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TECHBRIEF: DIGITAL AS-BUILTING AS AN INTEGRAL PART OF DIGITAL DELIVERY—AN IOWA DOT CASE STUDY

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EXECUTIVE SUMMARY

Data is a crucial asset for the Iowa Department of Transportation (Iowa DOT), and the agency recognizes the need for a comprehensive data management strategy to facilitate a seamless exchange of information through digital as-builts (DABs) as it transitions to digital workflows. The agency's current process for creating DABs involves redlining PDFs and storing project information, and manually entering some data fields into the geographic information system (GIS). The current process is fragmented and challenged by incomplete or inaccurate georeferencing and a lack of detailed element-level asset information. Consequently, there is a disconnect in information exchange between the construction and operations phases.

Guided by its Strategic Plan for Digital Delivery (SPDD), Iowa DOT has been making steady progress to improve the accessibility of highway project data throughout the entire project lifecycle. By adopting an incremental approach, Iowa DOT is gradually transitioning away from electronic, non-digital workflows toward a more advanced digital workflow (digital delivery). The agency's overarching goal is to establish a unified source of truth that will provide every user with the information they need to make informed decisions related to each lifecycle phase of a facility or asset. The agency envisions a future state where seamless data handoffs are the norm, incorporating geospatial information and harnessing the potential of available technologies.

To achieve this vision, the agency has strategically employed a fourfold approach: (1) using three-dimensional (3D) models to develop project models that can serve as legal documents; (2) expanding data collection to enrich the digital models; (3) leveraging various existing and new technologies, including Masterworks and e-Ticketing, to support specific business functions; and (4) developing and implementing data management processes to streamline data flow and ensure effective communication among various systems.

Iowa DOT spearheaded this initiative with the implementation of DABs on two pilot projects: the I-80/I-380 Interchange Reconstruction Project and the US 30 Roadway Project in Benton County. This Technical Brief discusses Iowa DOT's overall implementation approach, the piloting of model as a legal document on two pilot projects, Iowa DOT's experience with deploying tools and technologies in conjunction with business process changes to create DABs, and the agency's future plans.

INTRODUCTION

Background

Iowa DOT uses a diverse range of data to support agency functions. This information is traditionally exchanged through paper-based documents or extracted from electronic documents. Most of the agency's workflows are electronic, and some do not qualify as fully digital, which results in workflow inefficiencies. As stated in its SPDD, Iowa DOT acknowledges data as a critical asset. The agency also recognizes the importance of implementing a data management approach and transitioning to digital workflows. Digital workflows are data-based exchanges that enable effortless transfer of information to a computer system with minimal to no manual entry. In contrast to electronic workflows, which rely on paperless, document-type exchanges that require manual extraction and entry into other systems, digital workflows facilitate seamless information sharing among Iowa DOT divisions, bureaus, and business groups to support business functions. The benefits of this transition to digital workflows are widely acknowledged.

Iowa DOT established the Strategic Data Business Plan (SDBP) to guide data management. The SDBP outlines the agency's strategic, operational, and tactical approaches for effective data management, including actionable items and their respective timeframes. The SPDD, a component of the SDBP, outlines the roadmap for advancing the use of digital data for project development, construction, maintenance, and operations. The SPDD identifies the following four strategies to ensure that asset data can be collected and applied throughout an asset's lifecycle:

- Use two-dimensional (2D) and three-dimensional (3D) modeling technology to develop project models that can be used as legal documents.
- Leverage existing technology and explore new tools to support specific uses.
- Expand data collection to manage assets by developing digital models that represent as-built conditions (DABs).
- Develop and implement data management processes aligned with data management goals.

Digital As-Builts Timeline

Since 2006, Iowa DOT has been steadily progressing toward the implementation of DABs. In 2006, the agency began its journey toward digital delivery by introducing 3D earthwork models. These models, which served mainly for informational purposes, assisted contractors in implementing automated machine guidance on a project-by-project basis.

