Iowa Department of Transportation

Strategic Plan for Digital Delivery

SPR 3224

DEVELOPING A ROADMAP FOR DIGITAL DELIVERY IN IOWA

October 2022

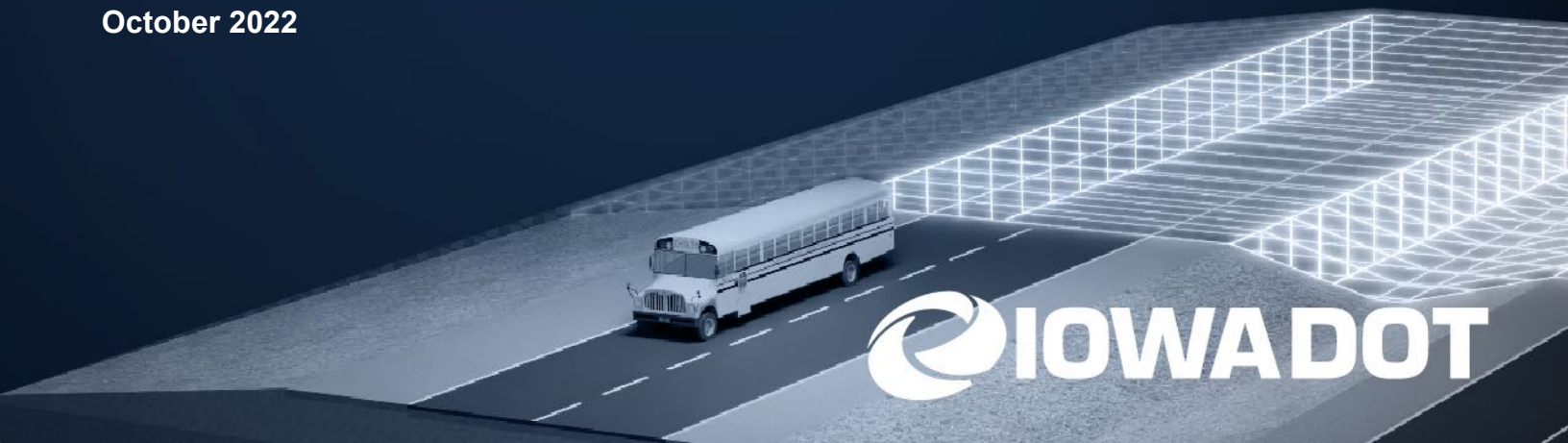


Table of Contents

Introduction

Overview

The Iowa Department of Transportation (DOT) uses a wide range of data to support business functions across the enterprise. While data is not always available, accessible, or reliable, it is critical for developing products that meet the needs of the Department's customers and supporting DOT business operations. The Department recognizes the urgency to transform today's analog way of exchanging information between Divisions, Bureaus and Business Groups into a sustainable method to leverage digital workflows. Today, most workflows within the Department are considered electronic, but not digital. Electronic workflows are based on paperless, document-type exchanges, in which information must be manually extracted and entered into other systems. On the other hand, digital workflows are based on data-based exchanges, in which information can be easily transferred to a computer system with little to no manual entry. The Department recognizes the urgency to transform today's analog way of exchanging information between Divisions, Bureaus and Business Groups into a more robust and sustainable method by implementing digital delivery.

Vision

Digital Delivery workflows will enhance the Iowa Department of Transportation's ability to share information seamlessly across the enterprise, significantly improve managing assets more effectively throughout their lifecycle, and provide greater value to external users of the digital deliverables, such as construction contractors and suppliers.

> **DIGITAL DELIVERY** is a modern process in which 3D models and other files are created and delivered to facilitate construction and incorporate digital information to support maintenance and operations activities and lifecycle asset management.

