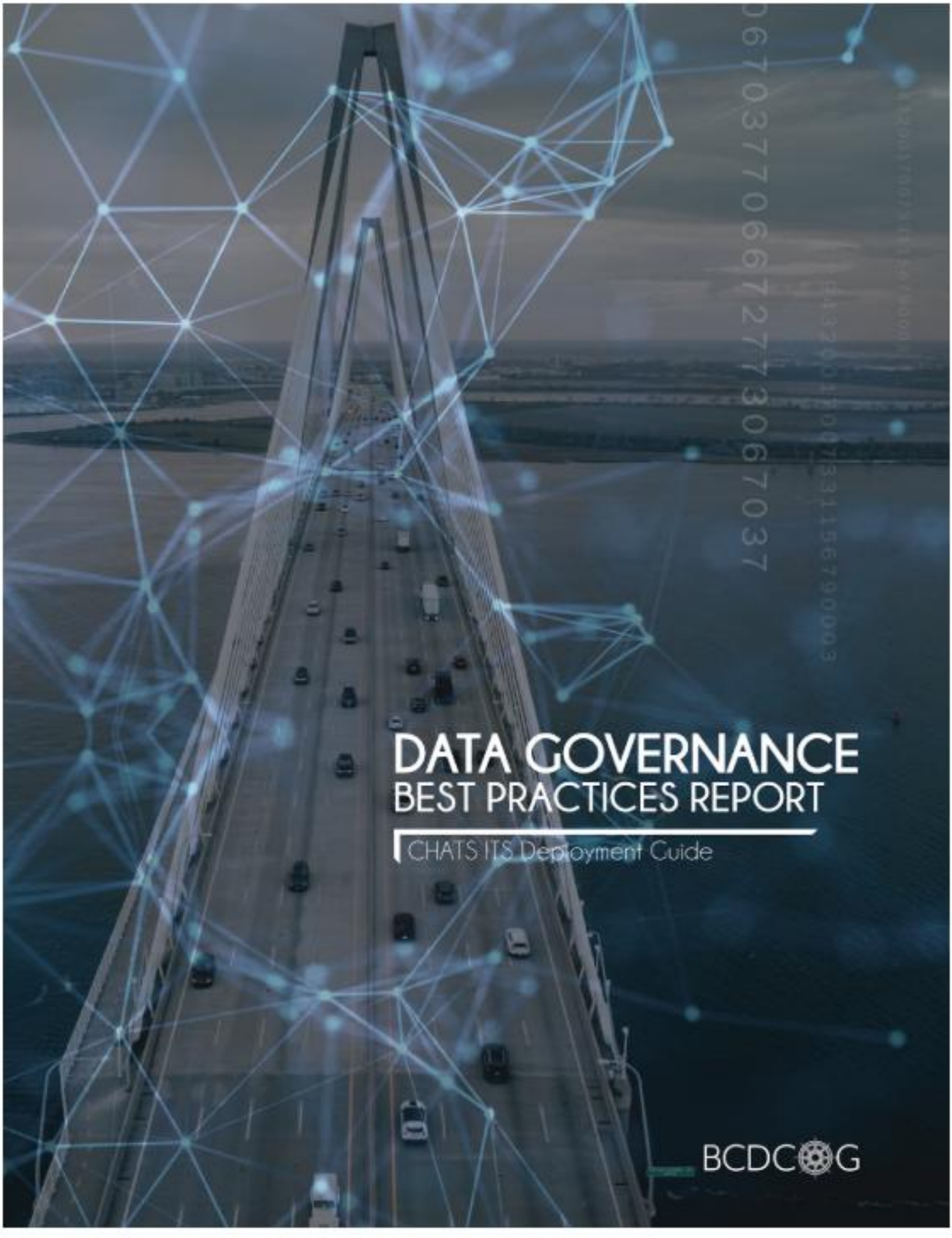
DATA GOVERNANCE
BEST PRACTICES REPORT
CHATS ITS Deployment Guide
BCDCOG

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1 Introduction

The primary focus of this document is for the purpose of preparing to integrate and share data across multiple agencies for transportation-related purposes. Preparation and planning are necessary as the transportation sector changes to address data as a strategic asset. This document will address a review of best practices in the industry, an overview of benefits of establishing data governance, data access and governance from a who/what/when/why/where standpoint, and other considerations for developing data governance for the CHATS Region. A part of this effort included a review of example data governance documents from a mixture of agencies across the country and at the federal level. This document cites relative reference documents including efforts with Metropolitan Planning Organizations (MPOs), state DOTs, and AASHTO.

2 Overview of Data Governance

One of the earliest decisions that groups face when establishing Data Governance protocols pertains to selecting a viable stewardship model that organization(s) will embrace. Data Governance typically falls within two primary data stewardship models: hierarchical and flat. AASHTO identifies the Flat Model (shone on the left) as defining direct links between the Data Council and each individual Data Steward. The Hierarchical Model (shown on the right) inserts a Highway Data Coordinating Data Steward to function as a liaison.

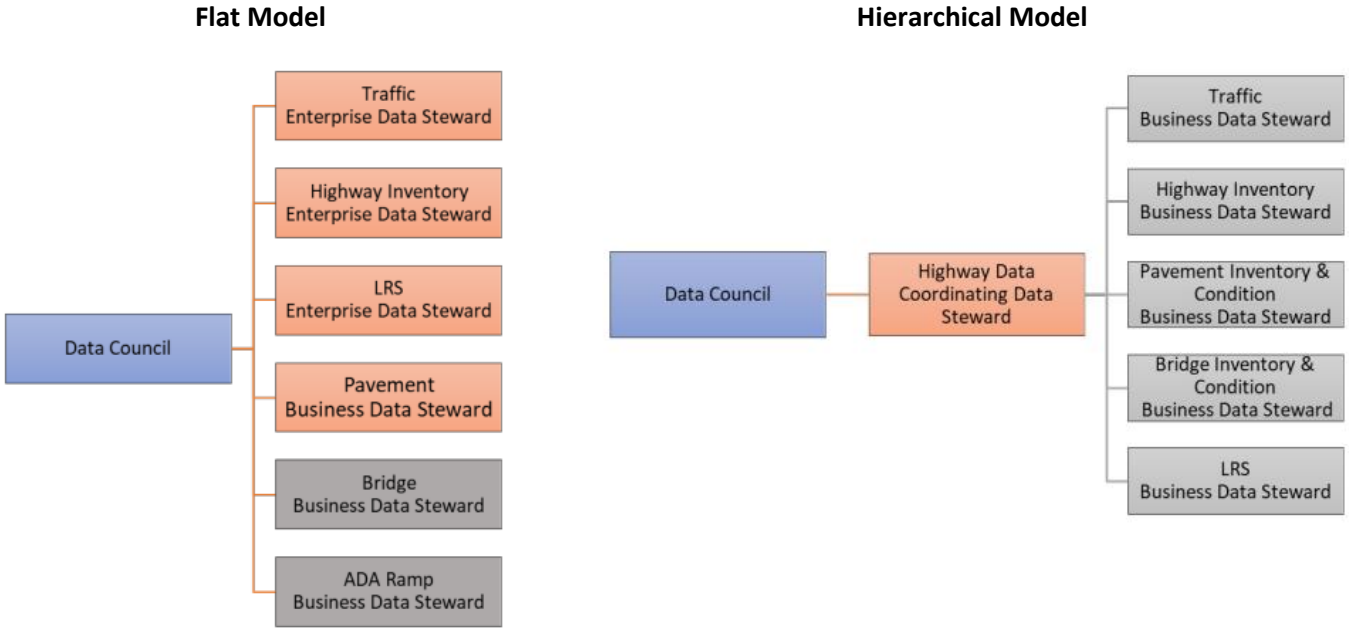

Figure 1. AASHTO Data Stewardship Models

In the Hierarchical Model, the Data Coordinating steward serves as a liaison to the Data Council and the respective sub-system data stewards. This level of oversight provides has the added benefit of establishing consistency standards across the varying datasets. Withing the Flat Model, there lack of this intermediary role requires the region to distribute those responsibilities between the Data Council and the respective individual data stewards. Coordinating between multiple data owners requires a focus on certain standards to address system-wide programmatic consistency and interoperability.

The region will need to assess the most appropriate strategy for assigning data stewards. Stakeholders can assign data stewards by ***subject areas*** such as bridges, pavement, transit, construction projects, traffic & congestion, or ITS technology equipment. Alternatively, stakeholders can assign data stewards by ***business units*** (i.e., Region X, Agency, Ops & Maintenance division, Safety Programs) or by ***Information Technology (IT) Systems*** such as Crash Database, 511, TOC, or Digital Video Management Systems.

2.1 Benefits

Maintaining a central, organized data catalog for your agency makes it easier to understand what information is currently available. Transparency into the full universe of data held by an agency helps to prevent the possibility of duplicating efforts, misallocating resources, or wasting funds due to lack of knowledge around existing data. A single data catalog provides a particular individual, program, or department the knowledge regarding whether data already exists. A consolidated scope and cost center can streamline resources for new data procurements and allow all stakeholders to use and pair that data with internally held, complementary data sets, and improve decision-making capabilities of the agency. A data governance plan provides a roadmap for regional stakeholders to recognize the following benefits:

- Avoiding unnecessary data duplication
- Identifying complementary data sets
- Leveraging group buying power to reduce data acquisition costs
- Improving capabilities to identify needs of residents
- Improving decision-making
- Enhancing transparency and accountability
- Reducing FOIA requests
- Shared performance monitoring

In addition to the above benefits, a data governance plan can support supplemental benefits to the region.

- **Civic hacking:** Publicly available data supports government agencies and the private sector in determining new undiscovered opportunities that can sometimes yield great community impacts. Go Code Colorado is statewide app developer competition in Colorado that partners entrepreneurs with developers to build apps using publicly available data.[1] Drip and Hud Buddy are two winners of this competition from 2017.
    - ***Drip:*** *A team comprised of technical experts, healthcare expertise, and knowledge about the real estate market, representing Colorado Springs, created a platform that helps streamline water data discovery and analysis. The app helps real estate agents, developers, investors, appraisers, and consultants make better business decisions with publicly available water data.*
    - ***Hud Buddy:*** *This Fort Collins team developed a solution to perform noise analysis for HUD residential projects. Their application helps real estate developers easily comply with federal and state regulations. Traditionally, real estate developers have spent thousands of dollars on noise analysis of potential development sites, often later in the*

[1] https://www.xentity.com/how-entrepreneurs-are-using-open-data-to-start-businesses/

development process. Hud Buddy allows noise analysis to be performed remotely with a click of a button, much earlier in the process.

- **Economic impacts:** A McKinsey report estimated that unlocking the potential of open data could yield an economic impact of $3 Trillion globally.[2] **Figure 2** shows the three value levers that Government can impact to support these economic impacts.

Figure 2. Three Value Levers for Generating Global Economic Impacts

- **Productizing data:** This term represents the process by which an entity can convert data into a product that is marketable or provides value to the user.[3] According **The Jabian Journal**, there are five keys to productizing data.
  - Data Storage and Access are Priority No. 1.
  - Data Governance Defines the Way Your Data 'Speaks'
  - Who Does What? How to Define Key Data Roles
  - Integration and Data Sharing Generates New Product Ideas
  - Avoiding Data Traps: How to Prevent Organization Miscues

Each of these topics and the associated articles provide additional resources that the region can reference as they develop their data governance strategy.

2.2 Challenges

Effective data sharing can experience challenges. The Atlanta Regional Data Governance Best Practices Report presents the top five issues identified by stakeholders with respect to sharing data with other organizations.

1. **Inconsistent access, challenges to access (platform), and data discovery:** This is dependent on both knowledge-oriented and technology-related challenges.
2. **Inconsistent structures, formats, and semantics:** Incompatible data sets make it difficult to interpret or correlate data.
3. **Unclear data responsibility:** This directly speaks to organizational and personal roles for the care and maintenance of datasets.
4. **Data restrictions:** Lack in data ownership leads to unclear data distribution and usage.
5. **Limited and costly resources to manage data:** Lack in commitment of resources to support continuous data maintenance.

[2] How Government Can Promote Open Data and Help Unleash Over $3 Trillion in Economic Value
[3] https://journal.jabian.com/setting-the-stage-for-data-productization/

Employing an effective Data Governance plan can mitigate these challenges by establishing consistencies and improving efficiencies for sharing data between multiple organizations. It also establishes rules and guidelines on formatting, organizing, and sharing data to streamline processes and increase overall utility. Data Governance should define ownership and oversight strategies directed at addressing challenges #3 and #4. A Data Governance plan, paired with a data business plan, can address the fifth challenge by prioritizing data needs and identifying the resources needed. Additionally, it can prescribe strategies to transition from manual data management processes to automated processes that improve the efficiencies for data stewards and owners. Automated processes also streamline practices around monitoring data quality, further saving time for the data owners.

3 Best Practices Industry Summary

Data governance at the core boils down to People, Process, and Technology. The main reason to establish Data Governance is to aid in the process of managing the use of data as a strategic asset. A national scan for formal data governance plans and strategies identified transportation-agency examples. Virginia Department of Transportation's (VDOT) Concept of Operations (ConOps) for a brand-new Operations Technology Asset Management platform places data management as a strategic asset at its core. VDOT's best practices in data governance includes the implementation of strategies that expand system connectivity and infrastructure access between the Department and local agencies.

USDOT leadership along with multiple committees have adopted AASHTO's Core Data Principles, shown in **Error! Reference source not found.**, as a guiding framework for data governance. The guidance places an emphasis on the value of data as an asset and recognizes that it needs to support the business functions of the agency (or agencies) and the underlying mission of the organization.

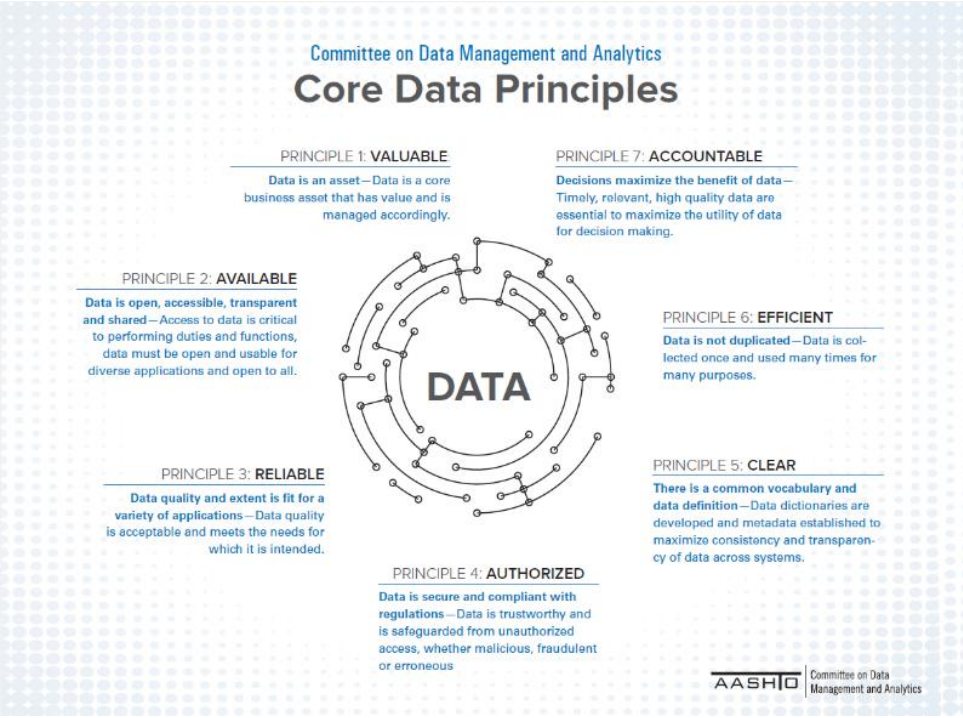

Figure 3. AASHTO Core Data Principles (Source: https://data.transportation.org)

A different perspective views data governance as a focus on who will use the system or the data, what their roles will be, the processes for getting data in and out of the system, and the technology needed to support those people and processes. The developers of the visual analytics platform Tableau, which is well known for the ability to summarize a high volume of data, provides six best practices[4] for data governance:

1) Think with the big picture in mind, but start small
2) Build a business case
3) Metrics and more metrics
4) Communicate early and often
5) Account for the fact data governance is a marathon, not a sprint
6) Identify related roles and responsibilities

Washington State DOT (WSDOT) has developed principles that guide data and information management as follows:

1) Data and information are critical to effective business decision making at WSDOT and shall be maintained in a manner appropriate to meet business needs.
2) Data and information are strategic, long-term assets owned by WSDOT, not by individual business units. They are findable, retrievable, and shared.
3) Data and information shall be collected once, stored once, and used multiple times.
4) Data and information that is not used shall not be collected or stored.
5) Data and information that is used by multiple applications or shared across business units shall be defined and managed from an enterprise perspective and fit for a variety of applications.
6) Data and information investments will consider business priorities, program impacts, and trade-offs.
7) Data and information shall be managed to provide availability, security, and integrity — they shall be both safe from harm and accessible by those who need them.
8) Data and information governance, costs, and stewardship processes will be transparent

This data management strategy requires a mindset shift from solely focusing on physical assets. **Figure** 4 considers the two sets of questions for managing two distinct types of assets – bridges and data. When asked how many bridges a DOT owns, most agencies can supply an answer in short order by referencing the FHWA National Bridge Inventory (NBI) database. However, when asked how many data systems they have, the same agency typically provides a vague answer and may even request additional clarification on what constitutes a data system.

It is challenging for an agency to articulate the total amount of money expended on data collection and management. The costs can include a wide range of individual costs including data collection, staff dedicated to data management, data storage, and IT maintenance costs for security and online access. Some costs are more easily determined, while others are too obscure to even estimate.

[4] Tableau.com Data Governance Best Practices

Managing Assets—Bridges	Managing Assets—Data
1. How many bridges do you have in South Carolina?	1. How many data systems do you have in South Carolina?
2. How far into the past/future do you assess/plan bridge projects?	2. How far into the past/future do you assess/plan data projects?
3. Number of staff associated with bridges management?	3. Number of staff associated with data management?
4. Budget/expenditures?	4. Budget/expenditures?
5. Chance for redundant construction or maintenance efforts?	5. Chance for redundant data collection or maintenance efforts?
6. Who are your bridge customers?	6. Who are your data customers?
7. Who defines the bridge management strategy?	7. Who defines the data management strategy?

Figure 4. Comparison of Asset Management (Bridges versus Data)
(Source: SCDOT Asset Data Collection Assessment Final Report – August 2019)

BCDCOG has already established the business case for sharing data between partnering agencies and one of the primary goals is to improve and expand on regional metrics. As part of this goal, BCDCOG should clearly define the most important regional metrics including how those metrics support decision making within the region. As regional partners define these metrics, remember that simplicity is key. Mode Analytics (Derek Steer) concisely notes that it is best to "keep governance systems as simple as possible…it may be impossible to answer questions about 1,000 key performance indicators (KPIs), whereas with five well-defined ones you can ensure consistency."[5]

The region identified limited resources as a challenge. Therefore, these regional metrics must be easy to collect, analyze, and report. Additionally, the alignment to each agency's core functions should be clear, so they can integrate the metrics into Standard Operations Procedures (SOPs) and decision-making.

4 Regional Project Plans and Strategies

In prior deliverables, this project identified multiple regional projects that fed into a *Summary of Existing and Planned Data Interconnects*. These projects and strategies drive the need to establish a data governance framework.

- **Regional Communications Plan:** developing a build-out plan addressing gaps, prepares for regional network data interconnections, and addresses the opportunities around shared trenching/conduit/fiber resources.
- **Integrated TMC Operations Concept of Operations:** developing use cases for how a regional TMC would function and defining roles and responsibilities within each of the participating agencies.
- **Regional Data Clearinghouse and Guidelines:** leveraging existing databases, sharing data between agencies, documenting processes for acquiring and accessing data to support the goals and objectives of the region.

[5] Mode Analytics (Derek Steer) Best Practices in Data Governance.

- **Regional Signal Timing Guidelines:** establishing consistent signal timing plans and implementations to better facilitate cross-boundary transitions and throughput.
- **Performance Measures Program:** building from the identified projects to establish key metrics that support what is important for the region. These metrics could include improving incident response/clearance times, increasing regional traffic throughput, minimizing Arrivals on Red for signalized corridors, and other operational parameters used in managing the freeways and arterials. The regional should define clear roles and responsibilities and data consistency/accuracy standards to ensure equivalent reporting across the region.
- **Maintenance Contract Template:** establishing a baseline understanding and template of the elements needed in on-call maintenance contracts across the entire region to streamline responsiveness and helping to achieve performance objectives for device/network uptime.
- **Technical Training Initiatives:** to improve the technical skills of regional staff for managing data as an asset, managing technology-based procurements, as well as emerging ITS technologies.

5 Data Governance Framework

The most challenging part of establishing Data Governance is often just taking that first step. As noted above, BCDCOG has been diligently working to establish the business cases for the collaboration. The next step is establishing a governance body and framework that is in unity with the vision of the BCDCOG initiatives for sharing data. In the VDOT example, they partnered with stakeholders to develop a ConOps and a migration strategy with their proposed platform as the central focus from which to base changes in user roles and responsibilities, data governance, and the technologies that would be employed. In addition to VDOT's example, the Federal government has published relevant resources for establishing a new Data Governance Playbook (*Federal Data Strategy's Data Governance Playbook* fds-data-governance-playbook.pdf). The first Play in the Playbook starts with Establishing a Data Governance Body. This includes setting up an organizational structure to address the upcoming and ongoing data needs, defining a vision for the associated infrastructure requirements, and creating policies and procedures to support those needs. In this first play, the questions of Who, What, When, and How are the key focus – and these questions are discussed in Sections 5.1 through 5.3 below.

5.1 Who?

The region should establish a *Data Governance* or *Tactical Board* with local and state stakeholders that begins with the vision for a Regional Data Clearinghouse as a target. The board should define a *Chief Data Officer* to chair the Board, and a mixture of members that include Information Officer(s), Information Technology, and Traffic Operations individuals to provide:

- tactical oversight to the deployment of the unified vision,
- identify and allocate funding to projects and initiatives,
- review and approve projects and architecture changes, and
- partner with Data Owners/Managers to establish and manage the review and approvals for changes to subsets of the architecture.

Data Owners/Managers are responsible for overseeing the data structures assigned to them, and to coordinate with the respective database managers for administrative changes needed for any operational adjustments needed to adapt to changes in the vision.

For larger datasets, Data Owners/Managers may consider making sub-assignments to *Data Stewards*, who in turn would monitor the datasets themselves for consistency, accuracy, gaps, and to manage any necessary updates to the type of data, managing metadata, and the impacts on existing datasets.

Data Users, represent the primary reason for establishing a regional clearinghouse. The data governance should group Data Users into differing levels of access and control privileges. For example, Data Stewards could be Data Users with sufficient privileges to manage a subset of the data. Other Data Users may only need Read/View only access to review, receive, or extract data for their operational mission. From a security standpoint, permissions should default to the lowest level of privileges allowable to satisfy the user's defined needs and protect the security of the data.

Figure 5 presents an example organizational relationship from the FHWA Data Governance Plan (Data Governance Plan – Volume 1 Data Governance Primer (dot.gov). This example provides a vision of how these individuals and groups could potentially interact with one another.

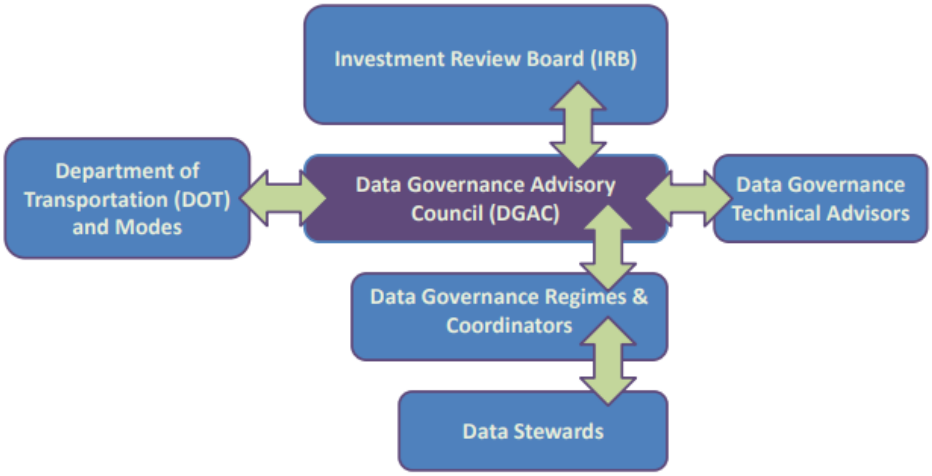

Figure 5. Data Governance Organization Example (Source: FHWA Data Governance Primer)

5.2 What?

Guided by the vision for the Regional Data Clearinghouse, the Data Governance Board will need to establish policies and procedures to guide the oversight, implementation, and operation. Development of prioritization criteria can be helpful to a data governance team faced with competing projects of seemingly equivalent importance. A Memoranda of Agreement (MOA) can memorialize the role of the Board and the associated commitments from stakeholders and the Authority granted to the Board.

Each entity that will be a collaborative partner or user with the Regional Data Clearinghouse should consider their own vision for leveraging the clearinghouse to answer key questions and address operational and performance needs.

5.3 How?... and Where?

The Board will establish policies and procedures to govern the implementation of the Data Governance. Additionally, identifying where data will reside, is equally as important as the preceding questions. As

part of the data governance oversight, the Data Governance Board will need to consider the deployment strategy of the data clearinghouse and the associated communications network implications. The deployment could use either on-premises or a cloud-based repositories.

The region should define subcommittees and assign supporting roles for Data Stewards to balance responsibilities and establish a sustainable structure for data governance. When leveraging third-party data sources (e.g., Inrix, Waze), the Board should assign a primary Data Manager to oversee any contractual requirements and confirm the health and reliability of the data set. This role also would coordinate maintenance needs from the data providers. As the stakeholders integrate data, they should continuously assess the value of shared benefits and potential cost savings resulting from the joint purchase of available datasets.

A plethora of reference templates are available on https://resources.data.gov/ for resources ranging from a Steering Committee charter template to best practices for handling data on the Internet (Data management & governance | resources.data.gov).

Additionally, OpenGovData provides important guidance and principles for datasets that will be openly available to the Public. The site provides The 8 Principles of Open Government Data (https://opengovdata.org/).

1. Complete… data is complete and not restricted based on privacy or permissions concerns.
2. Primary… data is collected at the source.
3. Timely… data is made available quickly.
4. Available… data is made available to accommodate the widest range of users and purposes.
5. Machine processable… data is structured to allow automated processing.
6. Non-discriminatory… available with no requirement for registration.
7. Non-proprietary… no single entity has exclusive control of the data.
8. License-free… data is not subject to copyright (or equivalent) restrictions for distribution.

Based on these principles, any data that a single agency purchases from third parties may have limited use by the partnering government entities associated with the Regional Data Clearinghouse. To avoid these challenges, it is important to incorporate the appropriate re-distribution permissions within procurement contracts.

6 Other Considerations for Data Governance of the Regional Data Clearinghouse

6.1 Data Archiving and Data Loss Prevention

Data Archiving, by definition, involves moving data out of production systems into separate storage until such time that it reaches the end of its designated retention period, and the owner can purge. Data Loss Prevention includes establishing procedures for point-in-time backups of production systems and data to minimize loss of system records and functionality. This can occur from an array of corruption, disruption, or intrusion events.

Traffic Management Centers (TMCs) manage copious amounts of data including incident management logs, massive amounts of traffic sensor data, and crowd-sourced data. This data provides both real-time and historical value to operations managers. TMC operators may have experienced the loss of that data

from risks such as storage device failures, accidental deletion (by users with system privileges set too high), malware that blocks access to servers and data, or a corrupt field device that overwrites the central database. Regardless of the risks associated with data theft or corruption, understanding the importance and value of the TMCs datasets is the first step in data loss prevention. Armed with that information, an appropriate data backup and archiving plan (including the right frequency) allows agencies to establish mitigation strategies as part of the data archiving and loss prevention plan.

Protocols and system design can layer loss prevention elements by performing incremental backups in near real-time; daily backups collected for a week; and weekly backups collected for 5-6 weeks. The design can overwrite each of these back-ups after an appropriate timeframe that is consistent with the data risk profile for each dataset.

The stakeholders should document data retention periods for the archives of each individual dataset. Each agency's data retention must follow state or local legal requirements for records retention and should align with established standards by the region for Freedom of Information Act (FOIA) in cases not covered by existing legal guidance. Based on the space requirements and performance monitoring preferences (such as trend analysis statistics), the region should optimize archiving requirements for specific data sets. For example, the region may vary retention timeframes for traffic signal data versus the more robust and sizable Automated Traffic Signal Performance Measures (ATSPM) data.

Data Stewards need to identify an Archival recommendation in conjunction with the Data Governance Board's approval. The Data Governance Board's responsibility is to focus on regional consensus while managing the appropriate levels of consistency across the entire Clearinghouse of datasets.

Since data backups for loss prevention have different requirements than simple data retention for recordkeeping, it is important for Data Stewards and Data Managers to clearly differentiate between archives and backup solutions. Further, the data collected for the Clearinghouse has a defined purpose and importance during its production life that requires mitigating against single points of failure. The archival process should take similar care to prevent single points of failure from impacting volumes of records (e.g., a data archive backed up to a single USB hard drive with no other backups).

6.2 Data Maintenance

Data maintenance generally involves the recurring review, organization, and routine correction of datasets for maintaining accuracy and addressing missing data (particularly when compiling traffic detector system data). In certain cases, data maintenance may involve using historical trend data for a similar time period to address missing data or flagging a data reliability value based on known inconsistencies in the dataset. In other circumstances, maintenance involves taking action to apply data archiving and retention policies to trim down the production dataset accordingly.

When owners update datasets to adjust to newer conditions or needs, maintenance may also require the Data Stewards to make adjustments that map datasets to the newer data models and Application Programming Interfaces (APIs). When owners update APIs, the owners should coordinate the rollout with other Data Owner/Managers to minimize impacts to data flows. The API release to Production should occur after the owner has conducted sufficient testing in a designated Test environment. The region should establish an SOP for change management for consistently managing changes across all datasets in the Clearinghouse. Virginia DOT has established a Change Management Process form that includes a checklist of items and potential impacts to other systems. Owners must address the checklist

before approving the rollout of updates to their Production operations systems. In doing so, the process triggers an internal notification process to alert the impacted operational and data systems managers of the timing of the scheduled maintenance and upgrade activities.

6.3 Security guidelines (FHWA and CIS guidance)

The FHWA has established security guidelines using other relevant industry standards that pertain to the transportation industry. The FHWA released the *Transportation Management Center Information Technology Security* guidelines that leverage the Center for Internet Security (CIS) recommendations for cybersecurity controls in conjunction with the National Institute of Standards and Technology (NIST) Cybersecurity Framework.

