IOWA DOT
TRANSPORTATION SYSTEMS MANAGEMENT & OPERATIONS PLAN UPDATE

What's TSMO?

Transportation Systems Management and Operations (TSMO) comprises integrated strategies to optimize the performance of existing infrastructure through the implementation of multimodal and intermodal, cross-jurisdictional systems, services, and projects designed to preserve capacity and improve security, safety, and reliability of the transportation system.

Benefits of TSMO

- Safer roads
- Efficient and reliable trips
- Cost-effective
- Quick turnaround

TSMO at Iowa DOT

Iowa DOT had informally used TSMO principles for years, and in 2016, the first formalized Statewide TSMO Plan was implemented. Iowa's TSMO Plan is updated every 5 years to ensure that its components evolve with Iowa's ever-changing transportation system.

The 2022 TSMO Plan Update will continue to address congestion and safety to make lives better through transportation.

Iowa DOT's core values are Safety First, People Matter, Customer Focused, Servant Leadership, and Integrity without Exception. These values, along with Iowa DOT's Core Focus, are interwoven into the 2021 TSMO Plan Update to create a successful path forward.

Iowa DOT's 2021 Business Plan outlines five priority goals that are helping guide Iowa's TSMO activities. A set of TSMO Program Projects, Services, and Activities is included in the 2021 TSMO Plan Update, and they correlate each TSMO action item with relevant goals from the Business Plan. They also outline key players, resources, and critical steps to complete the action successfully.

Iowa DOT's Priority Goals

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

Source: 2021 to 2025 Iowa DOT Business Plan

Business Case

Movement of Goods

The highway network is the backbone of our economy, allowing Iowa motorists to travel **33.5 billion miles annually** (compared to U.S. motorists traveling 3.225 trillion miles annually[1]) and moving a significant portion of the **$357.4 billion worth of commodities** shipped to and from the state each year.[2]

Travel Growth Outpacing Population Growth

From 2000 to 2018, vehicle travel on Iowa's roads increased by **14%**. The state's population increased by **8%** from 2000 to 2019.[1]

Freight Traffic Growth

Iowa is a major agricultural producer and approximately 80% of goods rely on trucking to get to market. From 2012 to 2040, truck tonnage is projected to grow by **32.4%** from **819 million tons** to **1,084 million tons.**[3]

Jobs

Approximately **759,000 full-time jobs** (out of 1.5 million total jobs in Iowa) in key industries like tourism, retail sales, agriculture, and manufacturing are completely dependent on the state's transportation network.[1]

Delay Costs

Annual congestion costs for Iowa's two largest cities, Des Moines and Cedar Rapids, alone account for **$250 million** due to lost time and wasted fuel.[4]

Road Condition Costs

A total of **23%** of Iowa's major roads are in poor or mediocre condition. Driving on deteriorated roads costs Iowa motorists **$759 million per year** – **$336 per motorist** – in the form of additional repairs, accelerated vehicle depreciation, and increased fuel consumption and tire wear.[1] TSMO strategies can help enforcement minimize impacts to our roads due to overweight vehicles.

Safety Costs

From 2016 through 2020, **1,726 people died** on Iowa's highways, an average of **345 annual fatalities**. Fatal and serious motor vehicle crashes in which the lack of adequate roadway safety features was likely a contributing factor cost Iowa motorists **$463 million per year** in medical costs, lost productivity, travel delays, workplace costs, insurance costs and legal costs. 190,270 people died on U.S. highways, an average of 38,054 annual fatalities. Traffic crash deaths cost U.S. travelers $55 billion in medical and work loss costs. **512 secondary crashes** occurred in Iowa in 2020; for every minute that a lane is blocked, the likelihood of a secondary crash increases by **2.8%**.[5] TSMO strategies can assist in improving the safety of our transportation network, whether it's working closely with emergency responders to remove crashes quickly or using sensing technologies to let motorists know when it's safe to cross a high speed rural expressway.