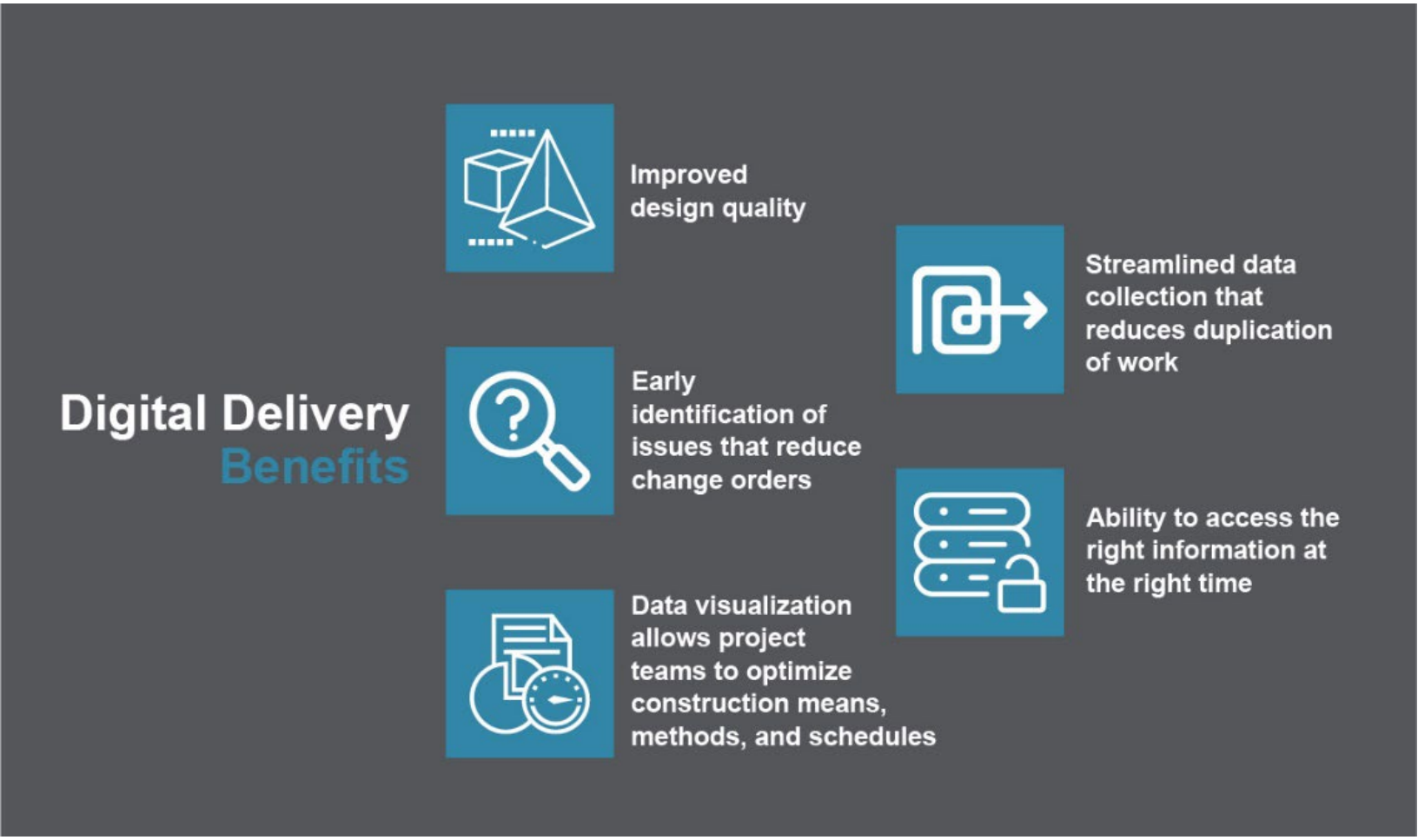
Benefits of Digital Delivery

Benefits of digital delivery include:

- Improved design quality
- Early identification of potential issues that result in an average fifteen percent reduction in change orders due to conflict avoidance.
- Data rich visualization that allows project teams to optimize construction means, methods and schedules by an average of thirteen percent.
- Streamlined data collection, reducing duplication of work and increasing accessibility to the right information at the right time.

When data is managed as another asset, lifecycle information is accessible and reliable, enabling people to spend less time searching for it. According to a 2018 study[1], organizational information is often incomplete, people have a hard time finding the right data, and when they do, it's often not trusted or not very easy to use. Asset managers on average are wasting nearly four hours per week just looking for data and another five and a half hours preparing it to be useful for decision making - nearly ten hours a week that could be used on higher value tasks. To put it in another way, out of five employees, only four are producing work while the fifth one is searching for answers and not adding any value. Digital delivery is a step in addressing these problems.

Digital Delivery will help the Department streamline information sharing, enhance collaboration and create a framework for long-term use of data to drive decisions for managing the Iowa Transportation System. This strategic plan provides the framework and foundation to enable an enterprise digital transformation.



Mission

The Iowa DOT will leverage digital data and workflows to support business functions across the enterprise. The mission of this initiative is to enable streamlined data sharing and active collaboration between different Divisions, Bureaus, as well as the public and other external stakeholders by:

1. Establishing realistic timelines and funding sources to achieve desired outcomes
2. Defining information requirements for specific use cases of data lifecycle use, and establishing data standards and authoritative data sources
3. Exploring new or reviewing existing technologies and systems to support specific users and job functions
4. Empowering business and technical subject matter experts to develop and implement best practices within their area of expertise
5. Developing strategies for soliciting input from stakeholders involved or affected by digital delivery workflows
6. Investigating available national data standards for organizing and exchanging transportation asset information between systems

Alignment with Department Goals and Key Initiatives

The Department has five key organizational goals that will guide the Digital Delivery Strategic Plan. Each of the strategic and tactical goals under this plan will satisfy one or more of the following five-year priority goals identified in the Iowa DOT Business Plan. The Digital Delivery Strategic Plan will be reviewed and updated annually for ongoing alignment with Department goals and advancements in technology.

1. Improve Transportation System Safety & Performance
2. Improve Customer Service
3. Advance Workforce for Future Challenges & Opportunities
4. Secure Stable & Sustainable Funding
5. Grow Innovation Outcomes

> This plan will also consider other key DOT initiatives including:
>
> - Strategic Data Business Plan
> - Project Development Process Improvement
> - Right-of-Way Annual Management Plan (RAMP)
> - e-Construction and e-Ticketing Construction Initiatives

Background

Iowa's Digital Delivery Journey

The Iowa DOT has been providing 3D roadway models on a project-by-project basis since 2006 to aid contractors with the use of automated machine guidance. In 2018, the Department launched its first pilot project, in which a 3D bridge model replaced the traditional 2D contract plans. Other innovations being adopted and piloted include construction technologies and methods, including e-Construction, e-Ticketing and the use of 3D roadway models for construction engineering and inspection tasks.

In 2011, the Iowa DOT launched its first effort to digitally collect as-built records through the construction process for ancillary assets including culverts, signs, and traffic barriers. However, data for managing the maintenance of transportation assets is quite extensive and includes information about pavements, bridges, intelligent transportation systems (ITS), lighting and geotechnical walls. Most recently, the Department has started collecting inventory data for living and man-made fences and rumble strips.

The Iowa DOT has also invested in a Right of Way Inventory Management System, which is now in production. The system is intended to manage and coordinate the property assets owned by the Department. With this system in place, the Department will be able to systemically analyze inventory of property assets when determining site-specific project needs.

Lastly, a Data Management Committee (DMC) has been established to provide strategic direction, assess current practices and development of improvement initiatives, and provide policy guidance and recommendations for agency-wide data management standards.

Enterprise Data Governance

The DMC has produced three plans related to enterprise data governance.