As noted in the guidelines:

> "The NIST Cybersecurity and Risk Management Frameworks were more abstract and strategic in nature, while the CIS Top 20 Controls provide more technical detailed guidelines of immediate benefit to TMC operators. Therefore, using the CIS Top 20 Controls in baselining security measures provides an immediate impact on guiding control of hardware, software, and networks in the TMC, while the NIST frameworks can play a beneficial role to supplement with strategic visioning of Risk Management Plans and Resiliency Plans."

Agencies establishing a Data Management strategy should reference Chapter 6 regarding Software used within the Network, and Cloud Hosting considerations. Figure 6 shows an excerpt of the process flow.

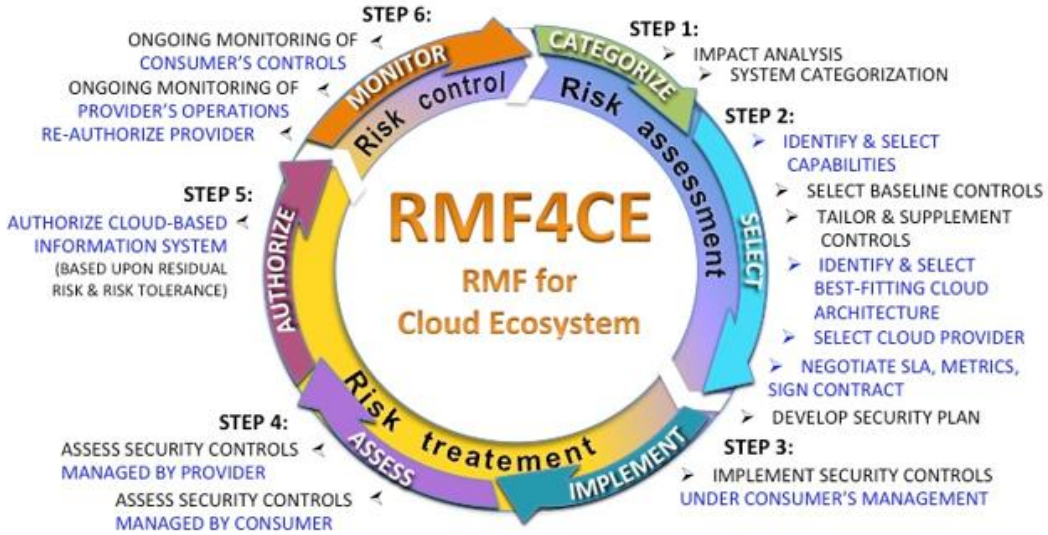

Figure 6. Cloud Consumers' View of the Risk Management Framework Applied to a Cloud Ecosystem (Source: Managing Risk in a Cloud Ecosystem, NIST.)

Chapter 6 emphasizes the need to catalogue or inventory the software assets that are employed on an agency's network, but it also stresses the importance of extending this inventory to include software and systems between partner agencies. CIS Control 2 provides guidance on managing software in these environments, and the importance of removing software that is unnecessary or no longer needed. This control designs procedures to allow or disallow specific software applications based on a vetting process. Furthermore, CIS Controls 5 and 7 cover a range of foundational and organizational aspects for

safely managing software within an agency's environment through the configuration of computing devices (mobile, laptops, and workstations), and through email and browser protections. CIS Control 18 discusses *Application Software Security*, which entails procedural measures to evaluate risks for software, identify mitigation strategies, and monitor networks and software systems for anomalous behavior and data flows.

For multi-agency collaborations, Chapter 7 provides a discussion relevant to controlling the network connectivity between various users, systems, and environments. Establishing firewalls between partner agency networks is just the first step in securing connectivity. Different protocols for traffic flowing between agencies tend to define a specific set of internet ports for functions like secure file transfer protocol (SFTP). In practice, the owner should configure each firewall to lock down and only allow the ports and protocols necessary to satisfy the mission for each data sharing initiative. The owner should document, annotate, and routinely review the Firewall rules to ensure that they remove outdated rules that agencies no longer need. CIS Control 11 covers this and multiple sub-aspects of managing firewalls as they pertain to *Secure Configuration for Network Devices, such as Firewalls, Routers, and Switches.* The regional roles overseen by the Data Governance Board should define a methodology for rolling out security updates to network and computing devices.

Chapter 9 expands on this theme by addressing inter-agency information sharing, along with data protection and recovery. This chapter emphasizes controlling the use of full administrative privileges (CIS Control 4) and limiting user access to the least privileges practical to support their role (CIS Control 14). The Data Governance Board, along with delegated authority to Data Managers, should establish a standardized hierarchy of User profiles that manages a range of access privileges and minimize risks associated with broad access to users.

BCDCOG should follow the NIST guidance for security management of networks and data by establishing a Risk Management Plan as it relates to the Cybersecurity Framework. **Figure 7** provides an overview of this process.

Risk Management Plan

Building upon the individual predecessor efforts above for TMCs that are lacking a risk management plan, the figure from *NIPP Supplemental Tool: Executing A Critical Infrastructure Risk Management Approach* provides a concise path to support those that are beginning to implement a risk management approach to cybersecurity to incorporate aspects of *NIST 800-37 Guide for Applying the Risk Management Framework*. It is unrealistic to expect complete prevention of all vulnerabilities. Risk analysis is used to identify where the greatest risks/ weaknesses exist, and a risk management plan is used to determine courses of action to mitigate and manage those risks.

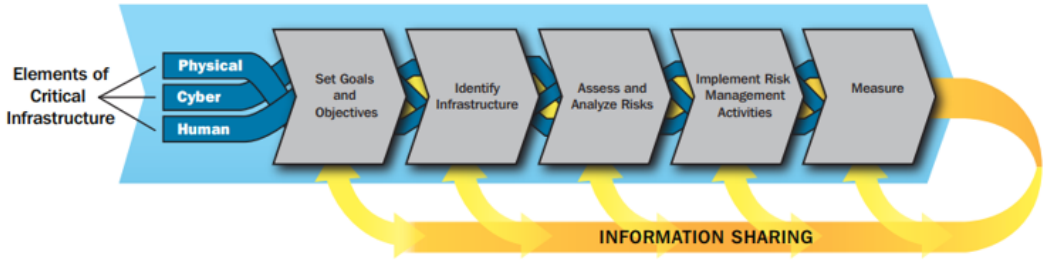

Figure 7. The National Institute of Standards and Technology 800-37 Risk Management Approach (Source: NIST 800-37 Guide for Applying the Risk Management Framework)

When addressing the Risk Management Plan, NIST further elaborates that there are four phases. BCDCOG should ensure that the region addresses and understands all four phases in managing data governance for the upcoming data sharing activities.

Sample Incident Response Process: The National Institute of Standards and Technology Incident Lifecycle

The Computer Security Incident Handling Guide (NIST SP 800-61r2) identifies the Incident Response Life Cycle by expressing it in four phases:[27]

- Preparation.
- Detection and Analysis.
- Containment, Eradication, and Recovery.
- Post-Incident Activity.

[27] NIST, "SP 800-61 Rev. 2 Computer Security Incident Handling Guide," 2012. Retrieved from: https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-61r2.pdf.

6.4 FOIA Requests and PII Privacy constraints

As the Data Governance Board establishes policies, it is important to define how (or if) how the region will use the Regional Data Clearinghouse as a means of satisfying FOIA requests. It will be important to consider the Statutes of limitations for the associated agencies to determine appropriate data management and archiving practices for any relevant FOIA data. Establishing data retention policies for that data will be necessary to align with those statutes.

If any records from mobile apps, billing systems, or other datasets contain personally identifiable information (PII), establish an appropriate method of protection commensurate with existing codes and laws and PII privacy practices. Data owners commonly use encryption, obfuscation, or anonymizers for the aggregation of travel time data systems. Data owners use similar protocols to avoid the storage of full credit card transactional information once the clearinghouse approves the transaction. As noted above, the region should use the Principles for Open Government Data as guidance to address these privacy considerations.

Once again, resources.data.gov provides examples for establishing an online FOIA request portal tool for managing access to the types of allowable data that end users could request.

7 Potential Regional Data Interconnections Gaps

As noted throughout this Data Governance document, establishing guidelines for inter-agency connectivity includes a range of potential requirements the region must define. The Regional ITS Architecture and Deployment Guide development identified multiple projects. Certain projects include the establishment of data interconnections that are new to the regional stakeholders. Similarly, the development identified potential gaps within existing Data Governance strategies. These gaps range from the creation and formalizing of Memoranda of Agreements (MOAs) to regionally defined Performance Measures. The following list provides specific components of a data governance strategy that the region should apply to implement these projects safely and securely.

MOAs: MOAs institutionalize the roles and responsibilities of the stakeholders, the type and frequency of shared data, operations and maintenance stipulations, and any monetary contributions (where appropriate).

API documents: When sharing data between entities, an API helps to describe the parameters for the data and the definitions for how to retrieve the specific sub-parts of the data.

FOIA requirements: When systems collect data, agencies can experience FOIA requests regarding activity logs or history for operations. Aside from weather data, these projects are likely to involve aspects of FOIA to consider (either sheltering data from disclosure due to security and privacy, or data retention aspects related to the defined statutes of limitation needs).

Security and privacy: When sharing sensitive data or operational control of a system across the region, security and privacy are paramount. The regional communication plan will contain elements of sensitive information that may expose vulnerabilities and therefore stakeholders should protect that content. The Clearinghouse and ICM projects should contain the levels of access to controlling systems and data to the least level of privileges practical for satisfying a user's mission. Furthermore, when evaluating an Integrated TMC concept, a shared facility with Public Safety personnel or servers will warrant a higher level of background checks for staff accessing the facility.

Shared trenching: Agreements such as these arise when multiple parties are involved with constructing or implementing communications infrastructure. The agreements provide an understanding of what and to what extent agencies share a resource, and what operations and maintenance activities each entity provides. They also define service level agreements based on each agency's dependency on the affected infrastructure.

Shared 3rd-Party Data: Agreements of this kind not only extend to regional partners among BCDCOG stakeholders, but also to the vendors of the data. The intent of the agreement is to establish the limits of how users can use the data and with whom the procuring agency can share without incurring additional fees or costs.

Performance Measures standards: A key aspect of the regional operations is to improve performance. As such, the region should establish a baseline set of measures to standardize current and future evaluations regarding how the region is performing.

7.1 POTENTIAL GAPS

Table 1 summarizes the data governance needs based on the defined interconnections from each of the projects. The table groups those needs into either *Data Governance and Collaboration Tools* or *Data Systems and Connectivity Tools*. The region should reference this table as it derives a way forward based on the guidance in the last section.

NEEDS vs. PROJECTS	Integrated TMC Operations ConOps	Real Time At-Grade Crossing Information	Integrated Corridor Management (ICM)	Weather Sensor Data	Transit ITS Technology	Regional Communication Plan	Regional Data Clearinghouse
Data Governance and Collaboration Tools							
Memoranda of Agreement	◎	◎	◎	◎	◎		◎
FOIA Requirements		◎	◎		◎	◎	◎
Security and Privacy Requirements	◎		◎			◎	◎
Shared 3rd-Party Data Agreements	◎		◎	◎			◎
Performance Measures – Standards	◎		◎		◎	◎	◎
Data Systems and Connectivity Tools							
Application Programming Interfaces (API) Documents	◎	◎	◎	◎	◎		◎
Shared Trenching			◎			◎	

Table 1. Data Interconnection Gaps by Project Type

BCDCOG can rely on examples from peer transportation agencies that have crafted formal data governance programs to address these gaps. The Appendix of this report includes links and embedded copies of sample MOAs, data sharing agreements, and even charters for establishing a Data Governance Council. Each of these projects involve s certain level of risk. That risk can impact a single agency, or the responsibilities of multiple agencies involved. Addressing the needs outlined for each project provides a means for the Region to mitigate those potential risks. For example, identifying MOAs for Shared Trenching establishes a mutual understanding of roles and responsibilities for maintaining the

infrastructure and the associated response timeframes to avoid confusion or misconceptions when future unplanned occurrences compromise cables or conduits.

8 Implementation – Go Forward Plan

As enumerated in the preceding sections, there are key steps needed for implementing an Interagency Data Governance framework.

Step 1: Create the Data Governance Council
Step 2: Select a data governance model
Step 3: Establish an initial shared regional vision
Step 4: Develop an initial stakeholder registry
Step 5: Conduct stakeholder outreach
Step 6: Set roles and responsibilities and document within a charter
Step 7: Complete data maturity assessment
Step 8: Create a data architecture guidance

Alternatively, CHATS would benefit from developing a Data Business Plan to better prepare the region for the proposed multiagency ITS strategies. The steps within the Data Business Plan development establish a foundation for the interagency shared governance model steps listed above.

Step 1: Develop internal data governance manual
Step 2: Create accessible databases
Step 3: Maximize externally available resources
Step 4: Improve technical expertise as a group

The Hillsborough MPO in Florida is a documented example of piloting this approach to establish a Data Business Plan. (Source: Hillsborough Metropolitan Planning Organization Pilot of the Data Business Plan for State and Local Departments of Transportation: Data Business Plan (bts.gov))

9 APPENDICES

Example forms and templates cross-referenced by the Report (source link AND embedded PDF copies)

- Example: Stakeholder roster
- Example: Stakeholder letter
- Example: Stakeholder survey
- Example: Stakeholder interview
- Example: Data Governance Council charter
- Example: Multimodal mobility performance measures matrix
- Example: Data sharing agreement
- Example: Data architecture guidance
- Example: Data directory website
- Example: Data hubs
- Example: Data innovation showcase

A – GLOSSARY

Maryland DOT's *Data Business Plan* (2017), pg 69-70 – https://ops.fhwa.dot.gov/publications/fhwahop18010/fhwahop18010.pdf

NCHRP Report 814: *Data to Support Transportation Agency Business Needs, A Self-Assessment Guide* (2015), pg 53-56 – https://nap.nationalacademies.org/download/23463#

APPENDIX E. GLOSSARY OF DATA MANAGEMENT AND GOVERNANCE TERMS

This appendix provides a glossary of terms related to data coordination, management, and governance.

Connected Vehicle Data—Data collected via a vehicle that has an independent onboard wireless capability to establish a two-way data linkage between a system onboard and another system not onboard, for the purpose of transferring information.

Data Business Plan—Describes a systematic process for Maryland SHA to follow while conducting activities related to the collection, management, and maintenance of mobility data.

Data Catalog—A catalog of information about the data used by stakeholders involved with mobility data programs in the Maryland SHA region. The data catalog includes a list of relevant data programs, data business owners, data stewards, and instructions for accessing data standards and definitions with that program.

Data Custodian—IT staff including IT security, network administrators, Database Administrators, server administrators, and Business area staff who are responsible for the "technical application" support for data systems. This may include application programmers and systems analysts who work in business areas other than the IT Office or Division.

Data Governance—The execution and enforcement of authority over the management of data assets and the performance of data functions. The management of data assets is accomplished through the Data Management Board. This role is critical in successfully managing data programs that meet business needs and in supporting a comprehensive data business plan for the organization.

Data Governance Charter—Sets forth the purpose, mission, vision, goals and objectives, and data management policies for implementation of the Data Management Board.

Data Governance Manual—Provides comprehensive guidance to the Data Management Board in implementing the Data Governance Model and Charter.

Data Governance Model—A diagram depicting the relationship between mobility data programs, the various individuals/agencies responsible for implementing data governance, and the users / stakeholders for the data programs.

Data Management—The development, execution, and oversight of architectures, policies, practices, and procedures to manage the information lifecycle needs of an enterprise in an effective manner as it pertains to data collection, storage, security, data inventory, analysis, quality control, reporting, and visualization.

Data Management Practices—Activities necessary to acquire, update, describe, standardize, analyze, store, and protect data to ensure it can be used.

Data Stewards—Individuals within Maryland SHA and external agencies who are subject matter experts and points of contact for the data programs they oversee. They are responsible for managing their data programs in accordance with common processes and procedures.

Data Stewardship—The formalization of accountability for the management of data resources. Data stewardship is a role performed by individuals within an organization known as data stewards. The functions of data governance and data stewardship typically are part of an overall data management program within an organization.

Mobility Data—On-time performance for transit, bike/ped counts, and travel time/speed and VMT for vehicles and truck freight.

Department Director's Meeting—Senior level managers from Maryland SHA. This group would provide executive level support for data governance, including dedicating resources as needed and establishing memorandums of understanding for data sharing with other partner agencies.

Data Management Board—The designated individuals from Maryland SHA's offices responsible for the oversight of data programs to support the business functions of their offices. This group dictates the policies, procedures, and business practices associated with mobility data programs.

Data Management Board Charter—Charter document that formally establishes the Data Management Board and sets forth the objectives, membership, structure, and operating framework for implementing the Data Management Board.

Mobility Data Program—A formal or informal program for the collection, analysis, or reporting of mobility data.

Mobility Data Users and Stakeholders—Any persons or agencies that use or interface with, access, benefit from, or are otherwise affected by mobility data.

Rules of Engagement—Practices followed or behavior displayed by the participants in situations of opposing interests such as negotiations. Unwritten rules of engagement determine what information is given, at what time, to whom, and in what manner; and what concession is granted and what is demanded in return. For work in a team, rules of engagement typically define the protocols of communication, conflict, decisionmaking, and meetings.

Data to Support Transportation Agency Business Needs: A Self-Assessment Guide (2015)

DETAILS

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CHAPTER 2

The Assessment Process

Overview

The assessment process has three phases as shown in Figure 1:

- **Prepare—**mobilization and scoping for the assessment process
- **Assess—**conduct of the assessment using the available tools
- **Improve and Monitor**—development of an action plan based on the assessment findings, and monitoring the implementation of this plan

Each of these phases is important:

- The *Prepare* phase ensures that the entire assessment process will be productive and manageable, scoped appropriately, and with involvement of the right people.
- The *Assess* phase is when various groups in the agency meet to conduct the assessments and agree on ratings and potential actions. This phase produces valuable information on the agency's current data capabilities and gaps.
- The *Improve and Monitor* phase is where the agency decides how to act to get more value from data. This phase also involves monitoring activities to ensure that the identified improvements are implemented. Without the Improve and Monitor phase, the assessment process will have educational value, but will produce no lasting impacts. Agencies need not create new monitoring processes—they can use existing management reporting processes already in place.

Figure 1 illustrates a cyclical process. The data assessment will not be a one-time activity, but repeated annually or bi-annually to track progress and update action plans. Because some parts of the assessment are geared toward application at the level of a particular business unit or function (as opposed to agency-wide), agencies may take a phased approach to the assessment. For example, agencies might spread the assessment of data within six key business areas over a 2-year period—tackling three areas each year.

The following three concepts are reinforced throughout the entire assessment process:

- *One size does not fit all*—Transportation agencies differ in goals, issues, business needs, and the ways they manage data. The scope of the assessment can be tailored to fit with agency priorities, data issues, or other current agency data-related initiatives. These activities can also be scaled to match resource availability and time constraints.
- *Sometimes less is more*—Limiting the number of areas selected for the assessment can help ensure that the process is manageable and sustainable, given competing work activities and agency priorities. Focusing improvements on achievable actions minimizes risk and produces clear value and benefit so as to ensure that the results of the process are not diminished by trying to take on too much.

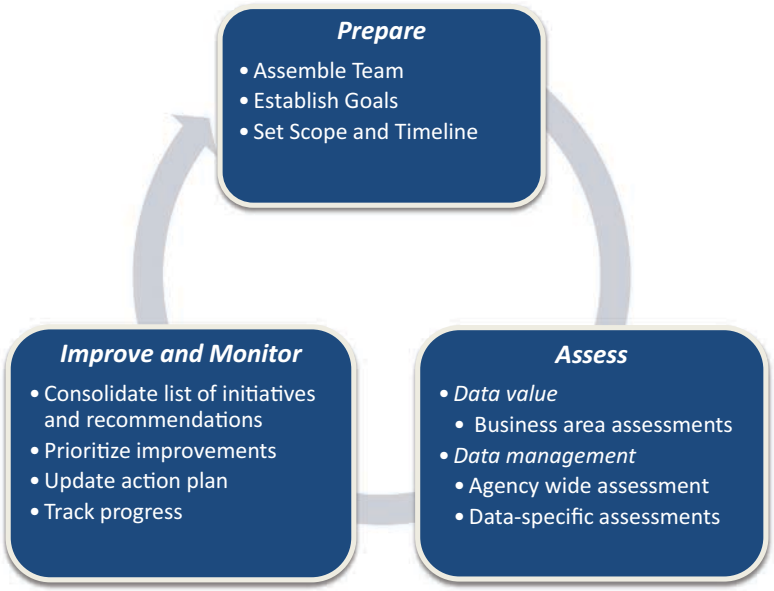


Figure 1. Data assessment process.

- *The process can be as valuable as the results*—The relationship building, discussions, and increased understanding that occur among data users, data providers, and information technology (IT) personnel can often be as valuable as the assessment results.

Key Elements of the Assessment

The Assess phase is designed to help agencies investigate both data user and manager perspectives. The data value assessment emphasizes the user perspective and considers three distinct elements that together determine whether data is adding value for an agency's business processes:

- **Data Availability** addresses whether or not the agency has the right kinds of data in place, at the right level of detail, and with sufficient coverage to meet its business information needs. Example: if a project manager needs to understand how much of the budget has been expended, but there are no tracking systems in place for this, one would say that expenditure data is not available.
- **Data Quality** addresses whether or not the available data is good enough to meet the agency's information needs. The assessment looks at three aspects of data quality of particular concern to data users: currency, accuracy, and completeness. Example: if a project manager gets budget status reports, but the reports are 1-month old or only include internal staff charges but not contractor costs, one would say that expenditure data is not of sufficient quality. Additional aspects of data quality are considered under the data management assessment.
- **Data Usability** addresses whether or not the agency's data can be easily accessed, integrated, analyzed, and presented in a convenient form for analysis and interpretation. Example: if a project manager gets two sets of monthly reports (one for internal charges and one for contractor charges) and the manager must manually combine the reports to get the full picture, one would say that the expenditure data have poor usability.

Each of these elements must be evaluated within the context of particular business needs. A given data set may be of sufficient quality to meet one need, but not another. For example, a maintenance level of service data set based on a 10% sample of road segments might be sufficient for developing an annual statewide budget, but would not provide a basis for developing work orders or planning equipment needs for a given maintenance area.

To provide meaningful results, separate data value assessments should be applied for specific agency business functions (e.g., planning, maintenance, project scoping, or traffic operations).

The data management assessment considers the following five elements:

- **Data Strategy and Governance** is concerned with how the agency and individual business units make decisions about what data to collect and how best to manage and deliver it. This element includes establishing, enforcing, and sustaining data management strategies, roles, accountability, policies, and processes.
- **Data Architecture and Integration** is concerned with practices to standardize and integrate data. This element includes standardizing spatial referencing and other key linkages across data sets and minimizing data duplication and inconsistencies.
- **Life Cycle Data Management** is concerned with the operational aspects of managing data to ensure that it is adequately maintained, preserved, protected, documented, and delivered to users.
- **Data Collaboration** is concerned with achieving efficiencies through processes to coordinate data collection and management within the agency and partner with external organizations to share data.
- **Data Quality Management** is concerned with practices to define required levels of quality, measure and report data quality, ensure quality as new data is acquired, and improve the quality of existing data.

The data management assessment can be applied to assess agency-wide data management capabilities and an individual data management area or program to examine how one or more specific categories of data (e.g., roadway data, traffic data, and project data) are being managed. In this Guide, "data management area" and "data program" are used interchangeably to refer to an organizational function that is responsible for scoping, collecting, managing, and delivering a particular category or form of data. Sometimes this function resides in a single organizational unit; at other times it is split across business units and IT units. Examples of DOT data programs include GIS, Road Inventory, HPMS, Traffic Monitoring, Crash Records, and Construction Project Data.

Options for the Assessment Process

The assessment was designed to be flexible to meet agency needs. For example, agencies can

- Conduct the data management assessment for the agency as a whole to get a quick read on their data management capability level;
- Conduct the data management assessment for one or more target data management areas (e.g., traffic data or maintenance data);
- Conduct the data value assessment to understand user perceptions of data value in one or more business areas;
- Conduct a combination of data value and data management assessments for a logical cluster of business functions and data types to obtain a balanced perspective (e.g., a data value assessment for preservation program development and a data management assessment for pavement and bridge data);
- Pursue a comprehensive approach covering agency-wide data management and combined data value and data management assessments for priority business areas or data categories.

Further details of these options are included in the following two chapters.

This Guide and accompanying data self-assessment tools can be used to complement and/or supplement any work that agencies have done as part of safety, asset management, operations management or performance management assessments or other data-related self-assessment activities or efforts. These efforts may have produced lists of strategies that can be factored into the Improve and Monitor phase.

B – EXAMPLE: STAKEHOLDER ROSTER

Mid-America Regional Council's *Data Business Plan* (2017), Appendix A – https://ops.fhwa.dot.gov/publications/fhwahop18012/fhwahop18012.pdf

APPENDIX A. STAKEHOLDER REGISTRY

Stakeholders include any internal or external person or organization that collects, owns, maintains, uses, interfaces with, accesses, or benefits from roadway travel mobility data. Internal stakeholders may include those involved in traffic operations, traffic safety, roadway design, pavement design, maintenance, air quality, modal, and connected vehicle capture activities. External stakeholders may include State and local transportation agencies, traffic management centers, transportation system managers, Corridor Coalitions, transit agencies, metropolitan planning organizations, researchers, freight operators, private data providers (e.g., INRIX, Nokia-Navteq-HERE, TomTom, TrafficCast, etc.), neighboring State departments of transportation (DOT), media providers, the traveling public, and the Federal Highway Administration (FHWA). Site stakeholders should also include the individuals who will fulfill various data governance roles identified in the Guide:

- **Data Governance Council**—Senior-level managers across business areas responsible for roadway travel mobility data.
- **Data Stewards**—Individuals responsible for ensuring data is collected, maintained, and used in accordance to the policies established by the data governance council.
- **Data Business Owners**—Individuals responsible for establishing business requirements for the use of roadway travel mobility data in their business area.
- **Data Custodians**—Information Technology (IT) staff responsible for data system support.
- **Working Group**—Collective group of internal and external stakeholders responsible for collecting and providing data and establishing business rules for roadway travel mobility data systems.
- **Community of Interest**—Collective group of internal and external stakeholders who are users of roadway travel mobility data.

Table 8 identifies specific stakeholders to be engaged in each step of the Data Business Plan (DBP) development.

Table 8. Stakeholder registry.

Name	Agency	Email	Type	Roles and Responsibilities			
				Governance	Stewards	Business Owners	Custodians
Ron Achelpohl	MARC	rona@marc.org	Internal	X			
Frank Lenk	MARC	flenk@marc.org	Internal	X			
Jay Heermann	MARC	jheermann@marc.org	Internal	X		X	X
Jim Hubbell	MARC	jhubbell@marc.org	Internal	X			
Paul Bushore	MARC	pbushore@marc.org	Internal	X		X	
Eileen Yang	MARC	eyang@marc.org	Internal		X		
Aaron Bartlett	MARC	abartlett@marc.org	Internal		X		
Andrea Repinsky	MARC	arepinsky@marc.org	Internal		X	X	
Whitney Morgan	MARC	wmorgan@marc.org	Internal		X		
Muril Stone	MARC	mstone@marc.org	Internal		X		
Karen Clawson	MARC	kclawson@marc.org	Internal		X		
Ray Webb	MARC	rwebb@marc.org	Internal	X		X	
Amanda Graor	MARC	agraor@marc.org	Internal	X			
John Hwang	MARC	jhwang@marc.org	Internal				X
Sasan Baharaeen	MARC	sasan@marc.org	Internal	X			X
Cities	Various		External				
Counties	Various		External				
Developers	Various		External				
General Public	Various		External				
Chuck Ferguson	Kansas City Area Transportation Authority (KCATA)	cferguson@kcata.org	Data Provider				
Karen Miller	MoDOT	Karen.Miller@modot.mo.gov	Data Provider				
Dana Majors	KDOT	danam@ksdot.org	Data Provider				
Randy Johnson	KC Scout	randy.johnson@modot.mo.gov	Data Provider				
Monali Shah	HERE	monali.shah@here.com	Data Provider				
	US Census		Data Provider				

C – EXAMPLE: STAKEHOLDER LETTER

Mid-America Regional Council's *Data Business Plan* (2017), Appendix B – https://ops.fhwa.dot.gov/publications/fhwahop18012/fhwahop18012.pdf

Maryland DOT's *Data Business Plan* (2017), Appendix B – https://ops.fhwa.dot.gov/publications/fhwahop18010/fhwahop18010.pdf

APPENDIX B. STAKEHOLDER LETTER

Dear Stakeholders,

The Mid-America Regional Council (MARC) is excited to announce its selection to participate as a pilot site for a Federal Highway Administration (FHWA) data business planning initiative. The FHWA Office of Operations and its consultant team, Cambridge Systematics, Inc., will assist the metropolitan planning organization (MPO) in developing a tailored Data Business Plan (DPB) to improve the management and governance of roadway travel mobility data, which, for the purposes of this effort, is defined as volume, speed, lane occupancy, and connected vehicle data for vehicle, freight, bicycle/pedestrian, and transit modes. The DBP will be a living document that addresses the data needs of the MPO and its local partners, tackling technical and institutional needs alike. The pilot effort will involve stakeholder outreach to gather your feedback and input, a data gap assessment, and development of an action plan for improving the management and governance of mobility data in the region.

This initiative is part of the U.S. Department of Transportation (DOT) Roadway Transportation DBP project, whereby the FHWA Office of Operations developed a U.S. DOT roadway transportation data business plan final report (FHWA-JPO-13-084)for State and local transportation agencies. The guide is intended to help these agencies understand what mobility data is being collected within their organizations and at the regional level, how the data supports mobility planning, operations, and performance measure activities, and who is responsible for managing and updating the data. The process will also help solidify working relationships by identifying how various offices/agencies share and exchange roadway travel mobility data to both internal and external stakeholders. Finally, the DBP will help identify potential duplicative data collection efforts, leading to more rapid, targeted data acquisitions that would reduce future data collection/management costs.

In order to have a positive impact in our data processes, commitments are needed not only from MARC, but also from our stakeholders. We hope your offices can engage in a meaningful and collaborative way, including responding to a survey, participating in two onsite meetings, and committing to working with other stakeholders in the creation and implementation of the DBP.

Within the next few weeks, the consultant team will reach out to stakeholders with a survey to gather your input regarding data practices, goals, and issues. Subsequent follow-up phone interviews are planned.

Should you have any questions on this initiative, please do not hesitate to contact me or Mr. Walter During at his address below.

We look forward to working with you on this exciting initiative!

Jim Hubbell, AICP
Principal Transportation Planner
816-701-8319
jhubbell@marc.org
Walter During
FHWA Office of Operations
202-366-8959

walter.during@dot.gov

APPENDIX B. STAKEHOLDER LETTER

Dear Stakeholders,

The Maryland State Highway Administration (Maryland SHA) is excited to announce its selection to participate as a pilot site for a Federal Highway Administration (FHWA) data business planning initiative. The FHWA Office of Operations and its consultant team, Cambridge Systematics, Inc., will assist the Maryland SHA in developing a tailored data business plan to improve the management and governance of roadway travel mobility data, which, for the purposes of this effort, is defined as volume, speed, lane occupancy, and connected vehicle data for vehicle, freight, bicycle/pedestrian, and transit modes. The data business plan will be a living document that addresses the data needs of the Maryland SHA and its local partners, tackling technical and institutional needs alike. The pilot effort will involve stakeholder outreach to gather your feedback and input, a data gap assessment, and development of an action plan for improving the management and governance of mobility data in the region.