In 2011, Iowa DOT took a significant step forward by launching its first pilot project to collect DAB records during the construction process. This effort initially focused on ancillary assets, such as culverts, signs, and traffic barriers.

In 2018, Iowa DOT replaced traditional 2D contract plans with a more advanced 3D bridge model on the I-80/I-380 Interchange Reconstruction Project. In 2021, the agency deployed 3D roadway models on the US 30 Roadway Project in Benton County, where the 3D models were introduced as the model as legal document. In 2022, Iowa DOT initiated the Enterprise Data Governance Plan and the SPDD to further advance its digital transformation and efficient data

management practices. The agency has identified six focus areas in its SPDD (Figure 1); however, it continues to advance the use of other digital technology initiatives including 3D earthwork models, e-Construction, and e-Ticketing.

Figure 1. Strategic Plan for Digital Delivery Focus Areas.

OBJECTIVES

Iowa DOT's goal for its DAB initiatives is to facilitate the extraction and use of data across the entire asset lifecycle to enhance the efficiency of project delivery and realize significant benefits for asset operation and maintenance. Iowa DOT seeks to enable a seamless exchange of data and establish a single source of truth for all stakeholders to make informed decisions related to each lifecycle phase. The agency strategically and incrementally aims to adopt a multipronged approach focusing on improved information for decisionmaking; reduced business and transportation asset risks; lowered asset lifecycle costs; and up-to-date storage, processing, and application of data. This comprehensive strategy reflects a commitment to systematic and holistic advancements in digital asset management.

This Technical Brief describes Iowa DOT's overall approach for digital delivery, its strategic workplan, current initiatives, and future plans to achieve its envisioned future state. This Technical Brief also discusses how Iowa DOT has been leveraging existing technologies and exploring new technologies to create digital models, reevaluating and refining existing business processes to enable digital workflows, and piloting Building Information Modeling (BIM)-focused models as legal documents on real-world projects. Finally, this Technical Brief documents Iowa DOT's challenges and lessons learned from its pilot projects.

IMPLEMENTATION

Traditional Workflow

The current lifecycle workflow of Iowa DOT's digital delivery process is illustrated on Figure 2. The current workflow begins with the survey phase, during which computer-aided design (CAD) files are created using OpenRoads for the subsequent design phase. The design phase generates machine-grading files and PDF plan sets for the construction phase. During construction, redline PDFs and Excel sheets are produced and entered into the Electronic Records Management System (ERMS) database. While some data fields are manually entered into the GIS, a disconnect often arises between the construction and operations phases. This disconnect leads to the loss of valuable information as PDFs are integrated into the ERMS database.