Time Matters

72% of congestion and delay experienced by the traveling public in Iowa is non-recurring; it is caused by bad weather, traffic incidents, work zones, special events, and similar events.[6] In 2020, the average clearance time for incidents was **33 minutes** in urban areas and **50 minutes** in rural areas.[7] Through strategic, data driven use of TSMO strategies, Iowa has become a national leader on its approach to managing traffic through highway work zones. Iowa's continued investment in driving down its clearance times and proactive management of highway work zones will help keeping Iowa moving safely.

[1] https://iowadot.gov/maps/msp/vmt/30yearvmt.pdf
[2] https://tripnet.org/wp-content/uploads/2020/04/TRIP_Fact_Sheet_IA.pdf
[3] https://iowadot.gov/iowainmotion/files/Iowa-State-Freight-Plan-Update-2018.pdf
[4] https://www.bts.gov/content/annual-highway-congestion-cost
[5] https://www.cdc.gov/transportationsafety/statecosts/index.html
[6] 2016 TSMO Plan
[7] CTRE Reactor

Organizational Structure

Several groups have been identified that play an integral role in the success of TSMO in Iowa. These groups assist with operations, research, policy, technology, and a multitude of other components that help advance TSMO throughout Iowa.

- Systems Operations Division (All Bureaus)

- Other Areas within Iowa DOT

- Internal TSMO-Oriented Groups

- External TSMO-Oriented Groups

- Other External Partners

Examples of TSMO-Related Groups

- Systems Planning Bureau
- Transportation Districts
- TSMO Steering Committee
- Statewide TIM Committee
- Universities
- Iowa Department of Public Safety

Performance Management

The following four items are the current priorities for TSMO measure improvement.

1. **Crashes**
   - Automate the Traffic and Criminal Software (TraCS) updates to daily
   - Track severe crashes daily and pinpoint root causes
2. **Non-Recurring Delay**
   - Leverage and adapt the daily process already in place with InTrans for the Location and Environment Bureau
   - Work on this area should coordinate with the design of the Resiliency Index
3. **Roadway Clearance Time**
   - This is a top priority TIM measure, and further work is needed for consistency and data quality
   - The TraCS updates should be increased to daily frequency via MVD and TAS to DOT's data warehouse, etc.
4. **Winter Operations Time-to-Normal**
   - Enable flow of data to a data warehouse and increase frequency to weekly (or daily rolling 7-day windows)
   - Explore development of a normalization process leveraging the existing severity index
   - Include performance items on DOT's web dashboard

TSMO Reporting

As measures improve and new ones are implemented, attention should turn to improved reporting and visually communicating performance. Here are examples and targeted recommendations:

- **Annual** – Fiscal Year Performance Plan, the TMC Annual Report, Operations Year in Review, and other required reporting

- **Quarterly or Monthly** – more frequent than annual, these intermediate reports are helpful for long term tracking of measures and trends

- **Operations Management** – TSMO reporting includes many metrics that aren't performance measures but are important for management, operations, and maintenance; common categories include activities (e.g., Highway Helper responses), milestones (e.g., project completion), tallies (e.g., number of cameras), outputs (e.g., DMS activations), or external data (e.g., snowfall).

