e-Ticketing: Implementation

Every Day Counts Initiative

December 10, 2020

© Iowa Department of Transportation (DOT).

Source: FHWA.

U.S. Department of Transportation
Federal Highway Administration

Every Day Counts
Innovation for a Nation
on the Move

1

Every Day Counts 6 (EDC-6) Technologies

Capitalize on momentum

Provide market-ready opportunities

Advance 21st century technologies

EDC

U.S. Department of Transportation
Federal Highway Administration

Benefits of e-Construction Technologies

Reduce work zone risks

Improve data collection and prevent information loss

Enable data-driven decision making

Advance digital delivery and information management

EDC

U.S. Department of Transportation
Federal Highway Administration

© 312201394/stock.adobe.com.

What is e-Ticketing?

U.S. Department of Transportation
Federal Highway Administration

Every Day Counts
Innovation for a Nation
on the Move

What is e-Ticketing?

e-Ticketing is a **paperless process** for **tracking**, **documenting**, and **archiving** materials information, **accessible in real-time** via mobile devices.
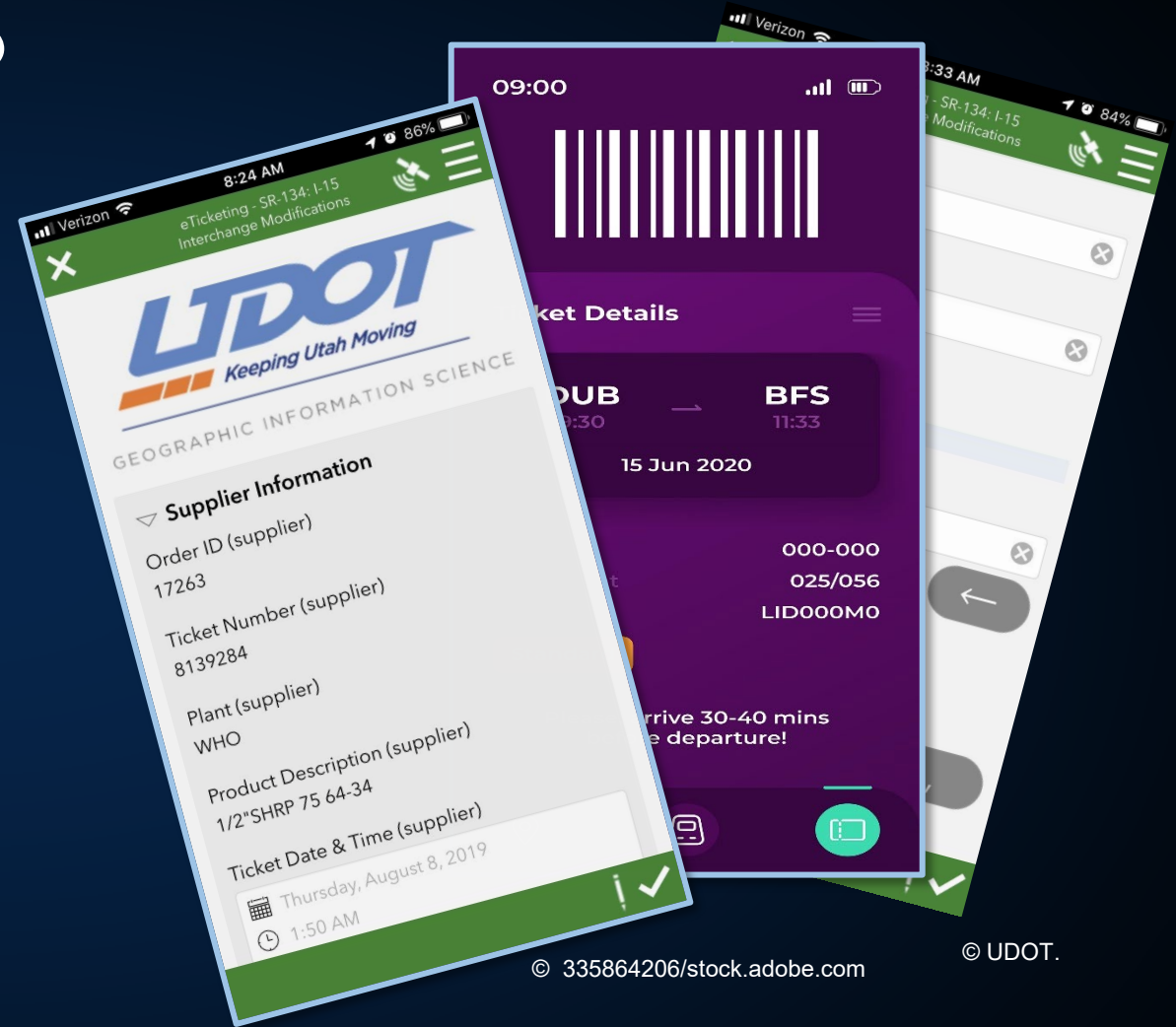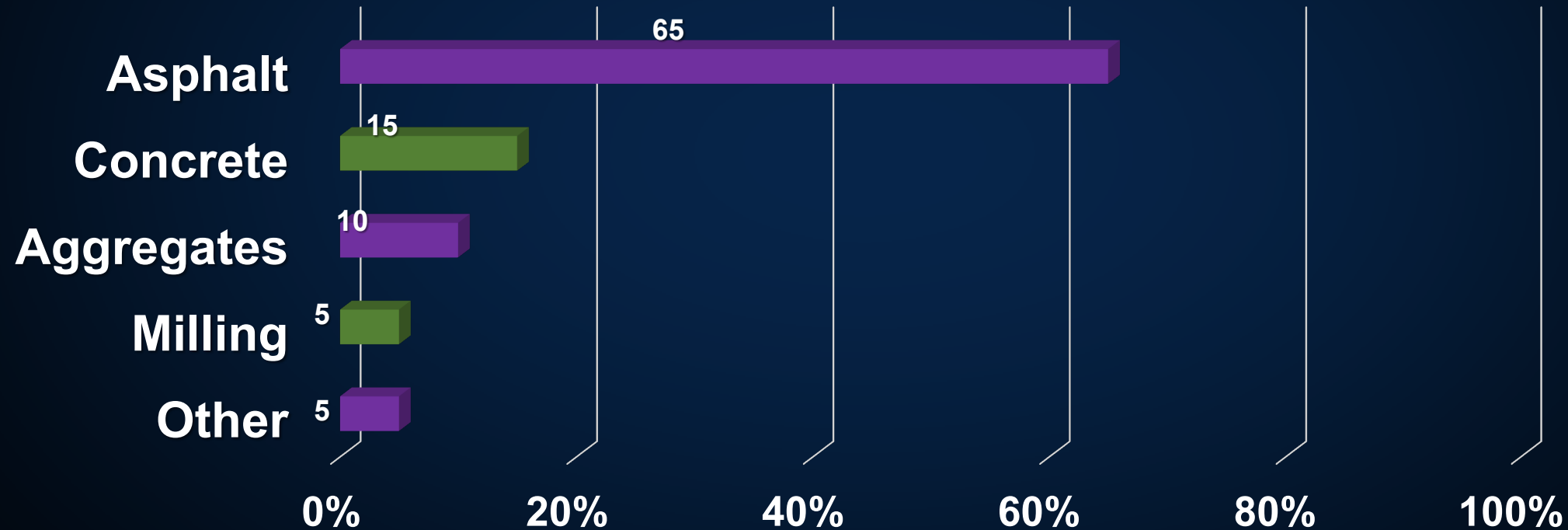
© 335864206/stock.adobe.com

