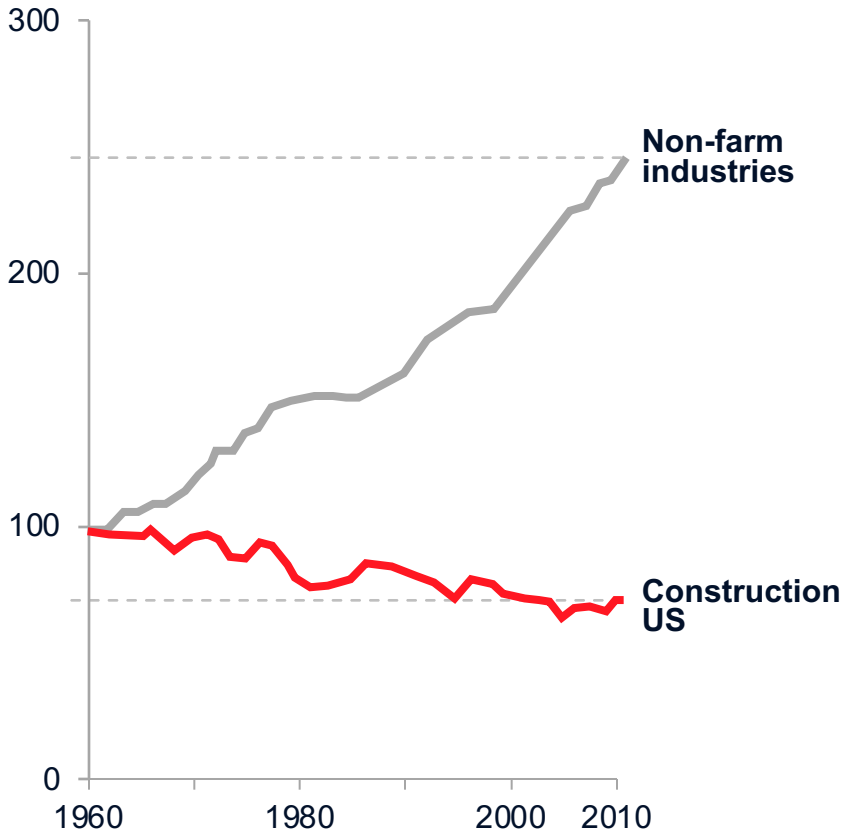
# Digital Project Delivery and Tomorrow's Workforce

**GCAA 2022 Management Workshop & Expo**
**24 February 2022**
**Matthew Valle, VP Industry Relations HaulHub Technologies**

# Construction Has Some Catching Up to Do

## Labor Productivity Index




| | ~1940s | ~2016 | Key Advances |
|---|---|---|---|
| **Agriculture** | | | Land assembly and automation for scale<br>Advanced bioengineering to increase yields |
| **Manufacturing** | | | Entirely new concepts of flow<br>Modularized and standardized designs<br>Aggressively automated to increase production |
| **Retail** | | | Utilized scale advantages and cutting-edge logistics to provide affordable goods to the masses |
| **Construction** | | | Limited improvements in technological capabilities, production methods, and scale |

