the existing data management program is shown in the **Table ES1**. The full summary of the SWOT discussions is provided in the *Summary Notes* included in **DMSP Appendix B**, and the results of the maturity assessment are documented in a standalone memorandum—*Iowa DOT Data Management Maturity Profile*—included in **DMSP Appendix A**.

Table ES1. *Strengths and opportunities for improvement within the Agency's existing data management practice*

Strengths		Opportunities
- Skilled technical staff - Established Data Management Committee - Good examples of data management successes	**Data Strategy and Governance**	- Communication about data management efforts - Inefficient use of resources - Suitable representation on DMC - Role conflicts with PMs
- Use of Open Data Portal	**Data Life Cycle Management**	- Policies and standards for data sources
- Data integration with LRS - Centralized Master Data Management System (MDM)	**Data Architecture and Integration**	- Understanding of IT strategies and data integration efforts - Unintegrated datasets
- Positive attitudes toward technology	**Data Collaboration**	- Oversaturation of products acquired by the Agency
- Use of federal standards to monitor data quality	**Data Quality Management**	- Lack of policies mandating data reporting procedures

04 Data Governance

Data governance can be described as an exercise of shared decision-making (planning and monitoring) over the management of assets and is largely supported through formalized data roles. To better support the Agency's data management goals, a data governance framework is proposed. The governance model, depicted in **Figure ES6**, is structured as a three-level (*strategic*, *tactical*, and *operational*) hierarchy. The hierarchy incorporates stakeholder input at every level and approaches data governance from multiple perspectives across the Agency.

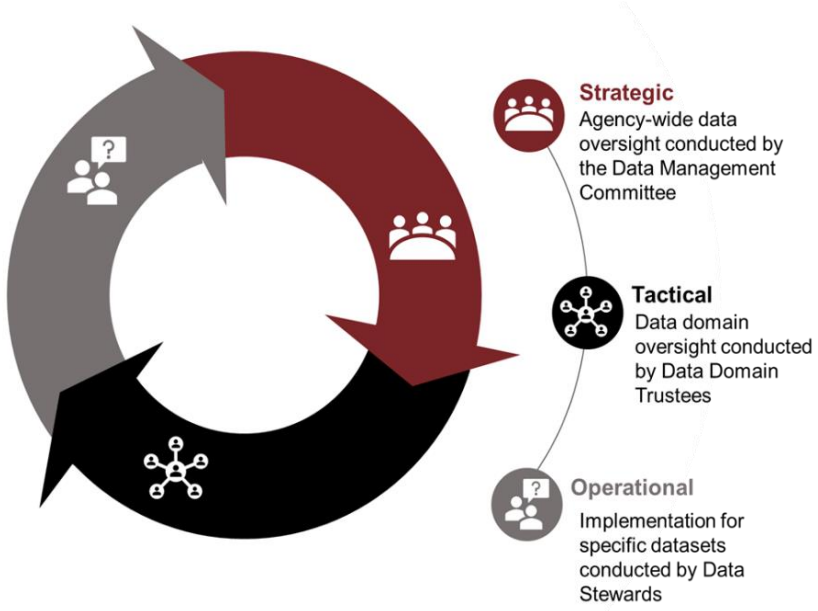

Figure ES6. *Overview of data governance framework*

Strategic-Level Governance

- Provides data oversight for all practices within the Agency.
- Represented by the ***Data Management Committee*** *(DMC)*, the ***Data Management Committee Chair*** *(DMCC)*, the ***Information Technology (IT) Division Head***, and the ***IT Governance Board.***
- Responsible for reporting to the Agency's Executive Team and ensuring continuous buy-in for data management initiatives and activities.

Tactical-Level Governance

- Facilitates top-down initiatives and supports bottom-up improvements to data management practices.
- Represented by ***Data Domain Trustees*** for a specific business function or practice.
- Responsible for integrating strategies supported by the DMC with the day-to-day data activities carried out by Data Stewards.

Operational-Level Governance

- Focuses on individuals who can provide feedback on the practicality and applicability of policies and practices proposed within the Agency.
- Represented by ***Data Stewards*** of specific data sets.
- Responsible for the putting the agency-wide data management policies and standards into practice and identifies any issues with domain datasets.

05 Data Management Strategy

Data management is a multi-faceted process; a data management program must align existing agency-level business strategies with procedures to address unit-level data issues. The Agency aligns its data management strategy with existing business priorities by establishing a vision, mission, data principles, and data goals that agree with the Agency's existing Strategic Plan. **Figure ES7** summarizes these elements.

