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Michigan Automated Incident Detection

Category: Emerging & Innovative Technologies

State: Michigan

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Executive Summary

Transportation infrastructure is an important component to Michigan's economy and safety of our residents. Gov. Gretchen Whitmer implemented the [Rebuilding Michigan Program](#), a bonding program focused on rebuilding state highways and bridges that are critical to the state's economy and carry the most traffic. This has brought the Michigan Department of Transportation (MDOT) a multi-faceted opportunity. The program allows MDOT to finance new and modified [road construction projects across](#) Michigan while accelerating many others such as key corridors, and rebuild major segments of highly travelled interstates. The Michigan Automated Incident Detection (AID) project is a transformative initiative that supports the Rebuilding Michigan Program, by enhancing transportation safety, efficiency, and incident management with cutting-edge video artificial intelligence (AI) technologies and strategic partnerships with local governments and law enforcement entities.

The AID project addresses the challenges of timely incident detection, rapid response, and effective coordination by integrating emerging technologies, including high-resolution cameras, to detect incidents, crashes, and traffic slowdowns in real-time. This accurate detection of accidents, road debris, and hazardous conditions empowers stakeholders to take immediate action, minimizing traffic disruptions. The system generates automated alerts that are sent to transportation operators to facilitate efficient coordination and faster incident resolution.

Beyond incident management and transportation efficiency, the AID project contributes to enhanced safety on Michigan's roadways by improving response times. The AID project represents a groundbreaking initiative harnessing the power of emerging technologies to revolutionize incident management and transportation efficiency, setting a new standard for transportation technology advancements.

Idea

What problem or opportunity does the project address? The project addresses the critical problem of incident management, safety, and transportation efficiency on Michigan's roadways at a time where Michigan is implementing the largest road construction program in its history, touching key travel corridors and major segments of highly travelled interstates. The project uses cutting-edge technologies to detect incidents in real-time, improve communication between stakeholders, and streamline incident response. This results in faster response times, improved safety, and reduced disruptions to the transportation network.

Why does it matter? Inefficient incident management and transportation delays have a significant impact on the agency, the state, and the travelers. The project's focus on improving incident management and transportation efficiency matters because it addresses a critical problem with tangible consequences. The



Figure 1: Crash Location (Hotspot Mapping)

project aims to reduce congestion, optimize resource allocation, and enhance public safety. By doing so, it will generate cost savings, improve productivity, and enhance the overall transportation experience for millions of people. The project provides a business rationale grounded in financial impact, human resource optimization, and the well-being of Michigan's constituents.



Figure 2: AID Lane Monitoring and Detection

What makes it different? The project is innovative and distinct from similar initiatives in its use of cutting-edge technologies, comprehensive approach, and strategic partnerships. These unique features enable the project to improve incident detection, streamline response processes, and proactively manage traffic, ultimately enhancing transportation efficiency and safety in a novel and effective way. The project uses cutting-edge technologies such as high-resolution cameras to enable real-time incident detection. This real-time detection capability is a significant departure from conventional approaches and enables

faster response times and improved incident management. The project also adopts a comprehensive approach to incident management. It goes beyond incident detection and incorporates automated alerts, data sharing, and stakeholder coordination. The seamless integration of these components ensures a holistic and streamlined incident response process. Finally, the project emphasizes strategic partnerships. Recognizing the collaborative nature of incident management, the project actively engages key stakeholders from various sectors, including transportation, law enforcement, and emergency services. These partnerships enable the project to leverage expertise, resources, and data from multiple sources, resulting in a more robust and integrated incident management system. By leveraging cutting-edge technologies, adopting a comprehensive approach, and building strategic partnerships, the project improves incident detection, streamline response processes, and proactively manage traffic, ultimately enhancing transportation efficiency and safety in a novel and effective way.

What makes it universal? The project addresses a universal challenge faced by all states, which is the need for effective incident management and transportation efficiency. The project's alignment with state and federal mandates, and its focus on safety enhancement make the project applicable and valuable to states nationwide.

It also aligns directly with several of the **NASCIO CIO Top Ten Priorities** including:

- **Digital Government / Digital Services** - The AID system utilizes digital services such as MILogin for Single Sign On (SSO) and identity management.
- **Legacy Modernization** - AID modernizes a legacy system which was 100% manual, requiring a phone call into a call center or an observation by an operator monitoring a camera. AID allows this to happen in near real-time, resulting in a business process improvement.

- **Identity and Access Management** - AID system utilizes digital services such as MILogin for Single Sign On (SSO) and identity management.
- **Cloud Services** - AID utilizes Google Government Cloud, which increases system reliability, security, and be less impactful on upgrades.
- **Consolidation/Optimization** - The system utilizes existing infrastructure such as Closed-Circuit Television (CCTV) Cameras and Video Transcoding Servers for the Advanced Traffic Management System (ATMS).