1. **DATA MANAGEMENT STRATEGIC PLAN (DMSP),** which provides the foundation and organizational understanding for data management
2. **DATA MANAGEMENT BUSINESS PLAN (DMBP),** which describes business strategies, processes, procedures, and needs for data management.
3. **DATA MANAGEMENT ACTION PLAN (DMAP),** which defines actions and timeframes to support the strategic business plan.

> **Objectives of the Department's DMSP** are to "strengthen data governance, formalize data lifecycle and management, improve data architecture and integration, and improve data collaborations and data quality."

Digital Maturity Today

The Iowa DOT has two authoritative systems, the Linear Referencing System (LRS) and the Roadway Asset Management System (RAMS).

LRS

Provides access to information about the entire State of Iowa's roadway network, and its data is managed through a Geographic Information System (GIS) interface.

RAMS

An LRS enabled database used to store roadway data for all public roads in the state. Data that is managed through RAMS includes traffic, roadway geometrics, pavement condition data, and structure and public rails crossing inventory.

Each Division, Bureau and/or Group within the Department uses specific systems to perform daily tasks that support project delivery, maintenance and operations activities. All processes are completely electronic today and leverage paperless technologies. However, the level of digital maturity varies across the Department.

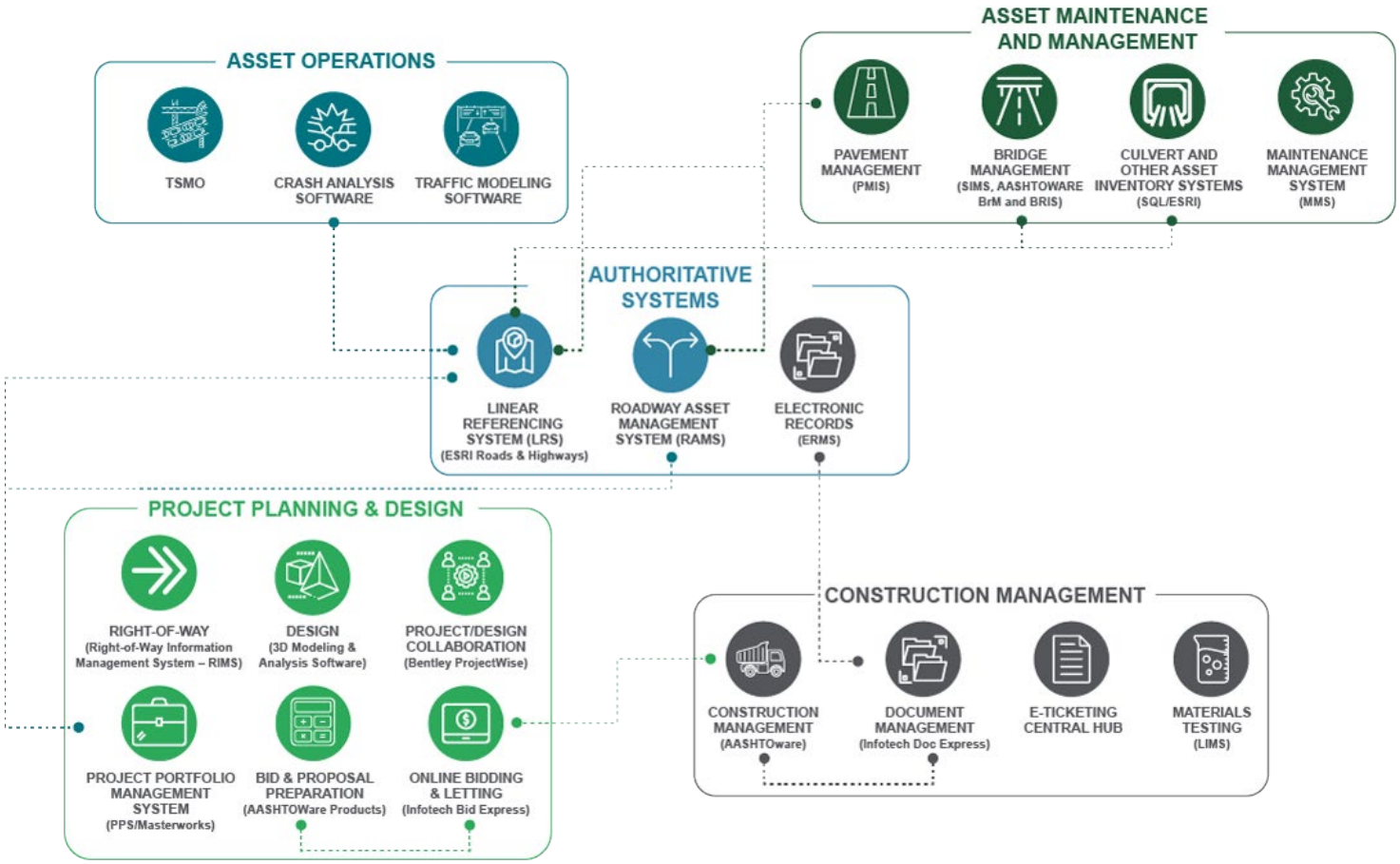
For example, construction documentation is fully electronic using systems that store information in static files, like Portable Document Format (PDF) files. PDF files are either generated directly as an export of the original source document (e.g., Word) or scanned. Information is difficult to retrieve, as it requires the user to locate the document, read it and extract the desired piece of data.

Digital information is not static, meaning that it exists live, in a local or enterprise database that can be easily queried by users. The distinction between electronic and digital maturity is important because digital transformations go beyond the elimination of paper. Digital maturity is achieved when users are able to easily retrieve, share and consume information using semi or fully automated techniques.