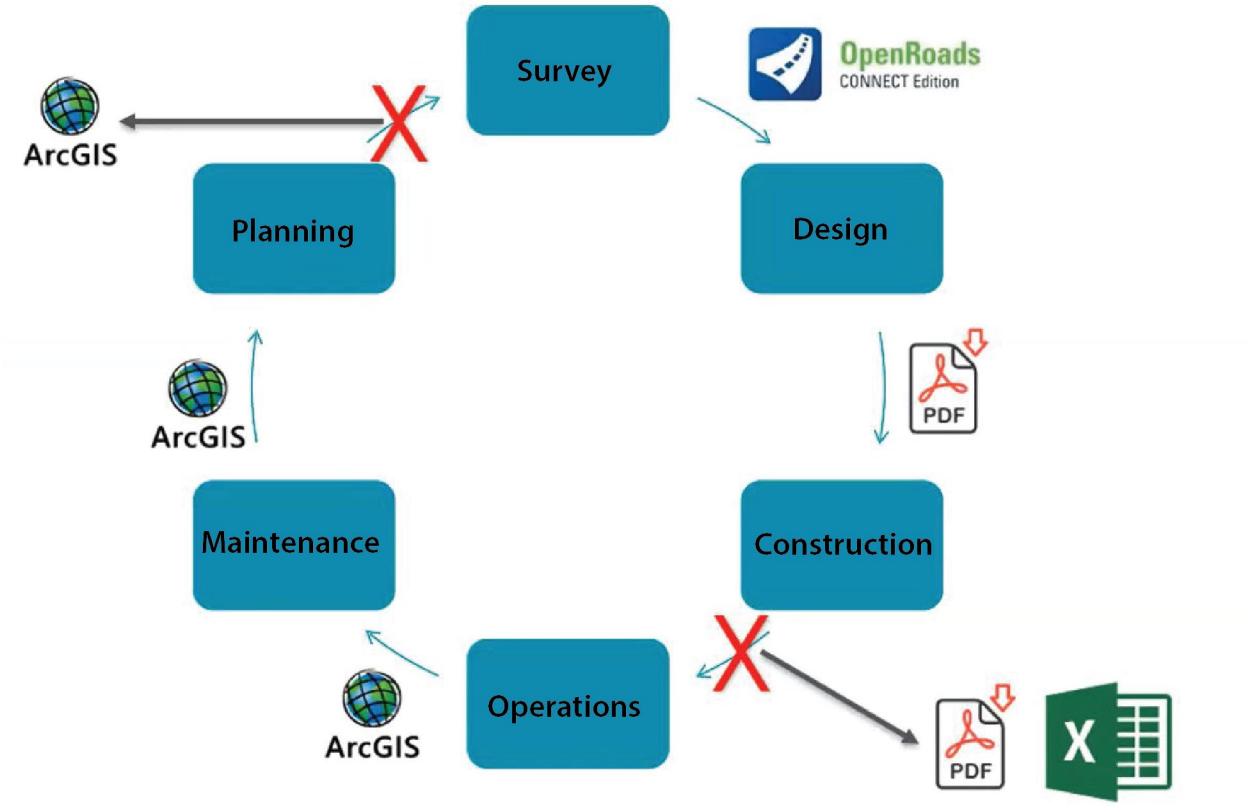

Figure 2. Current Lifecycle Digital Delivery Process (Image Credit: Iowa DOT, 2023).

Subsequently, in the operations to maintenance and maintenance to planning stages, ArcGIS is used for data management. Operations personnel face practical challenges in manually re-entering GIS information resulting in incomplete or generic data. Nevertheless, another disconnect becomes apparent in the workflow as GIS information does not seamlessly transfer from the planning phase back to the survey phase, resulting in a gap in the lifecycle.

Gaps and Needs

Iowa DOT acknowledges the inefficiencies in its current workflow arising from incomplete or inaccurate georeferencing and detailed element-level asset information. These issues often lead to costly errors and duplicative efforts in operations and maintenance. Additionally, the existing workflow fails to meet the agency's critical need for a digital product—specifically its need for efficient digital searching and analysis capabilities for specific infrastructure elements. To create a more reliable data environment, Iowa DOT has proposed integrating design information with operations through digital models, making it readily available for use in other lifecycle phases and thereby extending GIS use throughout the entire lifecycle.

Iowa DOT recognizes the need to identify process gaps to enhance data management. The agency has initiated changes in its business processes by incorporating digital tools. These changes include evaluating the role of designers, exploring alternative verification processes, considering training staff to use CAD software, employing electronic stamping tools, and implementing light detection and ranging (LiDAR) and photogrammetry equipment for as-built documentation.

Future State

Iowa DOT's overarching goal is to advance the use of digital data to establish a unified source of truth so that every user can access and use information for decisions related to each lifecycle phase of a facility or asset. The agency envisions a future state where seamless data handoffs are the norm to incorporate geospatial information and harness the potential of available technologies. To achieve this vision, the agency has strategically employed a fourfold approach: (1) using 3D models to develop project models that can serve as legal documents; (2) expanding data collection to enrich the digital models; (3) leveraging various existing and new technologies, including Masterworks and e-Ticketing, to support specific business functions; and (4) developing and implementing data management processes to streamline data flow and ensure effective communication among various systems.