**Source:** Stanford University

[1] Cumulative real growth in the United States, %, 1947–2010

# The Journey to Digitize Construction is Long and Hard

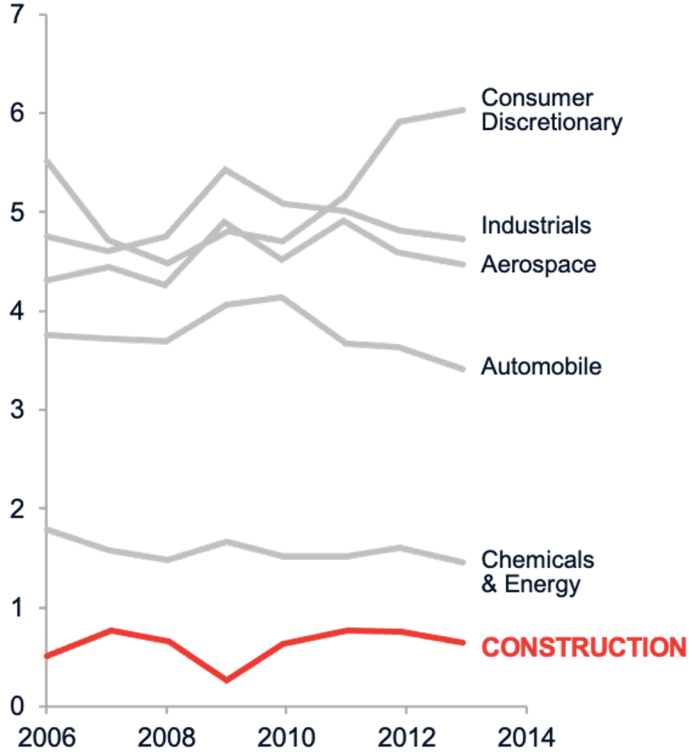
## Level of Digitization

*MGI industry digitization index, 2015 or latest available data*

ICT
Media
Professional services
Finance and insurance
Wholesale trade
Advanced manufacturing
Oil and gas
Utilities
Chemicals and pharmaceuticals
Basic goods manufacturing
Mining
Real estate
Transportation and warehousing
Education
Retail trade
Entertainment and recreation
Personal and local services
Government
Healthcare
Hospitality
**CONSTRUCTION**
Agriculture and hunting