Current Iowa DOT workflows feature various levels of digital maturity. The following practices are currently in place:

- Electronic workflows using both manual and automated transfer of non-machine-readable static files, such as PDF files, and manual data entry into existing systems and databases.
- Exchange of digital files such as computer-aided design files (CAD) and spreadsheets. Some workflows include the use of automated or manual transfer of information into business systems (e.g., project scheduling, estimating software). All groups developing contract plans share both CAD and electronic plans (PDF) with each other.
- Model-based design technology is used to develop 3D models for roadway, drainage, utilities, and bridge features.

- Data collection methods of existing conditions use multiple technologies including field surveys, photogrammetry, lidar, and unmanned aerial systems (UAS).
- Use of geographic information management systems (GIS), Google Earth and other aerial imagery visualize and contextualize the footprint of project corridors and analyze information used in the National Environmental Policy Act (NEPA) process.
- Electronic document management systems, tablets, 3D model viewers for construction, and e-ticketing technology used during construction.
- Data collection to improve asset inventories that include but are not limited to culverts, sign, and guardrail features.



Plan Scope and Development

Goals and Objectives

The Iowa DOT Digital Delivery Initiative is a component of the Department's Strategic Data Business Plan to manage and govern data as an asset. ***The key objective for the Digital Delivery Initiative is to advance the maturity of digital data use for project development, pre-construction and construction activities, and maintenance and operations activities.*** Key goals and objectives include:

1. Use 2D and 3D modeling technology to develop project information models sufficiently accurate for supporting models as legal documents.
2. Leverage existing technology as much as possible and explore new tools when appropriate to support specific use cases.
3. Expand data collection to manage asset inventory by capturing accurate digital models that represent as-built conditions accepted during construction.
4. Develop and implement new information management processes that align with data management goals.

Focus Areas

The Iowa DOT has a clear strategy with detailed business and action plans for enterprise data governance and management, a holistic approach for evaluating and documenting process improvements, and a focus on establishing best practices for storing and managing data. The Digital Delivery Initiative will not duplicate activities already established through the business data management strategy or other initiatives. This effort will augment and compliment efforts that enable the use of digital workflows in project development and construction management, advance data collection for digital as-builts already in place, and document best practices. The six focus areas of the plan are a direct result of interviews conducted across multiple groups within various bureaus and divisions, and the review of initiatives already underway to help manage and govern data and advance the use of digital workflows.

DATA REQUIREMENTS, STANDARDS AND GUIDELINES

Data requirements and standards are the foundation for effective data lifecycle management, and guidelines are the mechanism for users to comply with standards. A critical component for digital delivery to be successful is the development of specifications for the delivery of the right amount of information concerning design, construction, and handover information for operations and maintenance. This concept aligns with already established data standards framework per the Iowa DOT DMSP. Specifically, stakeholders are interested in leveraging existing federal, state, or industry standards to help close the gap where needed. A key standard to explore is ISO 19650 standard, which provides a unified approach to information management across an asset's lifecycle (e.g., organization of information, level of information need, attribution and metadata). The ISO 19650 standard bestows a framework an organization may use to digitize information

about civil infrastructure that includes 2D and 3D model data. Principles of ISO 19650 address both management of a project and asset information. This is important to recognize because data needs in the project development phase differ from those in the operations and maintenance phase. Digital workflows for project delivery without asset management considerations only set requirements for delivering 3D models for construction. Asset management with no project delivery considerations results only in requirements for data collection and management of maintenance information. When considerations are combined for both data needs, digital workflows will truly support the entire asset lifecycle.

DATA COLLECTION AND STORAGE

There are many challenges regarding who collects information, when it should be collected, and where and how it is stored. A plan to fully describe roles and responsibilities is critical for advancing data collection that meets project and asset information requirements and supports digital delivery. Bureaus will also need to work closely with the data management committee to create standards for storing data in ways that align with the Department's data architecture and integration, and data management quality goals.

WORKFLOW EFFICIENCY

Realizing workflow efficiencies comes from adapting to new ways of looking at information instead of fitting technology into existing practices. Stakeholders are excited to innovate and explore new technologies that help users perform tasks more effectively and efficiently. Finding ways to view information more efficiently that enables desired outcomes of each task is a high priority and key to reducing the time it takes to deliver projects. A critical technology to explore for improving efficiency is a real-time, collaborative processes that leverages cloud-based software. The ability to view information and collaborate in real-time using 3D models may reduce days and even weeks during the project development process. Another equally important functionality that improves workflow efficiency is the ability to make information available offline with the ability to sync to the cloud as soon as the user has internet access or a cellular connection. It is important to note that rural areas may not have reliable cellular or internet connectivity.

TECHNOLOGY IMPLEMENTATION

Technology implementation does not come without challenges. It is harder than ever before to keep the technology portfolio current and relevant to meet evolving data and user needs. An enterprise technology implementation management plan that is flexible in reviewing new tools will be necessary for successful adoption of digital delivery. Today's users are looking for technology that makes their job easier, enables them to collaborate in real time, provides an easy-to-use interface, and enables mobility. In other words, the technology solution must satisfy the needs of the intended user. Key recommendations include testing and implementing new versions of software with more capabilities, as well as exploration of new technology. Technologies and processes should be tested via pilot projects with a key focus on finding the right solutions for the intended user while meeting budgetary constraints. Technology is changing so rapidly that it is requiring organizations to explore new business models for replacing hardware and updating and retiring outdated systems.