This initiative is part of the U.S. DOT Roadway Transportation Data Business Plan project, whereby the FHWA Office of Operations developed a data business planning guidance document for State and local transportation agencies. The guide is intended to help these agencies understand what mobility data is being collected within their organizations and at the regional level, how the data supports mobility planning, operations, and performance measure activities, and who is responsible for managing and updating the data. The process will also help solidify working relationships by identifying how various offices/agencies share and exchange roadway travel mobility data to both internal and external stakeholders. Finally, the data business plan will help identify potential duplicative data collection efforts, leading to more rapid, targeted data acquisitions that would reduce future data collection/management costs.

In order to have a positive impact in our data processes, commitments are needed not only from the Maryland SHA but also from our stakeholders. We hope your offices can engage in a meaningful and collaborative way, including responding to a survey, participating in two on-site meetings, and committing to working with other stakeholders in the creation and implementation of the data business plan.

Within the next few weeks, the consultant team will reach out to stakeholders with a survey to gather your input regarding data practices, goals, and issues. Subsequent follow-up phone interviews are planned.

Should you have any questions on this initiative, please do not hesitate to contact me or Mr. Walter During at his below address.

We look forward to working with you on this exciting initiative!

Gregory Slater, Director of Planning
and Preliminary Engineering
410-545-0412
gslater@sha.state.md.us

Walter During, FHWA Office
of Operations
202-366-8959
walter.during@dot.gov

D – EXAMPLE: STAKEHOLDER SURVEY

Mid-America Regional Council's *Data Business Plan* (2017), Appendix C – https://ops.fhwa.dot.gov/publications/fhwahop18012/fhwahop18012.pdf

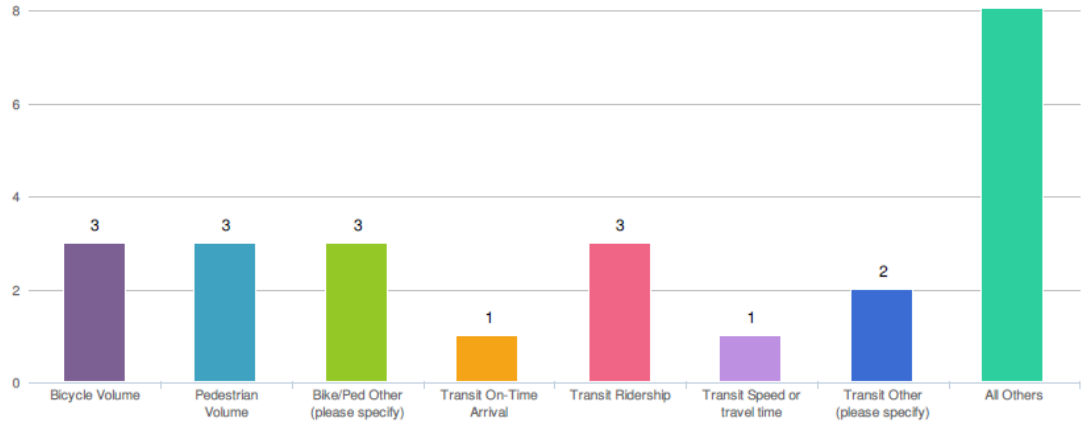
NCHRP Report 814: *Data to Support Transportation Agency Business Needs, A Self-Assessment Guide* (2015), Appendix E – https://nap.nationalacademies.org/download/23463#

APPENDIX C. STAKEHOLDER SURVEY

1. Please identify the organization where you are employed, and what your title is.:Organization:

Count	Response
1	City of Lee's Summit
1	City of Olathe
1	City of Overland Park, KS
1	HERE North America
1	Johnson County KS
1	KCATA
1	MoDOT
1	PWD-KCMO

2. What mobility datasets do you or your organization directly collect, develop, maintain, or use? For the purposes of this study, mobility data is defined as volume, speed, and operational performance data for vehicle, freight, bicycle/pedestrian, and transit modes.



Responses "Bike/Ped Other (please specify)"	Count
Left Blank	6
Bike Routes, Shared Use Paths, Sidewalks	1
No specific bike/ped counts, but boardings by stop could be used in pedestrian dataset	1
school crossings	1

Responses "Transit Other (please specify)"	Count
Left Blank	7
GTFS, operational stats, maintenace, accidents/incidents, etc.	1
See KCATA	1

Responses "Vehicular Other (Please specify)"	Count
Left Blank	3
Centerline, Traffic Counts	1
Class	1
Delay	1
O/D	1
Some signal parameters like occupancy percentage, cycle failures, etc.	1
classification	1

Responses "Freight Other (please specify)"	Count
Left Blank	6
ADT% of Truck Volume	1
Class	1
Railroads, Truck Routes	1

3. What is your role with respect to each mobility dataset?

	I am responsible for collecting or updating the data	I use and/or analyze the data	I generate metadata and/or resolve data quality issues	I am an IT professional responsible for technical application support, data security, backup, and/or storage of the data	I am an administrator and/or designer for databases and systems	Other (please specify)	Responses
Bicycle Volume	1 25.0%	2 50.0%	0 0.0%	0 0.0%	0 0.0%	1 25.0%	4
Pedestrian volume	0 0.0%	3 100.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	3
Bike/Ped other	1 50.0%	1 50.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	2
Transit On-time arrival	0 0.0%	1 100.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	1
Transit Ridership	0 0.0%	2 100.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	2
Transit Speed or travel time	1 50.0%	1 50.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	2
Transit Other	0 0.0%	2 100.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	2
Vehicular Speed or travel time	3 42.9%	3 42.9%	0 0.0%	0 0.0%	0 0.0%	1 14.3%	7
Vehicular volume	1 16.7%	4 66.7%	0 0.0%	0 0.0%	0 0.0%	1 16.7%	6
Vehicular other	1 20.0%	3 60.0%	0 0.0%	0 0.0%	0 0.0%	1 20.0%	5
Incident/crash data	2 25.0%	5 62.5%	0 0.0%	0 0.0%	0 0.0%	1 12.5%	8
Freight Speed or travel time	1 50.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	1 50.0%	2
Freight volume	0 0.0%	0 0.0%	0 0.0%	0 0.0%	0 0.0%	1 100.0%	1
Freight other	1 33.3%	1 33.3%	0 0.0%	0 0.0%	0 0.0%	1 33.3%	3

Please specify your role:Bicycle volume

Count	Response

Please specify your role:Pedestrian volume

Count	Response

Please specify your role:Bike/Ped other

Count	Response

Please specify your role:Transit On-time arrival

Count	Response

Please specify your role:Transit Ridership

Count	Response
1	MoDOT's role: collect, analyze, share and use it to determine state transit assistance allocation

Please specify your role:Transit Speed or travel time

Count	Response

Please specify your role:Transit Other

Count	Response

Please specify your role:Vehicular Speed or travel time

Count	Response
1	MoDOT's role: collect, do a qa review, consume (HERE data), analyse and share data

Please specify your role:Vehicular volume

Count	Response
1	MoDOT's role: collect, do a qa review, analyse and share data

Please specify your role:Vehicular other

Count	Response
1	MoDOT's role: collect, do a qa review, analyse and share data

Please specify your role:Incident/crash data

Count	Response
1	MoDOT's role: collect, do a qa review, analyse and share data

Please specify your role:Freight Speed or travel time

Count	Response
1	MoDOT's role: collect, do a qa review, consume (HERE data), analyse and share data

Please specify your role:Freight volume

Count	Response
1	MoDOT's role: collect, do a qa review, analyse and share data

Please specify your role:Freight other

Count	Response
1	MoDOT's role: collect, do a qa review, analyse and share data

4. Who Collects the Data?

	We collect it internally	We obtain it from another agency	We purchase it from vendors	Other	Responses
Bicycle volume	3 100.0%	0 0.0%	0 0.0%	0 0.0%	3
Pedestrian volume	3 100.0%	0 0.0%	0 0.0%	0 0.0%	3
Bike/Ped other	2 100.0%	1 50.0%	0 0.0%	0 0.0%	2
Transit On-time arrival	1 100.0%	0 0.0%	0 0.0%	0 0.0%	1
Transit Ridership	2 66.7%	2 66.7%	0 0.0%	0 0.0%	3
Transit Speed or travel time	2 100.0%	0 0.0%	0 0.0%	0 0.0%	2
Transit Other	1 50.0%	1 50.0%	0 0.0%	0 0.0%	2
Vehicular Speed or travel time	7 100.0%	1 14.3%	1 14.3%	0 0.0%	7
Vehicular volume	6 100.0%	3 50.0%	0 0.0%	1 16.7%	6
Vehicular other	6 100.0%	1 16.7%	0 0.0%	1 16.7%	6
Incident/crash data	7 100.0%	5 71.4%	0 0.0%	1 14.3%	7
Freight Speed or travel time	2 100.0%	0 0.0%	1 50.0%	0 0.0%	2
Freight volume	1 100.0%	0 0.0%	0 0.0%	0 0.0%	1
Freight other	3 100.0%	0 0.0%	0 0.0%	0 0.0%	3

Please indicate which agency/agencies you obtain data from.

Count	Response
1	All cities in JoCo, KDOT, KCATA, county departments
1	Kansas City Police Department, MSHP
1	Rural transit agencies, HWP
1	MoDOT, USDOT, FHWA, Operation Green Light, MARC, KCATA (Transit), OATS (Transit), School Districts, Misc. State Crash Databases (e.g. Highway Patrol, STARS, LETS, etc.), Available Health Organization (e.g. Jackson County Health Assessment).
1	KDOT, KHP, Johnson county, other bordering cities in Johnson County (Lenexa, Overland Park, Gardner, etc.)

Please indicate which vendor(s) you obtain data from.

Count	Response
1	HERE

Please specify Other (i.e., how you obtain the data).

Count	Response
1	Other traffic data is often obtained from private development/consultants that submit traffic impact studies.

5. On what network?

	Freeways	Arterials	Other (e.g., trails)	Responses
Bicycle volume	0 0.0%	3 100.0%	2 66.7%	3
Pedestrian volume	0 0.0%	3 100.0%	2 66.7%	3
Bike/Ped other	0 0.0%	2 100.0%	2 100.0%	2
Transit On-time arrival	1 100.0%	1 100.0%	1 100.0%	1
Transit Ridership	1 50.0%	2 100.0%	2 100.0%	2
Transit Speed or travel time	1 50.0%	2 100.0%	1 50.0%	2
Transit Other	2 100.0%	2 100.0%	1 50.0%	2
Vehicular Speed or travel time	4 57.1%	7 100.0%	3 42.9%	7
Vehicular volume	3 50.0%	6 100.0%	5 83.3%	6
Vehicular other	3 50.0%	6 100.0%	2 33.3%	6
Incident/crash data	3 42.9%	7 100.0%	4 57.1%	7
Freight Speed or travel time	2 100.0%	2 100.0%	0 0.0%	2
Freight volume	1 100.0%	1 100.0%	1 100.0%	1
Freight other	2 66.7%	3 100.0%	2 66.7%	3

Please specify

Count	Response
1	Other = major/ minor collectors
1	Other includes collector and local roads.
1	Vehicular speeds and volumes are taken on arterials and collectors.
1	collect transit data for all routes and stops on a variety of streets

6. On what geographic boundary? (e.g., Johnson County):Bicycle volume

Count	Response
1	City Limits
1	KCMO
1	Overland Park

6. On what geographic boundary? (e.g., Johnson County):Pedestrian volume

Count	Response
1	City Limits
1	City of Olathe
1	KCMO

6. On what geographic boundary? (e.g., Johnson County):Bide/Ped other

Count	Response
1	City of Olathe
1	Johnson County

6. On what geographic boundary? (e.g., Johnson County):Transit Ridership

Count	Response
1	City Limits
1	region
1	statewide

6. On what geographic boundary? (e.g., Johnson County):Transit Speed or travel time

Count	Response
1	region

6. On what geographic boundary? (e.g., Johnson County):Transit Other

Count	Response
1	Johnson County
1	region

6. On what geographic boundary? (e.g., Johnson County):Vehicular Speed or travel time

Count	Response
1	City Limits
1	City of Olathe
1	Global
1	Johnson County, Miami County
1	KCMO
1	Overland Park
1	statewide

6. On what geographic boundary? (e.g., Johnson County):Vehicular volume

Count	Response
1	City Limits
1	City of Olathe
1	Johnson County
1	KCMO
1	Overland Park
1	statewide

6. On what geographic boundary? (e.g., Johnson County):Vehicular other

Count	Response
1	City Limits
1	Johnson County
1	KCMO
1	North America & others
1	Overland Park
1	statewide

6. On what geographic boundary? (e.g., Johnson County):Incident/crash data

Count	Response
1	City Limits
1	Johnson County
1	KCMO
1	North America & others
1	Overland Park
1	region
1	statewide

6. On what geographic boundary? (e.g., Johnson County):Freight Speed or travel time

Count	Response
1	North America & others
1	statewide

6. On what geographic boundary? (e.g., Johnson County):Freight volume

Count	Response
1	City Limits
1	statewide

6. On what geographic boundary? (e.g., Johnson County):Freight other

Count	Response
1	Johnson County, Miami County
1	statewide

7. Are data collection standards in place for the data?
Bicycle volume

	Yes/No	If yes, are they adequate?	Total
Yes	66.7% **2**	50.0% **1**	60.0% 3
No	33.3% **1**	0.0% **0**	20.0% 1
I don't know	0.0% **0**	50.0% **1**	20.0% 1
Total	3	2	5

Pedestrian volume

	Yes/No	If yes, are they adequate?	Total
Yes	100.0% 3	33.3% 1	66.7% 4
I don't know	0.0% 0	66.7% 2	33.3% 2
Total	3	3	6

Bike/Ped other

	Yes/No	If yes, are they adequate?	Total
Yes	100.0% 2	100.0% 2	100.0% 4
Total	2	2	4

Transit On-time arrival

	Yes/No	If yes, are they adequate?	Total
Yes	100.0% 1	0.0% 0	50.0% 1
No	0.0% 0	100.0% 1	50.0% 1
Total	1	1	2

Transit Ridership

	Yes/No	If yes, are they adequate?	Total
Yes	100.0% 3	66.7% 2	83.3% 5
I don't know	0.0% 0	33.3% 1	16.7% 1
Total	3	3	6

Transit speed or travel time

	Yes/No	If yes, are they adequate?	Total
Yes	100.0% 1	0.0% 0	50.0% 1
I don't know	0.0% 0	100.0% 1	50.0% 1
Total	1	1	2

Transit other

	Yes/No	If yes, are they adequate?	Total
Yes	50.0% 1	0.0% 0	33.3% 1
Total	2	1	3

	Yes/No	If yes, are they adequate?	Total
I don't know	50.0% 1	100.0% 1	66.7% 2
Total	2	1	3

Vehicular speed or travel time

	Yes/No	If yes, are they adequate?	Total
Yes	85.7% 6	100.0% 5	91.7% 11
No	14.3% 1	0.0% 0	8.3% 1
Total	7	5	12

Vehicular volume

	Yes/No	If yes, are they adequate?	Total
Yes	66.7% 4	100.0% 4	80.0% 8
No	33.3% 2	0.0% 0	20.0% 2
Total	6	4	10

Vehicular other

	Yes/No	If yes, are they adequate?	Total
Yes	83.3% 5	100.0% 4	90.0% 9
No	16.7% 1	0.0% 0	10.0% 1
Total	6	4	10

Incident/crash data

	Yes/No	If yes, are they adequate?	Total
Yes	83.3% 5	100.0% 4	90.0% 9
I don't know	16.7% 1	0.0% 0	10.0% 1
Total	6	4	10

Freight speed or travel time

	Yes/No	If yes, are they adequate?	Total
Yes	100.0% 2	100.0% 1	100.0% 3
Total	2	1	3

Freight volume

	Yes/No	If yes, are they adequate?	Total
Yes	100.0% 2	100.0% 2	100.0% 4
Total	2	2	4

Freight other

	Yes/No	If yes, are they adequate?	Total
Yes	100.0% 2	100.0% 2	100.0% 4
Total	2	2	4

8. Are the current datasets meeting your business needs?

	Yes	No	Responses
Bicycle volume	1 25.0%	3 75.0%	4
Pedestrian volume	3 100.0%	0 0.0%	3
Bike/Ped other	2 100.0%	0 0.0%	2
Transit On-time arrival	0 0.0%	1 100.0%	1
Transit Ridership	3 100.0%	0 0.0%	3
Transit Speed or travel time	1 100.0%	0 0.0%	1
Transit Other	2 100.0%	0 0.0%	2
Vehicular Speed or travel time	6 85.7%	1 14.3%	7
Vehicular volume	6 100.0%	0 0.0%	6
Vehicular other	5 83.3%	1 16.7%	6
Incident/crash data	6 100.0%	0 0.0%	6
Freight Speed or travel time	1 50.0%	1 50.0%	2
Freight volume	1 50.0%	1 50.0%	2
Freight other	1 50.0%	1 50.0%	2

Why not, and how could you improve the data quality?

Count	Response
1	Plan and resources for implementation
1	The speed data is random (when residents complain about speeding in their neighborhood) and sometimes quite old data is used.
1	Need more detailed data, as datasets are based on truck volume, but do not tell us what the truck is hauling, if it's empty or full, or its origin or destination
1	Currently the peak/commuter bike volume is counted, but this does not accurately reflect the demand or use to properly measure performance and consider improvements. Daily counts would be more useful, but more time consuming and expensive to obtain. Currently the data collection is done at the same time as vehicle and pedestrian counts to efficiently gather information during the same opportunity.
1	on-time arrival information definition for data collection doesn't match the way public would see as on-time, some technical issues

9. Please indicate with whom is this data shared or made available to:

	Other divisions/business units within my organization (please specify)	Other external organizations (please specify)	General public	We currently do not share this with anyone	Responses
Bicycle volume	2 66.7%	1 33.3%	1 33.3%	1 33.3%	3
Pedestrian volume	2 66.7%	0 0.0%	1 33.3%	1 33.3%	3
Bike/Ped other	2 100.0%	2 100.0%	1 50.0%	0 0.0%	2
Transit On-time arrival	1 100.0%	1 100.0%	0 0.0%	0 0.0%	1
Transit Ridership	3 100.0%	3 100.0%	3 100.0%	0 0.0%	3
Transit speed or travel time	1 100.0%	1 100.0%	0 0.0%	0 0.0%	1
Transit other	2 100.0%	2 100.0%	1 50.0%	0 0.0%	2
Vehicular speed or travel time	4 66.7%	3 50.0%	3 50.0%	0 0.0%	6
Vehicular volume	6 100.0%	5 83.3%	5 83.3%	0 0.0%	6
Incident/crash data	6 100.0%	4 66.7%	3 50.0%	0 0.0%	6
Vehicular other	3 50.0%	3 50.0%	2 33.3%	1 16.7%	6
Freight speed or travel time	1 50.0%	2 100.0%	1 50.0%	0 0.0%	2
Freight volume	1 50.0%	1 50.0%	1 50.0%	1 50.0%	2
Freight other	2 100.0%	2 100.0%	2 100.0%	0 0.0%	2

Please specify other divisions/organizations you share data with.

Count	Response
1	Government, enterprise, automotive industry, media, and more.
1	Public Works, Parks, Cities, MARC, Emergency Mgmt.
1	We share the school crossing data with our local school districts and local law enforcement. We share vehicular volumes with KDOT, the Chamber and the public. We share crash data with KDOT.
1	Police Department, Planning Department, Administration Department, MARC, MoDOT, Economic Development Council, City Council, etc.
1	We place a lot of our data on-line for the public to see and use. We also share our counts with MARC.
1	MPOs, RPCs, Blueprint coalition externally; Internally throughout any division/ district where data is needed
1	Public Works Department Divisions City Planning Department Divisions Parks & Recreations Department Water Department
1	Ridership is the most publicly-available data, occasionally use OTP and other data for various projects or public purposes. Working on a new regional dashboard.

10. What are obstacles to sharing this data with other entities?

	Proprietary restrictions (please specify)	Data sharing platform (please specify)	Other (please specify)	Responses
Bicycle volume	0 0.0%	0 0.0%	0 0.0%	0
Pedestrian volume	0 0.0%	0 0.0%	0 0.0%	0
Bike/Ped other	0 0.0%	0 0.0%	0 0.0%	0
Transit On-time arrival	0 0.0%	2 100.0%	0 0.0%	2
Transit Ridership	0 0.0%	2 100.0%	0 0.0%	2
Transit speed or travel time	0 0.0%	2 100.0%	0 0.0%	2
Transit other	0 0.0%	1 100.0%	0 0.0%	1
Vehicular speed or travel time	0 0.0%	0 0.0%	1 100.0%	1
Vehicular volume	0 0.0%	0 0.0%	1 100.0%	1
Incident/crash data	1 33.3%	1 33.3%	2 66.7%	3
Vehicular other	0 0.0%	0 0.0%	0 0.0%	0
Freight speed or travel time	0 0.0%	0 0.0%	0 0.0%	0
Freight volume	0 0.0%	0 0.0%	0 0.0%	0
Freight other	0 0.0%	0 0.0%	0 0.0%	0

Please specify

Count	Response
1	Confidentiality and liability
1	No good structure or user-interface for sharing on an ongoing basis
1	Vehicular data Cost, Transit data format, Crash data requires maintainer's permission
1	cannot share site specific or person specific information on incident/ crash data

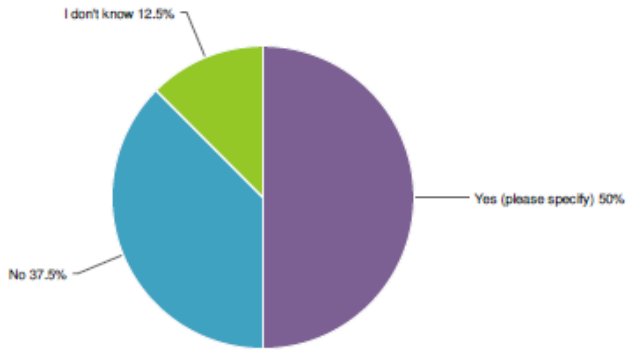
11. How good is the documentation for each dataset you have/work with?

	Non-existent	Bad	OK	Good	Responses
Bicycle volume	0 0.0%	1 33.3%	2 66.7%	0 0.0%	3
Pedestrian volume	0 0.0%	1 33.3%	1 33.3%	1 33.3%	3
Bike/Ped other	0 0.0%	0 0.0%	1 50.0%	1 50.0%	2
Transit On-time arrival	0 0.0%	1 100.0%	0 0.0%	0 0.0%	1
Transit Ridership	0 0.0%	0 0.0%	2 66.7%	1 33.3%	3
Transit Speed or travel time	0 0.0%	0 0.0%	1 100.0%	0 0.0%	1
Transit Other	0 0.0%	0 0.0%	2 100.0%	0 0.0%	2
Vehicular Speed or travel time	0 0.0%	0 0.0%	4 57.1%	3 42.9%	7
Vehicular volume	0 0.0%	0 0.0%	3 50.0%	3 50.0%	6
Vehicular other	0 0.0%	0 0.0%	5 83.3%	1 16.7%	6
Incident/crash data	1 16.7%	1 16.7%	2 33.3%	2 33.3%	6
Freight Speed or travel time	1 50.0%	0 0.0%	1 50.0%	0 0.0%	2
Freight volume	1 100.0%	0 0.0%	0 0.0%	0 0.0%	1
Freight other	1 33.3%	1 33.3%	1 33.3%	0 0.0%	3

12. What significant changes are planned for the data systems you work with? Include changes in data collection, dissemination, data uses, or storage of the data.

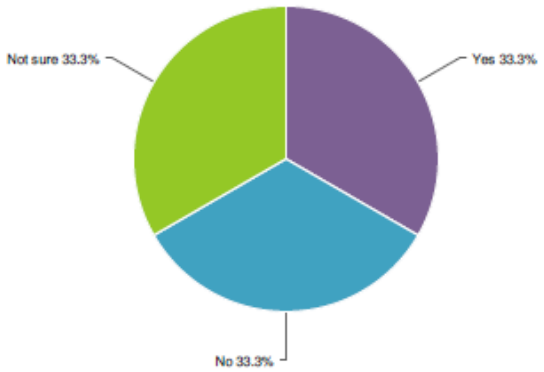
Count	Response
1	Data can be cumbersome to track and generate useful reports.
1	Source for crash data may change. Possible divided roads in centerline.
1	The plan is no plan
1	TMS Data Zone created to provide TMS data in an easily consumable way, started with traffic data and plan to add safety & other data; TMS Modernization project to bring the software up to date; the new FAST Act/ MAP-21 requirements for data based on the final Performance Measure rules
1	We are currently refocusing our priorities to intersection and turning movement counts. We also are looking to start systematic ped and bike counts within our community.
1	We are just starting our bike counting program and setting up our first counters today. We will have some permanent trail counters that will get deployed in the next month or so.

13. Is there a formal structure for managing and governing the data? This could include formally defined roles and responsibilities, formation of a data governance council, or development of a data governance manual and data catalog.

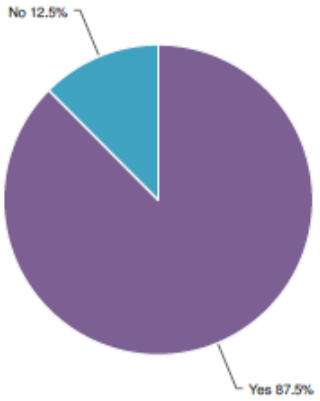


Responses "Yes (please specify)"	Count
Left Blank	5
Clear license agreement	1
We have a Technology Steering Committee to review significant projects (cost wise)	1
Management structure, defined data collection measures, defined data collection frequency targets, annual data reporting. Data measures and methods are derrived from standards of practice (e.g. FHWA performance metrics, HCM level of service methods)	1
Certain individuals or work groups are tasked with developing count needs and deploying equipment.	1

If no, would setting one be helpful?



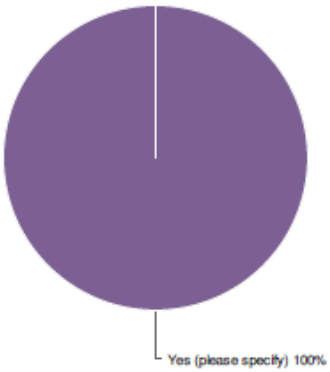
14. Do you collaborate with other organizations in the region on other topics? (e.g., sharing RFP's for current and upcoming initiatives, procurement plans, program roadmaps, vision/objective documents, sharing of current initiatives, activities, and best practices related to specific types of mobility data)



How does collaboration take place?

Count	Response
1	Assist with data, planning and analysis. Sharing relevant and available data.
1	Collaboration with MARC and local jurisdictions, data shared on an as-needed basis.
1	Regular Meetings, email, etc.
1	working with agencies to understand their needs
1	Share with MPOs and RPCs by email, webinar, demonstrations in meetings; also share with MPTA on transit data
1	Often one on one communication with others with similar duties in other organizations. Often in person, phone call or e-mail.
1	We have a quarterly meeting with the Johnson County Traffic Engineers to discuss common areas of interest.

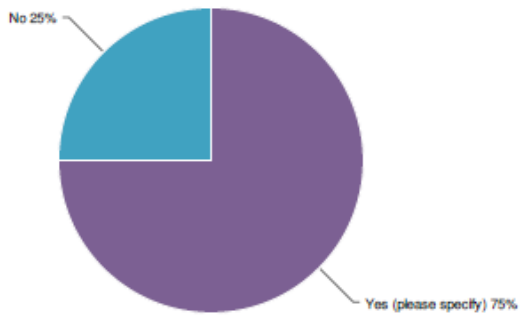
15. Do you see any benefit in engaging in a data sharing partnership with MARC?



Responses "Yes (please specify)"	Count
Left Blank	1
Depends of what would be shared	1
Interoperability of databases initiated by MARC	1
It\'s always good to know what is happening nearby.	1
Regional planning	1
We already do some of this.	1
coordiante with ped, bike, and traffic information to improve transit service	1
interested in integratign local data into TMS; we currently get KCATA data	1
We are not an island and need to know volumes near our borders so we can predict or respond to those impacts.	1

Responses "No (please specify)"	Count
Left Blank	9

16. Are there any challenges in engaging in a data sharing partnership with MARC?



Responses "Yes (please specify)"	Count
Left Blank	3
Depends if there is data MARC would have to share	1
Dissemination.	1
overcome technical hurdles and establishing roles and responsibilities	1
supporting staff and guidelines	1
Having the same format so data is easily shared; needs to be collected by the same standards and rules	1
Regionally inconsistent data and performance metrics/uses of data between agencies within MARC boundary	1

17. Please indicate any additional comments that would help us with this project. For instance, what should MARC look for to achieve an effective data sharing partnership with your organization?

Count	Response
1	I compiled the comments from Design, Planning, Transit and Safety Staff for this survey. I am not a collector of the data but included all MoDOT comments in this one survey. Last comment: There are various levels of "sharing" so clearly defining the scope of sharing is critical. I can share something with you by giving you a hard copy report, emailing you a data set, or set up a database where multiple agencies can enter their data, extract it to analyze and review. This wide range of "sharing" needs clarification on any data integration project.
1	Supporting IT designer to: a) evaluate and compile available data, b) eliminate duplication of efforts to create data, and c) identify the options to generate the needed data
1	When requesting data in an RFP focus on performance specs and standard data sets otherwise if you ask for customized data sets you will end up paying much higher fees.

APPENDIX E. EXAMPLE SURVEY INSTRUMENT ON GOVERNANCE INITIATIVES

Who to Survey: Managers (or designated representatives) from other DOT business offices or divisions

Purpose: **<AGENCY / DIVISION NAME>** is conducting safety data business planning initiative to improve the management and governance of our safety data, which, for the purposes of this project, is defined as crash, traffic volume, roadway feature inventory, or other transportation/safety related location data. The data business plan will describe our vision, goals, objectives, and actions related to improving the way we manage safety data within the agency.

An initial step is to gather more information on data management or governance initiatives underway in other business areas within the DOT. To assist us in the process, please respond to the survey below by **<DATE>**. We appreciate your assistance.