© UDOT.

© Utah DOT (UDOT).

Graph: Projects Currently Using e-Ticketing by Material Types (Dadi et. al 2020)

Material Types

Asphalt — 65
Concrete — 15
Aggregates — 10
Milling — 5
Other — 5

Percent axis: 0%, 20%, 40%, 60%, 80%, 100%

Percent of projects that utilized e-Ticketing

Source: FHWA.

Multiple Data Elements
Require collection, tracking, and management

- Project and contract number
- Plant name and location
- Product description
- Truck identification number, load times, and material weights
- Truck transit time and routing
- Temperature measurements
- Inspection notes
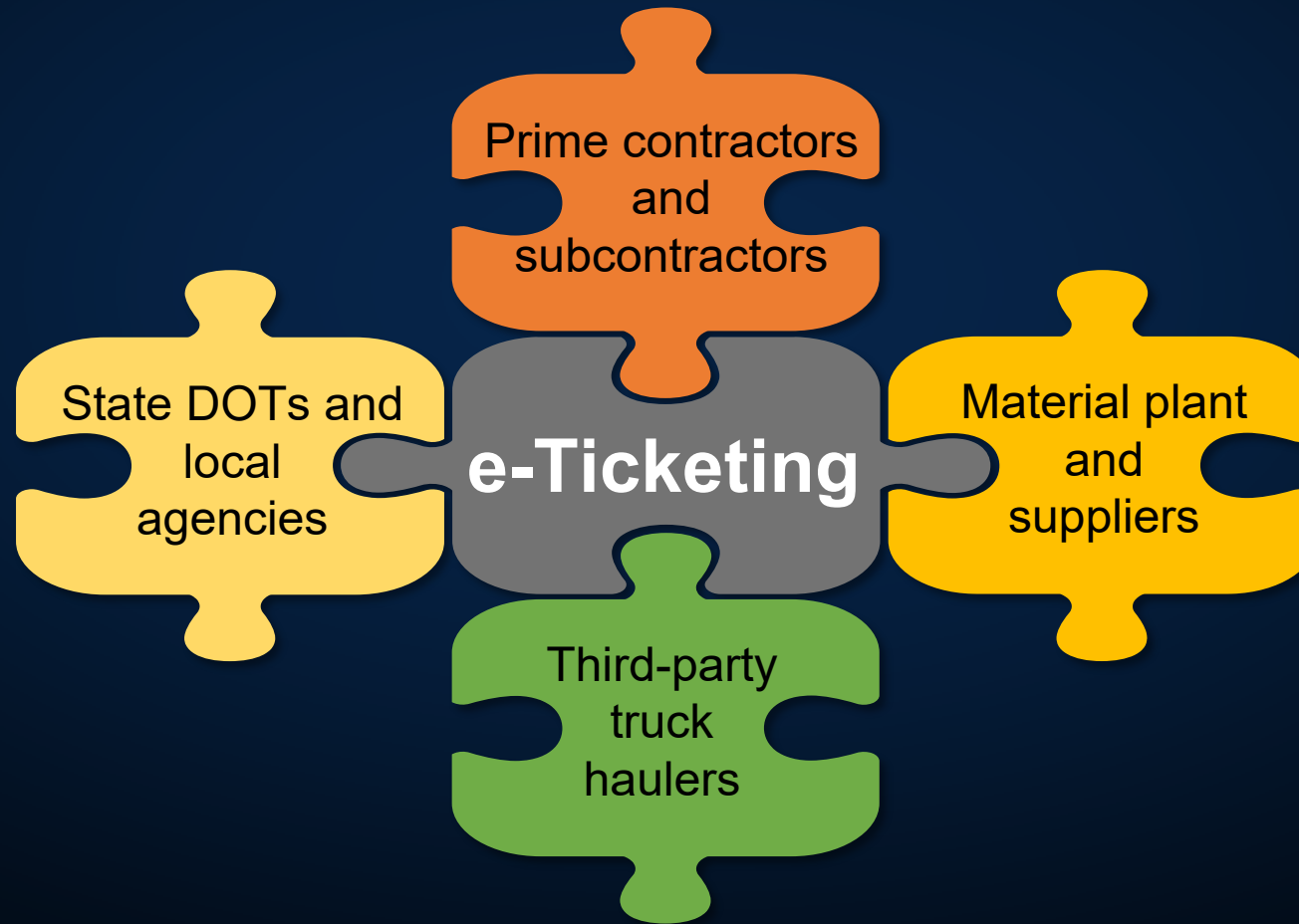- Point of delivery location and time stamps at paver
- Quantities of wasted and rejected materials
- Daily summary

© 115692194/stock.adobe.com.

U.S. Department of Transportation
Federal Highway Administration

Multiple Data Users
Across Public and Private Sectors

Prime contractors and subcontractors

State DOTs and local agencies

e-Ticketing

Material plant and suppliers

Third-party truck haulers

Source: FHWA.