WORKFORCE DEVELOPMENT OUTCOMES

Current staff dedicated to advancing technology and digital delivery practices are spread thin to perform their current duties, which makes it difficult to add capacity needed to manage and implement technology. There are several options to address this challenge, including:

1. Training current staff to support digital delivery. The first step will be to identify staff who is interested and has the aptitude to take on digital delivery assignments. The second step is identifying who will provide training. Prioritization of additional assignments will be important to manage expectations for digital delivery adoption. Without additional resources, it is likely to take at least 10 years to implement this plan.
2. Adding or augmenting staff that is dedicated to the management and deployment of information systems, as well as technical support for digital workflows will be necessary to fully implement lifecycle digital delivery workflows. Funding will be needed to add internal staff and/or augment staff with external resources to implement lifecycle digital delivery. With additional resources, this digital delivery plan could be implemented within a five-year period.
3. Another option is to add a bid item in construction to include requirements for a dedicated consulting team to manage digital workflows, create documentation and deliver final products. Tasks to be taken on under this option are project-based, rather than a holistic organizational approach. Thus, it is unknown how long it would take to implement this plan using a project-by-project approach.

DIGITAL DELIVERY LEAD AND COMMUNICATIONS

These two critical elements are necessary to achieve buy-in. A lesson learned from other states with strategic plans is the addition of a digital delivery lead whose responsibilities are specific to the initiative and not as “other duties as assigned”. A communication plan should be developed to convey a consistent message about the Digital Delivery Initiative and stakeholders should be engaged with frequently. These are the areas of greatest impact for building consensus and buy-in from internal staff as well as external stakeholders. Most audiences want to know what’s in it for me? A strong communication and stakeholder engagement plan is a great change management tool for guiding conversations with the right groups to understand their data needs and challenges they encounter when accessing, using, and sharing information to complete a specific task. These types of engagements are critical success factors in producing, collecting and exchanging the right amount and type of information. In addition, an external online portal is useful in disseminating information that is timely, and accessible to all stakeholders. This online resource serves as a one-stop shop for all stakeholders to access information.

Tactical Goals

This section lists goals that can be achieved within one to three years, depending on the level of resources available. Actual timeframes for accomplishing goals will depend on resource allocation decisions that will occur at a later date. Tactical goals include activities with low barrier to entry that can complement work conducted-to-date and accelerate work already in progress at Iowa DOT and align with AASHTO and FHWA national efforts. Funding for conducting activities to achieve tactical goals can potentially come from federal programs. The

Department applied for an Accelerated Innovation Deployment (AID) Demonstration grant to assist with implementation of this strategic plan. Other options for federal funding may be available under the Advanced Digital Construction Management Systems discretionary funds under the new Infrastructure Investment and Jobs Act. The Department will also coordinate with FHWA and other peer agencies through the Every Day Counts Program.

TG1. DEVELOP A STAKEHOLDER COMMUNICATION AND ENGAGEMENT PLAN FOR DIGITAL DELIVERY

Create a guiding document and graphics to communicate the roadmap for Iowa DOT's Digital Delivery Initiative. The plan should include activities to continuously monitor feedback and build support for ongoing stakeholder engagement and conference presentations. The plan should also include activities for monitoring progress, and developing and maintaining a dedicated, online platform for communicating information regarding the Digital Delivery Initiative.

Level of Effort: Low.
Duration: 6 months.
Pre-requisite: None
Co-requisite: None

Desired Outcomes	Focus Areas	Goals and Objectives Alignment
Stakeholder communication and engagement plan that includes key messages, tools, and tactics Templated resources that reflect a unique visual identity within the established Iowa DOT brand (PowerPoint and Word templates) Graphics and content for presentations	Workforce development outcomes Digital delivery lead and communications	Use 2D and 3D modeling technology to develop project information models sufficiently accurate for supporting models as legal documents. Expand the data collection to manage asset inventory by capturing accurate digital models that represent the as-built conditions accepted during construction. Develop and implement new information management processes that align with the Department's data management goals.

Coordination Needs	Resource Needs	Funding Needs
Digital Delivery executive champion and implementation team Internal DOT staff Contractors and consultants	Strategic communication professionals Technical subject matter experts providing content	Allocation of staff time. Consultant support to assist in development of graphics and branded material, and management of the communication and engagement plan.

TG2. DEFINE ORGANIZATION INFORMATION REQUIREMENTS

Organization Information Requirements (OIR) describe the content and nature of information an organization needs to maintain and operate its assets. The Iowa DOT currently has extensive OIR for bridges and pavements and mature databases for some ancillary assts. However, there is a need for design communities to align with the data structure and language of the same features. In addition, there are some efforts to assess asset management strategy being led by the Data Management Committee.

Activities to achieve this goal will include expanding OIR to include other priority assets to support the Iowa DOT Transportation Asset Management Plan (TAMP); and investigating options for a more proactive asset management approach.

Level of Effort: Medium
Duration: 6-12 months
Pre-requisite: TG1
Co-requisite: None

Desired Outcomes	Focus Areas	Goals and Objectives Alignment
A list of prioritized asset classes to include in the TAMP and other agency needs. A list of minimum information needed to make decisions for proactive asset management.	Data requirements, standards and guidelines Workflow efficiency Technology implementation	Expand data collection to manage asset inventory by capturing accurate digital models that represent as-built conditions accepted during construction

Coordination Needs	Resource Needs	Funding Needs
Collaboration with the DMC	Data stewards and data domain trustees for each of the asset classes. A facilitator may be helpful to lead discussions.	Allocation of staff time currently working on active projects and initiatives. Consultant support to backfill staff time delivering projects.

TG3. SELECT THREE PRIORITY ASSETS AND DEVELOP A PROTOTYPE FOR LIFECYCLE DIGITAL DELIVERY.