Survey Questions (using Survey Monkey or similar online tool)

1. Please identify the DOT division or office under which you are employed, and your job title.
    a. Name: <text box>
    b. Division/Office: <text box>
    c. Title: <text box>
2. Does your office own, develop, or maintain any data systems or databases? If yes, please identify the names of the data systems or databases.
    a. Yes (please explain) <Text box> <If yes, survey continues to Q3>
    b. No <If no, survey ends>
3. Does your office have a data business plan in place that guides the way you manage or govern your data systems or databases (or is one planned)?
    a. Yes, a data business plan is in place and being implemented within our business area
    b. Yes, a data business plan is in place, but has not been implemented yet
    c. We are in the process of developing a data business plan
    d. No, we don't have a data business plan, but one is planned or we recognize the need for one

e. No, we don't have a data business plan in place, nor is one planned

f. Other (please specify)

4. Does your office regularly assess its data systems or databases to identify needs for improvement? If yes, how often is the assessment conducted?

    a. Yes (please explain) <Text box>

    b. No

5. Have you done any assessments of data governance maturity or capability within your business area? If yes, please provide a brief explanation.

    a. Yes (please explain) <Text box>

    b. No

6. Does your office have formal policies and procedures in place for managing and governing its data systems or databases?

    a. Yes, we have formal standards, policies, and procedures in place for the way we manage and govern our data

    b. Yes, we have procedures in place, but they are not standardized or incorporated into policy, or our procedures differ each time we need to reconcile or correct data.

    c. No, we have no defined standards, policies, and procedures in place

    d. Other (please explain)

7. Are the workflows and business processes for managing your data systems or databases documented? If yes, please provide a brief explanation.

    a. Yes (please explain) <Text box>

    b. No

8. Are there clear roles and responsibilities (e.g., data stewards, data business owners, and data custodians) defined for data management and governance activities?

    a. Yes, roles and responsibilities are formalized and documented as part of our employees' job descriptions

b. Yes, there are clear roles and responsibilities, but they are not formalized or incorporated into job descriptions

c. No, we do not have defined roles and responsibilities

d. Other (please explain)

9. Is there a governance board or working groups set up for data management or governance?

    a. Yes, there is a governance board or working groups within our business area

    b. Yes, our office is part of a larger agency-wide governance board or working group

    c. No

    d. Other (please explain)

10. Please provide your (or a designated representative's) contact information for follow-up if we have questions regarding your response.

    a. Name: <Text box>

    b. Email: <Text box>

    c. Phone: <Text box>

E – EXAMPLE: STAKEHOLDER INTERVIEW

FHWA's *Data Governance & Data Management* (2018), pg 16-18 – https://rosap.ntl.bts.gov/view/dot/53783

Appendix A: Interview Guide

Background

1. Agency details:
    a. What is your role within your agency?
    b. Approximately how many full-time, non-contract employees work for your organization?
    c. What is the size of your GIS team, full or part-time, and not including contractors?
    d. Of the X [insert number from c] people on your GIS team, how many spend at least 50% of their time on GIS-related tasks?
    e. What is the number of contract staff, full or part-time, that work with your GIS team?
2. In what ways does your agency currently use GIS or geospatial tools?
3. Are there other uses of GIS that you would like to employ but currently do not?
    a. What are they?
4. What are your agency's biggest challenges or hurdles to using GIS tools and/or limitations to using potential GIS tools?

Data Policies

The following questions are related to data governance and management policies related to GIS that might be in place at your agency.

5. How does your agency currently define Data Governance?
6. How does your agency currently define Data Management?
7. Does your agency have an official Data Governance Policy document?
    a. If so, please briefly describe this policy at a high level.
    b. If not, does your agency employ any unwritten and/or unofficial data governance practices? Please explain.
8. Are there any designated data officers or a steering committee within your agency to oversee data governance and management?
9. Does your agency have an official Data Management Policy document?
    a. If so, please briefly describe this policy at a high level.
    b. If not, does your agency employ any unwritten and/or unofficial data management practices? Please explain.

10. Does your agency have an IT Strategic Plan?
    a. If so, please briefly describe this plan at a high level.
    b. If not, does your agency have any guiding IT policies? Please explain.
11. Does your agency have an official data standardization procedure or policy?
    a. If so, please briefly describe this procedure or policy at a high level.
    b. If not, how does your agency collect, process, and store GIS and GIS-related data?
12. Does your agency utilize a data warehousing system?
    a. If so, please describe this system.
    b. If not, what is your method for data storage?
13. Has your agency conducted a data maturity assessment?
    a. If so, please indicate when it was conducted and briefly describe the high level results of this assessment.
    b. If not, would you be interested in conducting such an assessment?

Opportunities and Challenges Related to Data Governance

14. What benefits or opportunities has your agency experienced in implementing data governance and data management policies?
15. What challenges has your agency experienced in implementing data governance and data management policies?

Applications

During our research, we identified a data governance project your agency has worked on called **(insert specific project)**. The following questions will focus on this specific application.

16. What was the motivation for this project?

17. Can you please describe the coordination, planning, and preparation that took place in order to get the project approved and carried out?
18. Was this project successfully implemented?
19. What were the challenges you experienced during this project?

Additional Resources

20. Have you experienced any **successes** in communicating with your agency's upper management about the importance of investing in data governance and data management?
21. Have you experienced any **challenges** in communicating with your agency's upper management about the importance of investing in data governance and data management?

a. What benefits of Data governance or data management would be most relevant to, or valued by, your agency's upper management?

22. What support from FHWA would be helpful in creating and/or implementing data governance and/or management policies?
    a. Would you be interested in attending a Peer Exchange regarding this topic?

F – EXAMPLE: DATA GOVERNANCE COUNCIL CHARTER

FHWA's *Data Governance Plan* (2015), pg 21-23 –
https://www.fhwa.dot.gov/datagov/dgpvolume%201.pd

Fairfax County –
https://www.fairfaxcounty.gov/data/sites/data/files/assets/documents/data%20analytics%20governance%20council%20&%20advisory%20group.pdfhttps://nap.nationalacademies.org/download/23463#

APPENDIX B - DATA GOVERNANCE CHARTER

The following Charter was signed by Sarah J. Shores, Associate Administrator for Administration and David R. Winter, Director, Office of Highway Policy Information, on December 1, 2012.

ARTICLE I. PURPOSE, AUTHORITY, AND DURATION

Purpose: The Federal Highway Administration (FHWA) Data Governance Advisory Council, hereinafter referred to as the "DGAC," is formally chartered and empowered to provide strategic review and oversight of all FHWA data collection efforts. The DGAC will consider guidance and information provided by the DOT Secretary, the FHWA Administrator and the FHWA Chief Information Officer (CIO) as part of its processes and functions. The DGAC has authority and responsibility to corporately advise on the utilization [of] FHWA's data resources and recommend major changes in FHWA data collection efforts that will result in increased consistency and coordination between existing and new data programs; the elimination of redundant data collection; the consolidation of data sources and resources; and compliance with external mandates. The DGAC will present recommendation to the Investment Review Board (IRB) for approval and prioritization.

Authority: The Council is formed under delegated authority from the Secretary of the DOT and FHWA Administrator, and in support of the Department's implementation of the following laws:

- The Clinger-Cohen Act of 1996
- Federal Acquisition Streamlining Act of 1994 (FASA)
- Federal Information Security Management Act of 2002 (FISMA)
- E-Government Act of 2002 (E-Gov Act)
- Paperwork Reduction Act of 1995 (PRA)
- Government Performance and Results Act of 1993 (GPRA)

The DGAC is also formed to assist in the Agency's compliance with various regulatory, policy, or procedural requirements of the OMB, and the DOT.

Duration: The DGAC is considered a permanent FHWA governance body.

ARTICLE II. SCOPE AND MANDATES

Scope: The DGAC is an Agency-level, senior leadership governance committee whose scope includes:

- Corporately provide advice on the management of FHWA data assets.
- Provide recommendations on FHWA strategic data decisions and resource allocations to the FHWA leadership to obtain initial approval of data policies and standards.
- Annually review the FHWA data programs and make change recommendations to the FHWA Investment Review Board (IRB) for approval.

Mandates: The DGAC shall be responsible for orchestrating FHWA's major data collection efforts, including the pre-selection, selection, control, and evaluation of individual data and entire data programs.

In addressing these stages, the DGAC shall perform the following functions:

- Develop a proposed plan for corporately managing FHWA data.
- Review existing data collection efforts for need, consistency and efficiency annually.
- Review and approve all new data collection efforts, including the establishment and approval of criteria.
- Monitor and evaluate performance of data programs.
- Creation of a functional data dictionary.
- Recommend to the FHWA Investment Review Board ways to improve and streamline existing and new data collection efforts.
- Coordinate FHWA data collection efforts with other modes within the Department.

ARTICLE III. MEMBERSHIP

Membership: The FHWA DGAC membership includes the following senior managers or their designees, who are all voting members:

- Director of the Highway Policy Information, who serves as the Chair
- Representative from the Office of the Chief Financial Officer
- Representative from the Chief Counsel Office
- Representative from the Policy and Program Review, Federal Lands Highway
- Representative from the Office of Bridge and Structures
- Representative from the Transportation Performance Management
- Representative from the Safety Programs
- Representative from the Research, Development and Technology
- Representative from the DA Council
- Representative from the IT Advisory Group
- Representative from a Program Office that will rotate on an annual basis

Note: Only one representative from each office is permitted.

ARTICLE IV. SCHEDULE

The DGAC will meet regularly at a time and place set by the Chair. The DGAC will meet at least once each quarter.

ARTICLE V. EFFECTIVE DATA AND REVIEW

This charter is effective as of December 1, 2012. There are no cancellations associated with the implementation of this DGAC Charter.

Charter
Fairfax County Data Analytics Governance Council and Advisory Group

PURPOSE

Establish a Fairfax County Data Analytics Governance Council and Data Analytics Advisory Group to guide the development of data management practices and provide actionable data for decision-making, improve data confidence, and increase long-term data value.

BACKGROUND

To best align resources with needs and improve the efficiency and effectiveness of Fairfax County Government, the county must operationalize a framework to increase the use of data and provide insights for practical decision-making and strategic planning. The data analytics framework includes processes and practices that streamline access, improve quality, and increase the comprehension of data. The Department of Management and Budget created a Countywide Data Analytics (CDA) unit to lead the development and management of the data analytics framework. The fundamental role of CDA is to increase access to data and foster the collective analysis, disaggregation, and sharing of data to increase understanding and inform decisions that improve community outcomes.

Countywide implementation of the data analytics framework requires a comprehensive data governance and data management structure that includes governance, analysis, and the supporting technological environment to enhance data analytics services. The framework is dependent on collective guidance and integrated planning at multiple levels. Senior level leaders are needed to determine the rules, policies, and protocols that help embed new practices across the organization.

ROLES AND RESPONSIBILITIES

This charter initiates the shared approach among senior county leaders to guide a progressive data analytics platform and routinely use data as a business asset. All efforts are conducted in accordance with applicable federal, state, and local laws, rules, and regulations. The Data Analytics Governance Committee and the related structure is also committed to the disaggregation and evaluation of data to support social and racial equity goals.

The Data Analytics Governance Council (AGC) serves as an executive steering committee to provide overarching direction and facilitate collaboration across the organization. Responsibilities include the following:

- Review, approve, and monitor laws, policies, and standards to guide data analytics throughout Fairfax County.
- Promote and foster data analytics, data interpretation, and data sharing to improve the utility of data for planning and decision-making, especially related to current issues, initiatives, and integrated problem-solving.
- Assess the value of available data as well as analytics activities and the effectiveness in informing county priorities.
- Guide practices for publishing meaningful data and actionable information.

Data Analytics Governance Council Members:

- **Chief Equity Officer**
- **Chief Financial Officer**
- **Deputy County Attorney**
- **Deputy County Executives**
- **Director, Department of Information Technology (DIT)**
- **Director, Department of Management and Budget (DMB)**

The directors of DMB and DIT are members of the AGC because of their unique data analytics roles. The Countywide Data Analytics Coordinator convenes the **Data Analytics Governance Council** and provides primary staff support. The Data Analytics Governance Council works with Fairfax County Public Schools to plan and coordinate on relevant topics and issues.

The Data Analytics Advisory Group (Advisory Group) provides knowledge and skills to inform recommendations and materials presented to the Data Analytics Governance Council. Members have experience analyzing, manipulating, and presenting quantitative and qualitative data. The data advisory role has a countywide focus, irrespective of the agency to which the member formally reports. Responsibilities include the following:

- Review data analytics curation practices for strategic use.
- Track and coordinate countywide analytics projects to align efforts where appropriate, leverage analytical resources, and mitigate duplication of effort.
- Leverage administrative data, where lawful, useful, and aligned with security and privacy standards to enrich data assets for policymaking and improve outcomes.
- Provide information to expand the usage of data analytics resources and modeling library.
- Identify data stewards and subject matter experts to inform specific research, analysis, and outcomes.

The Data Analytics Advisory Group Members:

- **Department of Economic Initiatives**, Division Manager, Catalytic Development
- **Department of Human Resources**, Deputy Director
- **Department of Information Technology**, Deputy Director
- **Department of Information Technology**, IT Security Director
- **Department of Management and Budget**, Countywide Data Analytics (CDA) Staff
- **Department of Management and Budget**, Demographics, Senior Economic & Statistical Analyst
- **Department of Planning & Development**, Planner IV
- **Economic Development Authority**, Director of Market Intelligence
- **Fire & Rescue Department**, Data Analytics Strategy Manager
- **Health Department**, Director of Epidemiology
- **Land Development Services**, IT Manager and LDS Learning and Development Program Manager/Coach
- **Office of the County Attorney**, Assistant County Attorney
- **One Fairfax**, Policy Advisor and Project Manager
- **Park Authority**, Director of Business Administration
- **Police Department**, Office of Data Analytics & Strategic Initiatives, Director

The following Advisory Group members are points of contact for the corresponding priority area listed below and guide targeted analyses, respectively. Subject matter experts will support the Advisory Group as needed.

Cultural and Recreational Opportunity

- Park Authority, Park Management Specialist

Economic Opportunity

- Department of Economic Initiatives, Director

Effective and Efficient Government

- Department of Management and Budget, Budget Analyst and Performance Measurement Coordinator

Empowerment and Support for Residents Facing Vulnerability

- Department of Family Services, Deputy Director and Data Analytics/Community Action Manager

Environment

- Office of Environmental and Energy Coordination, Division Director

Health

- Fairfax Falls Church Community Services Board, Data Analytics Manager

Housing and Neighborhood Livability

- Department of Housing and Community Development, Special Projects, Real Estate, Finance & Development

Lifelong Education and Learning

- Neighborhood and Community Services, Deputy Director and Strategic Planning and Data Manager

Mobility and Transportation

- Department of Transportation, Communications and Marketing Section Chief

Safety and Security

- Fire and Rescue Department, Data Analyst

The Countywide Data Analytics Coordinator is the **Data Analytics Advisory Group's chair** and the liaison between the Advisory Group and the Governance Council.

G – Example: Multimodal Mobility Performance Measure Matrix

FHWA's *Data Governance Plan* (2015), pg 21-23 – https://www.fhwa.dot.gov/datagov/dgpvolume%201.pd

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- Creation of a functional data dictionary.
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- Coordinate FHWA data collection efforts with other modes within the Department.

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- Representative from the Safety Programs
- Representative from the Research, Development and Technology
- Representative from the DA Council
- Representative from the IT Advisory Group
- Representative from a Program Office that will rotate on an annual basis

Note: Only one representative from each office is permitted.

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The DGAC will meet regularly at a time and place set by the Chair. The DGAC will meet at least once each quarter.

ARTICLE V. EFFECTIVE DATA AND REVIEW

This charter is effective as of December 1, 2012. There are no cancellations associated with the implementation of this DGAC Charter.

APPENDIX E. EXAMPLE DATA GOVERNANCE MANUAL

INTRODUCTION

This Data Coordination Manual provides comprehensive guide to members of the U.S. Department of Transportation (DOT) Roadway Mobility Data Coordination Group (hereafter called the Coordination Group) on the background and purpose of the Coordination Group, its overall structure, the kinds of topics that the Coordination Group addresses, how the Coordination Group works, expectations of Coordination Group members, and a plan for measuring the outcomes and overall success of the Coordination Group.

The following provides a basic understanding and overview of the Coordination Group:

- The Coordination Group is a forum for facilitating cross organizational collaboration, data sharing, and integration of roadway travel mobility data within U.S. DOT to address gaps and redundancies documented in the U.S. DOT Roadway Transportation Data Business Plan (DBP) (Phase 1),[2] and to collaborate on data management functions related to roadway travel mobility data.
- Since the Federal Highway Administration (FHWA) is the largest provider of roadway mobility data, the Coordination Group is managed under the Operations Regime of FHWA's Data Governance Advisory Council (DGAC).
- The Coordination Group includes members from other DGAC regimes, such as Planning, Policy and Research, as well as from other operating administrations and programs of the Department.
- Coordination Group activities and priorities are guided by the DBP, which documents stakeholder needs and gaps related to roadway travel mobility data programs and data business planning within U.S. DOT; establishes a framework for data coordination; and provides recommendations regarding data management functions related to roadway travel mobility data.
- The culture of the Coordination Group is one of collaboration and mutual trust, with shared ownership of decisionmaking as a key characteristic.

WHAT IS THE ROADWAY MOBILITY DATA COORDINATION GROUP?

The Coordination Group is charged with facilitating cross organizational collaboration, data sharing, and integration of roadway travel mobility data within U.S. DOT to address gaps and redundancies (documented in the U.S. DOT Roadway Transportation DBP (Phase 1) report)[3] and to collaborate on data management functions related to roadway travel mobility data.

[2] http://ntl.bts.gov/lib/48000/48500/48531/6E33210B.pdf.
[3] http://ntl.bts.gov/lib/48000/48500/48531/6E33210B.pdf.

Roadway travel mobility data includes travel data from roadway travel modes, including vehicle, truck freight, bicycle/pedestrian, and transit.

Travel data includes vehicle volume, speed, and lane occupancy data, as well as connected vehicle data such as vehicle location, presence and speed within the system, internal vehicle status such as fuel consumption rate, or externally measured data such as recorded external temperature. Travel data for transit vehicles could include location, speed, and status data, as well as passenger counts and schedule adherence data. Freight carriers may supplement a standard location and position report with gross weight data or data regarding the type and time-critical nature of goods carried. Public sector fleet vehicles may be able to contribute other key data related to their primary functions, such as snowplows reporting blade position or estimates of roadway snow depth. Additional travel data could include a multimodal trace of individual travelers through the transportation system.

The need for the Coordination Group evolved from the white paper, *Needs and Gaps in the Operation and Coordination of U.S. DOT Data Capture and Management Programs*, which was commissioned by the FHWA Office of Operations, Office of Transportation Management (HOTM) to examine current data capture and management activities across various U.S. DOT program areas, and identify gaps and potential opportunities to effectively and efficiently coordinate and manage the programs' activities. The white paper identified the need for a communication and coordination mechanism at the Federal level through formation of a data coordination team to address the gaps and share issues related to the capture and management of roadway travel mobility data.

The U.S. DOT Roadway Transportation DBP (Phase 1) report formalized the recommendation and proposed an initial structure, framework, and rules of engagement for the Coordination Group. The DBP also established that the scope of the Coordination Group be limited to formally recognized data programs within U.S. DOT that involve the collection, analysis, or reporting of roadway travel mobility data.

The member offices of the Coordination Group are listed in Table 9.

Table 9. Coordination group member offices.

Membership
OST-R/Intelligent Transportation Systems Joint Program Office (HOIT)
Bureau of Transportation Statistics (BTS)
FHWA Office of Highway Policy Information (HPPI)
FHWA Office of Program Performance Management (TPM)
FHWA Office of Transportation Management (HOTM)
FHWA Office of Transportation Operations Road Weather Management (HOTO)
FHWA Office of Transportation Operations Research & Development (HRDO)
FHWA Office of Human Environment (HEPH)
FHWA Office of Planning (HEPP)
FHWA Office of Freight Management & Operations (HOFM)
Federal Motor Carrier Safety Association (FMCSA)

HOW IS THE COORDINATION GROUP STRUCTURED?

The Coordination Group is managed under the Operations Regime of the FHWA DGAC, which is formally chartered and empowered to provide strategic review and oversight of all FHWA data collection efforts. The DGAC has authority and responsibility to corporately advise on the utilization of FHWA's data resources, and recommend major changes in FHWA data collection efforts that will result in increased consistency and coordination between existing and new data programs; the elimination of redundant data collection; the consolidation of data sources and resources; and compliance with external mandates.

As documented in *FHWA Data Governance Plan Volume 1: Data Governance Primer* (draft February 2014), data governance at FHWA comprises the following three-tiered hierarchy:

- **Data Governance Advisory Council.** The DGAC is responsible for developing the FHWA Data Governance Plan and Framework and serves as the point of contact for coordinating data collection efforts with other modes within the Department and with other branches of government. The DGAC is assisted by Technical Advisors that assist in developing formal documentation on data governance principles, and provide input into the decisionmaking process.
- **Data Governance Regimes and Coordinators.** Regimes are responsible for coordinating with individual data programs, and ensuring that the Data Governance Plan and Framework are adhered to, while Regime Coordinators liaison with the DGAC and provide oversight of stewardship and management processes of data programs within their regime. There are 12 Data Governance Regimes:
  - Headquarters (HQ) Administrative.
  - Financial.
  - Planning.
  - Operations.
  - Policy.
  - Research.
  - Infrastructure.
  - Chief Counsel.
  - Safety.
  - Federal Lands.
  - Division Office.
  - Technical Services.
- **Data Stewards.** Data Stewards are subject matter experts and points of contact for the data programs they oversee. They are responsible for managing their data programs in accordance with the processes and procedures established by the DGAC and the Regime Coordinator.

The Coordination Group is managed under the Operations Regime of the DGAC, with members from other DGAC regimes, such as Planning, Policy and Research, as well as from other operating administrations and programs of the Department. Figure 3 shows how the Coordination Group fits within the DGAC framework. The Coordination Group also influences other activities/areas outside of FHWA (such as safety).

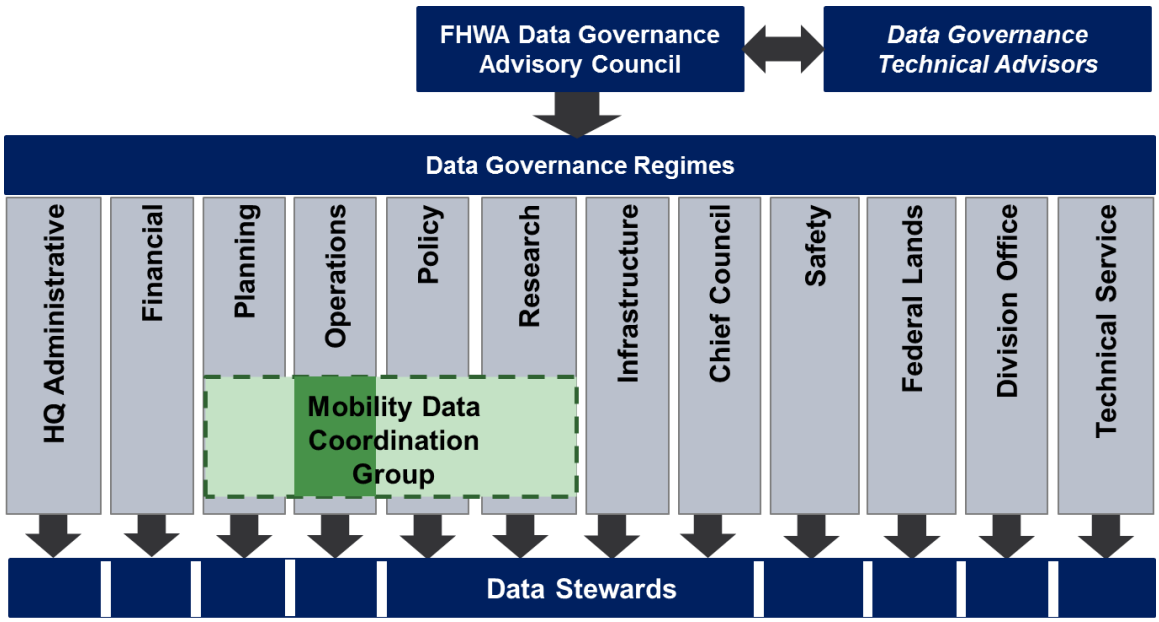


Figure 3. Flow chart. Framework for the coordination group with the Data Governance Advisory Council.

(Source: FHWA Data Coordination Manual (internal document)).

The structure for the Coordination Group comprises the Coordination Group Chair/Cochair, the Coordination Group itself, Working Groups, and Supporting Staff, as shown in Figure 4:

- **Roadway Mobility Data Coordination Group Chair/Cochair.** The Chair/Cochair are designated individuals from within the FHWA Office of Operations and one member agency representative who would cochair the Roadway Mobility Data Coordination Group and liaison with the FHWA DGAC and other offices outside of FHWA (such as Safety). The FHWA Office of Operations DBP champion (Walter During) would serve as the permanent chair, while the rotating Cochair would be selected from one member agency representative.
- **Roadway Mobility Data Coordination Group.** The Coordination Group consists of designated individuals within U.S. DOT who are responsible for the oversight of roadway travel mobility data programs to support the business functions of their offices.
- **Working Groups.** Working Groups may be temporarily formed to address issues that are pertinent to a specific type of mobility data (e.g., travel data, connected vehicle data, climate data, etc.) or that cross cut multiple types of mobility data (e.g., data quality, data standards, data privacy and security, analysis tools, etc.). Working Groups can also be formed to conduct work on specific activities deemed necessary by the Coordination Group (e.g., provide comments on upcoming Request for Proposals (RFP), develop a Strategy Document for the Coordination Group, oversee coordination project activities, etc.).
- **Supporting Staff.** Supporting staff provide administrative support and technical guide to the Chair/Cochair, Roadway Mobility Data Coordination Group and Working Groups, as

needed. Supporting staff members include consultants and other administrative staff support as needed.

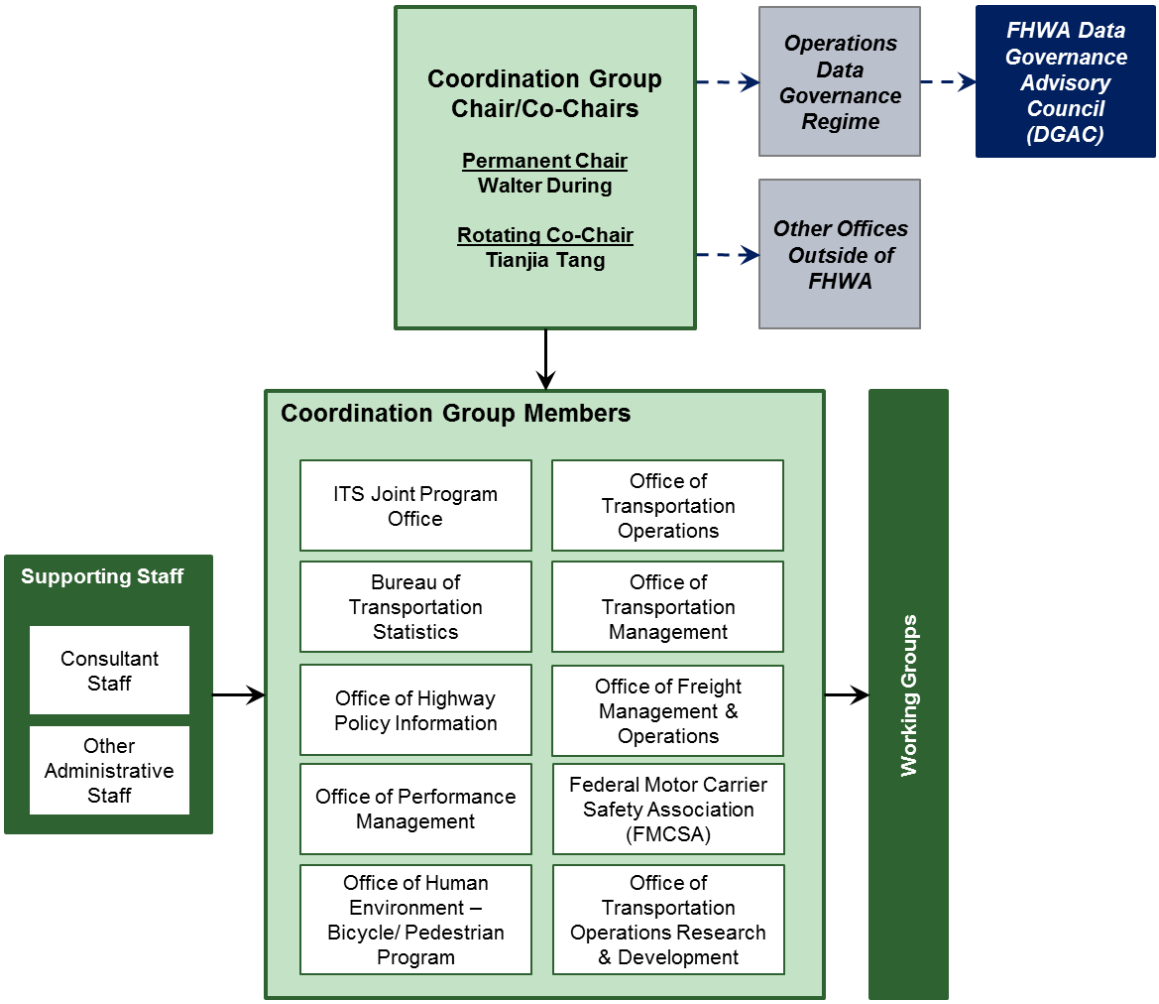


Figure 4. Organization chart. Structure for roadway mobility data coordination group.

(Source: FHWA Data Coordination Manual (internal document)).

WHAT KIND OF TOPICS DOES THE COORDINATION GROUP ADDRESS?

The Coordination Group is intended to be a forum for U.S. DOT and FHWA stakeholders involved with roadway travel mobility data to coordinate on the following types of activities:

- Share RFPs for current and upcoming initiatives related to roadway travel mobility data.
- Review and provide input on possible FHWA procurement actions related to roadway travel mobility data.
- Share current initiatives, activities, and/or best practices related to roadway travel mobility data, including data strategies, policies, standards, metadata, architecture, procedures, metrics, etc.

- Participate in indepth vetting of data standards/procedures and standards for linear referencing attributes/terminology to facilitate sharing/integration of U.S. DOT roadway travel mobility data.
- To the extent possible, identify and address gaps and redundancies (documented in the DBP) in mobility data programs within their respective offices.
- Identify needs and opportunities to coordinate resources, reduce data redundancies, and implement cost sharing strategies for the collection, management, and maintenance of roadway travel mobility data.
- Identify needs and opportunities to reduce redundancy in the development and maintenance of duplicate data systems, promote efficiency in system maintenance, and promote open-source initiatives.
- Identify needs and opportunities to integrate national data sets to support performance measurement and asset management purposes.
- Identify needs and opportunities to create links between existing data sets and connected vehicle data sets in the future.
- Identify needs and opportunities to enhance access to information and data for roadway travel mobility data programs, including the need for Web portals accessible by internal and external stakeholders to share data and information as needed.
- Identify and oversee potential data coordination projects or additional research needed to demonstrate reduced cost or improved Federal capability.
- Identify potential funding to conduct agreed-upon research projects and data coordination activities.
- Understand and promote the value of data as a U.S. DOT-wide asset.

DATA COORDINATION PROJECTS

Data coordination projects will be conducted to demonstrate the benefit and value of the DBP in terms of reduced cost or improved efficiency in business operations and work processes. The Coordination Group will be responsible for identifying and overseeing potential data coordination projects or research topics of interest to them, as well as potential funding sources to conduct agreed upon projects.