U.S. Department of Transportation
Federal Highway Administration

© 313749216/stock.adobe.com

Benefits of e-Ticketing

U.S. Department of Transportation
Federal Highway Administration

Every Day Counts
Innovation for a Nation on the Move

Why e-Ticketing?

- Reduces human interaction
- Eliminates work zone safety hazards
- Reduces paper ticket inefficiency
- Eliminates lost and damaged tickets
- Generates traceable materials
- Captures data for future analysis
- Provides authoritative real-time information
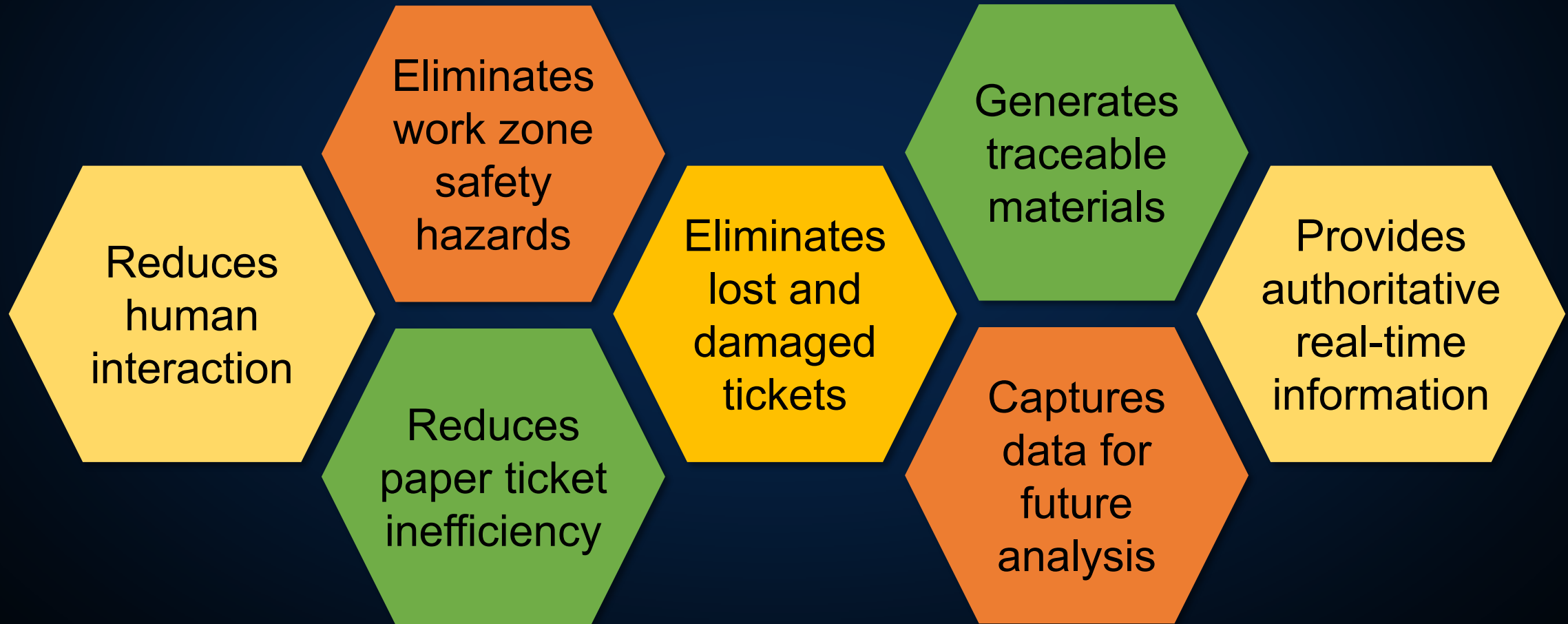
Streamlined Information Management

Automated tracking and verification
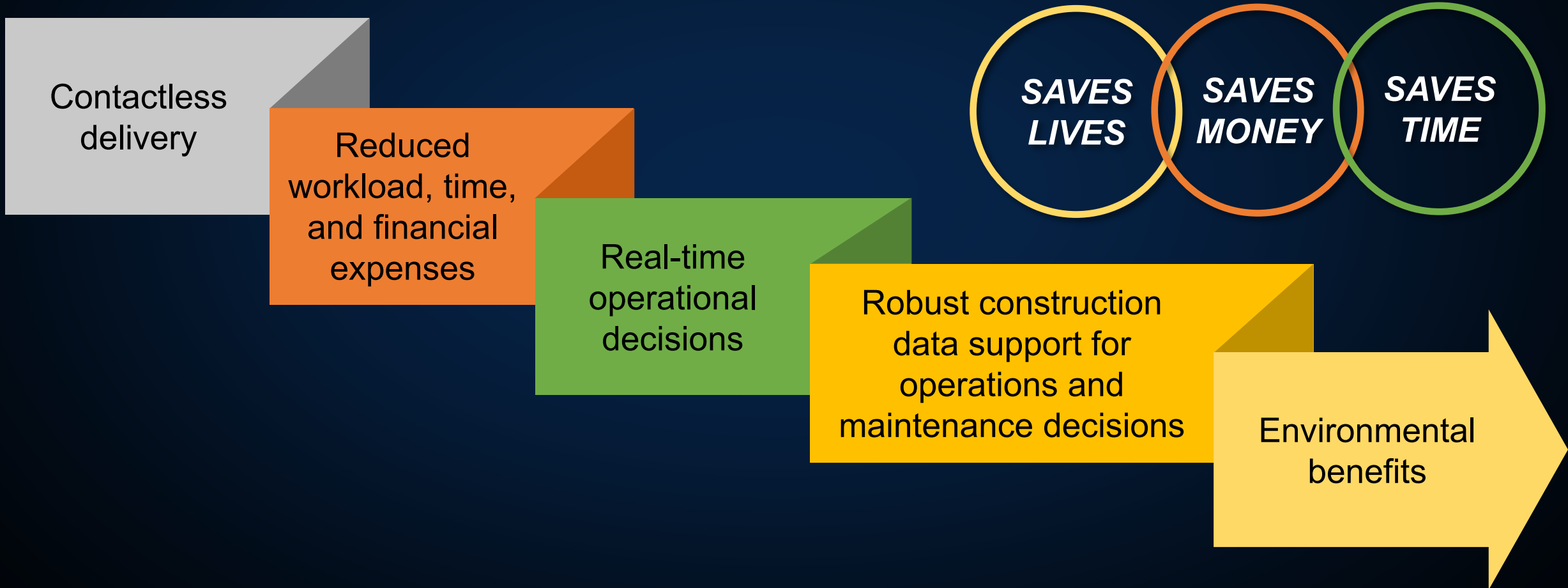
Electronic record capturing and archiving