The Iowa DOT has started the development of some asset information requirements (AIR) for collecting inventory data for ancillary assets, including culverts, signs and traffic barriers, and bridge items. Another good candidate would be sign trusses and high mast lighting tower assets already part of the SIIMS inventory. A low barrier to entry activity is to evaluate the current AIR for three of these ancillary assets and expand current requirements to create a prototype that can be piloted to connect the 3D model developed in design and updated in construction to deliver a digital as-built model as a starting point for asset data management. Activities to achieve this goal will include the review and documentation of existing data collection methods, standards and metadata associated with the three priority asset classes; and the development

of AIR, which describes information requirements for the operation of an asset. These requirements should contain details of information standards, methods and procedures of data collection, data dictionaries, feature level metadata (e.g., accuracy levels and geometry types), and specifications for delivering, validating, and updating data models. It is highly recommended to align data schema to the Industry Foundation Classes (IFC) standards to enable the use of open data standards. Lastly, optimize technology and processes during project development and construction phases to incorporate and collect information.

Level of Effort: High
Duration: 2 years
Pre-requisite: TG2
Co-requisite: TG4

Desired Outcomes	Focus Areas	Goals and Objectives Alignment
An information delivery manual (IDM) for the three selected priority assets. CADD workspace update to include “Item Types” for the model objects (assets) for piloting the prototype. Procedures to effectively exchange data models from CAD-to-GIS leveraging FME. List of projects for piloting they prototype. Training and development for pilot project teams.	Data requirements, standards and guidelines Data collection and storage Workflow efficiency Technology implementation Workforce development outcomes Digital delivery lead and communications	Use 2D and 3D modeling technology to develop project information models sufficiently accurate for supporting models as legal documents. Leverage existing Department portfolio technology as much as possible and explore new tools when appropriate to support specific use cases. Expand data collection to manage asset inventory by capturing accurate digital models that represent as-built conditions accepted during construction. Develop and implement new information management processes that align with Department data management goals.

Coordination Needs	Resource Needs	Funding Needs
Design Bureau Bridges and Structures Bureau IT Staff DMC	CADD and GIS subject matter experts Data stewards Data domain trustees	Allocation of staff time. Consultant support to augment CADD or GIS development.

TG4. UPDATE PROJECT INFORMATION AND EXCHANGE INFORMATION REQUIREMENTS TO ADVANCE DIGITAL MATURITY

Project Information Requirements (PIR) identify and define information required for key decisions during project delivery. For example, what's the purpose of information being delivered, what deliverables to submit at specific milestones, and what is the format in which they are provided? The Exchange Information Requirements (EIR) define the details of information standards, methods and procedures for the development of 3D model deliverables. The PIR and EIR should be developed for different types of projects. For example, requirements for a resurfacing project will differ from those for a bridge replacement.

Level of Effort: Medium
Duration: 1-2 years
Pre-requisite: None
Co-requisite: TG3

Desired Outcomes	Focus Areas	Goals and Objectives Alignment
Level of development, standards and model element breakdown structure to align with IFC schema. Digital project execution plan template for design and construction. Guidelines for reviewing model-based designs. List of deliverables for each milestone of the project. List of projects for piloting the updated PIR. Selection of software/hardware for pilot projects. Training for project development and construction staff.	Data requirements, standards and guidelines Workflow efficiency Technology implementation Workforce development outcomes Digital delivery lead and communications	Use 2D and 3D modeling technology to develop project information models sufficiently accurate for supporting models as legal documents. Leverage existing Department portfolio technology as much as possible and explore new tools when appropriate to support specific use cases. Develop and implement new information management processes that align with Department data management goals.

Coordination Needs	Resource Needs	Funding Needs
Multiple bureaus involved in project management and development of contract plans External agencies Contractors and consultants	Subject matter experts from all areas of project development. A consultant may assist with this task.	Allocation of staff time. Consultant support to assist in developing PIR and EIR. Possible procurement of software.

TG5. EXPAND THE USE OF E-TICKETING TO INCLUDE ADDITIONAL MATERIALS AND ASSETS

Efforts to advance and institutionalize e-ticketing are currently in place. The development of a hub to integrate e-ticketing information from DocExpress is already under way. Activities to achieve this goal will include identifying uses of e-ticketing for other materials and assets, defining data requirements to update e-ticketing workflows, and identify programmatic changes needed to improve the use of e-ticketing.

Level of Effort: High
Duration: 2-3 years
Pre-requisite: None
Co-requisite: None

Desired Outcomes	Focus Areas	Goals and Objectives Alignment
A prioritized list for uses for using e-ticketing, including types of materials and assets. An information delivery manual outlining e-ticketing data requirements for each material and asset. A list of potential programmatic changes to improve the use of e-ticketing. Training for systems users.	Data requirements, standards and guidelines Data collection and storage Workflow efficiency Technology implementation Workforce development outcomes Digital delivery lead and communications	Expand data collection to manage asset inventory by capturing accurate digital models that represent as-built conditions accepted during construction. Develop and implement new information management processes that align with Department data management goals.

Coordination Needs	Resource Needs	Funding Needs
Construction and Materials Bureau Software provides Material suppliers Contractors	Subject matter experts from Construction and Materials. IT resources for development and integration tasks	Allocation of staff time. Additional IT staff or consulting services to assist in the development and integration of systems. Possible procurement of software.

Strategic Goals

This section lists goals that can be achieved within 3-7 years, depending on the level of resources available. Actual timeframes for accomplishing these goals will depend on resource allocation decisions that will occur at a later date. These are high-value activities that have pre-requisites and require a higher level of coordination, funding and resources, and/or a longer time for completion. Pre-requisites and co-requisites may include activities under the Department's DMAP.

SG1. DEVELOP STANDARDS TO INCORPORATE OR CONNECT DATA HARVESTED FROM DIGITAL DESIGN THROUGH DIGITAL AS-BUILTS INTO AUTHORITATIVE SYSTEMS.

Develop and establish standards and guidelines for establishing naming conventions, data structure and geospatial connections across DOT systems. A reconciliation of data dictionaries may be needed to complete this task. This strategic goal may require completion of certain action plans under the Department's DMAP.