ICE-Ops

The Infrastructure Condition Evaluation-Operations (ICE-Ops) tool is a system screening tool that quantifies the relative risk to the safe and reliable operation of the primary highway system. The purpose of this tool is to determine which roadways should be considered priorities for operations enhancements. The scoring that ICE-Ops generates is out of 100; the higher the score, the fewer operational changes are needed.
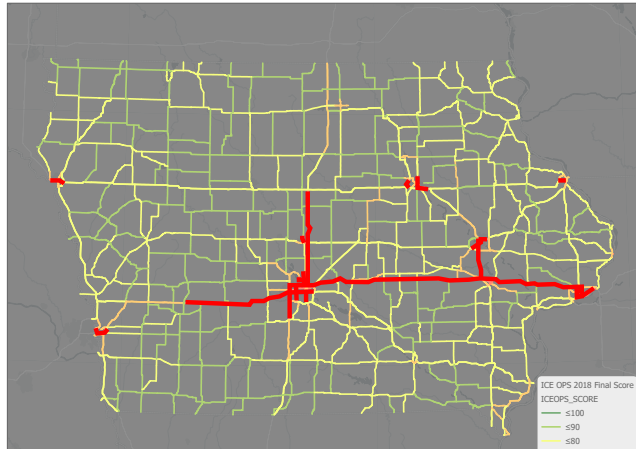
ICE-Ops compiles the data that it processes and aggregates it into a score up to 100, as seen above.
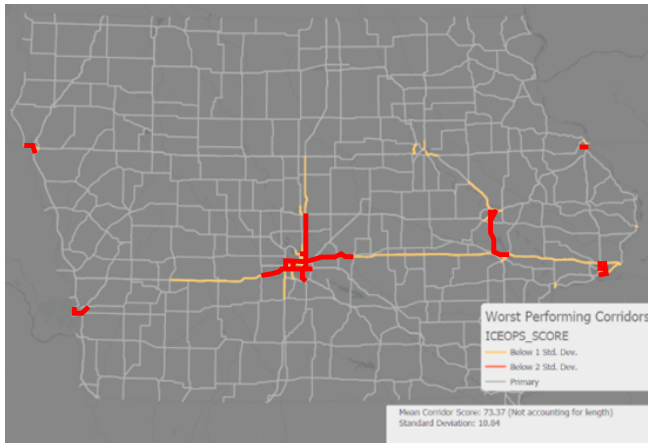

These "worst performing corridors" are ones that should be prioritized for operations and/or TSMO improvements. The 20 worst performing corridors are listed in the table to the right in descending order from areas of the highest concern to the least concern; the average score of the 20 lowest performing corridors is 43.87.

The top 20 corridors for operational enhancements, in descending order from areas of the highest concern to the least concern, are as follows:

Route	Segment	ICE-Ops Score
I-235	Iowa 28 to US 69	35.60
I-80	Nebraska Border to I-29	38.60
I-480	Nebraska Border to I-29	40.60
I-235	W. Mixmaster to Iowa 28	41.35
I-80	Iowa 415 to E. Mixmaster	41.57
I-74	Illinois Border to I-80	41.88
I-80	W. Mixmaster to US 6	42.38
US 77	Nebraska border to I-29	43.28
I-80	Iowa 28 to Iowa 415	43.36
I-80	US 6 to Iowa 141	43.69
I-235	US 69 to E. Mixmaster	44.14
I-29	US 20/I-129 to South Dakota Border	44.39
I-29	I-80 to I-480/US 6	44.55
I-80	US 141 to Iowa 28	44.58
I-35	Iowa 160 to US 30	46.21
I-80	I-380 to Iowa 1	46.82
US 20	Iowa 32 to US 52/US 61	47.92
I-35	I-80/I-235 to Iowa 160	48.48
I-380	I-80 to US 30	48.54
IA 922	I-380 to Iowa 100	49.37

