

Evolving and Phasing Out Legacy ITS Devices and Systems

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ENTERPRISE

Evaluating New Technologies for Road Program Initiatives in Safety and Efficiency (ENTERPRISE)

- FHWA Pooled Fund Research Program
- ITS research, development, demonstration, standardization, deployment and evaluation

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Members:

- Illinois DOT
- Iowa DOT
- Kansas DOT
- Michigan DOT
- Minnesota DOT
- Ontario (MTO)
- Pennsylvania DOT
- Texas DOT
- Wisconsin DOT

Project Purpose

- Transportation agencies have deployed numerous ITS devices and systems
- Important to evaluate these “legacy” devices and systems
 - Have operational or end user needs changed?
 - Should the devices be replaced, reused, repurposed?
 - Discontinue operation? Evolve in some other way?

This project investigated decision factors, approaches, criteria and tools for evolving or phasing out ITS devices and systems

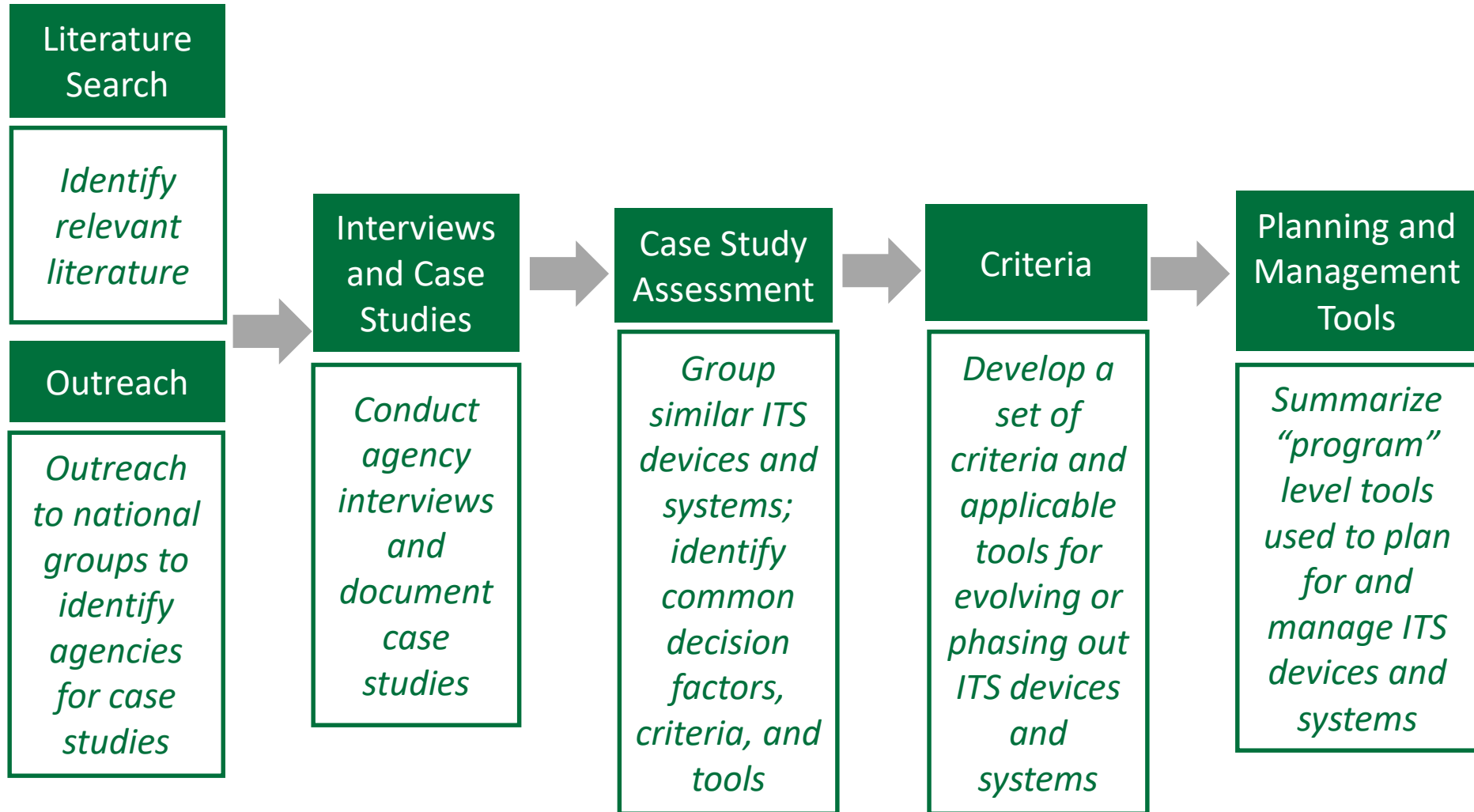
Example – Why Evolve or Phase Out?