Mission	Vision	Data Principles
To provide data management processes that enable users to locate and use data for agency-wide decision-making.	Iowa DOT will utilize reliable and comprehensive data to support business decisions.	■ Valuable ■ Uniform ■ Accessible ■ Relevant ■ Quality ■ Secure ■ Compliant ■ Efficient

Figure ES7. *Iowa DOT's data management strategy*

Goal 1—Data Strategy and Governance

Objective 1: Improve collaboration on necessary data improvements and planning tools by systematically and continuously reviewing data practices.

Objective 2: Identify roles and capabilities needed for data management activities.

Objective 3: Ensure data management procedures and policies are properly established, documented, and implemented.

Objective 4: Identify and track data collection or acquisition costs.

Objective 5: Identify data users and understand their needs.

Objective 6: Determine risks associated with the loss of key individuals and mitigate knowledge loss over time.

Goal 2—Data Life Cycle Management

Objective 7: Create data business rules to update data within data systems consistently.

Objective 8: Ensure data access control and standard guidelines are being adhered to in a safe and secure manner.

Objective 9: Provide data access to all users throughout the Agency by enabling data to be widely available on multiple platforms, using diverse analysis tools.

Objective 10: Create a data dictionary that is current, complete, and useful to data users throughout the Agency.

Objective 11: Establish data backups and archiving procedures to ensure data is secure and protected from losses.

Objective 12: Assess the impact of changes in data collection, policies, and procedures to the overall data program.

Goal 3—Data Architecture and Integration

Objective 13: Identify and standardize the process for adding additional data to the agency-wide data system.

Objective 14: Improve external data integration by vetting external data sources so that the data is compatible enterprise wide.

Goal 4—Data Collaboration

Objective 15: Improve internal collaboration on IT and data management activities through effective communication and planning.

Objective 16: Coordinate data collection and processing, as well as product acquisition, between Divisions within the Agency.

Objective 17: Share data externally in a manner that is appropriate and effective for all users.

Goal 5—Data Quality Management

Objective 18: Create common data metrics that enable consistent assessment across data programs.

Objective 19: Establish defined data metrics and standards for accuracy, timeliness, and completeness.

Objective 20: Promote formal guidelines for assessing data quality, validity, processing consistency, and ordinal accuracy.

06 Data Standards

Data standards provide the opportunity for the Agency to gather, format, define, and share data that meets the Agency's business needs. Through the implementation of data standards, the Agency can establish a process to reduce ambiguity, redundancy, and inconsistency present if data was managed without regard to other datasets. Clear management strategies are especially important as the Agency creates and uses diverse and abundant datasets. Therefore, by developing and implementing data standards, the Agency will be able to understand and reference data in a clear and concise manner through centralized policies and documentation, as well as save time in data processing and provide added value to data users.

This section describes a procedure for creating or updating data standards within the Agency. The recommended framework is intended to assist the Agency in better understanding where data standards are needed and how existing standards can be improved. A summary of the framework is provided in **Figure ES8**, and an explanation of the activities for each step is provided in **Figure ES9.**

Figure ES8. *Data standards framework*

Figure ES9. *Data standards activities*

07 Data Sharing and Integration

The Agency collects, combines, and shares data and information across Divisions, Bureaus, Districts, and business areas, as well as with external stakeholders. Internally, there is a horizontal and vertical flow of data and information across Divisions and Bureaus to support decision-making. Externally, the Agency shares data and information with the public and stakeholders of the transportation system. These activities are largely supported by the data sharing and integration practices adopted by the Agency. These processes, when correctly implemented, reduce issues related to mismatched management systems and data formats, timely access to information, data processing times, data duplication, and data redundancy. Therefore, it is important for the Agency to have efficient data sharing and integration processes in place. A summary of the framework is provided in **Figure ES10**, and an explanation of the activities for each step is provided in **Figure ES11**.

