Michigan Department of Transportation
RESEARCH Administration

RESEARCH SPOTLIGHT

Project Information

REPORT NAME: Construction Digital Delivery Technology Scan

START DATE: December 2022

REPORT DATE: June 2024

RESEARCH REPORT NUMBER: SPR-1735

PROJECT COST: $195,114

COST SHARING: 20% MDOT, 80% FHWA through the SPR, Part II, Program

MDOT Project Manager

Glenda Bowerman

Survey Construction Specialist Design

BowermanG@Michigan.gov

517-230-8000

RESEARCH ADVISORY PANEL MEMBERS:

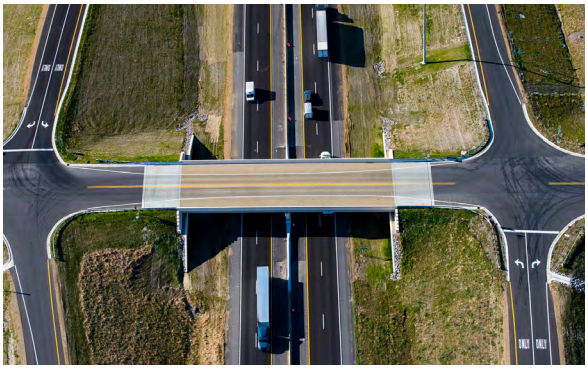
Luke Arnold, Karl Berg, Andrew Block, David Brunsting, Brent Johnson, Dean Kanitz, Jason Knauff, Brandon Lambrix, Richard McGowan, Mike Stoltz, and Brad Swanson.

Enhancing MDOT's digital vision to support construction processes

Digital technologies can enhance operations at the Michigan Department of Transportation (MDOT) by improving efficiencies and worker safety, increasing collaboration and optimizing resources. An evaluation of MDOT's construction processes from multiple staff perspectives identified the department's needs and challenges concerning digital delivery processes and technologies. New recommendations focus on ensuring the agency is equipped to manage the evolution of both technology and the workforce to optimize its vision for a digital future.

PROBLEM

Transportation agencies have increasing access to a multitude of digital tools for transportation asset management. Technological evolution and societal shifts are driving a growth of options for digital delivery, using digital technologies to streamline and enhance the planning, design, construction, and maintenance of transportation infrastructure projects.



MDOT's digital delivery efforts for infrastructure construction and management rely on having the right tools and equipment and ensuring the agency's workforce and culture evolve alongside the technology.

Since 2016, MDOT's Digital Delivery Workgroup has evaluated and advanced various digital delivery practices. MDOT research projects have analyzed specific digital tools, such as SPR-1680, which explored using 3-D models to streamline project delivery and communicate design intent for highway construction. Digital delivery, however, also has the potential to support MDOT in workflows and daily operations, from planning to maintenance.

MDOT wanted to understand how to best incorporate digital technologies into agency function and culture to equip field staff with digital data capabilities that were tailored to their specific roles and would eliminate redundancies, improve overall efficiencies and foster collaboration.

(continued)

"MDOT continually seeks ways to leverage new technologies to simplify our daily tasks and optimize our existing tools. In addition to having the right equipment, we need to focus on how our people and processes evolve with the technology."

Glenda Bowerman
Project Manager

RESEARCH

The research team explored how organizations from both the public and private sectors optimize the use of digital tools, such as technologies for remote inspections, robotics to maintain roadways, digital platforms for building construction, and connectivity to expand data access. Five other state transportation agencies provided examples of practices and approaches to technology adoption and indicated satisfaction with various tools and equipment for remote inspections; material certification and acceptance; virtual collaboration; data visualization, exchanges and collection; and other tasks. The agencies also shared experiences with mechanisms to fund technology integration.

A series of discussions, virtual whiteboard sessions and workshops with MDOT staff provided perspectives and organizational needs regarding digital tools. Input from a range of agency personnel – from project managers to field inspectors, construction engineers and support staff – fueled the inquiry into how digital solutions could address critical gaps and challenges within agency operations.

Field demonstrations of various digital technologies provided MDOT staff with hands-on experience in project management and collaboration platforms, surveying and mapping, and construction-grade digital twins (or virtual representations) to provide common data environments.

RESULTS

While researchers initially set out to identify digital tools and technologies that would be most helpful to MDOT in managing transportation infrastructure, they learned that successful digital delivery at the agency requires a focus on people and processes.

With the workforce rapidly changing and a high number of the MDOT workforce eligible to retire within the next five years, project results suggested the evolution should be guided by a change management strategy. According to the final report, that strategy would involve "the implementation of processes to review, evaluate and coordinate changes to products, applications and systems, with a strategy aimed at minimizing user impact, reducing errors, and overcoming institutional and cultural barriers to encourage staff acceptance of progress."

In addition to covering issues such as leadership, staff training and knowledge management, this strategy could highlight the importance of communication across the agency. While MDOT currently possesses various digital capabilities, many agency staff members may be unaware of the tools and the support they could provide.

Other recommendations suggested a robust technology evaluation process with regular demonstrations and peer exchanges, for example, given the rapid changes in digital tools and capabilities available. Additionally, leveraging and optimizing existing tools and technologies could help refine current processes and eliminate redundancies.

Study findings indicated some seemingly simple solutions, such as eliminating the use of USB drives and email for sharing data in favor of cloud-based storage to increase accessibility and encourage collaboration. This transition would be significant, however, requiring staff training, updated and standardized data collection equipment, and other measures. Finally, expanding network access in the field would eliminate another identified barrier to using updated and existing tools.

IMPLEMENTATION

Project results will support MDOT's continuing efforts to enhance the vision for its digital future, focusing on change management strategies and communicating digital capabilities across the agency. Enhancing the workflow from design through construction remains a priority, and restructuring funding processes can help ensure all programs have access to needed equipment. Enhanced data management throughout a project's life cycle can improve efficiency, reduce costs and enhance collaboration, ultimately improving the quality and sustainability of Michigan's infrastructure.

Research Administration

Principal Investigator

Mona Ketterl
Founder and Owner
CRAFT
16176 Marguerite St.
Beverly Hills, MI 48025
mona.ketterl@cocraft.org
313-702-1982

Contact Us

PHONE: 517-281-4004
E-MAIL: MDOT-Research@Michigan.gov
WEBSITE: Michigan.gov/MDOTResearch

The final report is available online at MDOTjboss.state.mi.us/TSSD/tssdResearchAdminDetails.htm?keyword=SPR-1735.

Research Spotlight produced by
CTC & Associates LLC, December 2024.