The following types of projects have been identified by the Coordination Group:

- Development of a searchable, sustainable, current data catalog and SharePoint site for Coordination Group members to share internal information on projects, and inform offices of upcoming initiatives related to roadway travel mobility data.
- Develop guide on developing DBPs for States and local jurisdictions.
- Investigate “big data” sources, such as crowdsourcing, social media, and private sector data sources that have not been traditionally utilized as sources for roadway travel mobility data.

- Investigate how current standards, such as the National Information Exchange Model (NIEM) and open-source, could be applied within the DBP or within an individual stakeholder office.
- Develop a tool for visualizing and analyzing large roadway travel mobility data sets within a cloud environment.

A complete list of candidate data coordination project concepts will be maintained on the Roadway Mobility Data Coordination Group Document Share site (FHWA internal site) (https://collaboration.fhwa.dot.gov/dot/fhwa/xhcx/dbp/default.aspx). Work on the first project concept will be conducted by Cambridge Systematics as part of the DBP (Phase III) project, Implementation and Maintenance of the Overall Mobility Data Coordination Group.

HOW DOES THE COORDINATION GROUP WORK?

Meetings

The Coordination Group meets quarterly on the first Tuesday of the months of March, June, September, and December to discuss data management/coordination issues. An annual one-day symposium/working meeting will be convened at the time of the March meeting for members to share information on current initiatives, activities, and best practices; and to establish and review the strategic direction and priorities for the Coordination Group for the coming year.

Meetings and teleconferences will be announced at least a week in advance, and conducted in accordance with a published agenda. Coordination Group members will be asked to update the group on their office's current initiatives and activities related to roadway travel mobility data. A draft agenda and any requests for presentations/updates will be sent to Coordination Group members in advance of the meeting. Members may request that additional discussion topics be added to the agenda by notifying the Chair/Cochair.

Meetings are normally open to all interested parties, but may be restricted to Federal participants when necessary (e.g., when RFPs or other upcoming initiatives are shared). Draft minutes documenting action items and responsibilities will be circulated to all members following the meeting. The meeting announcement and final minutes will be posted within two weeks on the Roadway Mobility Data Coordination Group Document Share site (FHWA internal site) (https://collaboration.fhwa.dot.gov/dot/fhwa/xhcx/dbp/default.aspx).

Coordination Group members seeking input on RFPs and other procurement actions related to roadway travel mobility data should share the RFP with the Chair/Cochair, who will decide whether it should be distributed to Coordination Group members for input/review. The Chair/Cochair will also decide the review mechanism (e.g., form a Working Group, distribute the RFP for review by all Coordination Group members, etc.), duration of review period, and whether to initiate a meeting to resolve issues.

Working Groups

The Coordination Group will be supported by Working Groups that are temporarily formed to address needs/gaps that are pertinent to a specific type of roadway travel mobility data (e.g., travel data, connected vehicle data, climate data, etc.) or that cross cut multiple types of roadway

travel mobility data (e.g., data quality, data standards, data privacy and security, analysis tools, etc.). Working Groups may also be formed to conduct work on specific activities deemed necessary by the Coordination Group (e.g., provide comments on upcoming RFPs, develop a Strategy Document for the Coordination Group, oversee data coordination project activities, etc.).

A request to form a Working Group may be made by the Chair/Cochair, any Coordination Group member, or through consensus by the Coordination Group. Working Groups will consist of two to four interested members, with one member serving as the lead and the remaining members serving as key content reviewers.

Working Groups will meet via conference call or in person as agreed upon by members of the group. The Working Group leader will report on their results at the next regularly scheduled Coordination Group meeting. The Working Group may be disbanded after their work is complete.

Data Coordination Mechanisms

Document Share Site

The Roadway Mobility Data Coordination Group Document Share site (FHWA internal site) (https://collaboration.fhwa.dot.gov/dot/fhwa/xhcx/dbp/default.aspx) will be used as a clearinghouse for Coordination Group members to share best practice documents and Coordination Group documents, meeting announcements, and meeting summaries. Hyperlinking to Share Site documents will be used for sending out requests for document review/comments to members.

Awards

The Coordination Group will give annual awards to recognize significant contributions that advance the DBP's goal to improve coordination and communication mechanisms across U.S. DOT and FHWA offices involved with roadway travel mobility data. In addition to a custom-designed award, recipients receive recognition for their efforts at the annual symposium/ working meeting convened at the time of the March meeting.

Each year, nominations for the award will be accepted by members of the Coordination Group. To submit a nomination, the nominator must submit the following information:

- Nominator's name, office, title, address, phone number, and email.
- Nominee's name (or contact person for a nominated organization or program), office, title, address, phone number, and email.
- A narrative, not to exceed 500 words, in support of the nomination, addressing the following areas:
  - Provide a clear, direct, and specific statement of why the nominee deserves recognition.

- Elaborate on why the nominee's accomplishments are worthy of the award, including what the nominee did (e.g., projects, activities), any challenges or issues encountered and overcome, how they did it (initiative/leadership, teamwork/collaboration, and/or creativity/innovation), and the results/outcomes (or major milestones) that the nominee's efforts accomplished.

Nominations should be submitted to the Coordination Group Chair by January 31st of each year. A Working Group will be formed to review nominations and select a winner, which will be announced during the annual symposium/working meeting.

WHAT IS EXPECTED OF MEMBERS?

Members of the Coordination Group shall:

- Maintain a culture of collaboration and mutual trust by regularly attending and participating in quarterly Coordination Group meetings and Working Groups and presenting their office perspective.
- To the extent possible, identify and address gaps and redundancies in roadway travel mobility data programs within their respective offices.
- Identify data standards and stewardship recommendations for consideration by the FHWA Data Governance Advisory Council.
- Engage Coordination Group members in procurement decisions by sharing RFPs for current and upcoming initiatives related to roadway travel mobility data.
- Develop recommended language for insertion into Statements of Work.
- Share best practices related to roadway travel mobility data, including data strategies, policies, standards, metadata, architecture, procedures, and metrics.
- Ensure that Coordination Group best practices are communicated to data stewards within their respective office.
- Identify potential data coordination projects or additional research needed to demonstrate reduced cost or improved Federal capability.
- Identify potential funding to conduct agreed upon research projects and data coordination activities.
- Provide feedback on research project ideas.

Coordination Group products include:

- Documentation of best practices related to roadway travel mobility data, including data strategies, policies, standards, metadata, architecture, procedures, and metrics.
- Recommendations for enhancements to Statements of Work or RFPs for current and upcoming procurements related to roadway travel mobility data.
- Completion of data coordination projects and research activities that reduce costs or improve the quality and effectiveness of roadway mobility data.

HOW WILL SUCCESS OF THE COORDINATION GROUP BE MEASURED?

The Data Business Plan outlined the expected outcomes of improved coordination of roadway travel mobility data programs through the Coordination Group, which include:

- Improved availability of data to support planning, operations, and performance measure activities.
- Elimination of redundant data collection efforts, resulting in a decrease in possible expenditure for duplicate data.
- More rapid, targeted data acquisitions.
- Broader sharing of data resources.
- Systematic coordination and clarification of data-related federal policy.
- Reduced data collection and management costs.
- Better serve the needs of customers of FHWA.
- Improved efficiency in business operations and work processes through use of data-sharing technology.
- Consensus in the use of streamlined data sources across organizational business units.

Success of the Coordination Group will be assessed using performance indicators to measure program activities (i.e., outputs), and confirm the program is effectively delivering results (i.e., outcomes). The linkages between program activities (i.e., outputs) and expected outcomes (both immediate and long term) are shown in Figure 5.

Performance indicators for Coordination Group activities (i.e., outputs) and outcomes are shown in Figure 6, Figure 7, and **Error! Reference source not found.**, respectively. Output indicators quantify the activities of the Coordination Group and reflect the level of effort expended or scale/scope of activities. These indicators are both qualitative and quantitative in nature, and will be assessed on an annual basis as part of the DBP Annual Update. Outcome indicators quantify the effectiveness of the Coordination Group in terms of meeting its mission and stated goals. These indicators will depend on the availability of internal U.S. DOT data to support calculation of the measure, and they may be refined as implementation of the DBP continues. After three years, an assessment of the effectiveness of the group will be made using the outcome indicators, and the Coordination Group will decide whether to continue its activities or disband the group.

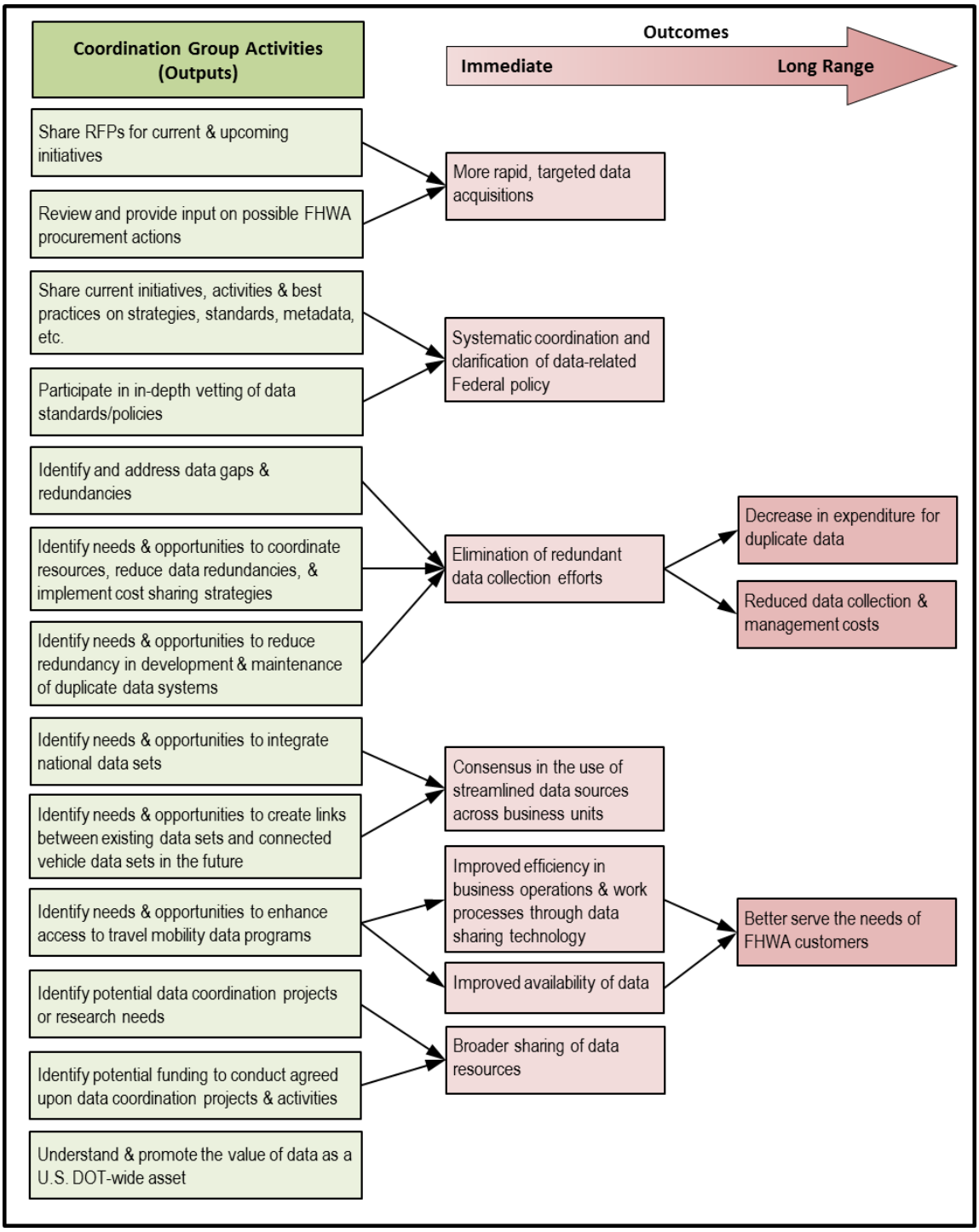


Figure 5. Flow chart. Relationship between group activities (outputs) and outcomes.

(Source: FHWA Data Coordination Manual (internal document)).

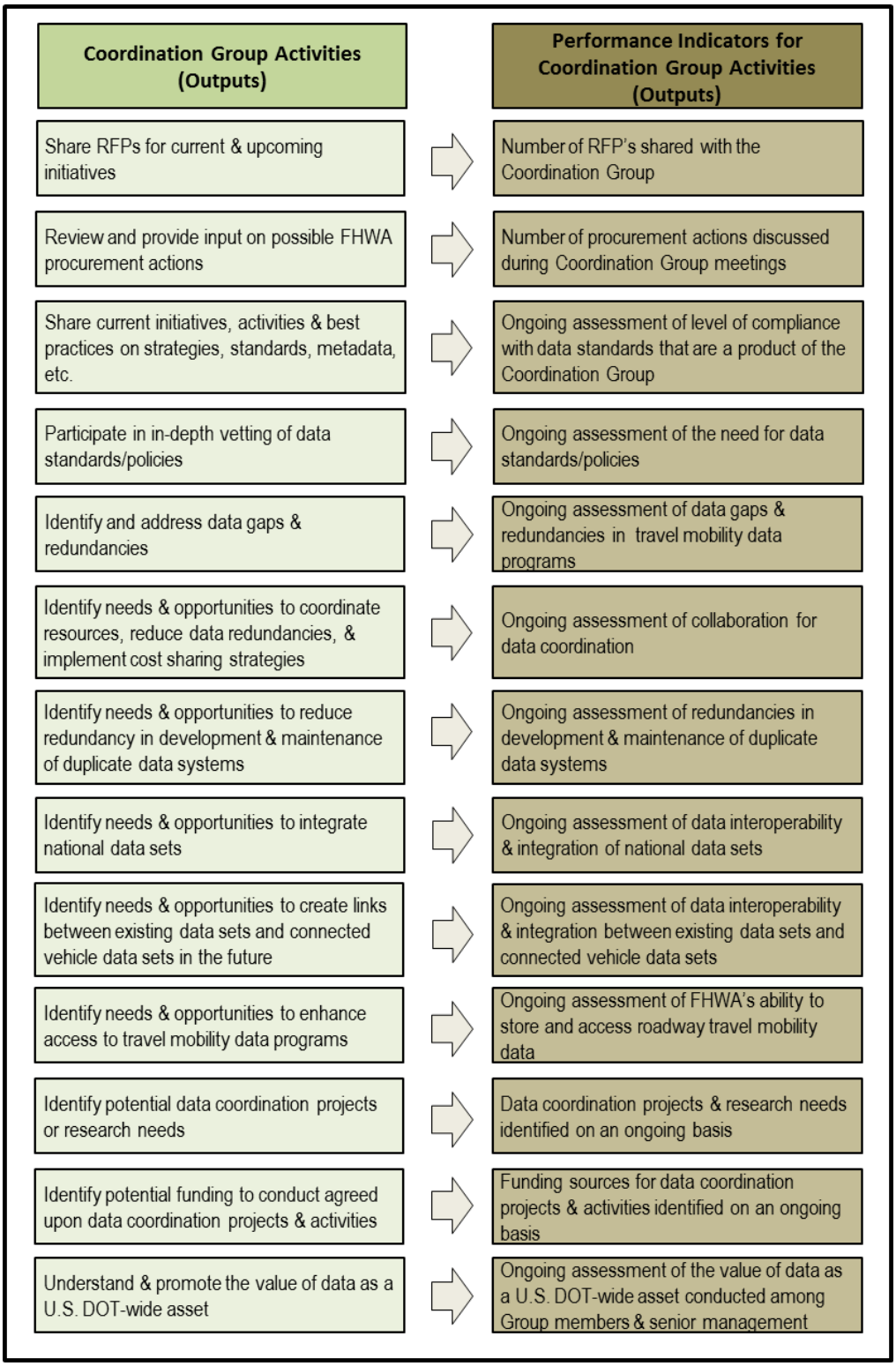


Figure 6. Process chart. Performance indicators for group activities (outputs).

(Source: FHWA Data Coordination Manual (internal document)).

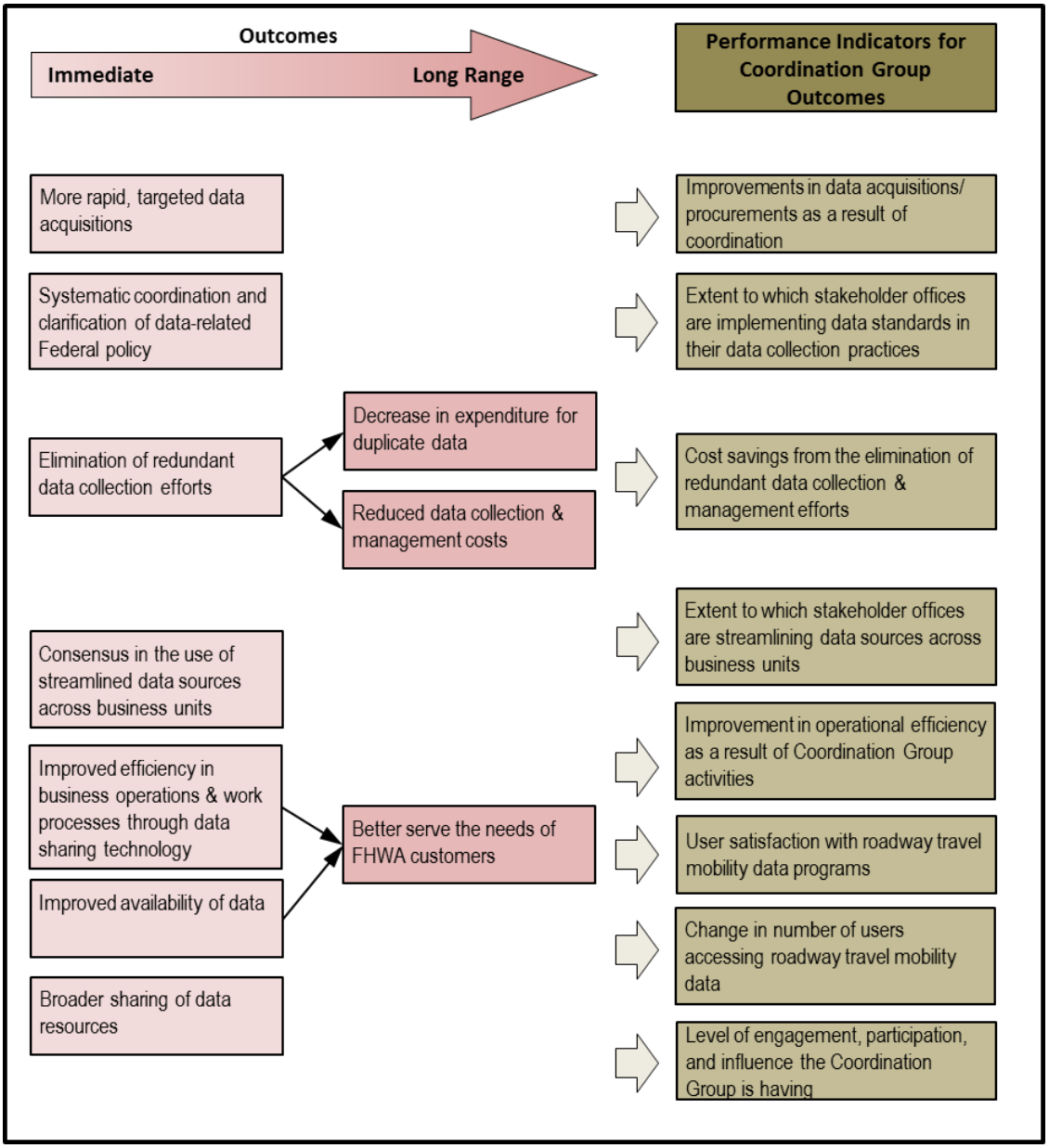


Figure 7. Flow chart. Performance indicators for outcomes.

(Source: FHWA Data Coordination Manual (internal document)).

WHAT ADDITIONAL DOCUMENTATION IS AVAILABLE?

The following supporting documents provide additional information on the history of the Coordination Group and U.S. DOT Roadway Transportation Data Business Plan:

- *Data Capture and Management: Needs and Gaps in the Operation and Coordination of U.S. DOT Data Capture and Management Programs*. This white paper examines current data capture and management activities across various U.S. DOT program areas, and identified gaps and potential opportunities for filling the gaps to effectively and efficiently coordinate and manage the programs' activities. The primary recommendation from the white paper was that the HOTM develop a DBP to address the gaps identified in the paper.
- *U.S. DOT Roadway Transportation Data Business Plan (Phase I): Data Business Plan* (January 2013). This report documents the results of Phase 1 of the DBP, which serves to improve coordination among real-time data capture programs within U.S. DOT by clearly defining U.S. DOT needs for real-time data, address gaps and overlaps in program needs with respect to stakeholders, and ultimately result in cost savings for U.S. DOT. (Available at: http://ntl.bts.gov/lib/48000/48500/48531/6E33210B.pdf)
- *U.S DOT Roadway Transportation Data Business Plan (Phase II): Data Business Plan* (June 2013). This report documents the results of Phase 2 of the DBP, which includes execution of the DBP coordination, as well as conducting two data integration test pilots to demonstrate the benefits and value of the DBP. (Available at: http://ntl.bts.gov/lib/48000/48500/48536/EBBC1DA.pdf)

WHO IS THE KEY CONTACT FOR INFORMATION?

The key FHWA contact for additional information on the Coordination Group and *U.S. DOT Roadway Transportation Data Business Plan* is:

Walter During, P.E.
FHWA, Operations Office of Transportation Management (HOTM-1)
1200 New Jersey Avenue, S.E. E86-317
Washington, DC 20590
(202) 366-8959 Office
(202) 366-3225 Fax
Email walter.during@dot.gov

H – EXAMPLE: DATA SHARING AGREEMENT

Oklahoma's Multi-Agency Data Sharing Agreement – https://oklahoma.gov/content/dam/ok/en/omes/documents/Multi-AgencyDataSharingAgreementOverview.pptx

Mid-America Regional Council's *Data Business Plan* (2017), Appendix D – https://ops.fhwa.dot.gov/publications/fhwahop18012/fhwahop18012.pdf

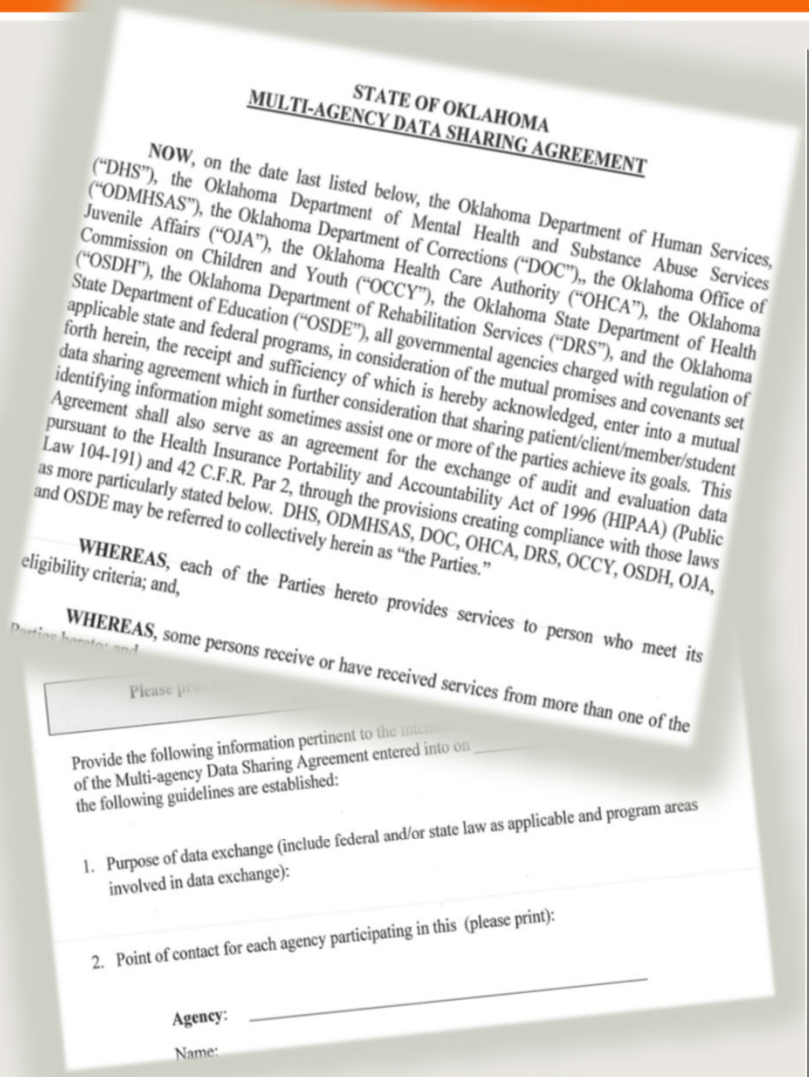
Mid-America Regional Council's *Data Business Plan* (2017), Appendix G– https://ops.fhwa.dot.gov/publications/fhwahop18012/fhwahop18012.pdf

Maryland DOT's *Data Business Plan* (2017), Appendix C – https://ops.fhwa.dot.gov/publications/fhwahop18010/fhwahop18010.pdf

Oklahoma Multi-Agency Data Sharing Agreement

July 2018

Multi-Agency Data Sharing Agreement



STATE OF OKLAHOMA
MULTI-AGENCY DATA SHARING AGREEMENT

NOW, on the date last listed below, the Oklahoma Department of Human Services, ("DHS"), the Oklahoma Department of Mental Health and Substance Abuse Services ("ODMHSAS"), the Oklahoma Department of Corrections ("DOC"),, the Oklahoma Office of Juvenile Affairs ("OJA"), the Oklahoma Health Care Authority ("OHCA"), the Oklahoma Commission on Children and Youth ("OCCY"), the Oklahoma State Department of Health ("OSDH"), the Oklahoma Department of Rehabilitation Services ("DRS"), and the Oklahoma State Department of Education ("OSDE"), all governmental agencies charged with regulation of applicable state and federal programs, in consideration of the mutual promises and covenants set forth herein, the receipt and sufficiency of which is hereby acknowledged, enter into a mutual data sharing agreement which in further consideration that sharing patient/client/member/student identifying information might sometimes assist one or more of the parties achieve its goals. This Agreement shall also serve as an agreement for the exchange of audit and evaluation data pursuant to the Health Insurance Portability and Accountability Act of 1996 (HIPAA) (Public Law 104-191) and 42 C.F.R. Par 2, through the provisions creating compliance with those laws as more particularly stated below. DHS, ODMHSAS, DOC, OHCA, DRS, OCCY, OSDH, OJA, and OSDE may be referred to collectively herein as "the Parties."

WHEREAS, each of the Parties hereto provides services to person who meet its eligibility criteria; and,

WHEREAS, some persons receive or have received services from more than one of the

Please

Provide the following information pertinent to the
of the Multi-agency Data Sharing Agreement entered into on
the following guidelines are established:

1. Purpose of data exchange (include federal and/or state law as applicable and program areas involved in data exchange):

2. Point of contact for each agency participating in this (please print):

Agency:

Name:

Nine Oklahoma State Agencies worked together to develop a Multi-Agency Data Sharing Agreement (DSA).

This allows participating agencies to streamline their data sharing processes as outlined in an overarching agreement. It also provides a form that can be used to detail an exchange of data between two or more of the agencies.

The form, or "Schedule A", is used to detail data exchange criteria such as intended uses, constraints, confidentiality, security and methods of data sharing to be applied.

Purpose of the Agreement

- **Streamline Data Exchanges:** The purpose of the data sharing agreement (DSA) is to streamline future data exchanges by providing an overarching agreement using standardized language that has been approved by the legal services and information security personnel of each participating agency.
- **Benefits:** The agreement allows participating agencies to:
  - Learn of other services being offered or provided to its clients
  - Better regulate government programs and increase efficiencies
  - Maximize clients' benefits received by the agencies

Participating Agencies

Oklahoma HHS Cabinet Agencies

- Commission on Children and Youth
- Department of Human Services
- Department of Mental Health and Substance Abuse Services
- Office of Juvenile Affairs
- Health Care Authority
- State Department of Health
- Department of Rehabilitation Services

Other Oklahoma Agencies

- State Department of Education
- Department of Corrections

Participating DSA partners include non-HHS cabinet agencies who often serve shared populations.

Recommended Uses

Recommended uses for the Multi-Agency Data Sharing Agreement include:

- Use for future data sharing projects involving one or more of the DSA participating agencies.

- Use as a model or template for the development of future data sharing agreements among state and non-state entities.

Background

- **Streamline Data Sharing**: Several years ago, State agencies recognized the need for a streamlined process that would allow agencies to more efficiently share information.
- **Agreement Signed:** A Multi-Agency Data Sharing Agreement (DSA) was signed and put into effect in 2013.
- **Adding State Department of Education:** In 2017 the agreement was expanded to enable SDE to participate.
- **Governance:** The *"Deliver Interoperable Solution Components Utilizing Shared Services Committee" (DISCUSS)* is the information technology and shared services governance entity for Oklahoma Health and Human Services Cabinet (HHS) initiatives. It also serves as the governing body for the data sharing agreement.

Agreement Governance

DISCUSS
DELIVER INTEROPERABLE SOLUTION COMPONENTS UTILIZING SHARED SERVICES

DISCUSS seeks to improve lives and empower Oklahomans by leveraging the collective strengths of HHS Cabinet agencies.

Under the direction of the HHS Secretary, DISCUSS provides governance for the data sharing agreement (DSA).

DISCUSS also provides assistance to participating agencies by establishing and administering online access and storing of the agreement and supporting documents:

http://omes.ok.gov/services/information-services/data-governance/discuss

Key Provisions

- **Compliance:** Participating DSA agencies remain subject to all applicable state and federal laws and regulations, including compliance with:
  - HIPAA - Health Insurance Portability and Accountability Act
  - HITECH - Health Information Technology for Economic and Clinical Health Act
  - FERPA - Family Educational Rights and Privacy Act
- **Use of Information:** DSA partnering agencies commit to using shared information as agreed upon by each agency.

Key Provisions

- **Security:** Participating agencies are responsible to provide for the protection, maintenance, confidentiality and security of the data being shared.
- **No new rules:** The agreement allows agencies to share data in accordance with current state and federal requirements; the agreement provides no new rights, rules or laws.
- **Schedule A:** When two or more participating agencies wish to engage in a project that requires the exchange of data, they jointly complete a "Schedule A" Form.

What is a "Schedule A" Form?

- **How the form is used:**
  - Serves as an addendum to the overarching agreement.
  - Is not to be used as a stand alone agreement.
  - Provides specific details about an individual data exchange.
  - Is jointly completed by two or more DSA agencies that wish to share data.

- **Requires participating agencies to comply with:**
  - State and federal rules and laws.
  - Stipulations as provided in the “Schedule A” form.
  - Requirements provided in the overall Data Sharing Agreement.
  - Any additional requirements agreed upon by the parties.