Data mining

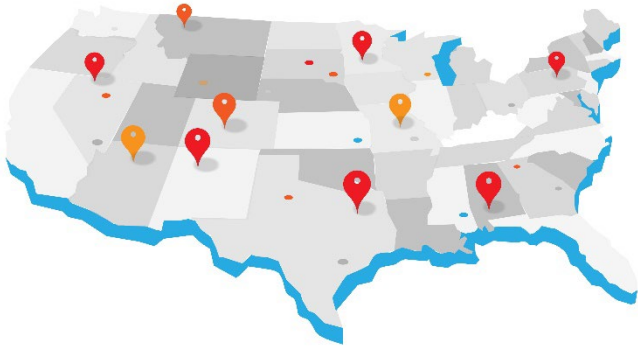Streamlined documentation of payments

Real-time capture of construction data

EDC

U.S. Department of Transportation
Federal Highway Administration

11

Real, Immediate Benefits

Contactless delivery

Reduced workload, time, and financial expenses

Real-time operational decisions

Robust construction data support for operations and maintenance decisions

Environmental benefits

SAVES LIVES

SAVES MONEY

SAVES TIME

EDC

U.S. Department of Transportation
Federal Highway Administration

© 232152692/stock.adobe.com.

State of the Practice

U.S. Department of Transportation
Federal Highway Administration

Every Day Counts
Innovation for a Nation
on the Move

Evolution of e-Tickets

Paper tickets → Image files → Electronic → Digitized data directly into CMSs → Digital, object-based, intelligent data
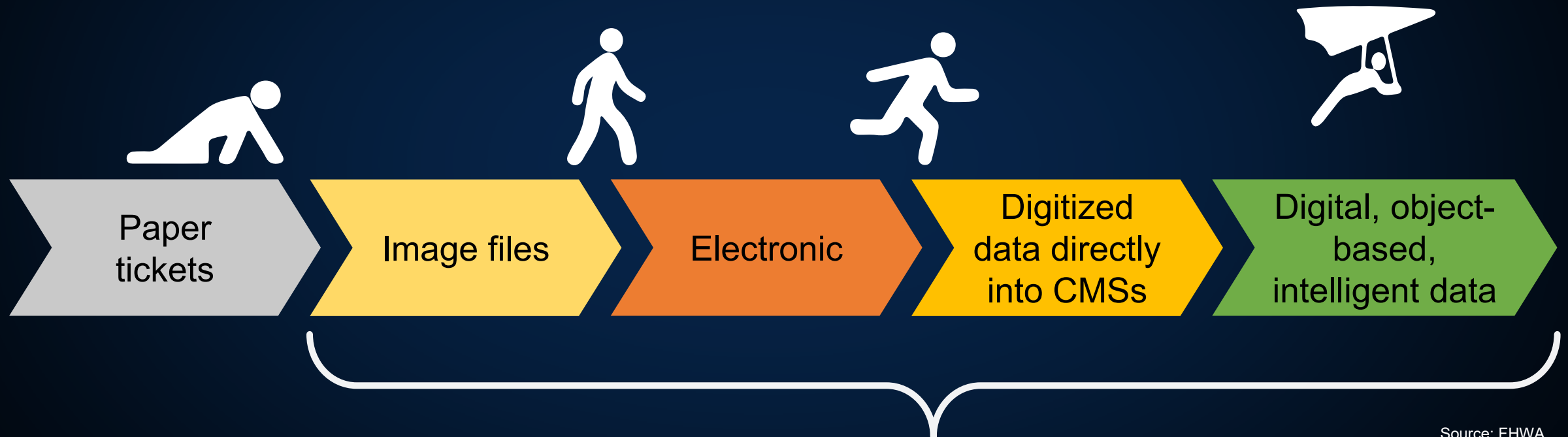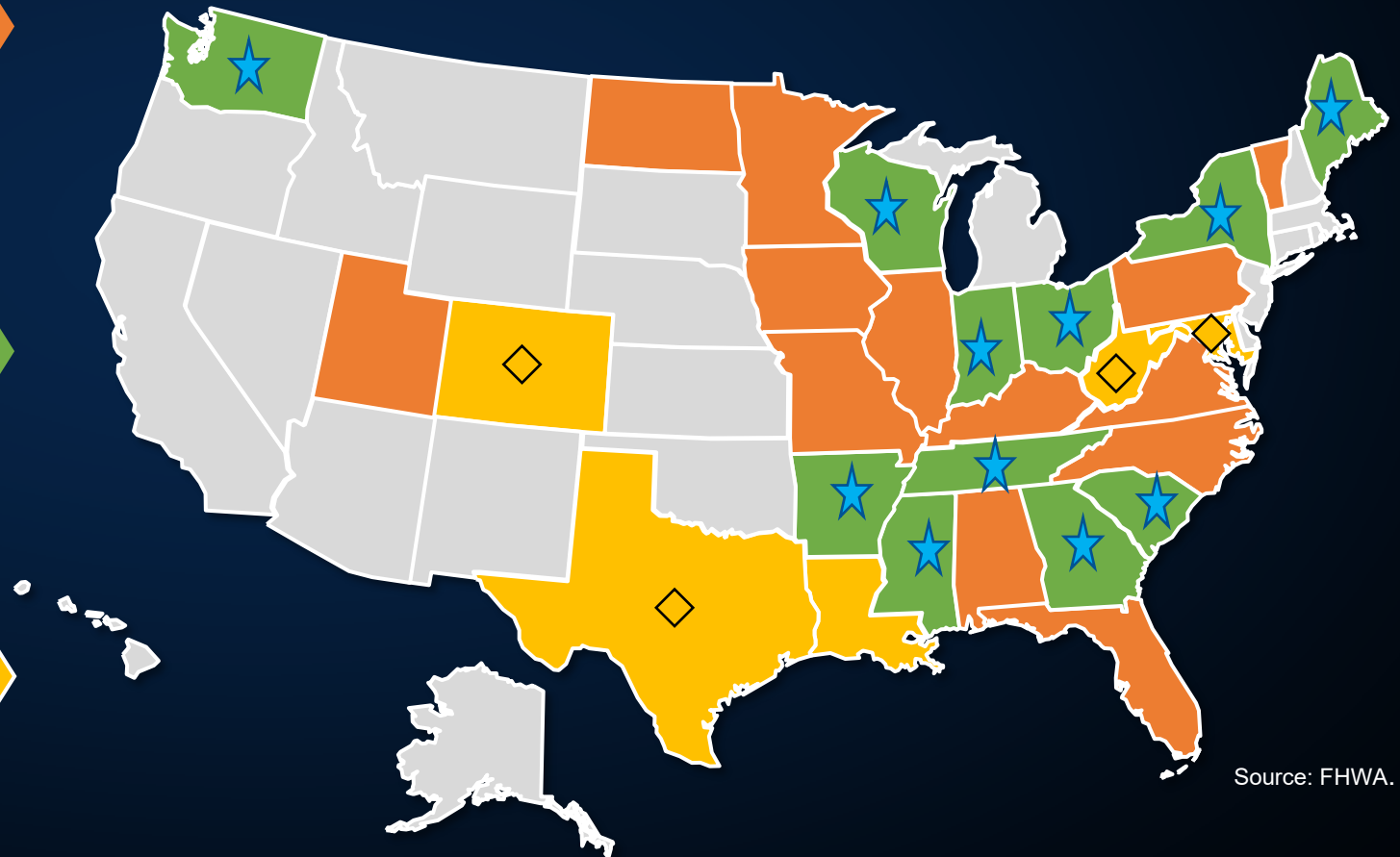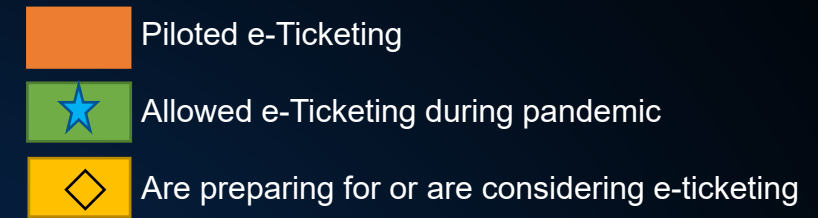
e-Tickets