Implementation

What was the roadmap? The project was developed with a clear roadmap that aligns with the enterprise view, ensuring its seamless integration into the broader organizational framework. The project's objectives and strategies were defined in collaboration with key stakeholders, including transportation agencies, law enforcement, emergency responders, and IT departments. This collaborative approach ensured that the project's goals were in line with the overall vision and mission of the enterprise. The project management approach follows a structured and agile framework to ensure efficient execution and successful implementation. The project team consists of multidisciplinary experts with diverse skills and experiences in incident management, transportation systems, and technology integration. A project manager oversees the day-to-day operations, facilitating effective communication, managing resources, and mitigating risks. The project is assessed through a comprehensive evaluation process that encompasses key performance indicators (KPIs) and predefined success metrics. The KPIs include incident detection accuracy, response time, incident resolution time, reduction in congestion, and improvement in safety metrics. These metrics are regularly monitored and evaluated to gauge the project's effectiveness in achieving its objectives. The project will be considered a success if it achieves the following outcomes:

- Seamless integration of the Automated Incident Detection (AID) system with existing infrastructure and systems.
- Improved incident management processes, including faster response times, reduced incident resolution times, and streamlined traffic management.
- Enhanced safety on roadways, reflected by a reduction in incidents, minimized congestion, and improved outcomes for injured motorists.
- Delivery of the expected return on investment, as demonstrated through cost savings, improved operational efficiency, and increased stakeholder satisfaction.
- Regular assessments, stakeholder feedback, and continuous improvement efforts will be integral to ensure the project's long-term success and alignment with the enterprise's evolving needs. The project team remains committed to monitoring and refining the implementation approach, adapting to emerging technologies, and evolving industry best practices.

Who was involved? The success of the project can be attributed to the collaboration of key stakeholders, including legislators, state agency staff, technology vendors, transportation agencies, and law enforcement and emergency responders. These stakeholders played crucial roles in the project, such as providing support and advocacy, implementing, and overseeing the project, and providing feedback and support. To obtain approval, buy-in, awareness, and adoption, the project team engaged

stakeholders through regular meetings, workshops, and consultations; conducted live demonstrations and presentations; implemented extensive training and education programs; and established continuous monitoring and feedback mechanisms. By working closely with key stakeholders, the project team was able to successfully implement the project and achieve its goals.

How did you do it? The project was successfully implemented by leveraging key resources, including financial, human, and time. The technical architecture of the project was designed to leverage new and emerging technologies, ensuring its relevance and effectiveness. By leveraging cutting-edge technology and adopting best practices, the project's technical architecture provided a foundation that enabled efficient incident management, enhanced stakeholder collaboration, and improved transportation network performance.

The Automated Incident Detection (AID) system is a cloud-based service that uses existing CCTV cameras and ATMS Video Transcoding server infrastructure to automatically detect incidents on freeways. The AID system will alert transportation operators through a vendor interface when an incident is detected. The AID system also uses the State's MILogin system (single sign-on) to provide superior identity management.

The AID system has several benefits, including:

- ✓ Faster incident detection and response times
- ✓ Reduced traffic congestion and delays
- ✓ Improved safety for motorists and workers
- ✓ Increased efficiency for transportation agencies

The AID system is a valuable tool for improving the safety and efficiency of our roadways. It is a cost-effective solution that can help to reduce traffic congestion, improve safety, and save lives.

Impact

What did the project make better? The project has made Michigan's transportation network safer, more efficient, and more cost-effective. The project has reduced response times, minimized congestion, and saved lives. Before the project, incident detection relied heavily on eyewitness accounts or driver reports, which led to delays, inaccuracies, and increased risks on the roadways. The AID system revolutionized incident management by enabling real-time incident detection and rapid response. This fundamental shift significantly reduced response times, enhanced coordination among stakeholders, and improved the overall safety and efficiency of Michigan's transportation network. The AID project has led to a remarkable reduction in incident-induced congestion and subsequent secondary crashes. By swiftly detecting and addressing incidents, traffic disruptions are minimized, resulting in smoother traffic flow and reduced travel delays. This has not only improved the commuting experience for Michiganders but also positively impacted productivity, fuel consumption, and the environment. Additionally, the AID project has brought about cost savings and resource optimization. The expedited incident response and efficient management have reduced the burden on emergency services, law enforcement agencies, and transportation operators, allowing for more effective

allocation of personnel and resources. Furthermore, the accurate incident data collected by the AID system has facilitated informed decision-making and proactive measures to prevent future incidents, leading to further cost savings and improved resource utilization.

How did you know? The impact of the project extends to the overall well-being and quality of life for Michiganders. By enhancing safety on the roadways, the project has contributed to a significant reduction in accidents, injuries, and fatalities. Prompt incident detection and response have aided injured motorists, potentially reduced the severity of injuries, and improved their chances of survival. The project's success in minimizing traffic disruptions and improving travel efficiency has also positively influenced citizen satisfaction and engagement with state government services.