"Schedule A" Form

When two or more DSA agencies have identified a need to share data, the agency Points of Contact (i.e. IT Strategists, Program Manager, Agency ITOC, etc.) work together to complete a "Schedule A" Form detailing the purpose and specifics of the exchange, including:

- Contact information for agency Points of Contact
- Who owns the data being exchanged
- A description of the data variables to be exchanged
- How data will be used, secured, stored, published, tracked, transported, released, or published
- When the agreement will end (if applicable)
- How data will be returned (if applicable)

"Schedule A" Form

The completed Schedule A Form should also include any additional requirements agreed upon by the parties that aren't addressed elsewhere, such as:

- Reference to additional applicable state or federal rules or laws
- Data management plan guidelines, protocols and standards
- A matrix detailing individual agency requirements
- Any rules that apply to the method of transfer, storage or destruction of the specific type of data being shared
- A business rules glossary
- Research, publication and distribution requirements

DISCUSS Email & Webpage

DISCUSS email address: datagovernance@omes.ok.gov

DISCUSS has developed an online webpage under the OMES Data Governance website, to provide a place to easily access the Multi-Agency Data Sharing Agreement, "Schedule A" Forms and FAQs about the agreement:

Webpage

http://omes.ok.gov/services/information-services/data-governance/discuss

Data Sharing Agreement

https://www.ok.gov/cio/documents/DataGovernanceMulti-AgencyMOU.pdf

DISCUSS Data Governance

Subcommittee Members

Agency	Voting Members	Designee
OHCA	Fred Oraene, Chair	Derek Lieser
DMHSAS	Tracy Leeper, Vice-Chair	Austin Ralstin
OSDH	Becki Moore	Derek Pate
OKDRS	Lyuda Polyun	Tiffany Davis
DHS	Molly Green	Tara Williams
JDMC	Erik Paulson	TBD
OJA	Len Morris	TBD
OSDE	Erik Friend	TBD
OMES	Patsy Leisering & Sumita Pokharel, Non-voting Members	
OMES	Autumn Felty, Data Governance Manager	
HHS DISCUSS	Nicole Prieto Johns, DISCUSS Program Administrator	

Questions?

Thank you!

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APPENDIX D. EXAMPLE DATA SHARING AGREEMENT

VOLUNTARY DATA CONTRIBUTION AGREEMENT
BETWEEN THE
U.S. DEPARTMENT OF TRANSPORTATION
AND
{CONTRIBUTING ENTITY}

In an effort to support the needs of Intelligent Transportation System researchers and developers while reducing costs and encouraging innovation, the Office of the Assistant Secretary for Research and Technology (OST-R) and the Federal Highway Administration (FHWA) of the U.S. Department of Transportation (US DOT) have developed the Research Data Exchange (RDE), a web-based transportation data sharing system to promote the sharing of multi-source and multi-modal data. In furtherance of this effort, this Agreement acknowledges the voluntary contribution of such data to the RDE.

WHEREAS, I, _____, am authorized to execute this agreement for and on behalf of _____ (hereinafter "Contributor");

WHEREAS, Contributor desires to voluntarily add its Data, as defined and described below, to the US DOT RDE;

WHEREAS, Contributor desires to grant to US DOT the rights to use and disseminate the Data as needed in support of the goals and objectives of its research projects; and

WHEREAS, US DOT desires Contributor to voluntarily add its Data, as defined and described in detail below;

Contributor definition and description of submitted data: _____
_____
_____
_____
_____
_____

Now Therefore:
I, the undersigned, hereby grant irrevocable, non-exclusive rights to the US DOT to copy, use, disseminate, publicly display, store, and to grant others these rights in advancing their own research goals and objectives.

_____ _____
Signature of Data Contributor Representative *Date*

_____
Title of Representative and Organization Name

APPENDIX G. REGIONAL DATA SHARING CASE STUDIES

This appendix highlights two important initiatives, led by the Mid-America Regional Council (MARC), that have increased data sharing in the Kansas City region. These were gathered through email and phone interviews with MARC staff.

BICYCLE/PEDESTRIAN DATA SHARING SCHEME BETWEEN MID-AMERICA REGIONAL COUNCIL AND OVERLAND PARK

Through this initiative, MARC and the City of Overland Park share their bicycle/pedestrian count data using equipment devices coming from the same vendor, along with a common platform to analyze and visualize the data.

How It Came to Fruition

MARC owns two portable bicycle counters and four portable pedestrian counters that are available for local jurisdictions to borrow. When the City of Overland Park was considering purchasing bicycle/pedestrian counters for their own use, they contacted MARC to learn about their experience. The City ultimately opted to purchase the same equipment that MARC had and, with this decision, MARC staff saw an opportunity for collaboration. The two organizations had some fruitful discussions, after which they agreed to enter a voluntary data-sharing agreement whereby each organization has access to data produced by both sets of counters. The fact that they both use counters and software from the same vendor ensured full interoperability, maximizing their efforts to better understand bicycle/pedestrian mobility in the region.

Overcoming Challenges

When MARC purchased its counters, the agency was faced with erroneous data and a lack of standards to correct it. Beyond manually changing the count errors by "eyeballing" the data, MARC had no guidance to address this issue. Faced with this, MARC and Overland Park staff painstakingly went through the process of identifying possible causes for the data inaccuracies; and after many trials and errors, it identified certain practices to install the equipment in a way that it produced dramatically more accurate data. In other words, as MARC planner Kaitlyn Service stated, "the best way to get good data is to prevent the equipment from recording bad data" by fine-tuning how to install it.

Lessons Learned and Next Steps

The common platform allows for a low-maintenance data sharing scheme, enabling multiple organizations access to information from any given counter regardless of counter ownership. MARC hopes to continue advancing this program in the following ways:

- Develop best practices guide for data collection (equipment installation).
- Organize a cooperative purchasing agreement.
- Encourage other jurisdictions to join this initiative by acquiring compatible counter equipment.

KANSAS CITY REGIONAL MAP

Through this initiative, route information from all public transportation providers in the Kansas City (KC) area were incorporated into one single, dynamic map. This can be accessed through the KC Smart Moves website.[4]

How It Came to Fruition

The initiative was first developed by the Regional Transit Coordinating Council, which serves as a MARC-led regional advisory committee for transit policy and funding priorities. It stemmed from the idea that a transit user does not care about who manages which bus routes; instead, this user looks at the system as a whole to determine his or her mobility options. To support a more integrated system, this regional transit map is part of a larger effort to create a single brand for all transit agencies in the region. While this initial idea came from the involvement of various transit stakeholders, MARC led the effort to develop the map from General Transit Feed Specification (GTFS) data.

Overcoming Challenges

This system is based on collecting GTFS feeds from transit agencies to integrate them into the regional transit map. However, some of the smaller transit agencies did not have their routes in GTFS format and their routes were not available. In one case, Kansas City Area Transportation Authority (KCATA), the largest transit provider, assisted a smaller agency in converting its routes to GTFS format. In other cases, the route information was obtained in the form of shapefiles. Another challenge was having to deal with GTFS-specific data quirks; through quality assurance (QA)/quality control (QC) and trial and error, MARC staff developed methods to address them. Lastly, certain analyses require advanced skills in database management and programming (e.g., calculating frequency of service). MARC staff did not have this capability and when having to conduct these analyses they would do so manually, spending considerable time and effort.

Lessons Learned and Next Steps

Although not all agencies were able to provide their data in GTFS format, MARC's flexibility and willingness to work with them using available resources ensured their successful inclusion in this initiative. With the hiring of two new staff with advanced data management skills, MARC hopes to automate more processes in its semi-annual update of this map.

[4] http://www.kcsmartmoves.org/.

I – EXAMPLE: DATA ARCHITECTURE GUIDANCE

Mid-America Regional Council's *Data Business Plan* (2017), Appendix E –
https://ops.fhwa.dot.gov/publications/fhwahop18012/fhwahop18012.pdf

Mid-America Regional Council's *Data Business Plan* (2017), Appendix I–
https://ops.fhwa.dot.gov/publications/fhwahop18012/fhwahop18012.pdf

APPENDIX E. EXAMPLE DATA GOVERNANCE MANUAL

INTRODUCTION

This Data Coordination Manual provides comprehensive guide to members of the U.S. Department of Transportation (DOT) Roadway Mobility Data Coordination Group (hereafter called the Coordination Group) on the background and purpose of the Coordination Group, its overall structure, the kinds of topics that the Coordination Group addresses, how the Coordination Group works, expectations of Coordination Group members, and a plan for measuring the outcomes and overall success of the Coordination Group.

The following provides a basic understanding and overview of the Coordination Group:

- The Coordination Group is a forum for facilitating cross organizational collaboration, data sharing, and integration of roadway travel mobility data within U.S. DOT to address gaps and redundancies documented in the U.S. DOT Roadway Transportation Data Business Plan (DBP) (Phase 1),[2] and to collaborate on data management functions related to roadway travel mobility data.
- Since the Federal Highway Administration (FHWA) is the largest provider of roadway mobility data, the Coordination Group is managed under the Operations Regime of FHWA's Data Governance Advisory Council (DGAC).
- The Coordination Group includes members from other DGAC regimes, such as Planning, Policy and Research, as well as from other operating administrations and programs of the Department.
- Coordination Group activities and priorities are guided by the DBP, which documents stakeholder needs and gaps related to roadway travel mobility data programs and data business planning within U.S. DOT; establishes a framework for data coordination; and provides recommendations regarding data management functions related to roadway travel mobility data.
- The culture of the Coordination Group is one of collaboration and mutual trust, with shared ownership of decisionmaking as a key characteristic.

WHAT IS THE ROADWAY MOBILITY DATA COORDINATION GROUP?

The Coordination Group is charged with facilitating cross organizational collaboration, data sharing, and integration of roadway travel mobility data within U.S. DOT to address gaps and redundancies (documented in the U.S. DOT Roadway Transportation DBP (Phase 1) report)[3] and to collaborate on data management functions related to roadway travel mobility data.

[2] http://ntl.bts.gov/lib/48000/48500/48531/6E33210B.pdf.
[3] http://ntl.bts.gov/lib/48000/48500/48531/6E33210B.pdf.

Roadway travel mobility data includes travel data from roadway travel modes, including vehicle, truck freight, bicycle/pedestrian, and transit.

Travel data includes vehicle volume, speed, and lane occupancy data, as well as connected vehicle data such as vehicle location, presence and speed within the system, internal vehicle status such as fuel consumption rate, or externally measured data such as recorded external temperature. Travel data for transit vehicles could include location, speed, and status data, as well as passenger counts and schedule adherence data. Freight carriers may supplement a standard location and position report with gross weight data or data regarding the type and time-critical nature of goods carried. Public sector fleet vehicles may be able to contribute other key data related to their primary functions, such as snowplows reporting blade position or estimates of roadway snow depth. Additional travel data could include a multimodal trace of individual travelers through the transportation system.

The need for the Coordination Group evolved from the white paper, *Needs and Gaps in the Operation and Coordination of U.S. DOT Data Capture and Management Programs*, which was commissioned by the FHWA Office of Operations, Office of Transportation Management (HOTM) to examine current data capture and management activities across various U.S. DOT program areas, and identify gaps and potential opportunities to effectively and efficiently coordinate and manage the programs' activities. The white paper identified the need for a communication and coordination mechanism at the Federal level through formation of a data coordination team to address the gaps and share issues related to the capture and management of roadway travel mobility data.

The U.S. DOT Roadway Transportation DBP (Phase 1) report formalized the recommendation and proposed an initial structure, framework, and rules of engagement for the Coordination Group. The DBP also established that the scope of the Coordination Group be limited to formally recognized data programs within U.S. DOT that involve the collection, analysis, or reporting of roadway travel mobility data.

The member offices of the Coordination Group are listed in Table 9.

Table 9. Coordination group member offices.

Membership
OST-R/Intelligent Transportation Systems Joint Program Office (HOIT)
Bureau of Transportation Statistics (BTS)
FHWA Office of Highway Policy Information (HPPI)
FHWA Office of Program Performance Management (TPM)
FHWA Office of Transportation Management (HOTM)
FHWA Office of Transportation Operations Road Weather Management (HOTO)
FHWA Office of Transportation Operations Research & Development (HRDO)
FHWA Office of Human Environment (HEPH)
FHWA Office of Planning (HEPP)
FHWA Office of Freight Management & Operations (HOFM)
Federal Motor Carrier Safety Association (FMCSA)

HOW IS THE COORDINATION GROUP STRUCTURED?

The Coordination Group is managed under the Operations Regime of the FHWA DGAC, which is formally chartered and empowered to provide strategic review and oversight of all FHWA data collection efforts. The DGAC has authority and responsibility to corporately advise on the utilization of FHWA's data resources, and recommend major changes in FHWA data collection efforts that will result in increased consistency and coordination between existing and new data programs; the elimination of redundant data collection; the consolidation of data sources and resources; and compliance with external mandates.

As documented in *FHWA Data Governance Plan Volume 1: Data Governance Primer* (draft February 2014), data governance at FHWA comprises the following three-tiered hierarchy:

- **Data Governance Advisory Council.** The DGAC is responsible for developing the FHWA Data Governance Plan and Framework and serves as the point of contact for coordinating data collection efforts with other modes within the Department and with other branches of government. The DGAC is assisted by Technical Advisors that assist in developing formal documentation on data governance principles, and provide input into the decisionmaking process.
- **Data Governance Regimes and Coordinators.** Regimes are responsible for coordinating with individual data programs, and ensuring that the Data Governance Plan and Framework are adhered to, while Regime Coordinators liaison with the DGAC and provide oversight of stewardship and management processes of data programs within their regime. There are 12 Data Governance Regimes:
  - Headquarters (HQ) Administrative.
  - Financial.
  - Planning.
  - Operations.
  - Policy.
  - Research.
  - Infrastructure.
  - Chief Counsel.
  - Safety.
  - Federal Lands.
  - Division Office.
  - Technical Services.
- **Data Stewards.** Data Stewards are subject matter experts and points of contact for the data programs they oversee. They are responsible for managing their data programs in accordance with the processes and procedures established by the DGAC and the Regime Coordinator.

The Coordination Group is managed under the Operations Regime of the DGAC, with members from other DGAC regimes, such as Planning, Policy and Research, as well as from other operating administrations and programs of the Department. Figure 3 shows how the Coordination Group fits within the DGAC framework. The Coordination Group also influences other activities/areas outside of FHWA (such as safety).

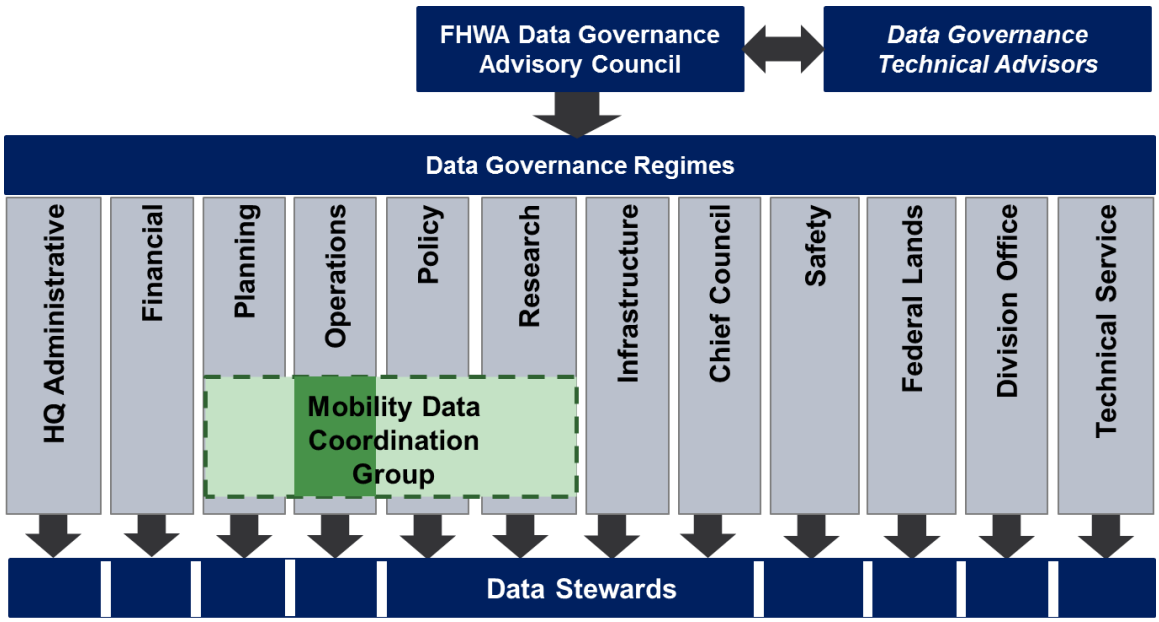

Figure 3. Flow chart. Framework for the coordination group with the Data Governance Advisory Council.

(Source: FHWA Data Coordination Manual (internal document)).

The structure for the Coordination Group comprises the Coordination Group Chair/Cochair, the Coordination Group itself, Working Groups, and Supporting Staff, as shown in Figure 4:

- **Roadway Mobility Data Coordination Group Chair/Cochair.** The Chair/Cochair are designated individuals from within the FHWA Office of Operations and one member agency representative who would cochair the Roadway Mobility Data Coordination Group and liaison with the FHWA DGAC and other offices outside of FHWA (such as Safety). The FHWA Office of Operations DBP champion (Walter During) would serve as the permanent chair, while the rotating Cochair would be selected from one member agency representative.
- **Roadway Mobility Data Coordination Group.** The Coordination Group consists of designated individuals within U.S. DOT who are responsible for the oversight of roadway travel mobility data programs to support the business functions of their offices.
- **Working Groups.** Working Groups may be temporarily formed to address issues that are pertinent to a specific type of mobility data (e.g., travel data, connected vehicle data, climate data, etc.) or that cross cut multiple types of mobility data (e.g., data quality, data standards, data privacy and security, analysis tools, etc.). Working Groups can also be formed to conduct work on specific activities deemed necessary by the Coordination Group (e.g., provide comments on upcoming Request for Proposals (RFP), develop a Strategy Document for the Coordination Group, oversee coordination project activities, etc.).
- **Supporting Staff.** Supporting staff provide administrative support and technical guide to the Chair/Cochair, Roadway Mobility Data Coordination Group and Working Groups, as

needed. Supporting staff members include consultants and other administrative staff support as needed.

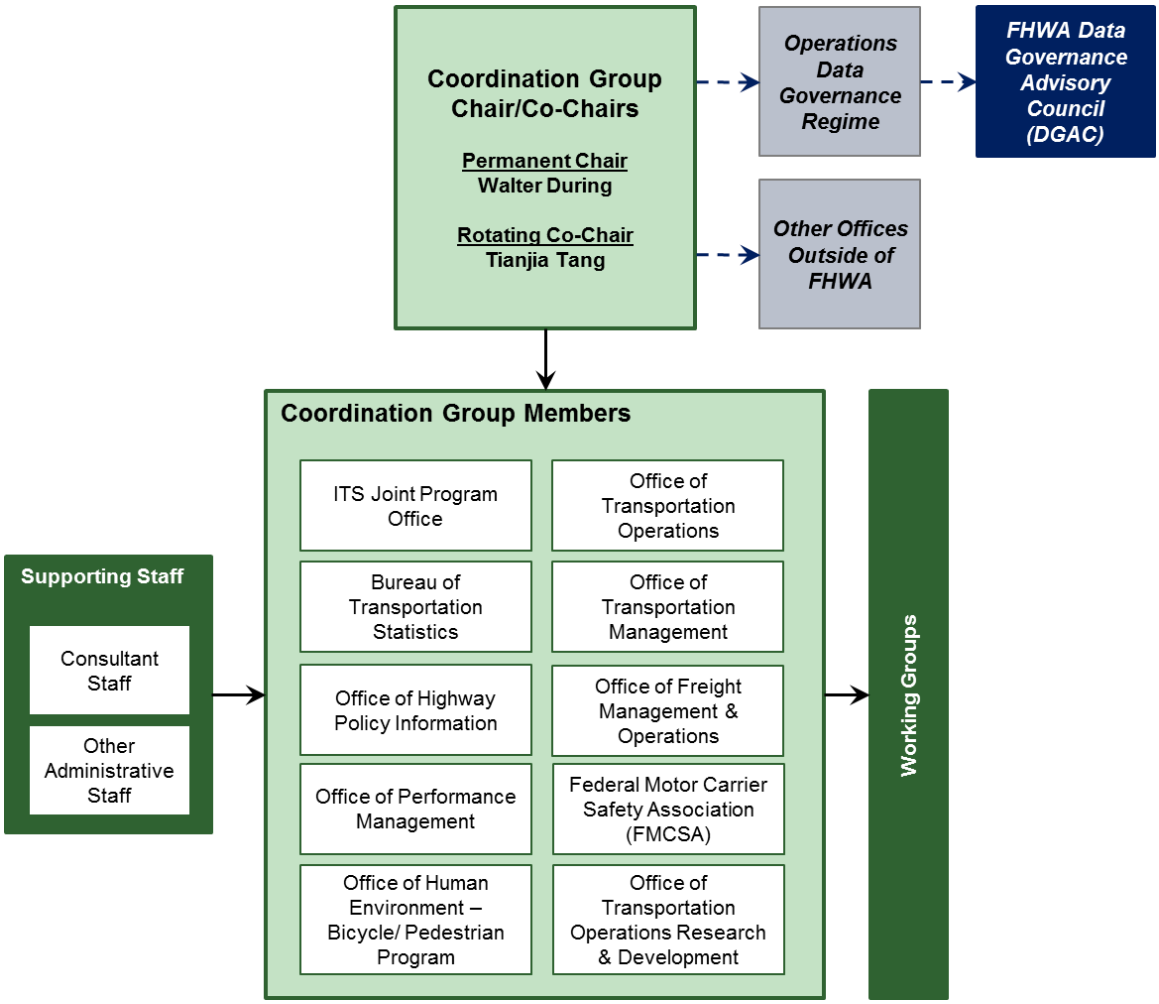

Figure 4. Organization chart. Structure for roadway mobility data coordination group.

(Source: FHWA Data Coordination Manual (internal document)).

WHAT KIND OF TOPICS DOES THE COORDINATION GROUP ADDRESS?

The Coordination Group is intended to be a forum for U.S. DOT and FHWA stakeholders involved with roadway travel mobility data to coordinate on the following types of activities:

- Share RFPs for current and upcoming initiatives related to roadway travel mobility data.
- Review and provide input on possible FHWA procurement actions related to roadway travel mobility data.
- Share current initiatives, activities, and/or best practices related to roadway travel mobility data, including data strategies, policies, standards, metadata, architecture, procedures, metrics, etc.

- Participate in indepth vetting of data standards/procedures and standards for linear referencing attributes/terminology to facilitate sharing/integration of U.S. DOT roadway travel mobility data.
- To the extent possible, identify and address gaps and redundancies (documented in the DBP) in mobility data programs within their respective offices.
- Identify needs and opportunities to coordinate resources, reduce data redundancies, and implement cost sharing strategies for the collection, management, and maintenance of roadway travel mobility data.
- Identify needs and opportunities to reduce redundancy in the development and maintenance of duplicate data systems, promote efficiency in system maintenance, and promote open-source initiatives.
- Identify needs and opportunities to integrate national data sets to support performance measurement and asset management purposes.
- Identify needs and opportunities to create links between existing data sets and connected vehicle data sets in the future.
- Identify needs and opportunities to enhance access to information and data for roadway travel mobility data programs, including the need for Web portals accessible by internal and external stakeholders to share data and information as needed.
- Identify and oversee potential data coordination projects or additional research needed to demonstrate reduced cost or improved Federal capability.
- Identify potential funding to conduct agreed-upon research projects and data coordination activities.
- Understand and promote the value of data as a U.S. DOT-wide asset.

DATA COORDINATION PROJECTS

Data coordination projects will be conducted to demonstrate the benefit and value of the DBP in terms of reduced cost or improved efficiency in business operations and work processes. The Coordination Group will be responsible for identifying and overseeing potential data coordination projects or research topics of interest to them, as well as potential funding sources to conduct agreed upon projects.

The following types of projects have been identified by the Coordination Group:

- Development of a searchable, sustainable, current data catalog and SharePoint site for Coordination Group members to share internal information on projects, and inform offices of upcoming initiatives related to roadway travel mobility data.
- Develop guide on developing DBPs for States and local jurisdictions.
- Investigate “big data” sources, such as crowdsourcing, social media, and private sector data sources that have not been traditionally utilized as sources for roadway travel mobility data.

- Investigate how current standards, such as the National Information Exchange Model (NIEM) and open-source, could be applied within the DBP or within an individual stakeholder office.
- Develop a tool for visualizing and analyzing large roadway travel mobility data sets within a cloud environment.

A complete list of candidate data coordination project concepts will be maintained on the Roadway Mobility Data Coordination Group Document Share site (FHWA internal site) (https://collaboration.fhwa.dot.gov/dot/fhwa/xhcx/dbp/default.aspx). Work on the first project concept will be conducted by Cambridge Systematics as part of the DBP (Phase III) project, Implementation and Maintenance of the Overall Mobility Data Coordination Group.

HOW DOES THE COORDINATION GROUP WORK?

Meetings

The Coordination Group meets quarterly on the first Tuesday of the months of March, June, September, and December to discuss data management/coordination issues. An annual one-day symposium/working meeting will be convened at the time of the March meeting for members to share information on current initiatives, activities, and best practices; and to establish and review the strategic direction and priorities for the Coordination Group for the coming year.

Meetings and teleconferences will be announced at least a week in advance, and conducted in accordance with a published agenda. Coordination Group members will be asked to update the group on their office's current initiatives and activities related to roadway travel mobility data. A draft agenda and any requests for presentations/updates will be sent to Coordination Group members in advance of the meeting. Members may request that additional discussion topics be added to the agenda by notifying the Chair/Cochair.

Meetings are normally open to all interested parties, but may be restricted to Federal participants when necessary (e.g., when RFPs or other upcoming initiatives are shared). Draft minutes documenting action items and responsibilities will be circulated to all members following the meeting. The meeting announcement and final minutes will be posted within two weeks on the Roadway Mobility Data Coordination Group Document Share site (FHWA internal site) (https://collaboration.fhwa.dot.gov/dot/fhwa/xhcx/dbp/default.aspx).

Coordination Group members seeking input on RFPs and other procurement actions related to roadway travel mobility data should share the RFP with the Chair/Cochair, who will decide whether it should be distributed to Coordination Group members for input/review. The Chair/Cochair will also decide the review mechanism (e.g., form a Working Group, distribute the RFP for review by all Coordination Group members, etc.), duration of review period, and whether to initiate a meeting to resolve issues.

Working Groups

The Coordination Group will be supported by Working Groups that are temporarily formed to address needs/gaps that are pertinent to a specific type of roadway travel mobility data (e.g., travel data, connected vehicle data, climate data, etc.) or that cross cut multiple types of roadway

travel mobility data (e.g., data quality, data standards, data privacy and security, analysis tools, etc.). Working Groups may also be formed to conduct work on specific activities deemed necessary by the Coordination Group (e.g., provide comments on upcoming RFPs, develop a Strategy Document for the Coordination Group, oversee data coordination project activities, etc.).

A request to form a Working Group may be made by the Chair/Cochair, any Coordination Group member, or through consensus by the Coordination Group. Working Groups will consist of two to four interested members, with one member serving as the lead and the remaining members serving as key content reviewers.

Working Groups will meet via conference call or in person as agreed upon by members of the group. The Working Group leader will report on their results at the next regularly scheduled Coordination Group meeting. The Working Group may be disbanded after their work is complete.

Data Coordination Mechanisms

Document Share Site

The Roadway Mobility Data Coordination Group Document Share site (FHWA internal site) (https://collaboration.fhwa.dot.gov/dot/fhwa/xhcx/dbp/default.aspx) will be used as a clearinghouse for Coordination Group members to share best practice documents and Coordination Group documents, meeting announcements, and meeting summaries. Hyperlinking to Share Site documents will be used for sending out requests for document review/comments to members.

Awards

The Coordination Group will give annual awards to recognize significant contributions that advance the DBP's goal to improve coordination and communication mechanisms across U.S. DOT and FHWA offices involved with roadway travel mobility data. In addition to a custom-designed award, recipients receive recognition for their efforts at the annual symposium/ working meeting convened at the time of the March meeting.

Each year, nominations for the award will be accepted by members of the Coordination Group. To submit a nomination, the nominator must submit the following information:

- Nominator's name, office, title, address, phone number, and email.
- Nominee's name (or contact person for a nominated organization or program), office, title, address, phone number, and email.
- A narrative, not to exceed 500 words, in support of the nomination, addressing the following areas:
  - Provide a clear, direct, and specific statement of why the nominee deserves recognition.

- Elaborate on why the nominee's accomplishments are worthy of the award, including what the nominee did (e.g., projects, activities), any challenges or issues encountered and overcome, how they did it (initiative/leadership, teamwork/collaboration, and/or creativity/innovation), and the results/outcomes (or major milestones) that the nominee's efforts accomplished.

Nominations should be submitted to the Coordination Group Chair by January 31st of each year. A Working Group will be formed to review nominations and select a winner, which will be announced during the annual symposium/working meeting.

WHAT IS EXPECTED OF MEMBERS?

Members of the Coordination Group shall:

- Maintain a culture of collaboration and mutual trust by regularly attending and participating in quarterly Coordination Group meetings and Working Groups and presenting their office perspective.
- To the extent possible, identify and address gaps and redundancies in roadway travel mobility data programs within their respective offices.
- Identify data standards and stewardship recommendations for consideration by the FHWA Data Governance Advisory Council.
- Engage Coordination Group members in procurement decisions by sharing RFPs for current and upcoming initiatives related to roadway travel mobility data.
- Develop recommended language for insertion into Statements of Work.
- Share best practices related to roadway travel mobility data, including data strategies, policies, standards, metadata, architecture, procedures, and metrics.
- Ensure that Coordination Group best practices are communicated to data stewards within their respective office.
- Identify potential data coordination projects or additional research needed to demonstrate reduced cost or improved Federal capability.
- Identify potential funding to conduct agreed upon research projects and data coordination activities.
- Provide feedback on research project ideas.

Coordination Group products include:

- Documentation of best practices related to roadway travel mobility data, including data strategies, policies, standards, metadata, architecture, procedures, and metrics.
- Recommendations for enhancements to Statements of Work or RFPs for current and upcoming procurements related to roadway travel mobility data.
- Completion of data coordination projects and research activities that reduce costs or improve the quality and effectiveness of roadway mobility data.

HOW WILL SUCCESS OF THE COORDINATION GROUP BE MEASURED?

The Data Business Plan outlined the expected outcomes of improved coordination of roadway travel mobility data programs through the Coordination Group, which include:

- Improved availability of data to support planning, operations, and performance measure activities.
- Elimination of redundant data collection efforts, resulting in a decrease in possible expenditure for duplicate data.
- More rapid, targeted data acquisitions.
- Broader sharing of data resources.
- Systematic coordination and clarification of data-related federal policy.
- Reduced data collection and management costs.
- Better serve the needs of customers of FHWA.
- Improved efficiency in business operations and work processes through use of data-sharing technology.
- Consensus in the use of streamlined data sources across organizational business units.