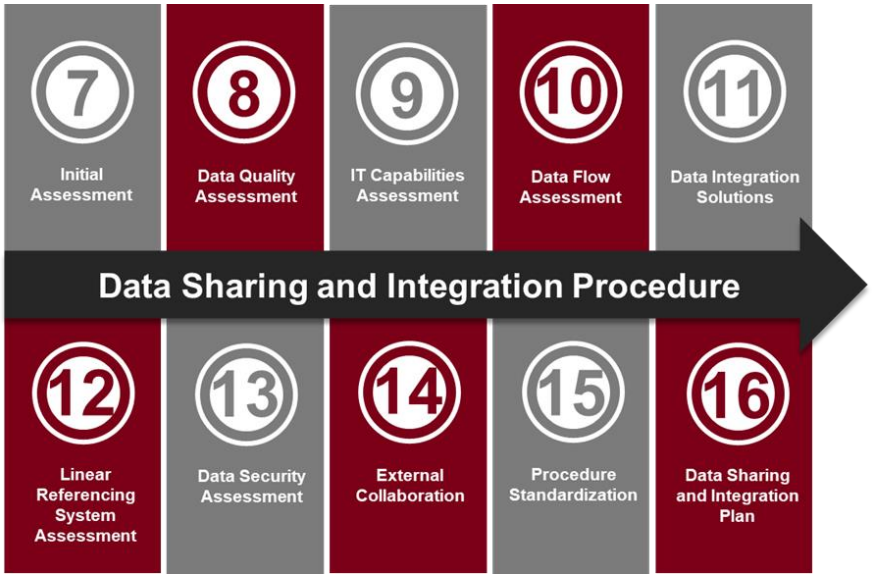

Figure ES10. *Data sharing and integration framework*

7 *Determine key data activities, data sources, necessary skills, and data sharing and integration objectives.*

Assess the quality of data sources being shared and integrated through profiling and assessment of business rules. 8

9 *Assess the capabilities of the existing IT systems that support the business area activities.*

Establish a data flow for the data sources within the business area being assessed. 10

11 *Identify data integration techniques to be used by the Agency.*

Reassess and improve upon the universal Linear Referencing System (LRS) adopted by the Agency. 12

13 *Identify, assess, and create data security standards to reduce data-related risks.*

Identify stakeholders and develop an engagement plan to enable collaboration. 14

15 *Standardize data sharing and integration procedures for new data or applications.*

Develop and implement a data sharing and integration plan. 16

Figure ES11. *Data sharing and integration activities*

08 Action Plan

The Agency's Action Plan outlines the recommended actions necessary to achieve the Agency's data management goals and objectives—specifically, action items directly related to the data goals, objectives, and principles established, and the strategies suggested in the Data Management Strategic Plan (DMSP) and the Data Management Business Plan (DMBP), respectively. These recommended action items are crucial in improving the Agency's data management practices; each action item builds on the existing strengths of the Agency and focuses on leveraging the Agency's resources to effectively bridge data management gaps overall. The Action Plan also addresses how and why specific actions should be accomplished. The Agency has prioritized these action items using the prioritization framework described.

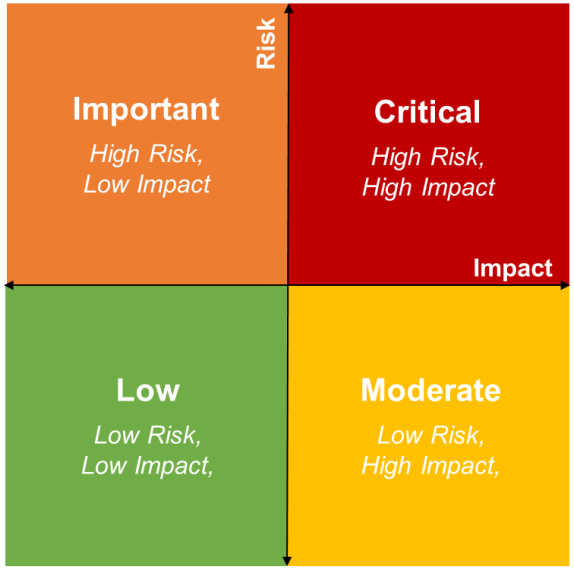

Figure ES12. *Risk-impact priority matrix*

Prioritization Framework

The framework relies on an assessment of the level of risk and the level of impact associated with each recommended action item. Once these elements have been assessed, the action items are placed in a matrix, as depicted in **Figure ES12**, based on the action item's level of risk and level of impact in relation to other action items. Such a matrix utilizes the determined risk and impact to categorize action items into four priority categories. The four categories are as follows:

- ***Critical***: These action items are considered high risk and high impact, meaning they are both important to achieving the Agency's data management goals, objectives, and principles as well as furthering the overall function and development of strong data management strategies.
- ***Important*****:** These action items are considered high risk, low impact and are therefore considered second.
- ***Moderate:*** While these actions are of low risk, they are of high impact in achieving the Agency's data management goals, objectives, and principles and are therefore considered third.
- ***Low:*** These action items are considered low risk, low impact and therefore, are considered last.

Level of Effort

Level of risk refers to the importance of the action item in a) enabling the Agency to access data safely and efficiently and b) supporting the implementation of other interdependent action items.