CMS = construction management system

Source: FHWA.

State of the Practice (Dadi et. al 2020; National Asphalt Pavement Association [NAPA] 2020)

Piloted e-Ticketing

Allowed e-Ticketing during pandemic

Are preparing for or are considering e-ticketing

Thirteen State DOTs have piloted e-Ticketing

Eleven State DOTs have allowed e-Ticketing during the pandemic

Five State DOTs are preparing for or are considering e-Ticketing

Source: FHWA.

U.S. Department of Transportation
Federal Highway Administration

Iowa DOT

First pilot: 2015
80-plus projects in 2020

Information

Project, material, testing data, pictures, and geolocation.

Applications

- Safer ticket collection.
- Real-time auditing of material placement and testing.
- Electronic documentation of construction data.

Integration Plans

Piloting integration with AASHTOWare Project™ CMS software.

AASHTO = American Association of State Highway and Transportation Officials.

Batch Data	Moisture	
Max Water/Add	Actual W/C	Max W/C
33.1	0.376	0.42
Material	Batched	Variance
CONTINENTAL BUFFALO TYPE I/II	3410 LB	-0.58
HOT WATER	0 GA	0
TEMPER WATER	9 GA	0
W.R. GRACE DARAVAIR 1400	212 GA	0
	37 OZ	-2.63
RIVERSTONE ALLIED 1" CONCRETE STONE	14200 LB	-0.36
RIVERSTONE ALLIED 3/8" CHIPS IA	4600 LB	0.13

Reject   Pending   Cancel

Screen capture of application.
© 2020 Iowa DOT.

U.S. Department of Transportation
Federal Highway Administration

Pennsylvania DOT (PennDOT)

First Pilot: 2017
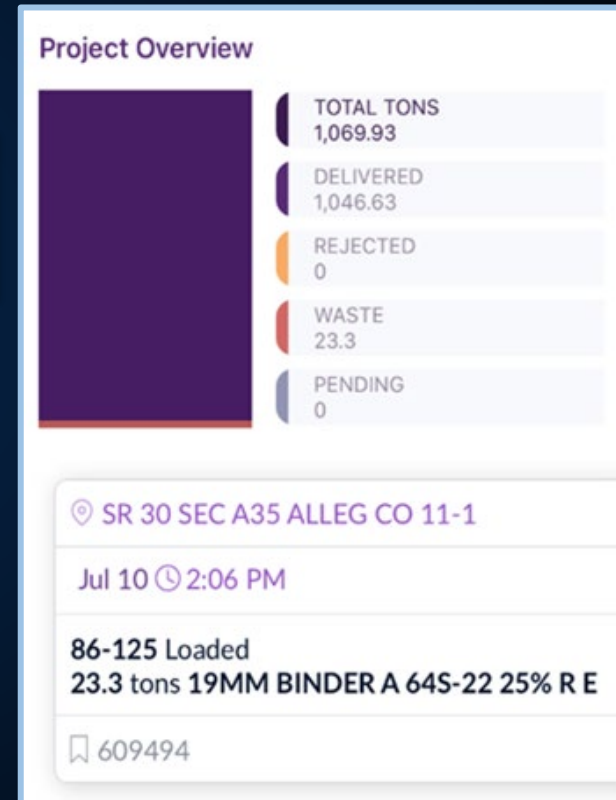## 17-plus projects to date

Information

- Project, location, materials, tonnage, and inspector notes for asphalt concrete.
- Inclusion of concrete and aggregates.

Applications

- Safer ticket collection.
- Real-time verification of material placement.
- Digitized construction data.

Integration Plans

- Real-time data feed into engineering and CMS.
- Smart data and applications for PennDOT's digital delivery initiatives.

Project Overview

TOTAL TONS	1,069.93
DELIVERED	1,046.63
REJECTED	0
WASTE	23.3
PENDING	0

SR 30 SEC A35 ALLEG CO 11-1

Jul 10 2:06 PM

86-125 Loaded
23.3 tons **19MM BINDER A 64S-22 25% R E**

609494

Screen capture of application display.
© 2020 PennDOT.