Success of the Coordination Group will be assessed using performance indicators to measure program activities (i.e., outputs), and confirm the program is effectively delivering results (i.e., outcomes). The linkages between program activities (i.e., outputs) and expected outcomes (both immediate and long term) are shown in Figure 5.

Performance indicators for Coordination Group activities (i.e., outputs) and outcomes are shown in Figure 6, Figure 7, and **Error! Reference source not found.**, respectively. Output indicators quantify the activities of the Coordination Group and reflect the level of effort expended or scale/scope of activities. These indicators are both qualitative and quantitative in nature, and will be assessed on an annual basis as part of the DBP Annual Update. Outcome indicators quantify the effectiveness of the Coordination Group in terms of meeting its mission and stated goals. These indicators will depend on the availability of internal U.S. DOT data to support calculation of the measure, and they may be refined as implementation of the DBP continues. After three years, an assessment of the effectiveness of the group will be made using the outcome indicators, and the Coordination Group will decide whether to continue its activities or disband the group.

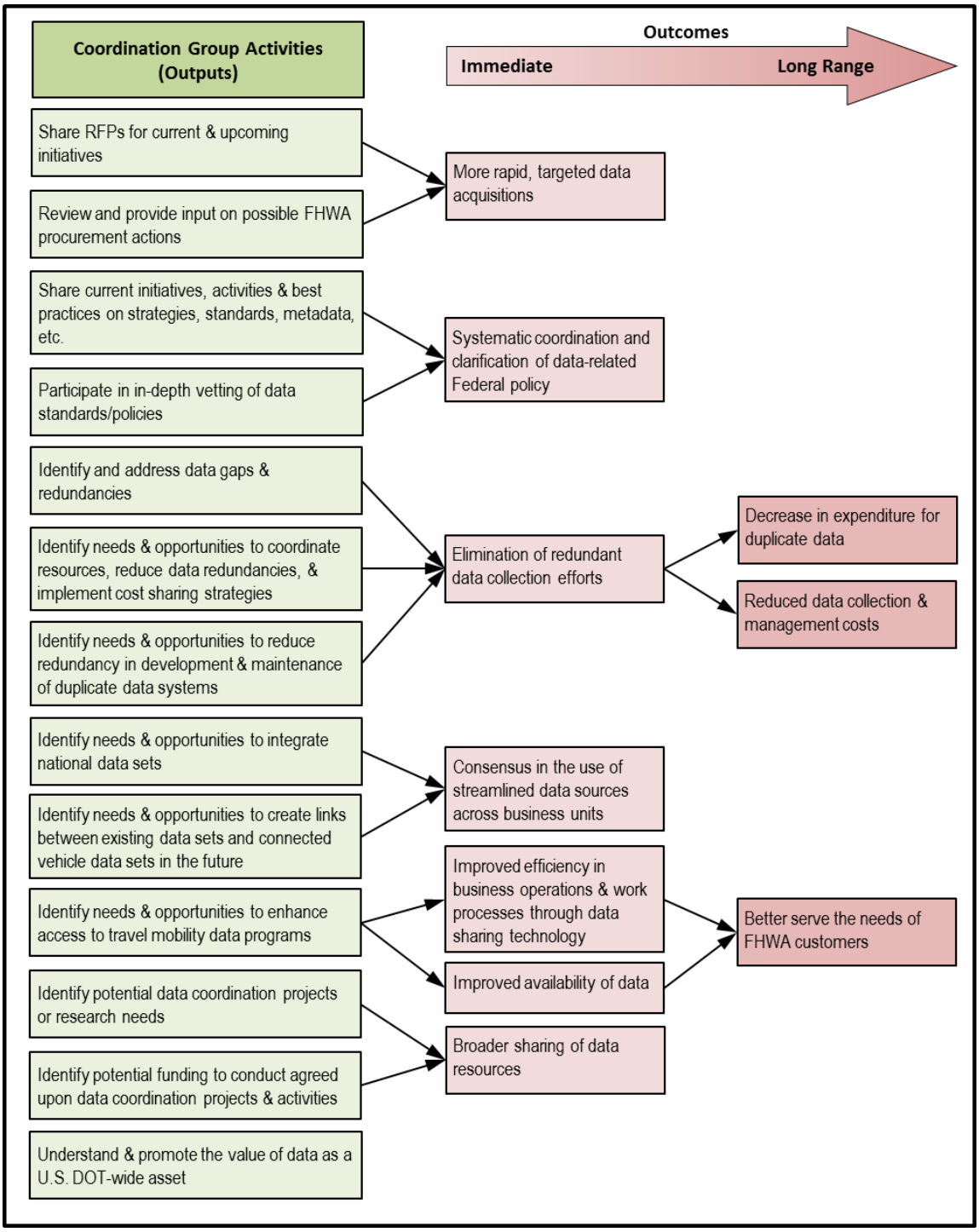

Figure 5. Flow chart. Relationship between group activities (outputs) and outcomes.

(Source: FHWA Data Coordination Manual (internal document)).

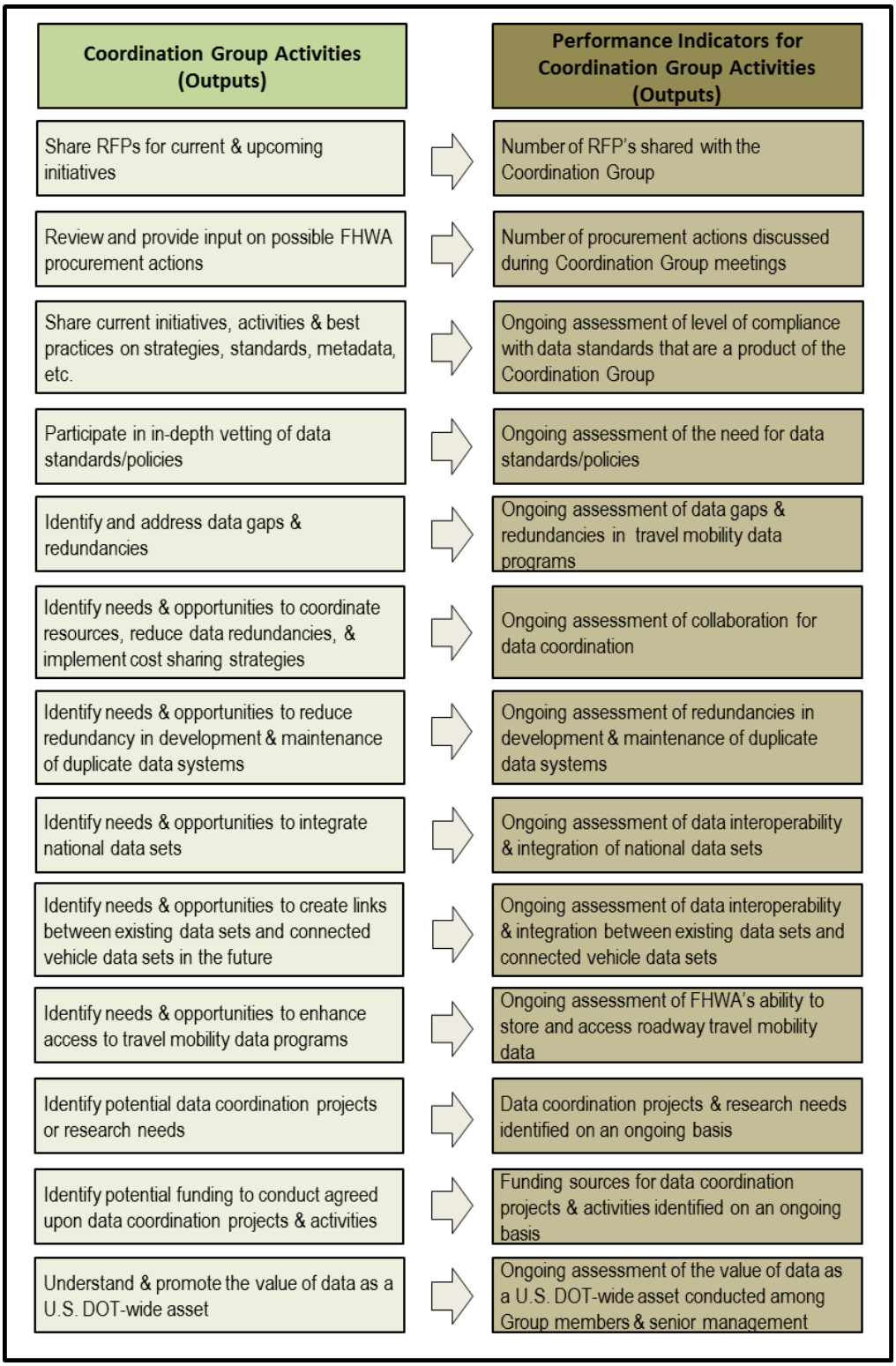

Figure 6. Process chart. Performance indicators for group activities (outputs).

(Source: FHWA Data Coordination Manual (internal document)).

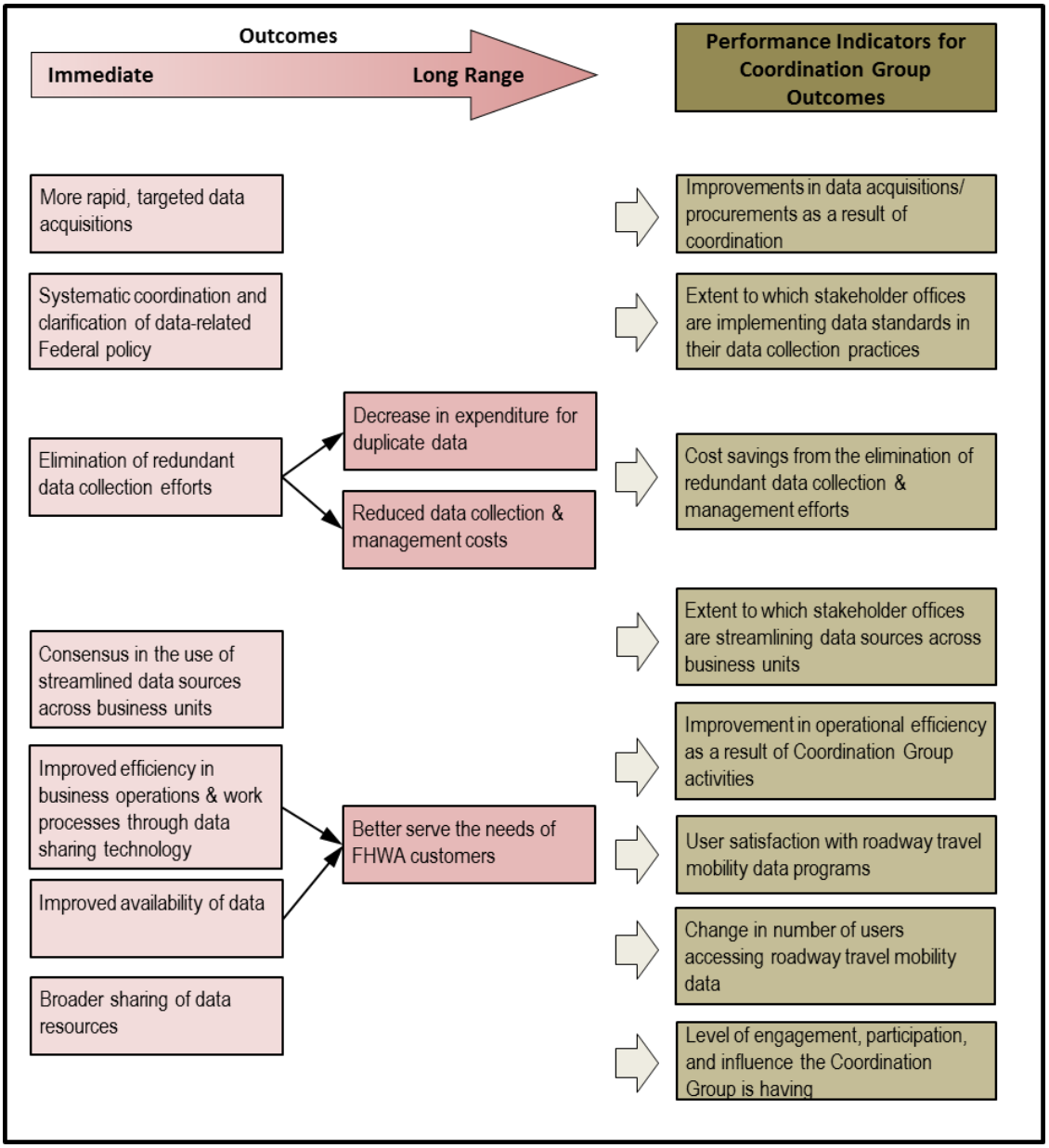

Figure 7. Flow chart. Performance indicators for outcomes.

(Source: FHWA Data Coordination Manual (internal document)).

WHAT ADDITIONAL DOCUMENTATION IS AVAILABLE?

The following supporting documents provide additional information on the history of the Coordination Group and U.S. DOT Roadway Transportation Data Business Plan:

- *Data Capture and Management: Needs and Gaps in the Operation and Coordination of U.S. DOT Data Capture and Management Programs*. This white paper examines current data capture and management activities across various U.S. DOT program areas, and identified gaps and potential opportunities for filling the gaps to effectively and efficiently coordinate and manage the programs' activities. The primary recommendation from the white paper was that the HOTM develop a DBP to address the gaps identified in the paper.
- *U.S. DOT Roadway Transportation Data Business Plan (Phase I): Data Business Plan* (January 2013). This report documents the results of Phase 1 of the DBP, which serves to improve coordination among real-time data capture programs within U.S. DOT by clearly defining U.S. DOT needs for real-time data, address gaps and overlaps in program needs with respect to stakeholders, and ultimately result in cost savings for U.S. DOT. (Available at: http://ntl.bts.gov/lib/48000/48500/48531/6E33210B.pdf)
- *U.S DOT Roadway Transportation Data Business Plan (Phase II): Data Business Plan* (June 2013). This report documents the results of Phase 2 of the DBP, which includes execution of the DBP coordination, as well as conducting two data integration test pilots to demonstrate the benefits and value of the DBP. (Available at: http://ntl.bts.gov/lib/48000/48500/48536/EBBC1DA.pdf)

WHO IS THE KEY CONTACT FOR INFORMATION?

The key FHWA contact for additional information on the Coordination Group and *U.S. DOT Roadway Transportation Data Business Plan* is:

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FHWA, Operations Office of Transportation Management (HOTM-1)
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Washington, DC 20590
(202) 366-8959 Office
(202) 366-3225 Fax
Email walter.during@dot.gov

APPENDIX I. BEST PRACTICES

This appendix highlights two organizations that have been successful in implementing data initiatives, namely the City of Chicago and the Delaware Valley Regional Planning Council (DVRPC).

CITY OF CHICAGO

The City of Chicago has been nationally recognized for its efforts in making data accessible to the public. The following are some lessons learned and recommendations from Brett Goldstein, the City's first Chief Data Officer:[6]

- The first step should be to assess existing baseline and decide where to take vision and direction for the organization.
- Philanthropic support was an important component for Chicago in this initiative. The MacArthur foundation sponsored a competition to encourage businesses and software engineers to use Chicago's open data to create helpful apps for residents. This competition also helped create a framework to engage with the community.
- The city created a new senior-level post within the Mayor's office: the Chief Data Officer (CDO), tasked to make government data available to the public and use data analysis as a tool to inform policy and improve services. This ensured that data initiatives had a clear mandate.
- They discovered that "there is enormous benefit to a high-profile release of a high-interest dataset early on." City officials know that crime incident data was hard to obtain in disaggregate, raw form. There was also a strong interest from the public to obtain prompt and transparent crime data. The City prioritized this data to be the first one launched, and they created publicity and buzz around it.
- Rather than getting into the business of developing apps, the City of Chicago provided a standards-based data portal that enabled them to be a platform that supports innovation from researchers, civic developers, and for-profit use.
- Providing data in machine-readable formats is of utmost importance. This may require the "tedious, but critical, work" of an intern to convert an unusable file into one that can serve as a data source.

  For the data to be successful, they had to:

  - Reduce the data to block size and scatter spatial coordinates in order to protect privacy.
  - Capture updates and replicate them into the data set as the source system records were updated.
  - Have a system in place to handle uploads, updates, and queries of large datasets.

[6] http://beyondtransparency.org/.

- Proprietary platforms are often much easier to use and are ready to go. However, they are an investment that requires ongoing funds to be sustained. An open-source platform may demand significantly more technical skills to set it up, but may be potentially much cheaper.
- Agencies need to find ways to extract data, understand it, and load it into the platform. Think about network, storage, and systems.
- Automation is a key component to work with large datasets. "An open data program that relies on a human to keep it updated is fundamentally flawed." The Chicago portal updates itself every day.
- Sometimes public agencies will get bad press coverage due to errors or oversights in releasing data. To help prevent that from happening, it is important to develop a strong relationship with stakeholders, including explaining to the press the importance and significance of the initiative.
- Top-Down and Bottom-Up: As this data initiative gained traction and maturity, to take to the next level, the mayor issued an Open Data Executive Order mandating that each department would designate an Open Data Coordinator and determine a system of annual accountability regarding the release of open data. In the case of Chicago, Goldstein claims it made more sense to let this initiative evolve and gain momentum before an executive or legislative action. Otherwise there is a risk that it might become too prescriptive.
- There are two key items that are crucial for the success of a data initiative: 1) clear and vocal support of the executive sponsor, and 2) financial support.

DELAWARE VALLEY REGIONAL PLANNING COUNCIL

DVRPC was identified by MARC and the project team as leader from whom to learn about data management practices. Kimberly Korejko, Data Coordination Manager at DVRPC, shared through an interview the following lessons learned:

- It is helpful to have a clear sense of organization to coordinate data initiatives.
- In the case of DVRPC, they have set a series of coordinating levels, as shown in Figure 8.
- *Data Resources and Coordination Team*: This core group is comprised of staff whose daily tasks are strongly oriented toward data management. They are vital in helping complete the tasks identified through data coordination efforts.
- *Advisory Teams* are in charge of identifying and prioritizing data initiatives each year, as well as assisting in creating standards and policies. It is comprised of Planning, Technical, and Management staff.
- *Innovation Teams*: These teams are formed on an as-needed basis for specific needs or initiatives.
- *Member Governments and Planning Partners*: These are external stakeholders that provide data to DVRPC and may participate in data sharing initiatives.

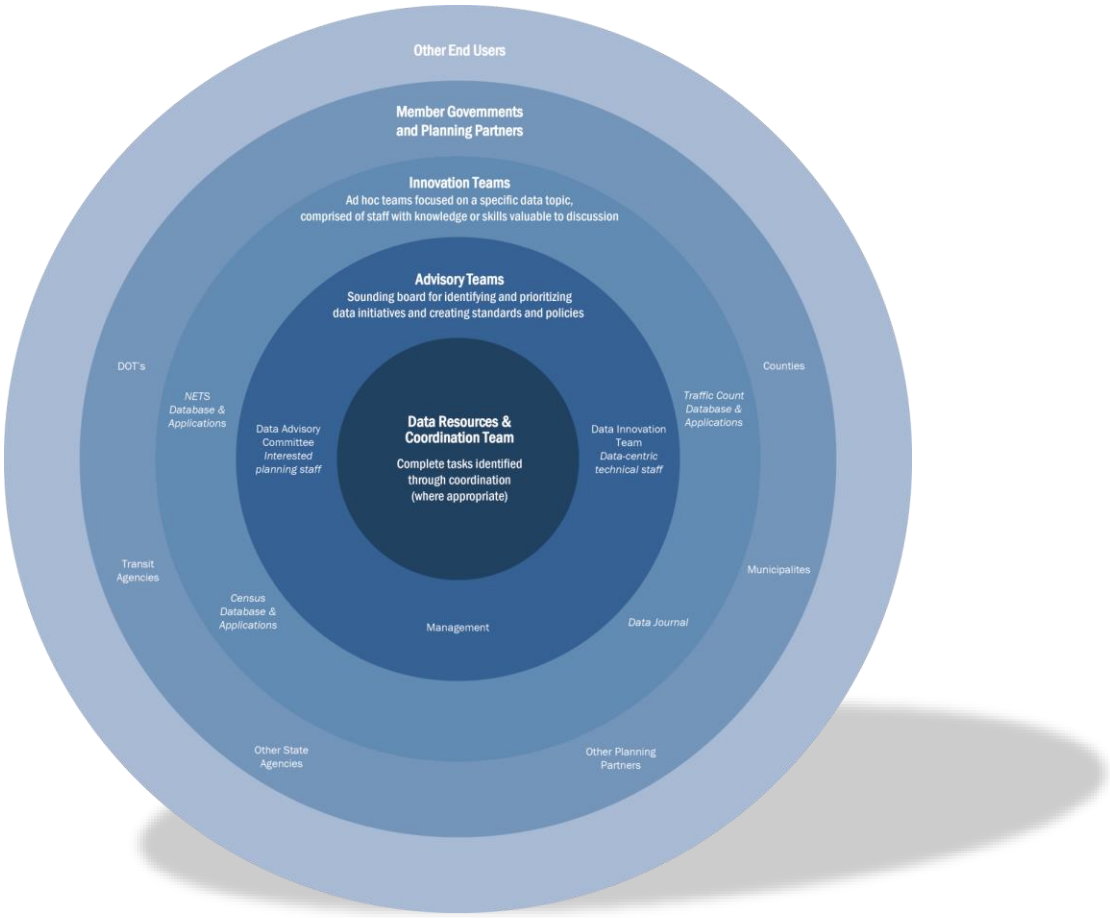


Figure 8. Chart. Data coordination framework at Delaware Valley Regional Planning Council.

(Source: DVRPC, unpublished PowerPoint presentation.)

- *Other End Users* may be organizations or individuals interested in information or data.
- Start with what you can, and build from there.
- DVRPC is rarely a producer of data. Instead, it uses other organization's data. As a two-State Metropolitan Planning Organization (MPO), the data it receives is often not compatible with one another. Although DVRPC has not been able to set standards, this has not prevented it from leading many data initiatives. For instance, DVRPC has an online, searchable GIS Data Catalog with data location, abstract, purpose, use limits and licensing, and data elements. The MPO is now working to create metadata for non-geographic information system (GIS datasets and hopes to have a unified, searchable interface to make data available online.
- Make management aware of the importance of data initiatives.
- It is crucial to be an advocate for data initiatives and data governance. Although one may need to repeat oneself doing this, having buy-in from upper management pays off well. In

the case of DVRPC, they were able to formally establish that members of the Innovation Team should dedicate 5 percent of their time in data governance.

- Working with Information Technology (IT) Department is key.
- It is critical that IT staff understand the *why* behind data initiatives. To roll out the Online GIS Data Catalog, DVRPC arranged for Esri to meet with IT and go through all the technical "nuts and bolts" to make the initiative successful.

J – EXAMPLE: DATA DIRECTORY WEBSITE

Virginia DOT's Open Data Portal – https://data.virginia.gov/

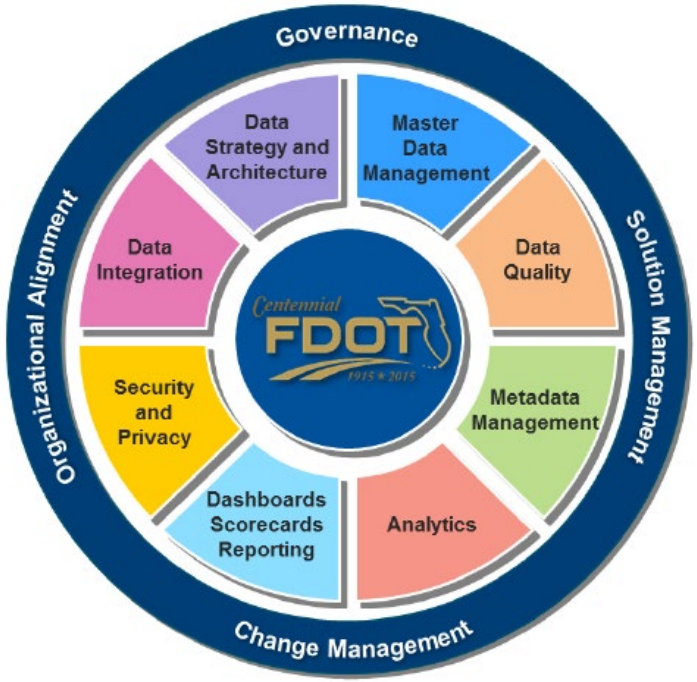
K – EXAMPLE: DATA HUBS

Maryland DOT's *Data Governance & Data Hub* (2019).pg 18-23 – https://transops.s3.amazonaws.com/uploaded_files/MDOT%20Data%20Governance%20Action%20Plan_FINAL%20May%2020%202019_0.pdf

Notable Practices: Development of Data Hubs within Broader Data Governance Framework

Successful implementation of a Data Hub requires systematic planning and visualization of the desired functionality of the Data Hub and its connection to the agency's mission and core business needs. This leads to the proper design, planning, and implementation of an architecture that feeds the needs of the department. Once this is envisioned based on the needs of the agency, the teams responsible for the development of the portal and systems must organize and understand all available datasets and visualize their different uses to adequately construct the architecture needed for the system.

- After investigating options for development of a Data Hub, the **Alaska DOT&PF** settled on two main architecture components for its **Transportation Asset Management Information System (TAMIS),** a data warehouse and a data viewer, along with a collection of business processes that support decision making. With the TAMIS Data Governance framework in place, Alaska DOT&PF was able to develop robust functional and technical requirements for a **maintenance management system (MMS) and a pavement management system (PMS)** that are sustainable over the long term, support the agency's core asset management needs, and link asset management to broader strategic goals.

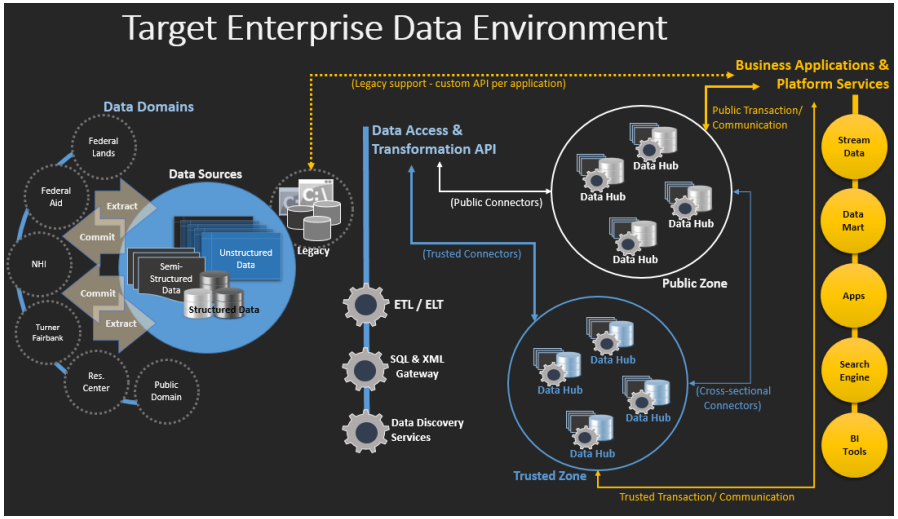


- **FDOT's Reliable, Organized, Data Sharing (ROADS) initiative** will provide a formal structure for **Data Governance, Solution Management, Change Management, and Organizational Alignment.** The structure will guide decisions related to information, standardized processes and routines to formalize Data Governance implementation, a set of resources for training FDOT staff on Data Governance, and common, standardized approaches to acquiring, managing, and disposing of **business intelligence and data warehousing tools** that will be used across FDOT to make information more accessible. As an initial step in implementing Data Governance as part of this framework, FDOT has developed and released a **Transportation Data Portal** for visualizing, questioning, analyzing, and interpreting available data. The Transportation Data Portal is a platform for locating data related to FDOT's core mission and will be enhanced and maintained in a manner that is consistent with the Data Governance structure.

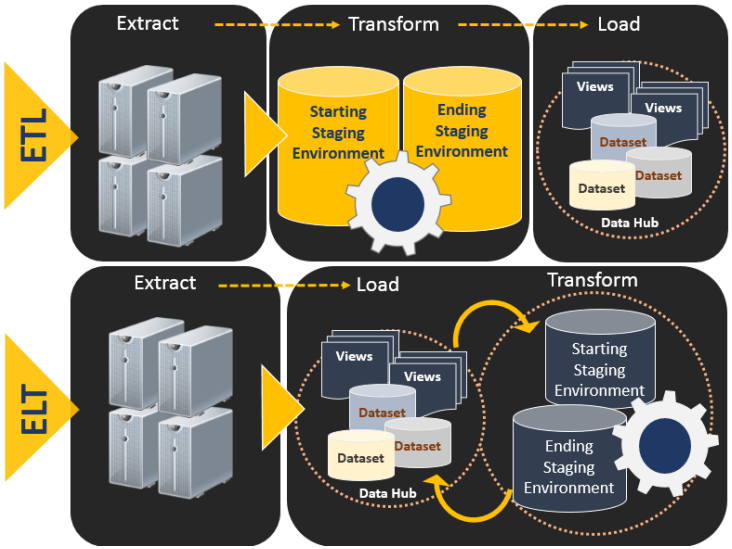
Notable Practices: Data Hub Architecture

During the development and implementation of **FHWA's Target Enterprise Data Environment (T-EDE)**, the agency first set the goal of developing a unified ecosystem for FHWA data, established standardized interfaces for linking and processing information, and offered advanced capabilities such as Big Data Storage/Analytics and Business Intelligence applications as part of T-EDE common services, based on their needs. Then, they set up the steps required to complete their envisioned T-EDE. As illustrated below, in the T-EDE architecture, data domain hubs will be used as in-memory staging areas for information content and will consist of various data types ready for consumption by their receiving nodes. Both Extract Transform Load (ETL) and Extract Load Transform (ELT) will be used in the architecture of the Cloud Data Hub Environment.

FHWA T-EDE Architecture/Environment



Cloud Data Hub ETL and ELT Architecture



Source: FHWA, Enterprise Data Architecture

What Do We Need to Do?

This section describes actions MDOT can undertake to develop an MDOT Data Hub and address gaps in Data Governance.