Current Initiatives

Iowa DOT established a strategic working group called the Data Management Committee that is responsible for guiding the implementation of data governance. The committee works with three subcommittees (Digital Delivery, GIS, and Policy) to develop the roadmap, formulate strategies, and allocate resources for the implementation effort. The subcommittees have two working groups: the CAD and GIS working group is focused on improving data collection and management practices, and the parcel data working group is focused on process improvement within the agency, particularly utility management.

Iowa DOT also has been leveraging many digital technologies to support the business processes related to data capture, documentation, and management, including various e-Construction initiatives, e-Ticketing, export of design details to GIS maps, and drone and LiDAR mapping.

Changed Workflow

The proposed lifecycle workflow of Iowa DOT's digital delivery process is depicted on Figure 3. In comparison with the current workflow shown on Figure 2, ArcGIS would be implemented throughout the entire lifecycle workflow. The use of GIS addresses the limitations of PDFs, which are characterized by their lack of intelligence in data interactions. In contrast, GIS offers opportunities to integrate information from various digital technologies with spatial references and ensures a seamless flow of data beyond project completion for better data lifecycle management.

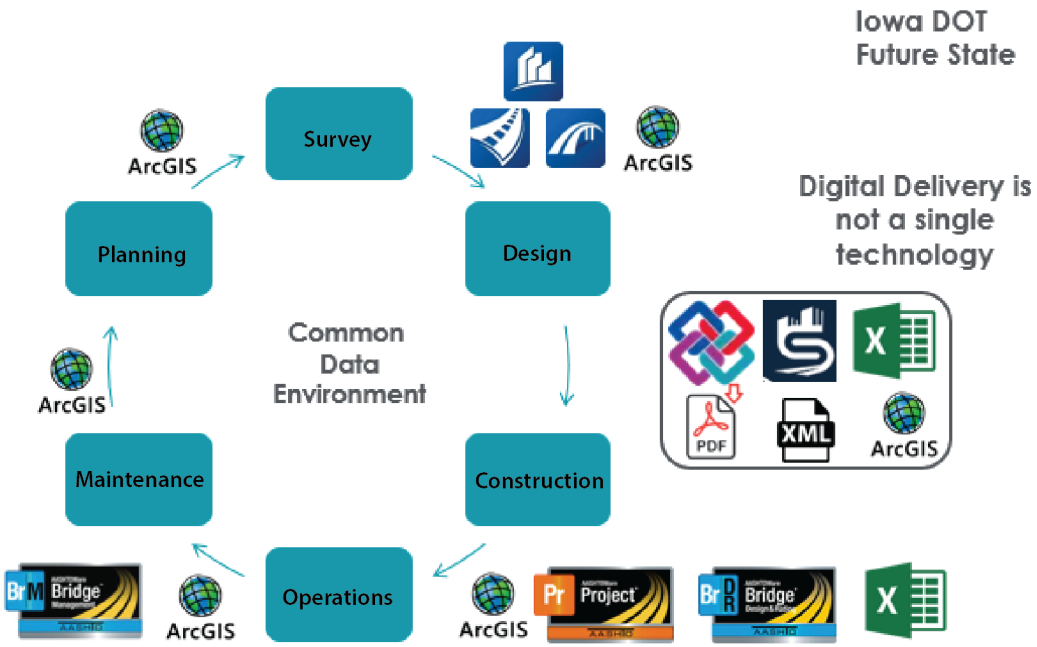

Figure 3. Proposed Lifecycle Digital Delivery Process (Image Credit: Iowa DOT, 2023).

Tools and Technologies

Iowa DOT has been leveraging a diverse range of technologies and exploring newer technologies for individual lifecycle phases and comprehensive data management. The agency consistently deploys new technologies, such as e-Ticketing and Masterworks, to support specific business functions and contribute to advancing its digital maturity. The key to the successful creation of DABs lies in seamlessly integrating these technologies and fostering effective communication between them.