U.S. Department of Transportation
Federal Highway Administration

Alabama DOT

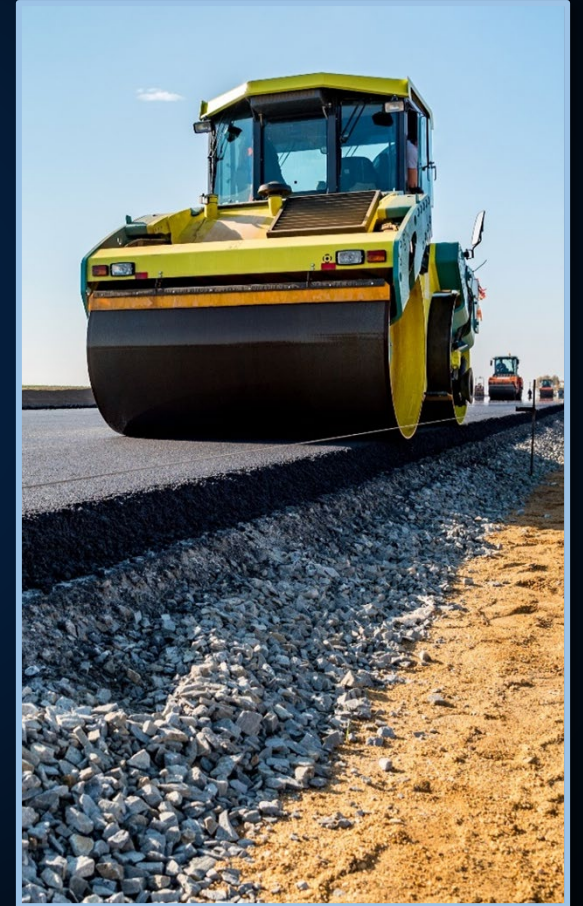## First Pilot: 2017
9 projects to date

Information

- Savings of 1–2 percent of construction costs (~$4–8 million/yr) expected.
- Project, truck number, material tonnage, mix temperature, and point of delivery.

Applications

- Safer ticket collection.
- Real-time verification of material placement.
- Reliability and efficiency.

Future Plans

- Expansion of pilots for more contractor buy-ins.
- Inclusion of small contractors with less sophisticated load-out systems.

© 95426986/stock.adobe.com

U.S. Department of Transportation
Federal Highway Administration

Minnesota DOT (MnDOT)

First Pilot: 2018
40-plus projects to date

Technology Integration

- Intelligent compaction.
- Paver-mounted thermal profiler.

Applications

- Safer ticket collection.
- Real-time verification of material placement.
- Electronic documentation of construction data.

Integration Plans

- AASHTOWare Project software.
- Other DOT platforms (e.g., Intelligent Compaction).

© 83418548/stock.adobe.com

U.S. Department of Transportation
Federal Highway Administration

Utah DOT (UDOT)

First Pilot: 2019
36 projects to date

Technology Use

- In-house technology solution.
- Current commercial software.
- Electronic dashboard.

Current Integration Efforts

- Use a data gathering application to access information system and go online.
- Use JavaScript Object Notation file format to catalogue data.
- Post quantities in UDOT CMS to document pay items.
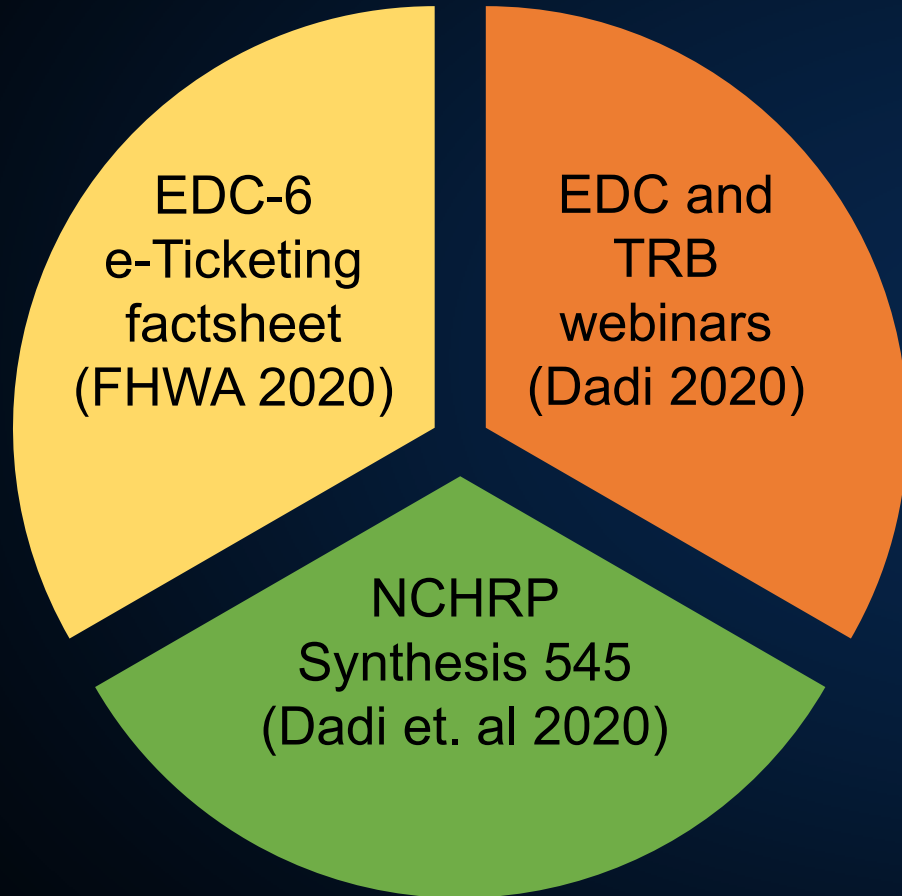
Future Plans

- Develop standard operating procedure.
- Govern and integrate data into CMS.
- Expand to hydraulic concrete and aggregates.

Screen capture of application display.
© 2020 UDOT.