Device / System	How Evolved or Phased Out?	Why?
Highway Advisory Radio	→ Eliminated →	<ul style="list-style-type: none">• Emergence of 511 websites and mobile apps; HAR coverage not statewide, newer vehicles don't have AM radio• Some continued use of portable HAR units



Some agencies have retained HAR to serve travelers in rural or mountainous areas with limited cell coverage

Project Approach



Literature Search, Outreach, Interviews

16 Agencies Represented in the Case Studies:

- Alaska DOT&PF
- Caltrans
- Delaware DOT
- Illinois DOT
- Iowa DOT
- Kentucky Transp. Cabinet
- Maryland DOT State Hwy Administration
- Massachusetts DOT
- Michigan DOT
- Minnesota DOT
- Missouri DOT
- North Carolina DOT
- Ohio DOT
- Ontario Ministry of Transportation
- Pennsylvania DOT
- Wisconsin DOT

Nearly 60 case studies documented

Case Studies

How are agencies evolving or phasing out their ITS devices and systems? Why?

Case Studies

- Overview of Change
- Decision Factors
 - Why did your agency make this change?
- Feedback Received
- Tools
 - Used to inform decisions



“Evolving and Phasing Out ITS Systems/Devices”

Case Study Summary - MnDOT

Agency	Minnesota Department of Transportation (MnDOT)
Information Source(s)	511 Citizen Reporting and 511 3G Website: <ul style="list-style-type: none"> • 1/9/19 email from Kelly Braunig, MnDOT • 1/15/19 interview with Kelly Braunig, MnDOT Intelligent Lane Control Signals in ATMS System: <ul style="list-style-type: none"> • 3/29/19 Interview with Brian Kary, MnDOT
ITS Devices or Systems in this Case Study Summary	1) 511 Citizen Reporting Feature (eliminated) 2) 511 3G Website (eliminated) 3) Intelligent Lane Control Signals in ATM System (eliminated)

MnDOT Case Study #1: 511 Citizen Reporting Feature (eliminated)	
Overview	MnDOT eliminated its 511 Citizen Reporting feature in July 2018. The citizen reporting feature allowed citizens to report road conditions via a web-based platform. These reports were then used to assist MnDOT convey road condition information on 511. The feature was initiated in November 2015; in use for approximately 2.5 years.
Decision Factors	<ul style="list-style-type: none"> • Usage – The number of citizen reporters who reported road conditions was very low. • Cost vs. Benefits - MnDOT reviewed the number of individuals reporting road conditions through the citizen reporting feature versus the maintenance/operational cost of the feature. The cost of the feature far outweighed the benefits from the few citizen reporters who used it. • Improved Alternative – At the time the citizen reporting feature was eliminated, MnDOT had <u>made a decision</u> to launch a Maintenance Decision Support System (MDSS)/Segments automated system which will provide much more frequent, accurate, and useful road condition information, compared to MnDOT’s current reporting methods. The MDSS/Segments system, to be implemented in 2020, will provide road condition updates every 30 minutes, with more accurate and useful road condition data from numerous sources including Road Weather Information Stations (RWIS), National Weather Service, on-road data collected by plows, and Surface Weather Observation Stations (ASOS/AWAS).
Feedback	No feedback was received by MnDOT following this change.
Tools Used to Inform Decisions	<ul style="list-style-type: none"> • MnDOT uses monthly usage statistics to evaluate features in all of its 511 systems, including 511 <u>phone</u>, websites (full-featured and low-band), and mobile app. • MnDOT has also utilized results from an in-depth market research analysis, which included a survey of 511 users, to identify user preferences and usage habits.