Advancing TSMO at Iowa
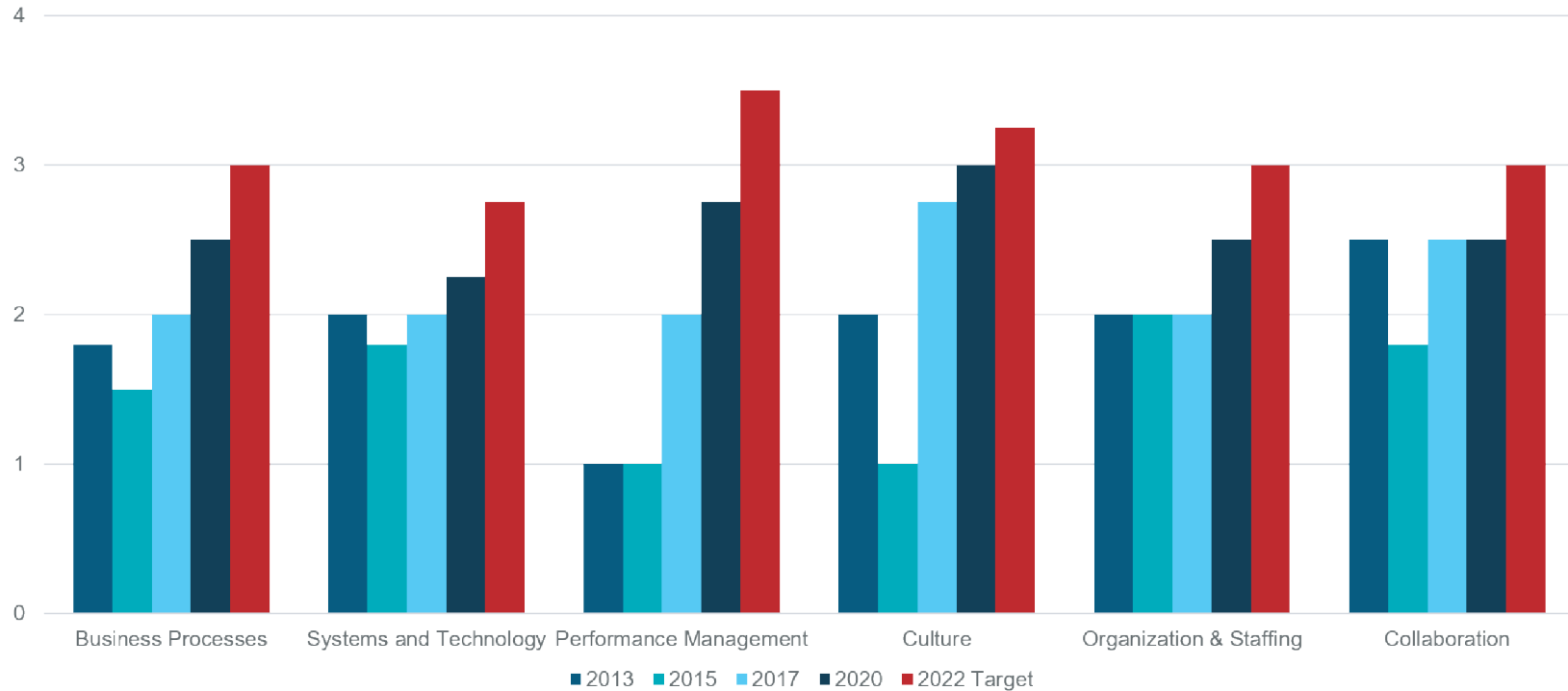
Over the last several years, there have been periodic times when the maturity of TSMO at Iowa DOT was measured, or assessed based on national guidance. The last scoring event occurred in early 2020 and was completed by the TSMO Steering Committee. The figure above shows the results of historical scoring and the 2022 targets established by the TSMO Steering Committee. Scoring is on a scale from 1 to 4, with 1 being informal, ad hoc activities and 4 being formal, established activities.
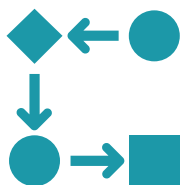
The original TSMO Plan established a goal to score a 3 across all dimensions in its first five years. While not all dimensions reached a score of 3, there has been significant progress since the original TSMO Plan was published in 2016.

Projects, Services, & Activities

In 2020, the TSMO Steering Committee scored the maturity of TSMO at Iowa DOT by CMM category using the following scale:

- **Level 1** - Activities and relationships largely ad hoc, informal, and champion-driven, substantially outside the mainstream of other Iowa DOT activities.