A list of tools and technologies used by Iowa DOT to develop DABs is included in Table 1. The table also describes how technologies are used in the DAB process.

Table 1. Description of Tools and Technologies Used to Develop Digital As-Builts.

Category	Tools and Technologies	Use
IT Database Management	Oracle	The database that is currently used to store geospatial data.
IT Database Management	SQL Server	Store GIS data with a new data structure: transactional databases, analytic databases, and geolibrary.
IT Database Management	ArcSDE	Application server facilitates storing and managing spatial data.
Design/Survey	Bentley OpenRoads	Main design software from Bentley, including 2D and 3D design features. Excel and PDF links for as-built information can be accessed.
Design/Survey	Topcon	Tool commonly used in land surveying, supports integration with CAD and GIS software.
Design/Survey	OpenBridge Modeler	Main software for design and modeling.
Design/Survey	ProStructures	Bentley module can visually present small elements, such as rebar.
Design/Survey	SYNCHRO	3D model inspection software currently using or testing. Connected to ProjectWise. Operating in field on iPad. View element attributes.
Design/Survey	BIMvision	A software that enables users to visualize and collaborate on BIM. Quantities can be calculated for Industry Foundation Classes (IFC) structure.
Design/Survey	vGIS	Software to be tested. Dimensions can be visualized. Mix scanned area with design area and upload to GIS portal.
Design/Survey	OnStation	Software to be tested. Linear reference system, stations/offsets can be located. Photos can be taken. Information can be uploaded to the Esri portal.
Project Management	Masterworks	The enterprise cloud software to streamline the process for all highway, right-of-way, and capital construction projects.
Construction	e-Ticketing Technologies (HaulHub)	Software to enter and collect real-time data of ticket information. It can use the data to automate forms.

Category	Tools and Technologies	Use
Construction	Document Management Technologies (ProjectWise, DocExpress)	Organized creation, storage, retrieval, and sharing of project-related documents, including blueprints, contracts, permits, and reports to ensure efficient collaboration, compliance, and project progress tracking.
Construction	Redlining PDFs (Bluebeam Revu, PDF Expert)	PDFs with information drawn in red to reflect the information to be updated from approved document.
Construction	AASHTOWare Project	An application to support project management, asset management, and material testing for highway and transportation management. The application is also used to prepare bids.
Operations	GIS/FieldMaps	A software used to document crash inspections and capture cost data for repair tied to an asset.
Operations	Portals/Dashboards	A web interface that provides relevant information, data, and applications to visualize and interact with data.
Operations	Workday	A cloud-based enterprise software platform to streamline business processes and enhance organizational efficiency.
GIS	Esri ArcGIS Server	A GIS platform that is used for searching and finding information (PDFs) scanned documents in selected area.
GIS	FME	A comprehensive platform used for data integration, transformation, and translation. Custom workflows can be created to manipulate and process data to meet specific requirements. It is used as a quality assurance and quality control tool.
Asset Management/ Dashboarding	Deighton	A performance management and budgeting software, helps the business allocate resources and make data-driven decisions efficiently.
Asset Management/ Dashboarding	Roads and Highways	Specialized transportation asset management system (an extension of ArcGIS platform) to manage and maintain road infrastructure, monitor assets, and plan maintenance and construction activities for roads and highways.
Asset Management/ Dashboarding	SAP	Enterprise Resource Planning system enables businesses to streamline their operations, manage data, and facilitate decisionmaking by providing a unified platform.
Asset Management/ Dashboarding	AASHTOWare BrM	An application to support project management, asset management, and material testing for highway and transportation management. The application is also used to prepare bids.

Category	Tools and Technologies	Use
Asset Management/ Dashboarding	PowerBI	Interactive data visualization software allows users to transform raw data into insightful visual reports and dashboards.