Case Studies - Groupings

ITS Devices and Systems that Interface with Motorists as Primary Use	ITS Devices and Systems Primarily Used for Transportation Operations
<ul style="list-style-type: none">• Highway Advisory Radio• Traveler Information Phone Service• Traveler Information Websites and Mobile Apps• Signs and Traffic Control Devices	<ul style="list-style-type: none">• Traffic Detection• Monitoring Devices• Traffic Cameras• TMC Facilities and Operator Support• ITS Communications Systems• Agency-owned Devices vs. Service-based Solutions

Case Studies - Groupings

ITS Devices and Systems that Interface with Motorists as Primary Use

- Highway Advisory Radio
- **Traveler Information Phone Service**
- Traveler Information Websites and Mobile Apps
- **Signs and Traffic Control Devices**

ITS Devices and Systems Primarily Used for Transportation Operations

- **Traffic Detection**
- Monitoring Devices
- Traffic Cameras
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- ITS Communications Systems
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Traveler Information Phone Service



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511 Information Line

Motorists traveling through North Carolina can call 511 during the day for the latest road conditions and other important information, including:

- Crashes, weather-related closures and road construction
- Transfers to neighboring states' 511 systems

Using 511

When calling 511 – or (877) 511-4662 from outside North Carolina – callers will hear urgent messages regarding closures for major interstates.

On weekdays from 8:15 a.m. to 7:45 p.m., weekends from 8:15 a.m. to 4:45 p.m. and state holidays from 9:15 a.m. until 4:45 p.m., callers speak directly with an operator who can answer traffic and travel-related questions.

Overnight and during emergencies, travelers should go to DriveNC.gov for the latest travel information.

Traveler Information Phone Service

Traveler Information Phone Service	
Description of Change	Number of Case Studies
Elimination of traveler information phone service	3 (KYTC, MoDOT, IDOT)
Replacing Interactive Voice Response (IVR) with recorded messages, live operators, region-specific messages	3 (NCDOT, PennDOT, MDOT SHA)
Replacing phone service as part of an upgrade to statewide 511 system	1 (WisDOT)

Traveler Information Phone Service

Agency & Case Study	Type of Change	Description of Change	Decision Factors
KYTC – 511 Phone Service	Eliminated	Discontinued 511 phone service in 2016. A state-run website and mobile traveler information partnership with WAZE are in place to provide traveler information.	<ul style="list-style-type: none"> • Usage • Input from Motorists • Cost
MoDOT – 511 Phone Service	Eliminated	Discontinued 511 phone service available only in the St. Louis area. The service was initiated for a major construction project, funded through sponsorship ads with no direct cost to MoDOT.	<ul style="list-style-type: none"> • Cost
IDOT Statewide Traveler Information Service			
NCDOT – 511 Service			
MDOT SHA 511 Phone Service			
PennDOT 511 Phone Service		motorists of conditions being reported in 511.	<ul style="list-style-type: none"> • Safety • Ability to track usage • Other strategic considerations
WisDOT 511 Phone Service	Replacing	Replacing the current 511 system with a new system that has greater functionality, is more user friendly, and includes all the features of the existing system.	<ul style="list-style-type: none"> • Alternatives • Usage • Cost • Motorist feedback • Equity

Main Decision Factors:

- Cost, declining usage, increased usage of other info mechanisms, motorist feedback
- Maryland DOT – 60,000 calls/mo. in 2012 to 10,000 calls/mo. in 2017. Operating cost without IVR dropped by approximately 70%.

Other Factors:

- Access/equity, safety, usage during emergencies or weather events.

Signs and Traffic Control Devices



Signs and Traffic Control Devices

Signs and Traffic Control Devices	
Type of Change	Number of Case Studies
Limited or decreased deployment of DMS	4 (AKDOT&PF Central Region, Iowa DOT, ODOT, WisDOT)
Evolving from mono-chromatic to full-color DMS	1 (PennDOT)
Eliminating or evolving various advisory signs and traffic control devices (e.g. Intelligent Lane Control Signals, Intersection Conflict Warning Systems, remotely operated interstate gates)	3 (MnDOT, Iowa DOT, Iowa DOT)

Signs and Traffic Control Devices

DMS Usage:

- Trend toward limited or decreased DMS deployments
 - Often with re-use or re-location to higher priority sites
- Driven by: Changing operational needs, understanding of actual usage of DMS for traffic messages, motorist feedback, and future CAV in-vehicle messaging