Level of Impact

Level of impact describes the importance of an action item in accomplishing the data management objectives and goals and promoting the data principles of the Agency.

Data Management Roadmap

To better understand how the Agency will implement and allocate resources to data management activities over time, a data management roadmap was developed. The roadmap, depicted in **Figure ES13,** is divided into two data management strategy areas—data standards and data sharing and integration—with action items within each area proposed concurrently. Action items in each strategy area are arranged along a 5-year timeline. Recommended actions identified for the 1-2-year timeframe are considered short-term and are the first action items to be implemented. Mid-term (2-3-year timeframe) action items are to be conducted following the short-term action items, and long-term action items (3-5-year timeframe) are to be conducted last.

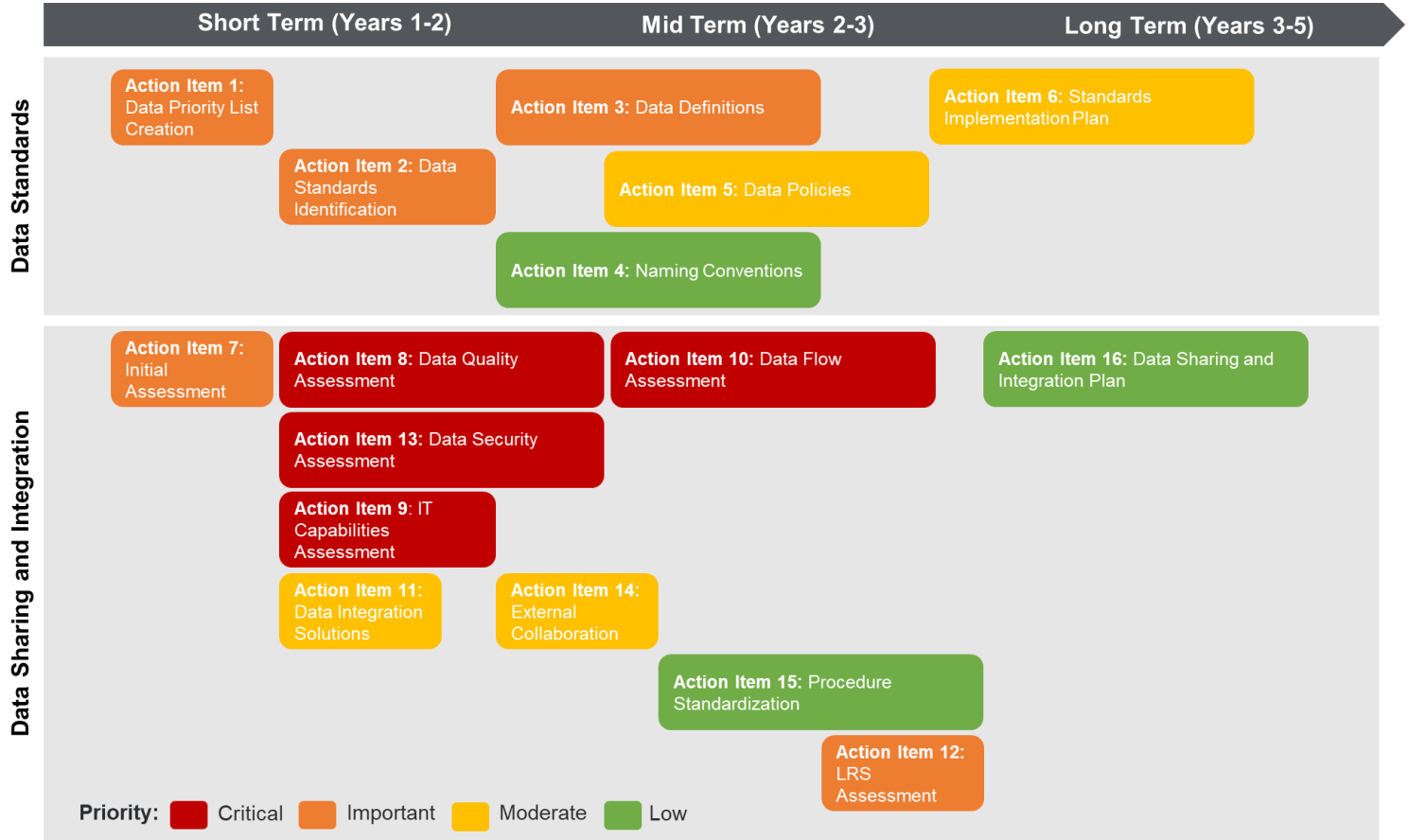

Figure ES13. *Data management roadmap*