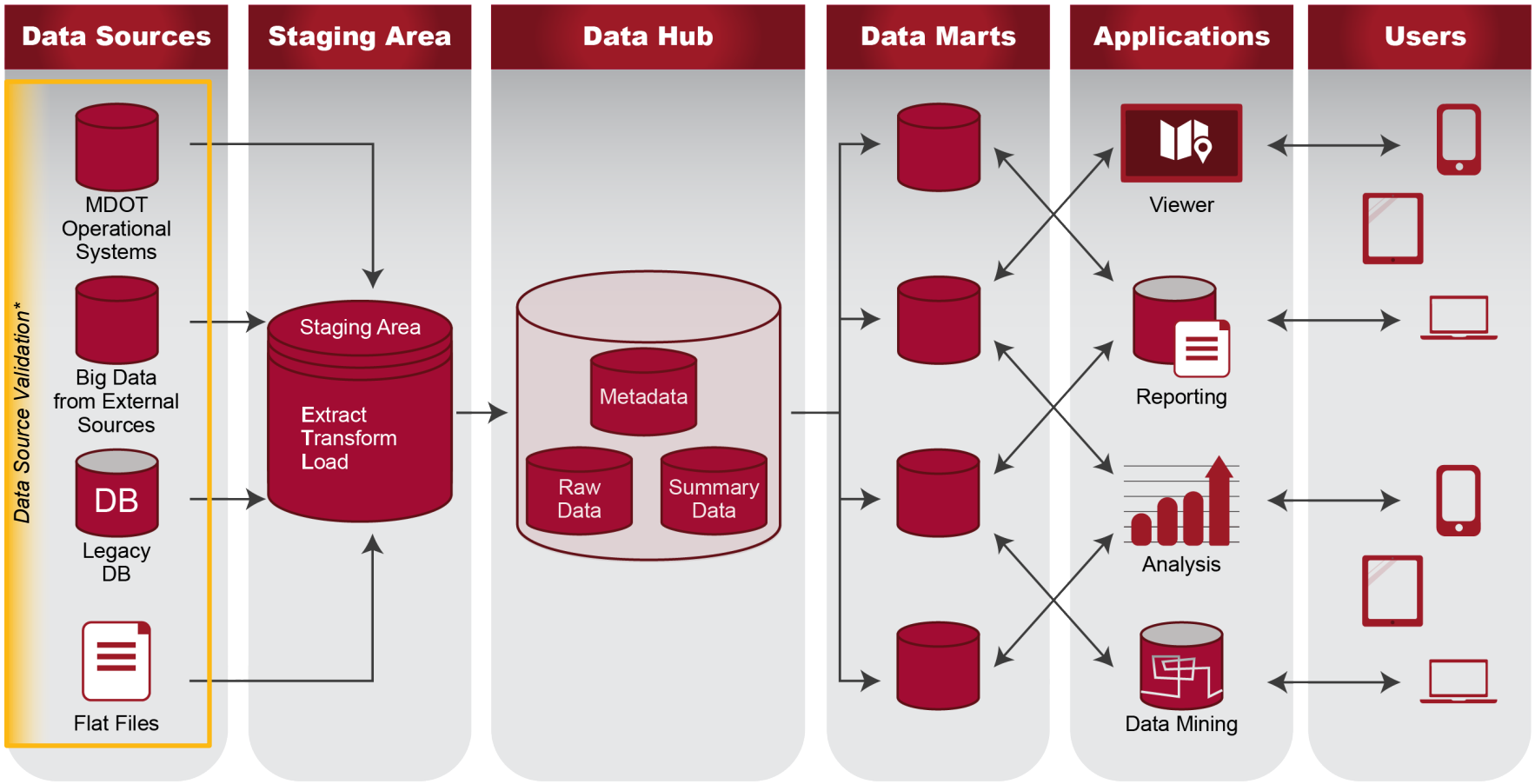
Develop an MDOT Data Hub

The MDOT Data Hub is envisioned as an information system that supports a set of defined datasets and processes, supported by people with clearly defined roles.

The figure on the opposite page shows potential conceptual elements, or layers, that may be considered for the implementation of a Data Hub. This framework could include the following layers:

- **Data Sources:** Where original data, collected from various sources, resides in each operational and legacy database. So-called "Big Data" sources and streams of data from third-party sources and vendors also could potentially be accessed. Particularly with respect to legacy databases and flat files, any data cleaning (for example, to address incomplete records), validation, screening (for example, to remove personally identifiable information), or other preparation is assumed to be the responsibility of Data Stewards assigned to each data asset. These tasks would be completed prior to the Extract Transform Load procedure.
- **Staging Area:** The middle layer between data sources and the MDOT Data Hub. Extract, Transform, Load (ETL) tools would be used to extract validated data from original sources, transform and prepare data to conform to the Data Hub's storage structure and meet other requirements, and finally load data into the hub.
- **Data Hub:** Where all clean and organized data would be stored. In addition to the raw data storage space, it would also have separate metadata database to store data descriptions. Summary data stores could pre-calculate time-consuming data aggregation operations, which could optimize the data hub usage, particularly with respect to very large data tables.
- **Data Marts:** A subset of the Data Hub storage designed to serve specific business domains and processes. Subject-oriented data marts could accelerate business processes and help users gain insights quickly.
- **Applications:** A suite of tools to support data viewing, reporting, analysis, and mining. Each tool would be built on top of one or more related data marts. For instance, the data viewer in Alaska DOT & PF's TAMIS and FDOT's Transportation Data Portal (both described above) are examples. These applications would serve as platforms through which end users could interact with both data marts. They would process data inputs and deliver data outputs in various formats.
- **Users:** MDOT staff and others with permission to view outputs of the Data Hub in various formats.

Conceptual Framework for an MDOT Data Hub



Note: Prior to the ETL process to bring data into the Data Hub Staging Area, Data Stewards are responsible for data validation and for ensuring that security, confidentiality, authority, and liability policies are established and enforced according to published and disseminated standards.

The table below summarizes the implementation steps that will be necessary to develop the first iteration of an MDOT Data Hub, consistent with the Vision, Goals and Objectives for Data Governance implementation. A full set of prioritized action items for Data Governance implementation is in the next section.

Objectives of MDOT Data Governance	Actions Needed to Implement an MDOT Data Hub
▪ Establish clear data guidelines and standardized documentation for integrated data management. ▪ Enhance consistency in organization of data across Transportation Business Units (TBUs). ▪ Ensure that leadership at the TBUs are informed of data requests and (to the extent possible) the use of data in published reports.	▪ Draft a Data Governance Manual that formalizes Data Governance roles and responsibilities, data standards, policies, and procedures, focusing initially on the data assets and information systems related to the *MDOT Attainment Report*, *MDOT Managing for Results* and *MDOT Excellerator*, which will be the initial focus of the Data Hub.
▪ Document and maintain a formal statement of roles, hierarchy, and responsibilities for internal/external data sharing and dissemination. ▪ Provide intuitive reports or data summaries in export formats (e.g., pdf, doc, xls, csv) with functionality and a user experience designed for people with a range of technical capabilities. ▪ Create clear paths between the Data Hub and systems of record	▪ Assign roles (e.g., owners, stewards, and custodians) with clear responsibilities in Data Governance implementation. ▪ Draft user experience (UX) guidelines and principles as part of a functional requirements document. ▪ Develop an inventory of data assets that will feed the Data Hub, indicating which are contained in systems of record.
▪ Limit data redundancy during integration while maintaining data consistency.	▪ Develop an inventory of data assets that will feed the Data Hub. ▪ Identify redundancies in data collection and/or maintenance. ▪ Assign roles (e.g., owners, stewards, and custodians) with clear responsibilities in Data Governance implementation.
▪ Maintain and provide up-to-date access to data, facilitate timely transformation and validation for integration. ▪ Document information (standardized metadata) to include information on data owners including contact information for each data set.	▪ Develop an inventory of data assets that will feed the Data Hub. ▪ Develop a data dictionary and standardize metadata, with tools and processes for maintaining them as specified in the Data Governance Manual. ▪ Develop a data validation process to encompass extract-transform-load (ETL) testing, to automate and enhance data validation by deploying tools that are suited for use across various MDOT/TBU environments.
▪ Provide better access to source data underlying reports, accompanied by attribute descriptions and other metadata to explain data collected/analyzed/published, completeness and reliability, limitations and appropriate uses, use restrictions, permissions or copyright, etc.	▪ Develop an inventory of data assets that will feed the Data Hub. ▪ Develop a data dictionary and standardize metadata, with tools and processes for maintaining them as specified in the Data Governance Manual.

Road Map for Data Hub Development

Finalize Data Hub architecture and associated technical components	▪ Interview representatives of TBUs and MDOT TSO to document what data sources they own; how data can be transferred from those sources (API, ad hoc export, existing reports, etc.); end uses of the data they generate and relative priorities; what data they consume from other TBUs and/or from MDOT TSO, and their priorities for inclusion into the data hub; and any additional functionalities (reports, data mining, etc.) desired from data hub that are not currently available, and their relative priorities. ▪ Interview MDOT Office of Transportation Technology Services (OTTS) staff to backfill any needed information about data sources and transfer methods from different TBUs and TSO (if applicable) and review current technologies used/preferred by MDOT OTTS. ▪ Summarize and distill information from results of the above interviews to assess the general needs of the MDOT Data Hub and finalize the architecture and associated technical components.
Review and prioritize data for inclusion in the Data Hub	▪ After assembling initial data asset catalogue, convene Data Governance Council to prioritize data sets for inclusion in the Data Hub (starting with *MDOT Attainment Report*, *MDOT Managing for Results*, and *MDOT Excellerator*). ▪ Determine how often these data are updated, process for verification, sensitivity for internal vs. external consumption, etc. ▪ Enumerate end uses for different data sets.
Develop Data Hub requirements	▪ Design schema for all priority data sets (include tabular, spatial, and network data). ▪ Specify access rules for elements of the schema (e.g., data that can be accessed in provisional form vs. final form). ▪ Determine near-term methods for transferring data from source systems to the Data Hub (initial extract-transform-load (ETL) processes and longer-term methods and technologies to automate ETL). ▪ Design APIs or export routines for transferring data to end-use systems (e.g., Open Gov, Socrata). ▪ Enumerate any customized user interface or reporting requirements (beyond what is already provided by core technical components such as GIS).
Build initial version of the Data Hub	▪ Implement schema and data access controls. ▪ Develop any needed scripts/code for data transfer/transformation methods. ▪ Import initial data. ▪ Develop APIs/export routines. ▪ Develop any additional required UI or reporting components.
Make enhancements to the Data Hub	▪ Prioritize additional data sets related to MDOT and TBU core business processes. ▪ Develop more advanced (automated) methods for extract, transform, and load (ETL) functions. ▪ Augment APIs/export routes to include additional datasets. ▪ Develop any additional desired UI or reporting components.

L – EXAMPLE: DATA INNOVATION SHOWCASE

Federal Data Strategy's *Data Innovation Event Playbook* (2020) – https://resources.data.gov/assets/documents/data-innovation-event-playbook.pdf

PRESIDENT'S MANAGEMENT AGENDA

Federal Data Strategy

Data Governance Playbook

July 2020

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Federal Data Leadership

Data plays an increasingly important role in our modern world and new approaches to gathering, analyzing and using data are transforming the way federal agencies fulfill their missions and serve the nation. This expansion in data use poses challenges for how agencies execute data-related activities as each agency faces a different set of infrastructure challenges, abides by different mission parameters, and maintains a unique culture. In this evolving environment, working with data and data management have become disciplines key to organizational success.

The importance of data is reflected in new legislative focus on ensuring that agencies are effectively incorporating data in fulfilling their missions. For example, the Foundations for Evidence-Based Policymaking Act of 2018 (hereinafter "Evidence Act") requires that CFO Act agencies[1] develop a learning agenda plan every four years as part of their strategic plan. These learning agendas identify agency key questions based on consultation with internal and external stakeholders, give agencies the opportunity to identify key questions related to mission and operations, and include short- and long-term questions. By using data to address key questions, agency leaders can develop evidence-based solutions to organizational challenges and improve mission and operational outcomes. Effective data leadership is critical to the success of the learning process envisioned in the Evidence Act.

The Federal Data Strategy (hereinafter "Strategy") supports a coordinated approach to federal data leadership, including data use and management, to help agencies deliver on mission in the 21st century. By guiding agencies in establishing more consistent and integrated data infrastructure and data practices, the Strategy seeks to move the Federal Government toward fully leveraging data as a strategic asset, including supporting strong data governance and providing the data protection and security the American people deserve.

The Strategy consists of a mission statement articulating the intent and core purpose of the Strategy, 10 principles serving as motivational guidelines, and 40 practices informing agencies on leveraging the value of data. The mission statement, principles, and practices are presented in final form in Office of Management and Budget (OMB) Memorandum M-19-18, and additional detail regarding their deployment can be found at strategy.data.gov.

This playbook will help agencies implement the Strategy and fulfill the requirements of the Evidence Act by improving their organizsational leadership for leveraging data as a strategic asset.

[1] This Evidence Act provision applies to the 24 CFO Act agencies named in section 901(b) of title 31: The Departments of Agriculture, Commerce, Defense, Education, Energy, Health and Human Services, Homeland Security, Housing and Urban Development, Interior, Justice, Labor, State, Transportation, Treasury, Veterans Affairs, the Environmental Protection Agency, National Aeronautics and Space Administration, Agency for International Development, General Services Administration, National Science Foundation, Nuclear Regulatory Commission, Office of Personnel Management, Small Business Administration, and Social Security Administration.

Data Leadership Playbook

This playbook supports agencies in developing organizational infrastructure and identifying first steps toward a coordinated and integrated approach to using data to deliver on mission, serve the public, and steward resources while respecting privacy and confidentiality. This is not an easy task, given that each agency has a unique culture, level of data and related infrastructure maturity, and human and fiscal resource capacity to develop the systems necessary to use data in a transformative way.

The two "plays" included here are designed to help agencies improve their organizational leadership for leveraging data as an asset and respond to the requirements of the Evidence Act. Each play includes activities for building data infrastructure through data governance bodies and maturity assessments. These activities create the foundation for developing a data-driven culture in which agencies are poised to embrace the Strategy's mission statement, principles, and practices.

The two practices addressed in this playbook are:

- **Practice 11 - Prioritize Data Governance:** Ensure there are sufficient authorities, roles, organizational structures, policies, and resources in place to transparently support the management, maintenance, and use of strategic data assets; and
- **Practice 15 - Assess Maturity:** Evaluate the maturity of all aspects of agency data capabilities to inform priorities for strategic resource investment.

It is critical that all agencies make progress on data governance and maturity. This playbook describes these activities in a recommended order:

1. **Play 1 – Data Governance**
    a. Step 1: Establishing a data governance body
    b. Step 2: Setting the vision
2. **Play 2 – Data and Related Infrastructure Maturity**
    a. Step 1: Conducting a data maturity assessment
    b. Step 2: Establishing agency data architecture guidance

These plays are not intended to be strict, prescriptive recipes that require exact enactment. Rather, each agency should consider its current organizational environment, structure, culture, and capacity to decide how to implement the plays. Agencies should prioritize and adapt the individual checklist items in ways that make the most sense for their own organization. In addition, implementing these plays should create significant organizational learning, especially in the initial years, so agencies should plan to regularly review and update their data governance approach and ensure it supports their learning agenda.

Play 1: Data Governance

Step 1 – Establishing a Data Governance Body

What? Data governance is the process of setting and enforcing priorities for managing and using data as a strategic asset. A data governance body with authority and oversight over the management of agency data assets is a key piece of data infrastructure. These bodies are commonly called by such names as Data Governance Boards, Data Councils, or Data Strategy Teams. The data governance body establishes policies, procedures, and roles for developing, overseeing, and coordinating data management policy and helps prioritize data resource allocations to answer agency key questions and meet stakeholder needs.

When? An effective data governance body is foundational to leveraging data as a strategic asset and a critical precursor to making conscious and realistic decisions about stewarding data assets and developing related data infrastructure. Agencies should make establishing a data governance body a top priority, thereby setting up the organizational structure to address data and related infrastructure needs.

Who? A data governance body is authorized and chartered by the agency head or delegated authority, chaired by the Chief Data Officer (CDO), and includes senior staff with responsibility for diverse aspects of data management as well as senior officials from agency program areas. In addition to the CDO, membership should include the Evaluation Official (EO) and the Statistical Official (SO) named in accordance with the Evidence Act. Agencies should consider their own needs and structure as well as related OMB guidance, such as M-19-23, in identifying other senior leaders for membership. Finally, to be truly effective, executive leaders must get regular updates about the data governance body's impact and hold its members accountable for raising the organization's data maturity.

How? An agency data governance body identifies the scope of the data that needs to be managed and prioritizes key data-related issues that need to be addressed. Then it identifies appropriate policies, standards, and reporting structures to ensure that key information assets are formally and properly managed. The data governance body uses maturity models to assess agency capabilities and seeks meaningful and broad agency and stakeholder input before recommending data investment priorities (see Play 2). It also sets forth a process for monitoring compliance with policies, standards, and responsibilities throughout the information lifecycle. Regardless of how the data governance body is constituted, it must be integrated into agency decision-making and operations to ensure that data are used effectively to address agency key questions and meet stakeholder needs.

The key activities of data governance are:

- Data Identification – Identify data assets and develop a data inventory with appropriate metadata.
- Data Management Policy – Develop short statements of management intent and fundamental rules for governing the creation, acquisition, privacy, integrity, security, quality, and use of data and information.

- Data Issue Management – Create a process for identifying and then addressing the obstacles that prevent effective use of data.
- Data Assessment – Develop processes to measure the quality, utility, and impact of data.
- Data Oversight – Monitor the organization's data assets and any actions taken to improve them.
- Data Communications – Create opportunities for information flow to staff and managers. Open and transparent lines of communication are crucial to improving data management processes.

Checklist:

- ☐ Hire or assign a CDO as a senior-level official within the agency in accordance with Evidence Act requirements and related OMB guidance, such as M-19-23.
- ☐ Create a data governance charter to formalize roles. The charter should reflect the agency vision for data governance (see Step 2).
- ☐ Set forth the roles and responsibilities of the CDO to define their relationship with other senior officials in the agency, including the SO, EO, Privacy Official, Chief Information Officer (CIO), and Chief Performance Officer.
- ☐ Formally appoint data governance body members based on agency structure.
- ☐ Identify the expectations and responsibilities of each role in data governance. Ensure that stakeholders recognize and agree what authority those in a role have to establish policies and procedures and to monitor compliance related to that role.
- ☐ Ensure that there is accountability for each role.
- ☐ Communicate with agency stakeholders about the various roles and authorities of the data governance body.
- ☐ Build a regular process for reviewing and updating the governance framework and membership.

Questions:

- What motivates the agency to establish a data governance body beyond law and policy requirements? What issues will it tackle?
- For each data governance role, what are its responsibilities and activities? What is its scope and authority to establish policies and procedures and monitor compliance?
- Who is the owner of each role and what organizational changes have been made to ensure that they have sufficient authority and support for their work?
- Who needs to be in engaged in or aware of the data governance body? How will the agency create the necessary communication channels?

Step 2 – Setting the Vision

What? Each agency should consider its vision for how it will leverage data to address agency key questions and meet stakeholder needs. The vision should identify agency leadership goals and expectations for using data to achieve mission and improve operations. It should also address the agency values that will drive decisions about data governance and management including how to align agency resources and prioritize its efforts. While the vision and its implementation will change over time, a clear statement of agency vision and values can help shape an effective data governance process from the outset.

Effective data governance and management often requires a change in culture. Therefore, the vision should drive a shared data culture and support small, interim successes to build towards long-term success. It should also emphasize collaboration as a keystone for the success of the agency's vision and empower data stakeholders to make decisions for which they will be held accountable.

When? Setting an agency vision for governing and managing data assets is a crucial first step in establishing an effective data governance process and should be undertaken as one of the first actions taken by the data governance body (see Step 1 checklist).

Who? The CDO, as data governance body chair, should lead the effort to set the agency vision for governing and managing data assets. The CDO should solicit and incorporate the views of agency executive leadership to ensure the vision is aligned with agency policies and priorities. Data governance body members should take an active part in creating the vision, so it is relevant throughout the agency.

How? The CDO should work with agency leadership and senior executives throughout the organization to develop a vision that is consistent with agency goals and realistic as a basis for determining resource priorities and for developing the strategic information resources management plan required by the Evidence Act. In developing the vision, the agency should review relevant law and policy, particularly the requirements of the Evidence Act and related OMB guidance, such as M-19-23. The agency should also consider the Strategy's mission statement, principles, and practices as input to its vision.

Checklist:

- ☐ Task the CDO with leading the vision development process.
- ☐ Consider appointing a data governance body subcommittee to solicit input and craft a draft vision.
- ☐ Solicit input from agency executive leadership and senior executives throughout the organization.
- ☐ Review the Evidence Act, other relevant legislation, and OMB policies to make the vision consistent with requirements; consider the Strategy's mission statement, principles, and practices as input to the vision.
- ☐ Seek broad input on the draft vision to ensure it is relevant and practical for guiding data governance and management decisions and priorities.

- ☐ Develop metrics to assess whether the agency vision is being realized; collect data to inform the metrics and take action based on the results.
- ☐ Communicate frequently on how the data vision aligns with the overall organizational vision (as embodied in its strategic plan, for example), so it can be shared, accepted, and sustained.
- ☐ Incorporate the vision into agency planning processes, including those required for budgets, strategic planning, and to comply with the Evidence Act.

Questions:

- What motivates the agency to establish a vision for data governance and management? How will the vision support agency mission and operation priorities?
- What data information or products do agency leaders, employees, and public stakeholders need now and in the future? How do those needs relate to the agency's mission? What are the implications of those needs for the agency vision for data governance and management?
- Does the data vision have buy-in from agency leaders? Does the data vision have buy-in from those who will implement it? If not, how will the vision be shared, communicated, and adapted in order to obtain buy-in?
- Which organizational leaders will be responsible for implementing the vision?
- How will the agency know where it is doing well and where it needs to focus next?
- How will the agency test and measure progress along the way?

Play 2: Data and Related Infrastructure Maturity

Step 1 – Conducting a Data Maturity Assessment

What? Maturity assessments allow an organization to evaluate itself against documented best practices, determine gaps, and identify areas to prioritize for improvement. A maturity assessment analyzes all aspects of agency policies, procedures, and operations related to data and data infrastructure, including data governance, data management, data culture, data systems and tools, data analytics, staff skills and capacity, resource capacity, and compliance with law and policy. The results of a maturity assessment feed into the data governance and management processes to inform investment decisions and to prioritize subsequent actions. A maturity assessment should be repeated periodically, as determined by the agency, to measure progress and prioritize next steps.

When? An assessment of agency data and related infrastructure maturity provides a starting point for prioritizing time and resources to improve the agency's data assets and how they are managed. The assessment helps the agency determine which areas of data and data maturity are most mature and which ones need further attention and development. Therefore, assessing data maturity should be one of the data governance body's first activities.

Who? The data governance body, in consultation with agency stakeholders, should choose, adapt, or create the data maturity assessment model, conduct the assessment, evaluate the results, and make recommendations for next steps to improve agency data and related infrastructure maturity. The data governance body should also evaluate the usefulness of the assessment model and make recommendations for changes for subsequent assessments. The data governance body may wish to establish a subcommittee for this activity.

How? For many agencies, a targeted focus on data governance and management will result in new operating processes and promote a shift in culture towards leveraging data as a strategic asset. Therefore, the data governance body should engage agency stakeholders and solicit input on the current state of the agency's data management activities when selecting a data maturity assessment model. Agencies may wish to select a model that is roughly aligned with their current capacity and can measure the agency's current successes while identifying areas for improvement. Agencies should select a model that balances the information they need and the resources they have for assessment and, in the selection process, consider their previous experience with maturity assessments and the types of action that can be taken based on the results. The results of the maturity assessment help the agency prioritize time and resources to improve their data and related infrastructure. Over time, agencies can move to more complex data maturity assessment models to build capacity and attain higher levels of maturity.

The MAX Federal Community website community.max.gov/display/DATA/Federal+Data+Strategy will include a collection of references and examples of commonly used data maturity assessment models, including both open-source and proprietary models. The inclusion of proprietary assessment models should not be interpreted as an endorsement of any particular product or service. Agencies should adopt or adapt an existing data maturity assessment model or create one to meet their own needs. In

the future, agencies may be offered a suite of standardized government-wide maturity assessments to ensure consistency in reporting across the Federal Government.

Checklist:

- ☐ Discuss and informally assess the current state of data and related infrastructure maturity. Based on this informal assessment, select, adapt, or create an appropriate data maturity model to meet agency needs. Consult with agency stakeholders as part of the informal assessment and in selecting a data maturity model.

- ☐ Determine the level of effort needed to complete the data maturity assessment and ensure that sufficient resources are available. Consider asking other organizations that have used the assessment or solicit assistance from industry experts to determine the required level of effort.

- ☐ Identify the desired level of maturity for each area assessed. It may be fine to decide that a moderate level of maturity is acceptable in some areas at a particular time.

- ☐ Compare the desired maturity level in each area against the assessed agency maturity to identify potential areas of improvement. Prioritize areas of improvement to determine next step actions or projects to reach the desired level of maturity. Plan for resources to conduct priority next step actions or projects.

- ☐ Participate in a data governance community of practice to learn about experiences with assessing data and related infrastructure maturity and about how other organizations have used assessment results.

Questions:

- What motivates the agency to assess data and related infrastructure maturity? How will the results of the assessment be used to improve mission delivery and operations?

- What are the most important areas of data and related infrastructure maturity for the agency to accomplish its mission, promote efficient operations, and meet stakeholder needs? What level of maturity should the agency aspire to in these areas?

- What is a realistic level of maturity for the agency in each area assessed?

- What would it take to achieve the next level of maturity? Does the agency have the resources and capacity to achieve that level of maturity?

Step 2 – Establishing Agency Data Architecture Guidance

What? Agency data architecture guidance is designed to ensure that data systems have consistent metadata to promote interoperability, minimize redundancy, and improve the user experience. Agency architecture guidance includes identifying authoritative data systems and establishing common schema for specific data elements. For example, an agency might identify one specific data system as the "master" for social security number and set a standard for how social security numbers will be stored.

To establish data architecture guidance, agencies need to have a good inventory of data assets that includes metadata with information about what data elements are included for each asset and how the data elements are stored. Developing this inventory will also help agencies meet the requirements of the Evidence Act.

When? Establishing agency data architecture guidance is one of the first substantive tasks the data governance body will need to undertake because it affects the effective and efficient operation of all the agency's data systems. Agencies should prioritize the establishment of data architecture guidance for those data elements that are key to their mission and operational processes. Data elements that define the agency's customers (e.g., name, address, social security number) are likely to be highest priority as they often exist across data systems and lack of consistency can be a barrier to effective customer service and data interoperability.

Who? The data governance body should lead the development of agency data architecture guidance, monitor its progress, and evaluate its effectiveness. The data governance body may wish to establish a subcommittee and engage relevant technical staff in this process. Agency leaders performing the functions of a Chief Enterprise Architect or Chief Data Architect will play a key role in developing the technical specifications for agency data architecture guidance; the data governance body's implementation guidance should focus on promoting efficiency among business units.

How? The data governance body should work with agency stakeholders to identify and prioritize common data elements, establish guidance for related metadata, and designate authoritative data systems for common elements. Often this means focusing on data elements that define the agency's customers (e.g., name, address, social security number).

The data governance body should ensure that all agency stakeholders know about the new guidance and why it is important for all agency data systems to adhere to agency-wide standards. Emphasize the overall cost efficiencies inherent in consolidating data systems such as increasing standardization, reducing risk management activities, and eliminating data duplication and burden on operations staff and data analysts. Listen to the concerns of agency stakeholders about potential risks and work within the agency to mitigate those risks.

It is also critical to help staff and leaders understand that the process of improving data architecture is likely to identify multiple data challenges and opportunities. This is an iterative process that will continue to yield results especially as the agency gains more experience with data governance and a deeper understanding of its data activities. Continuing to identify questions and issues to address is often a sign of growing organizational maturity, rather than a sign of failure.

Checklist:

- ☐ Identify and define common data elements—data elements shared and used across the agency. Prioritize common data elements based on their importance for the agency's mission and operations.
- ☐ Identify the metadata associated with priority common data elements. Determine the level of consistency of metadata for priority common data elements in existing systems. Determine the level of consistency needed for efficient agency operations.
- ☐ Consult with agency stakeholders to determine which data system should be the authoritative source for each priority common data element and ensure that the metadata is appropriate for agency-wide use.
- ☐ Create a single repository where agency stakeholders can find information about data architecture standards. Communicate the existence of the repository and the importance of its use throughout the agency.
- ☐ After creating agency data architecture guidance for priority data elements, repeat these steps for additional common data elements until complete. Please know that this process may take years.

Questions:

- What motivates the agency to establish data architecture guidelines? What problems will it address or how will it improve agency mission and operation processes?
- What data elements are most essential for agency missions and operations? Which data elements most affect the customer experience?
- Which agency program areas/business units will be most affected by data architecture guidance related to each priority data element? How are their needs incorporated into the development of data architecture guidance?
- Which technical experts at the agency can support the development of data architecture guidance?
- What resources are available to implement any technical adjustments that are identified through this process?

Data Governance Resources

Federal, state and local governments across the United States are now beginning or are in the midst of major reforms and transformations to the way that they approach the data they manage. An incredible body of knowledge, learned expertise, and tools have emerged from early adopters of these reforms. There are now many models, resources, and communities of practice that agencies can and should consult when building out their data governance body. To that end, the Federal Data Strategy development team is contributing to a repository found at resources.data.gov. This repository will eventually include a range of resources related to data governance and management, including a guide to maturity models that can be used to conduct self-assessments, and a list of communities of practice where agency staff can connect with other data practitioners.

Implementation Timeline, Metrics, and Related Practices

Implementation Timeline: See related OMB guidance, such as M-19-23, on implementation of the Evidence Act for required timelines for setting up a data governance body. Creating a culture around data will require ongoing investment in data infrastructure and human resources. While standing up a data governance body will only take a few months, incorporating its input and recommendations into daily agency processes may take several years. Agencies will need to commit to regular data and related infrastructure maturity assessments to guide the work of the data governance body and to ensure that it is focusing on priority agency needs for improvement.

Metrics: Agencies should develop performance metrics, assign responsibility, audit practices, collect implementation and outcome data, document and learn from results, and make needed changes. Next, agencies should share processes, metrics, and results with OMB and other agencies to promote a government-wide culture of learning about data governance.

Related Federal Data Strategy Practices: Virtually all of the Strategy practices relate to data governance and maturity to some extent. The practices most closely related include:

- **Practice 1 - Identify Data Needs to Answer Key Agency Questions:** Use the learning agenda process to identify and prioritize the agency's key questions and the data needed to answer them.
- **Practice 2 - Assess and Balance the Needs of Stakeholders:** Identify and engage stakeholders throughout the data lifecycle to identify stakeholder needs and to incorporate stakeholder feedback into government priorities to maximize entrepreneurship, innovation, scientific discovery, economic growth, and the public good.
- **Practice 10 - Provide Resources to Explicitly Leverage Data Assets:** Ensure that sufficient human and fiscal resources are available to support using data for agency decision-making and accountability and to spur commercialization, innovation, and public use.

- **Practice 12 - Govern Data to Protect Confidentiality and Privacy:** Ensure there are sufficient authorities, roles, organizational structures, policies, and resources in place to provide appropriate access to confidential data and maintain public trust and safeguard privacy.

- **Practice 16 - Inventory Data Assets:** Maintain an inventory of data assets with sufficient completeness, quality, and metadata to facilitate discovery and collaboration in support of informing key agency questions and meeting stakeholder needs.

- **Practice 17 - Recognize the Value of Data Assets:** Assign value to data assets based on maturity, key agency questions, stakeholder feedback, and applicable law and regulation to appropriately prioritize and document resource decisions.

- **Practice 20 - Leverage Data Standards:** Adopt or adapt, create if needed, and implement data standards within relevant communities of interest to maximize data quality and facilitate use, access, sharing, and interoperability.