Iowa DOT DMS Decision Matrix

Scoring Criteria

ID	TSID	Route	Direction	MM	Location	Justification Categories					Volumes	Crashes	DMS Usage	TMC Input	Overall Score	
						2	3	4	5	Sum	Category Score	AADT Score	Crash Score			Usage Score
						8	6	2	5		20%	20%	20%			20%
1	2	I-35	SB	88.4	Corp Woods	1	1	1	1	21	10	9	10	10	10	97
Prop 19		I-35/80	NB	125.43	US 6	1	1	1	1	21	10	10	8		10	95
212												9	9	9		94
Prop 59												8		10		93
655												9	10	10		93
23												10	10	10		92
658												10	10	10		92
4												7	10	10		90
24												9	9	9		88
Prop 60												8		8		88
125												10	10	10		87
45												9	9	9		86
25												9	10	10		84
76												10	10	10		84
657												10	8	7		82
Prop 18												9		10		81
26												7	8	8		80
211												4	10	10		80
69												10	7	7		79
3												4	10	10		77
Prop 13												9		5		77
403												10	10	2		76
302												8	9	9		76
Prop 10												9		5		75
653												7	4	8		72
63												8	5	8		72
218												8	4	4		72
22	32	I-235	EB	6.15	31st St		1	1	1	13	6	6	8	8	8	72
Prop 20		I-35/80	EB	130.34	I72nd Street	1	1	1	1	21	10	8	1		10	71
656	299	I-235	EB	11.7	Guthrie		1	1	1	13	6	7	5	8	8	68

- **Justification Categories (location type)**
 - ✓ Major interchanges
 - ✓ Metro entrances and exits or state entrance points
 - ✓ Routinely congested corridors
 - ✓ Key locations for special events or incident management
- **Volumes**
- **Crash History**
- **DMS Usage**
- **TMC Operator Input**

The Flip Side – Variable Message Signs

Governor Cuomo Announces Additional Electronic Message Signs and Traffic Cameras Along New York State Highways to Enhance Safety for Motorists

“...Department of Transportation installed and activated an additional 125 cameras and 143 Variable Message Signs (VMS) units at critical locations along major traffic corridors.”

Source: www.governor.ny.gov/news/governor-cuomo-announces-additional-electronic-message-signs-and-traffic-cameras-along-new-york (Retrieved 12/2/19)

Traffic Detection



Traffic Detection

Traffic Detection	
Type of Change	Number of Case Studies
Using or considering (third-party) vehicle probe data to replace some or all field detectors	5 (ODOT, MassDOT, PennDOT, MoDOT, Caltrans)
Replacing pavement intrusive devices (e.g. loop detectors) with non-intrusive devices such as radar, Bluetooth, or microwave	3 (ODOT, MassDOT, MTO)
Use of updated Bluetooth technology, to enable real-time data collection	1 (DeIDOT)

Traffic Detection

- Trend toward eliminating in-pavement field detectors for real-time operations
 - Difficult to maintain, disruption to operations
- Growing confidence in accuracy of probe data
 - Increased coverage compared to physical detectors
- Some physical detectors retained, for reporting to FHWA

Case Studies

ITS Devices and Systems that Interface with Motorists as Primary Use

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ITS Devices and Systems Primarily Used for Transportation Operations

- Traffic Detection
- Monitoring Devices
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- TMC Facilities and Operator Support
- ITS Communications Systems
- Agency-owned Devices vs. Service-based Solutions

Planning and Management Tools & Approaches

What tools and approaches are used to guide decision-making, at a program level?

Planning/Management Tools and Approaches

Categories	Program-Level Tools and Approaches
Statewide ITS and TSMO Planning	<ul style="list-style-type: none">• Regional Operations Plans (PennDOT)• TSMO Traffic Infrastructure Process (WisDOT)• GIS Application for TSMO Planning (PennDOT)• Comprehensive Systems Engineering Process (MassDOT)• Overarching Criteria and Considerations (MTO)
Asset Management	<ul style="list-style-type: none">• Asset Management Planning (MoDOT)• Transportation Management System (TMS) and other Asset Tracking Tools (MoDOT)• Asset Management Software (WisDOT)