Tools and Resources

- EDC-6 e-Ticketing factsheet (FHWA 2020)
- EDC and TRB webinars (Dadi 2020)
- NCHRP Synthesis 545 (Dadi et. al 2020)

NCHRP = National Cooperative Highway Research Program

NCHRP
SYNTHESIS 545

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Electronic Ticketing of Materials for Construction Management

A Synthesis of Highway Practice

The National Academies of
SCIENCES · ENGINEERING · MEDICINE

TRB
TRANSPORTATION RESEARCH BOARD

100 YEARS
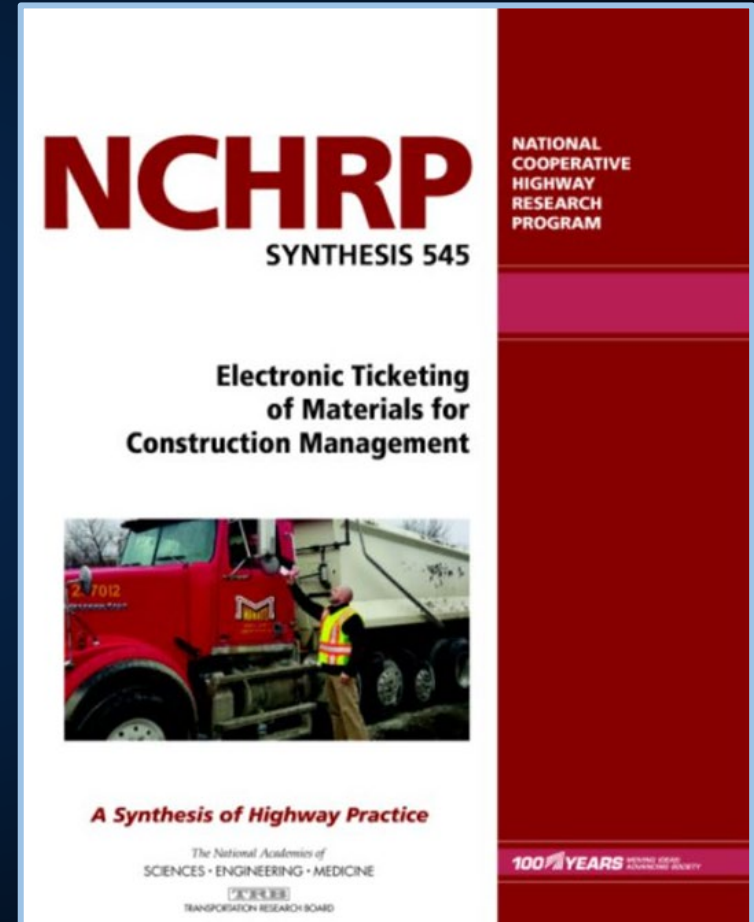
Source: National Academy of Sciences, TRB.

U.S. Department of Transportation
Federal Highway Administration

© 136144334/stock.adobe.com.

Implementation Tools, Tactics, and Goals

Implementation Tools

Implementation toolbox

- Technical literature and assistance
- Vendor forums
- In-person and virtual events
- Standards forums
- Informational videos
- Applied research