Level of Effort: High
Duration: 2 years

Desired Outcomes	Focus Areas	Goals and Objectives Alignment
A list of naming conventions for specific authoritative data. A set of standards for structuring data. A set of standards and procedures for geospatial connections across DOT systems. Training for users of the standards.	Data requirements, standards and guidelines Data collection and storage Workflow efficiency Technology implementation Workforce development outcomes Digital delivery lead and communications	Use 2D and 3D modeling technology to develop project information models sufficiently accurate for supporting models as legal documents. Leverage existing Department portfolio technology as much as possible and explore new tools when appropriate to support specific use cases. Expand data collection to manage asset inventory by capturing accurate digital models that represent as-built conditions accepted during construction. Develop and implement new information management processes that align with the Department's data management goals.

Coordination Needs	Resource Needs	Funding Needs
The DMC IT staff Multiple bureaus responsible for development of data.	IT resources for development and integration tasks Data stewards Data domain trustees	Allocation of staff time. Additional IT staff or consulting services to support development and integration of systems.

SG2. REVIEW CURRENT PLAN FOR REPLACING ERMS AND MAKE UPDATES TO IMPROVE DATA SEARCHING AND REPORTING

A plan to replace the ERMS is already in place, but it may need to be updated to incorporate feedback received during stakeholder interviews for the selection and deployment of a new system. Currently, the ERMS may be searched using key parameters, but information within the documents must be reviewed and extracted by the user. This workflow while electronic, it is not

completely digital. To enable a truly digital workflow for searching and extracting data from record documents will require close collaboration between IT and the business groups. Business groups will need to define information they would like to extract from record documents. Processes and technologies in place to transfer project data after construction into ERMS result in the delivery of one flattened PDF file containing all project records into one single document. These processes and technologies will need to be evaluated and updated to enable the exchange of digital information necessary for future development to provide the desired functionality. However, this higher level of automation will enable system users to run queries and reports to extract the information, which will dramatically improve efficiencies when gathering data during the planning and pre-design phases of a project. Information will also be easier to access during the operation and maintenance phases.

Level of Effort: High
Duration: 5-6 years

Desired Outcomes	Focus Areas	Goals and Objectives Alignment
An IDM defining the specific type of data to set up searching capabilities from project records. Selection and deployment of a system that provides better tools for searching and reporting. Training for system users.	Data requirements, standards and guidelines Data collection and storage Workflow efficiency Technology implementation Workforce development outcomes Digital delivery lead and communications.	Develop and implement new information management processes that align with the Department's data management goals.

Coordination Needs	Resource Needs	Funding Needs
The DMC IT staff Multiple bureaus responsible for developing and retrieving data from the system.	IT resources for development activities Data stewards Data domain trustees	Allocation of staff time. Additional IT staff or consultant support to assist with deployment activities. Procurement of new system

SG3. IMPROVE TRANSFER OF DATA BETWEEN VARIOUS DEPARTMENT SYSTEMS

Develop automation tools to streamline processes for data sharing between various systems, such as Bid Express, ProjectWise and Masterworks Project Management System, AASHTOWare, and BrM. Stakeholders currently rely on a manual process for uploading files for many of the systems. There is a lot of opportunity to improve workflows that will result in significant efficiencies during project development by using automated tools to transfer files and extract digital information to populate various databases. The level of effort for making this happen may be high depending on the level of programming needed to create automated tools.

Level of Effort: High
Duration: 4-5 years

Desired Outcomes	Focus Areas	Goals and Objectives Alignment
Procedure for transferring data between systems. Automated tool to enable the transfer of data between systems. Training for systems users.	Data requirements, standards, and guidelines Workflow efficiency Technology implementation Workforce development outcomes Digital delivery lead and communications	Leverage existing Department portfolio technology as much as possible and explore new tools when appropriate to support specific use cases. Develop and implement new information management processes that align with the Department's data management goals.
Coordination Needs	**Resource Needs**	**Funding Needs**
Contracts and Specifications Bureau Project Management Bureau Construction and Materials Bureau Bridges and Structures Bureau Design Bureua IT Staff	Technical subject matter experts Program developers	Allocation of staff time. Additional IT staff or consultant support to assist with program development.

Plan Implementation and Evaluation

Overview

This section of the strategic plan provides recommendations for future implementation to be carried out in a subsequent effort. The Iowa DOT has applied for a federal AID Demonstration grant as a way to secure funding for carrying out activities that achieve the goals set herein. Lessons learned from other states with enterprise implementation of digital delivery were captured during strategic plan development and incorporated into recommendations for future implementation.

Considerations for Implementation

CHANGE MANAGEMENT

Adopting digital delivery is a large undertaking that requires careful planning, deliberate communication and engagement with stakeholders, and dedicated resources to manage transformational change. The Department should consider assigning a dedicated resource to serve as the technical lead or project manager overseeing implementation of the strategic plan. Assigning a dedicated project lead demonstrates commitment to the initiative. The digital delivery technical lead will need support from multiple disciplines to ensure successful implementation. Thus, it is recommended to also create a Digital Delivery Committee including technical champions that represent all bureaus and business groups at the user level. These champions will serve as subject matter experts and will ensure that all stakeholders have a voice, which ultimately supports buy-in. Lastly, the stakeholder communication and engagement plan should be reviewed and updated periodically throughout the duration of the initiative. It may be advantageous to engage strategic communication professionals to work with technical leads in developing and managing the communication and engagement plan and facilitating conversations with internal and external stakeholders. The importance of consistent and frequent communication and engagement should not be overlooked.

TECHNOLOGY ASSESSMENT

It is recommended to implement a phased approach for establishing and managing assessment and acquisition of new technology. New tools and technologies will continue to emerge to address gaps in the market and enable user success. It can be overwhelming for IT staff to assist on an ad-hoc basis. A key success factor for digital delivery is to involve IT staff early in the process and establish a partnering relationship in setting protocols for evaluating, selecting, and procuring new technology.