PILOT PROJECTS

Iowa DOT undertook two pilot projects to showcase the implementation of DAB projects to promote a broader understanding among contractors of the advantages of employing 3D models directly at construction sites. The first pilot project, the I-80/I-380 Interchange Reconstruction Project, used 3D BIM models as the deliverable for constructing the ramp bridges. The second pilot project, the US 30 Roadway Project in Benton County, employed digital models as part of its project delivery.

Iowa DOT's primary objective for the two pilot projects was to develop a comprehensive BIM model that thoroughly examined the risks and opportunities within the bridge group. Both pilot projects departed from the conventional approach of using plans for contractor submittals, opting instead to submit and use models as legal documents. Actively using the BIM model at the construction site allowed Iowa DOT and its contractors to perform real-time updates to capture essential information, including both design modifications and non-model-based data. Iowa DOT retained a consultant with sufficient expertise to make changes to the 3D BIM model to add in the as-built additional asset attributes ascertained during the construction process. Given that changes to the bridge design model require approval from the Engineer of Record, this process provided the necessary policy compliance and removed the burden from the contractor to understand the design tools. Consequently, comprehensive database housing design details and asset-related information were established and consistently maintained post construction to serve as a valuable resource for future endeavors.

Furthermore, the pilot projects assessed the feasibility and benefits of incorporating many technology-based solutions within the context of digital delivery initiatives and laid the foundation for achieving the objectives outlined in Iowa DOT's SPDD Roadmap.

I-80/I-380 Interchange Reconstruction Project

The I-80/I-380 Interchange Reconstruction Project in Johnson County began in 2017 and was completed in late 2020. This reconstruction project entailed the design and construction of three bridges: Ramp B Bridge, Ramp BH Bridge, and Ramp H Bridge. The project adopted a hybrid approach in collaboration with the local associated general contractors. A 3D BIM model was developed and delivered as a legal document for the Ramp B Bridge, (a three-span steel plate girder bridge). A combination of BIM model information and 2D plans were provided for the Ramp BH Bridge and Ramp H Bridge. The BIM model for these bridges was provided for informational purposes only and was not a part of the model as legal deliverable pilot.

The digital model that was developed serves as a supplementary component to the bridge design contract and aligns with Iowa DOT's initiative to test and extend the capabilities of Bentley's BIM software. The 3D BIM model for the Ramp B Bridge was digitally sealed using a special provision. Throughout the project's duration, the project design team used Bentley Software,

including OpenBridge Modeler, ProStructures, and Navigator Connects. OpenBridge Modeler was used to define the primary elements of the bridge model, including the bridge deck, girders, and substructure elements. ProStructures was then employed to incorporate granular details into the model, while Navigator Connect served as the visualization tool.

To ensure accessibility for contractors in the field, the project design team initially attempted to employ a free software tool to view the design model. However, due to the limitations of the free model viewer, the contractor ended up purchasing Bentley View software. Bentley View software promoted contractor engagement and effectively reduced associated risks throughout the project's construction phase. Furthermore, there was active coordination with contractors to maximize the utility of these models during the construction phase to gain insights into the advantages and challenges associated with contractor engagement in BIM use.

One notable benefit of using digital submittals and the BIM model was the ability to continuously update BIM models during construction. These updates encompassed vital information such as pier elevations, disc bearings, and anchor bolts. Moreover, non-model-based data, including shop drawings, requests for information, photos, and material certifications, were integrated into the model. SYNCHRO, a collaborative digital construction solution for real-time project data, modeling, and performance analyses, was actively tested on this project. However, the standardization of the non-proprietary IFC format is still pending, and the conversion process may lead to potential data loss.

Iowa DOT used OpenRoads Designer to create DABs. The 3D models within OpenRoads Designer incorporate elements with underlying intelligent information and feature links to PDF and Excel summaries. Each as-built Excel worksheet includes embedded PDF documents, accessible through Excel cell links. These PDF documents contain links that direct users to various files, such as material certifications, boring logs, submittals, requests for information, construction photos, special provisions, developmental information, soil profiles, profile sheets, and other pertinent as-built details. Nevertheless, securing the appropriate technology for the pilot projects presents a challenge in the context of DABs. Discrepancies have become more pronounced when the model has been exported to different applications. Consequently, the exploration and procurement of diverse technologies might prove challenging, particularly when the design project is under a tight timeframe.