EDC
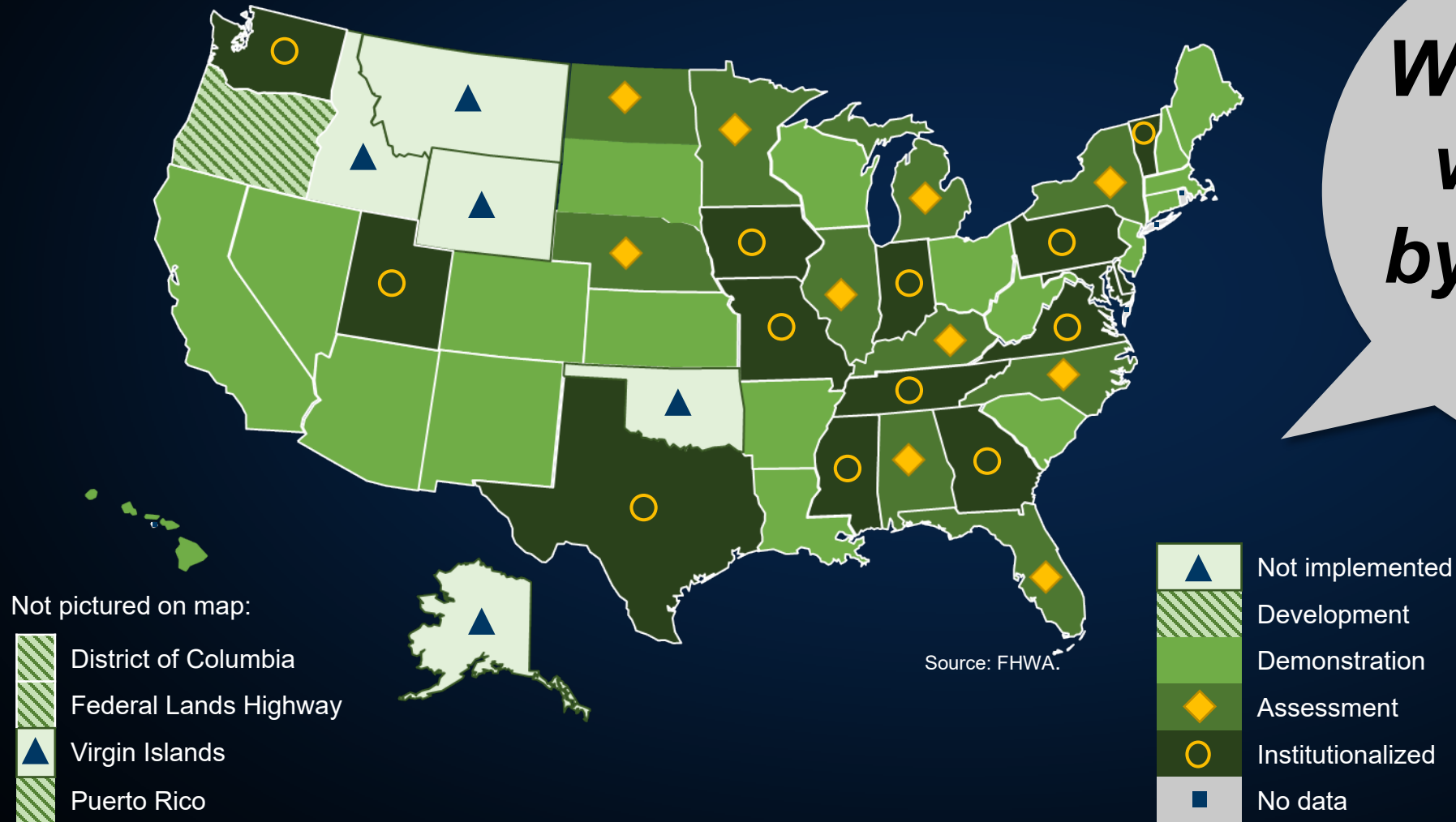
U.S. Department of Transportation
Federal Highway Administration
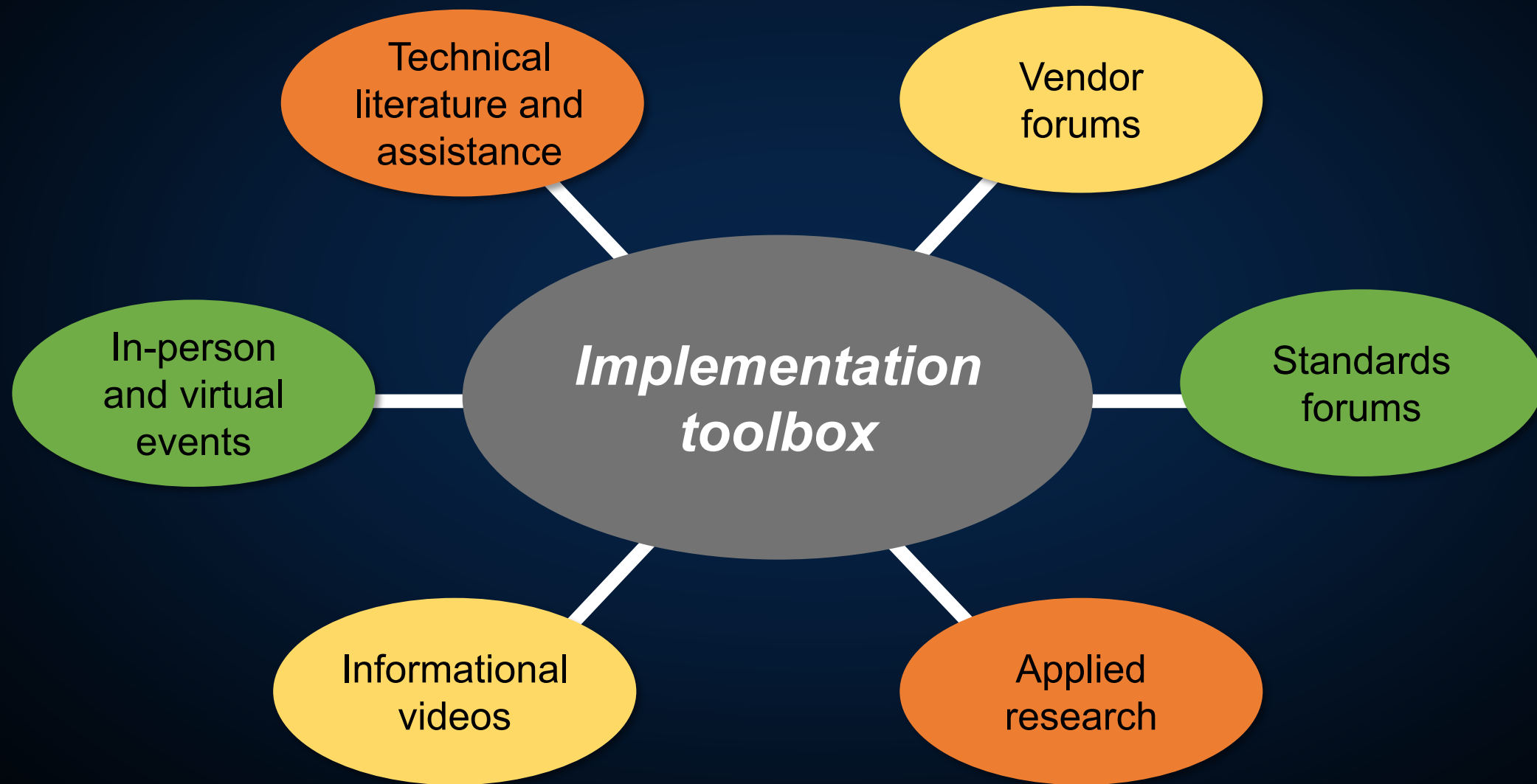
Implementation Goals

Where do we want to be by the end of 2022?

Not pictured on map:

- District of Columbia
- Federal Lands Highway
- ▲ Virgin Islands
- Puerto Rico

Source: FHWA.

Legend:
- ▲ Not implemented
- Development
- Demonstration
- ◆ Assessment
- ○ Institutionalized
- ■ No data

EDC

U.S. Department of Transportation
Federal Highway Administration

© 250755204/stock.adobe.com.

Open Discussion

U.S. Department of Transportation
Federal Highway Administration

Every Day Counts
Innovation for a Nation
on the Move

Thank you

U.S. Department of Transportation
Federal Highway Administration

Every Day Counts
Innovation for a Nation
on the Move

References

Dadi, G.B.; R.E. Sturgill, Jr.; D. Patel; C. Van Dyke; and G. Mulder. 2020. *NCHRP Synthesis 545: Electronic Ticketing of Materials for Construction Management.* Washington, DC: National Academy of Sciences, Transportation Research Board. http://www.trb.org/Main/Blurbs/180798.aspx, last accessed September 30, 2021.

Dadi, G.B. 2020. "Managing Construction Through Electronic Ticketing." Transportation Research Board webinar. http://www.trb.org/Main/Blurbs/180935.aspx, last accessed August 30, 2021.

FHWA. 2021. "e-Ticketing and Digital As-Builts" (web page). https://www.fhwa.dot.gov/innovation/everydaycounts/edc_6/eticketing.cfm, last accessed August 30, 2021.

NAPA. 2020 "e-Ticketing Synopsis" (web page). https://www.asphaltpavement.org/uploads/documents/State_E_Ticketing.pdf, last accessed October 24, 2021.

Every Day Counts
Innovation for a Nation on the Move

Disclaimer

The U.S. Government does not endorse products or manufacturers. Trademarks or manufacturers' names appear in this presentation only because they are considered essential to the objective of the presentation. They are included for informational purposes only and are not intended to reflect a preference, approval, or endorsement of any one product or entity.