Planning/Management Tools and Approaches

Categories	Program-Level Tools and Approaches
Strategic Technology Obsolescence Planning	<ul style="list-style-type: none"> • Device Consistency (Ohio DOT) • <i>ITS Device Obsolescence and Modernization Planning (MDOT)</i> • Antiquated ITS Devices Effort (PennDOT) • ITS Device Replacement Planning (Ohio DOT) • Continual Evaluation of ITS Technology Needs (MassDOT)
Organizational and Agency Philosophy	<ul style="list-style-type: none"> • Centrally Located ITS Function within DOT (ODOT) • IT Services Integrated within ITS Office (ODOT)
Motorist Input	<ul style="list-style-type: none"> • Customer Surveys and Motorist Feedback (WisDOT) • “Grassroots” Customer Feedback (DelDOT)

Michigan DOT Example

ITS Device Obsolescence and Modernization Planning

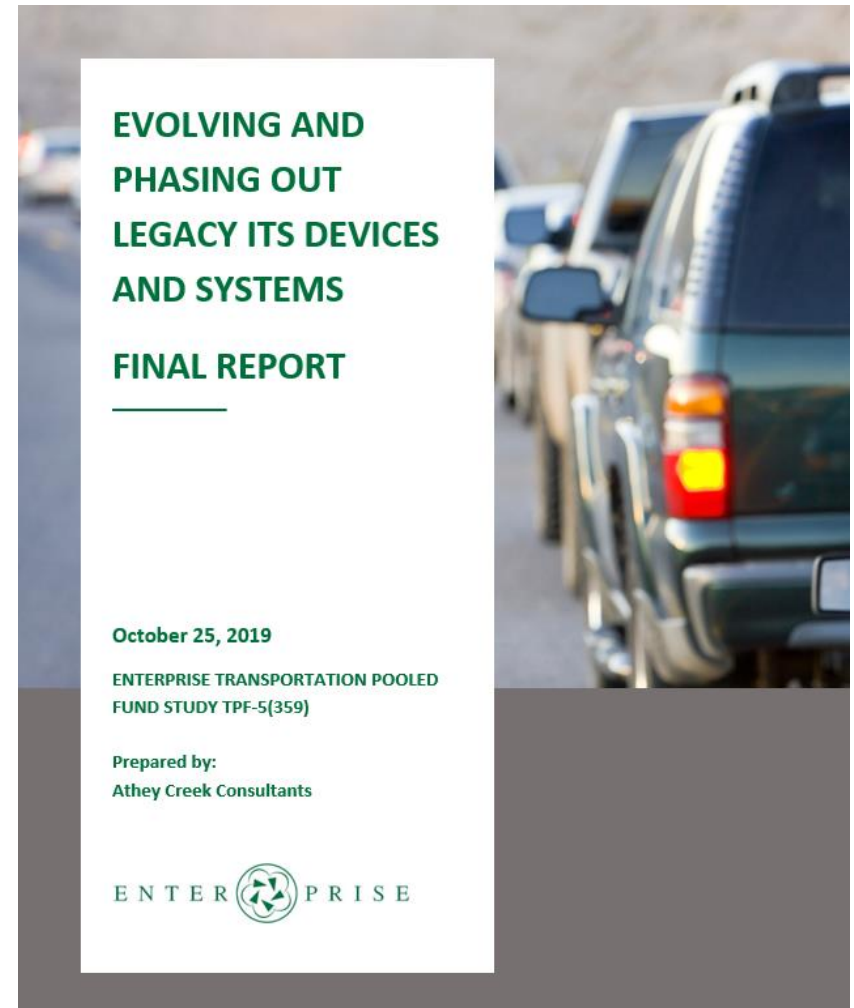
- 5-year ITS Device Modernization Plan (DMP):
 - Evaluate all ITS devices, ESS, and CAV devices that have reached a state of technical obsolescence and/or high probability of failure in next 5-10 years
- Annual Plan Maintenance:
 - Evaluate devices for state of practice, maintenance history
 - Determine device value to the motoring public
 - Recommend devices for removal

Final Report

Final Research Report:

Published on ENTERPRISE Pooled Fund website: <http://enterprise.prog.org/>

- Projects ==> Completed
- *Evolving and Phasing Out Legacy ITS Devices and Systems*



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