US 30 Roadway Project in Benton City

The US 30 Roadway Project in Benton County began in 2021. This project, a proposed four-lane expansion of 7 miles of concrete paving in Benton County, includes two bridges, boxed culverts, and stream mitigation. Iowa DOT employed a combination of traditional plans and digital modeling, and conducted photo scanning of the as-built construction model for the project.

Although a digital model was provided, the contractor expressed the need for plan and profile sheets. However, contractors generated cross sections themselves using SYNCHRO during construction. Consequently, this model as legal document pilot project only provided the final model, plans, and profile sheets in PDF for contractors.

Key lessons learned from this pilot project include recognizing the importance of initiating early conversations with stakeholders and collaborating closely with software vendors. While it was evident that construction staff recognized the value of digital models in certain aspects, field inspectors encountered challenges in effectively navigating the tools.

CHALLENGES

Iowa DOT experienced several challenges related to data collection and management, use of tools and technologies, and technology adoption. Notable points are as follows:

- Digital tools were generally effective; however, because no single comprehensive suite of software applications was available to support the DAB process, field users experienced several challenges:
    - Certain tools are designed for specific purposes, necessitating the use of multiple tools. For instance, OpenBridge Modeler was used to generate digital models with a low level of design detail granularity. ProStructures was then used to augment these models with additional data, such as rebar details.
    - Field inspectors potentially faced accessibility and integration problems due to software compatibility issues.
    - Handling multiple tools in the field for information retrieval was a challenge.
    - Sharing detailed models with contractors and field inspectors was challenging due to licensing and software capabilities[1].
- Technology Adoption Challenge: Inconsistent adoption of technology into the GIS platform across different disciplines in the agency, with a 50 to 60 percent adoption rate, contributed to disparities in workflow efficiencies and data management practices.
- Challenges in Achieving Process Standardization: It was difficult to achieve uniform design details across all districts for effective 3D model introduction, including georeferencing in CAD files.
- Need for Standardized Protocols and Guidelines: The development of standardized digital delivery protocols was time consuming because it represented a significant shift from the current system.
- Personnel-related Challenges: The lack of a dedicated team, resource limitations, and insufficient CAD training among staff hindered digital delivery adoption.
- Missing Georeference Data Despite CAD Standards: Challenges in asset management data persisted because CAD files lacked georeferencing. Despite rigorous standards for

[1] The software capabilities stated particularly referring to TPF-5(372): Building Information Modeling (BIM) for Bridges and Structure. The goal of the BIM for Bridges and Structures pooled fund is to establish an open-source, non-proprietary data format, specifically IFC 4.3, to enhance interoperability in alignment with AR-19.

CAD files, design files often lacked georeferencing and required manual digitization, which increased the risk of errors.

- Lack of Data Governance Plan: The absence of a formalized data governance plan exacerbated these challenges, hindering seamless integration into the system. The agency plans to check design files for georeferencing and make this a standard process. Iowa DOT has a complete asset data repository for digital integration, but this also poses challenges.
    - 2D and 3D GIS data: Assessing if future GIS databases can handle CAD survey, 3D survey, 2D GIS, and 3D data together without data loss during transfer.
    - Survey data: Handling large unstructured files such as Demographic Transition Model surfaces, LiDAR point clouds was difficult; and merging them with other data formats was complex.
    - Legacy data: Converting LandXML format for alignments at Iowa DOT and DXF file format for 3D line strings to an open or usable format was challenging.
    - IFC or open data future: IFC is still under development. Iowa DOT identified a need for information exchange requirements for asset classes, which was addressed by project mapping.
- Training and Development: Significant investments are needed in training and development, especially for non-CAD users.
- Communication and Feedback: Clear channels and robust mechanisms are vital to address challenges effectively.
- Continuous Efforts: Coordinated efforts with a focus on training are key for successful digital adoption and improved collaboration.