PILOT PROJECT INITIATIVES

Implementing pilot projects is a great way to manage and scale adoption of digital delivery. The activities under the detailed implementation plan should include the development of tools, procedures and training to be tested through a series of pilot projects each year of the initiative. Pilot projects should be conducted to test very specific use cases and increase in complexity as the initiative progresses. This iterative piloting approach will help manage the pace of change, which is needed for stakeholder buy-in.

RISK MANAGEMENT

Managing risk is a big component for transforming an organization from analog to digital workflows. The detailed implementation plan should include a risk management strategy for documenting potential risks, assessing impacts of risks, and identifying strategies for responding to each risk through the use of a risk registry. The risk registry should be reviewed on a quarterly or semi-annual basis during the initiative to update or retire risks as work is completed.

SCHEDULE

The high-level timeline provided within this plan should be expanded into a detailed schedule. A digital transformation is a complex program with milestone deliverables. Developing a critical path method (CPM) schedule will help manage, monitor and report activities to keep the project on track. However, providing flexibility within the schedule will enable adoption of evolving digital practices and allows updates to address emerging challenges and opportunities.

Tactical and Strategic Goals for Digital Delivery	Anticipated Duration of Minimal Level of Effort									
	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y10
TG1. Develop Stakeholder Communication and Engagement Plan (6 months)										
TG2. Define Organizational Information Requirements (6-12 months)										
TG3. Select Three Priority Assets and Develop a Prototype (2 years)										
TG4. Update Project and Exchange Requirements to Advance Digital Maturity										
TG5. Expand the Use of E-Ticketing to Include Additional Materials and Assets										
SG1. Develop Standards to incorporate or Connect Data Harvested from Digital Design through Digital As-Builts into Authoritative Systems										
SG2. Review Current Plan for Replacing ERMS and Make Updates to Improve Data Searching and Reporting										
SG3. Improve Transfer of Data Between Various Department Systems										

Key Success Factors

PROJECT CHAMPION AND STRONG EXECUTIVE SUPPORT

Successful implementation of enterprise-wide digital delivery will require a strong leader who will champion the initiative at the executive level. The executive champion should be a member of the executive team who provides management support and whose role is to be informed of progress. The executive champion should have the authority to delegate implementation tasks to the digital delivery team, make critical decisions, and secure funds.

COORDINATION AND COMMUNICATION

Implementing this plan will require extensive coordination with both internal staff and external stakeholders and partners. Internal activities should be coordinated closely with each business group and the DMC to ensure alignment with established business objectives and direction related to data governance and management. Externally, the Department should consider collaborating with industry, and establishing strategic partnerships with software vendors for finding solutions that meet the needs of external stakeholders like contractors, consultants, and sister agencies. Keeping momentum going requires managing the pace of change and helping people recognize progress. Proceeding too quickly can result in people feeling overwhelmed but moving too slowly can result in frustration due to a perceived lack of progress. There will be people who will be more involved in implementation of digital delivery than others. Thus, it is important to provide a way for all stakeholders to monitor progress. The Department should consider developing a Digital Delivery online platform that provides updates and reports progress to help those not directly involved understand program accomplishments and manage expectations regarding next steps and future actions.

BUSINESS PROCESS IMPROVEMENTS

Find opportunities to streamline processes for exchanging information during the project development phase. The Department should consider eliminating requirements to prepare and exchange plan sheets between disciplines during project design. Digital delivery enables designers to reallocate their time spent detailing sheets to creating a more mature design earlier in the project development process. In addition, software capabilities to automatically propagate changes with 3D design allows the designer to test alternate design scenarios to enhance constructability and optimize project design and cost. Another area of improvement is the design review and approval process. Digital delivery enables real-time collaboration using cloud-based software to view the federated model (a combined model showing the design of each discipline). Each discipline can make decisions as the design evolves, eliminating the need for re-work, and expediting turnaround time for addressing comments. Digital delivery also provides a complete representation of the design intent for construction, enabling contractors to spend less time extracting information to prepare bids. Lastly, digital delivery enables the collection of information about the installation of assets during construction by the inspector or contractor, eliminating the need for maintenance staff to be in the field after the project has been completed to collect the same information.

INNVOATION THROUGH EMPOWERMENT

Foster a safe environment for innovation by establishing a culture where staff is empowered to contribute to the implementation of digital delivery regardless of where they are at on the organizational chart. Another key component for creating a safe environment is letting people know that it is acceptable for staff and customers to speak up when things are not going well, and they have technical support when they need it most. This kind of environment sets the expectation that everyone has a part in making digital delivery successful and empowers people to opt-into pilot projects. However, it is important to note that this is a level of support that current staff would not be able to provide without staff augmentation through professional services.

Annual Metrics

Transparency of progress in any initiative can serve as a powerful foundation for accountability. The Department should consider setting metrics to assess progress and effectiveness of the Digital Delivery Initiative. Metrics should be realistic, and the data needed for reporting results should be easy to acquire. Metrics should be re-evaluated every year and adjusted as digital maturity increases. Metrics to consider, but are not limited to, include:

- Number of ancillary assets with information delivery requirements (e.g., asset features with full attribution).
- Number of new procedures or standards implemented as a result of internal collaboration.
- Number of new or updated processes resulting in workflow efficiencies.
- Number of pilot projects conducted for each use case
- Number of pilot projects by district
- Number of contractors engaged in pilot projects
- Number of consultants engaged in pilot projects
- Customer satisfaction reported in an annual survey

References

[1] IDC (2018) The State of Data Discovery and Cataloging. Accessed on July 7, 2022, from The State of Data Discovery & Cataloging.pdf (alteryx.com)