The AID project has made a significant impact on Michigan's transportation network. By addressing critical challenges, optimizing resources, and prioritizing the well-being of Michiganders, the project has made Michigan's roads safer, more efficient, and more cost-effective.

The Federal Highway Administration's (FHWA) Tool for Operations Benefit/Cost (TOPS-BC) was used to conduct a comprehensive analysis of both quantitative and qualitative data. This tool includes a framework and default cost data to estimate the lifecycle costs of various Transportation Systems Management and Operations (TSMO) strategies, including capital, replacement, and continuing operations and maintenance (O&M) costs.

The data analyzed was used to calculate 36 benefit permutations, similarly 18 different cost permutations were calculated. Comparing each potential benefit permutation against each permutation for costs, 648 potential benefit-cost ratios were identified for this analysis. The likelihood of a net positive BCR is 96.3%, with an average BCR of 9.17.

Quantitative data reveals significant cost savings and avoidance resulting from the AID system. One primary benefit from AID is computed as a reduction in travel time and the benefit analysis concluded a range of 26.18 to 848.29 cumulative hours of travel time saved per day with AID implementation. This results in an average daily savings ranging from \$555.45 to \$17,996.49, which at continuous (365 days/year) operation, have yearly savings of \$202,738.25 to \$6,568,719.45. These financial metrics demonstrate the efficiency and effectiveness of the project, indicating that the AID system generates substantial financial benefits that outweigh the initial investment.

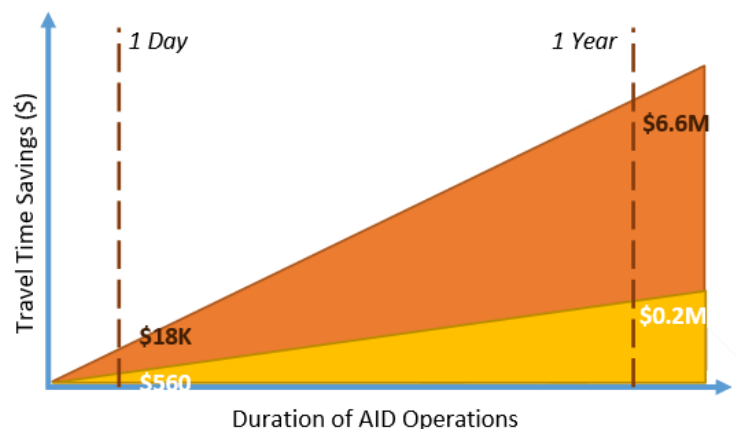


Figure 3: Cumulative Benefits of AID Implementation

In terms of usage and transaction times, the AID system has significantly improved transportation efficiency and incident management. By enabling prompt incident detection and response, the system has reduced incident response times, minimized traffic disruptions, and improved traffic flow. These

improvements are supported by data on reduced congestion, faster incident resolution, and improved reliability metrics.

The success and impact of the AID project are supported by a range of data, including cost savings, ROI, usage metrics, transaction times, and positive feedback from stakeholders. These data points demonstrate the project's ability to address critical challenges, deliver tangible benefits, and provide a valuable return on investment. The AID system has not only improved transportation efficiency but has also positively transformed the overall experience for constituents, making it a resounding success.

What now? Looking ahead, the AID project has a well-defined plan for sustainability and continued success. Maintenance and support will be integral to ensure the ongoing functionality and effectiveness of the system. Regular monitoring and evaluation of the AID infrastructure, including high-resolution cameras, advanced radar systems, and data integration mechanisms, will be conducted to address any technical issues and optimize performance.

The project's ongoing investment is also justified by its broader impact. The AID system enhances safety, reduces congestion, and optimizes Michigan's transportation network, resulting in improved traffic flow, reduced travel time, and increased quality of life for citizens. The positive feedback and testimonials from stakeholders and constituents further validate the project's value and the need for continued investment.

Furthermore, the AID project aligns with the state's long-term goals and priorities. It addresses critical transportation challenges, supports statewide mandates, and aligns with the NASCIO CIO Top Ten Priorities. By investing in the AID system, the state of Michigan demonstrates its commitment to leveraging innovative technologies and approaches to improve incident management, transportation efficiency, and overall public safety.

The AID project has a clear roadmap for sustainability, including maintenance, monitoring, and evaluation. The initial investment and ongoing funding are justified by the project's tangible benefits it delivers to the state of Michigan. With a focus on continuous improvement, the AID system will remain a valuable asset in enhancing transportation operations, improving safety, and meeting the evolving needs of constituents and stakeholders in the long term.

In conclusion, the Automated Incident Detection (AID) project in Michigan demonstrates the transformative potential of emerging technologies in incident management, congestion reduction, and transportation optimization. The project's innovative approach, seamless integration, and commitment to excellence position Michigan as a leader in transportation innovation. We are honored to submit this entry for the NASCIO Award.