- **Level 2** - Basic strategy applications understood; key processes support requirements identified and key technology and core capacities under development but limited internal accountability and uneven alignment with external partners.

- **Level 3** - Standardized strategy applications implemented in priority contexts and managed for performance; technical and business processes developed, documented, and integrated into DOT; partnerships aligned.

- **Level 4** - Full, sustainable core DOT program priority, established based on continuous improvement with top level management status and formal partnerships.

Recommendations for advancing in each dimension are summarized below.

6 Dimensions of TSMO Capability Maturity Model (CMM)

1. Collaboration
2. Culture
3. Systems & Technology
4. Performance Measurement
5. Business Processes
6. Organization & Staffing

Collaboration

The effectiveness of TSMO activities depends on the ability of divisions, bureaus, districts, partner agencies, and other stakeholders to work together. Taking advantage of opportunities to build internal and external relationships will help with communication and overcoming challenges in the future.

Integrate TSMO into Multi-Disciplinary Safety Team (MDST) Meetings

Enhance Multi-Disciplinary/Multiagency TSMO Training and Capacity Building

Integrate TSMO into MPO & RPA Plans

Enhance Joint Traffic Ops Performance Agreements

Enhance TSMO Communication with Local Orgs

Establish TSMO Policy Stakeholder Group with External Partners

Develop and Maintain Open Contracts Clearinghouse

Culture

Represents the values and beliefs that lead to certain decisions being made. Through a business case or outreach opportunities, TSMO messaging can be communicated to others inside and outside of the agency to gain support.

Add Access Management to TSMO Processes

Add Maintenance Operations to TSMO Processes

Share TSMO & ITS Benefits Within/Beyond Iowa DOT

Integrate TSMO into Existing Conferences & Meetings in Iowa

Systems & Technology

Appropriate planning, construction, operations, and maintenance of systems and technology ensures operational needs of an agency are met. By developing standard protocols and an iterative data management process, transportation solutions can be effective in enhancing mobility.

Improve Traveler Info for Transit & Ride Share

Improve Connectivity/Interoperability between State & Locally Managed Systems

Establish ITS Configuration Control Board

Establish Systems Engineering Guidelines & Repository

Develop Approaches to Better Leverage Ops Data

Implement Integrated Corridor Management Concepts

Expand Statewide Video Sharing Strategy
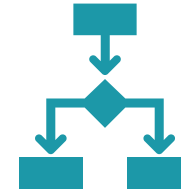
Business Processes

Includes all the planning, budgeting, procurement, and process development required for TSMO programs. To be implemented, TSMO activities and initiatives must be supported financially and institutionally. Protocols and procedures are necessary for TSMO to become ingrained in agency culture.

Integrate TSMO into DOT Iowa Policies & Guidance

Integrate TSMO Deployment Planning & 5-Year TIP

Develop District-Level TSMO Plans

Ensure Adequate Access to Funding for TSMO Projects through Existing/New Budget Categories

Streamline TSMO Procurement Processes

Establish Innovative Funding Team

Performance Measurement

Used to evaluate the effectiveness of mobility strategies and whether additional changes need to be made to achieve mobility goals. They are essential for making the business case for TSMO to decisionmakers and the public, and for gauging program success. Furthermore, monitoring performance measures regularly allows the program to be constantly improved and advances institutional continuous improvement.

Develop Ops-Oriented Resiliency Index

Develop B/C Estimates for Key TSMO Applications

Increase Frequency of Performance Reporting

Organization & Staffing

Technically qualified staff and an organizational structure that unites TSMO activities into an integrated project delivery approach are key to supporting effective TSMO solutions. Through training, identifying TSMO responsibilities, and building relationships across teams, TSMO functions can be engrained in an agency's day-to-day work efforts.

Increase Direct Iowa DOT Staffing in TMC

Develop a TSMO Training Rotation Program

Conduct System Ops Division Staffing Assessment

Enhance GIS Capabilities & Resources to Support Ops