To address these issues, Iowa DOT is actively standardizing data collection, particularly in construction, and improving georeferencing in CAD files. The agency has created a new digital delivery subcommittee to guide these improvements. Furthermore, Iowa DOT has been investigating emerging technologies, including vGIS and OnStation, to support its DAB processes. The agency also is reassessing its workflow and data governance policies to establish data repositories and data management procedures to effectively collect, store, and integrate data. The integration of GIS maps and e-Ticketing information on platforms like OnStation allows users to efficiently locate project-related plans and correlate data from various sources. This enhances collaboration by sharing information through an enterprise GIS portal. Additionally, Iowa DOT is exploring vGIS, an augmented reality platform that enables field users to visualize 3D models on mobile devices, providing a detailed view of project features on a map.

LESSONS LEARNED

Effective engagement with stakeholders, the construction team, and a software vendor is always pivotal for the successful implementation of DABs.

In the context of Iowa DOT's I-80/I-380 Interchange Reconstruction Project, a notable advantage is the ability to repeatedly access the model for visualization purposes. This capability enables the swift retrieval of onsite information directly from the model, bypassing the need to involve designers when the information is not readily available on 2D plans. The dynamic nature of the model, which is updated during the construction phase, further enhances its utility.

Nonetheless, the two pilot projects highlighted the challenges in leveraging existing tools and technologies for DABs (e.g., licensing, software incompatibilities, and limited capabilities) and the emerging applications of newer tools for visualization, mapping, and integration purposes. Collaborating with a software vendor could alleviate the challenges associated with software adoption.

Contractors were generally receptive to embracing new technologies; however, they found it challenging to handle several tools for information access and their lack of proficiency with CAD software was a contributing factor. Consequently, the technology adoption rate has been uneven across Iowa DOT. Contractors require comprehensive training to adapt themselves to this new routine. Integrating the construction data with the GIS data also posed challenges. The issues including fragmented processes; inconsistencies in entering georeferencing data in design files; and poor quality of field data collected by field inspectors emphasized the importance of developing data standards, implementing data governance, and training.

Strategic planning plays a critical role in facilitating the transition from electronic to digital workflows. While strategic plans have guided Iowa DOT's steady and significant progress to date, the agency could benefit from establishing a dedicated digital delivery team and enterprise project lead, adequate staffing resources, and effective change management measures, such as training.

FUTURE PLANS

Iowa DOT has been diligently addressing the six key focus areas outlined in its SPDD. Notably, the agency intends to incorporate a seventh focus area that addresses asset management needs into the next iteration of the Iowa DOT roadmap.

Currently, Iowa DOT lacks a centralized enterprise asset management system and it relies on data integrated into a GIS system linked to its road networks. However, this approach is often hindered by inadequate process streamlining and persistent data gaps. Iowa DOT acknowledges these limitations and is actively seeking process improvements by systematically identifying key questions and potential areas for enhancement.

Iowa DOT has made significant progress by adopting an incremental approach. For example, the agency has prioritized specific focus assets, such as underground utilities and signage. The agency is consolidating data from various sources, including bid items from Masterworks, repair costs, inspection details, and historical imagery into the GIS portal to establish a unified information source. This work will enhance information access and streamline data management.

Iowa DOT has been leveraging developmental specifications to improve the delivery process. The agency has been focusing on institutionalizing quality assurance for design to ensure georeferencing in design files. Furthermore, the agency is working to enhance the CAD system

with new tools that allow element data to be added to models by recognizing the constraints associated with adding detailed information in modeling tools.

Iowa DOT intends to implement a pilot project that uses a 3D model as a digital deliverable for an upcoming bridge construction project. The project aims to integrate augmented reality technology into the 3D model, leveraging it solely for informational purposes. This initiative involves gathering requirements for the assets to be collected primarily through photo scanning techniques to generate as-built construction models.

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