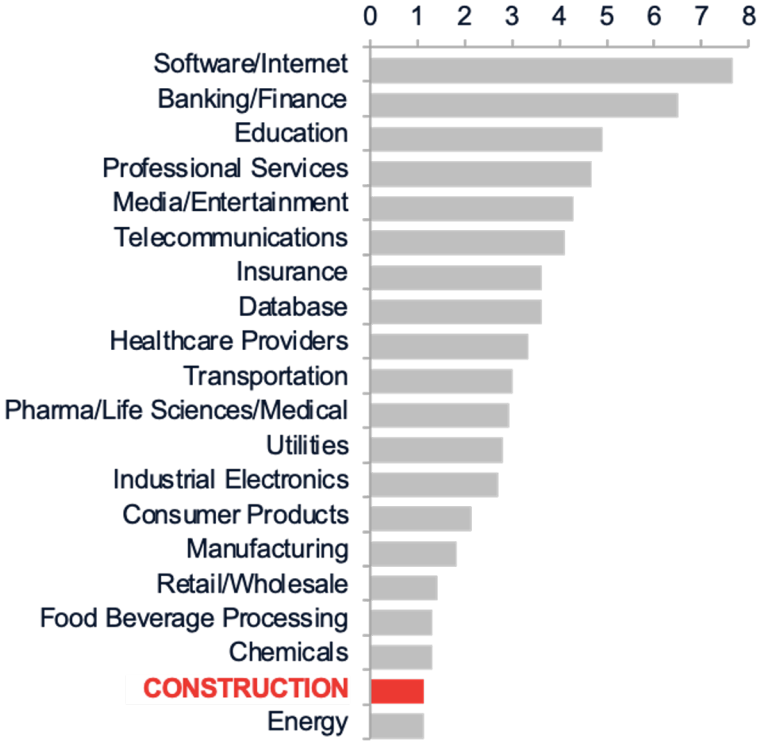
## R&D Investment

*% of revenue spent on R&D*



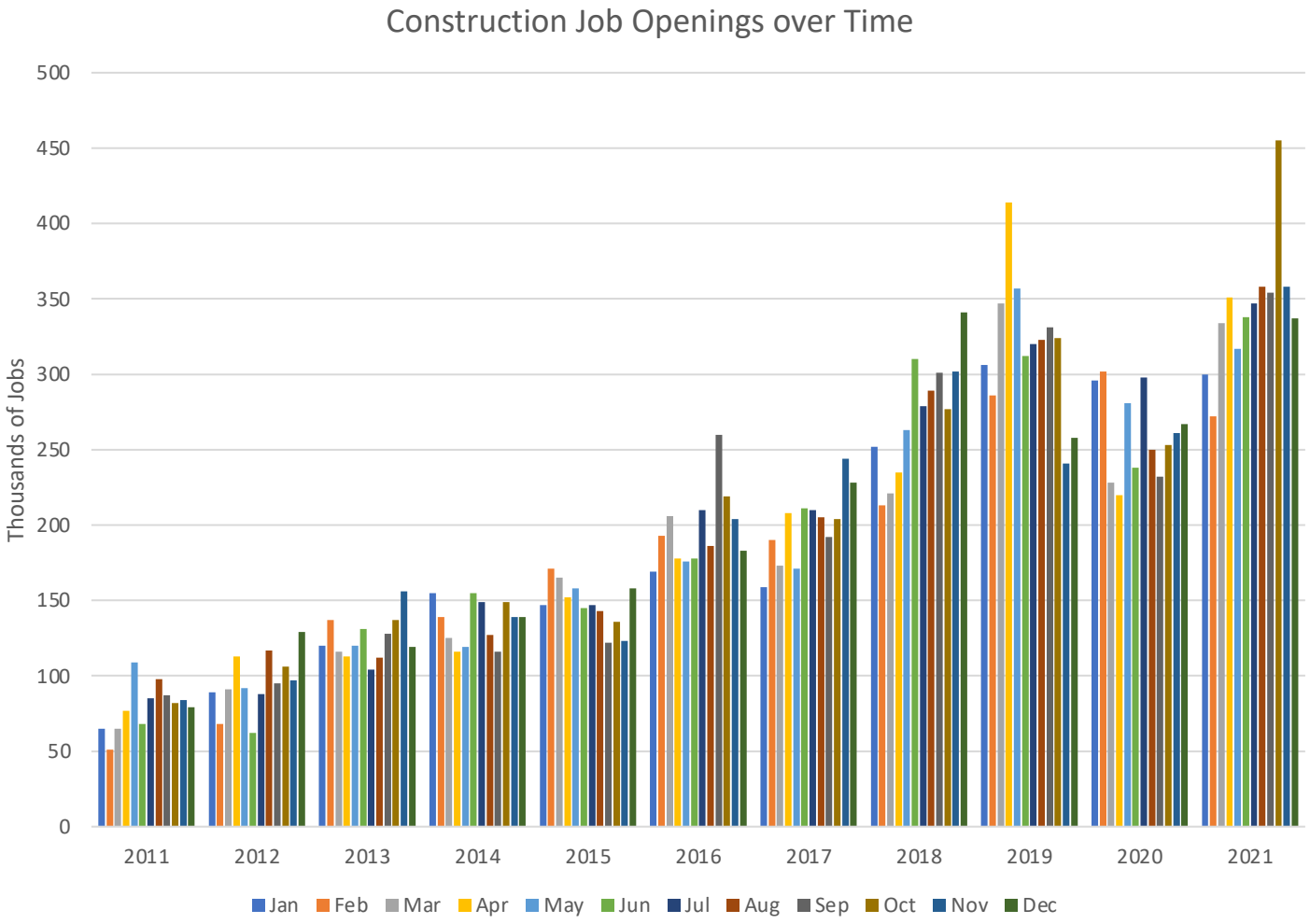

## IT Spending

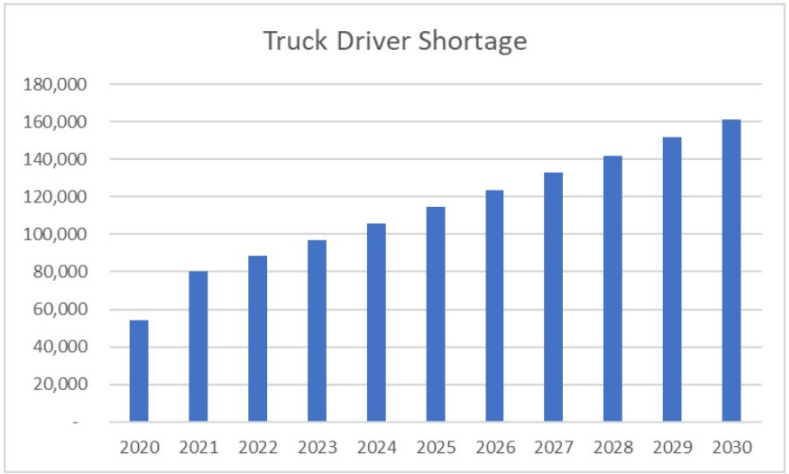
*% of revenue spent on IT*

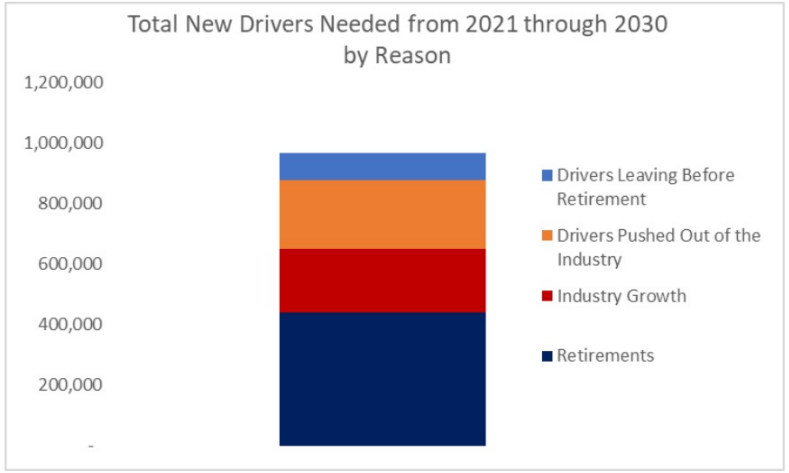



[1] Based on data of top 20 E&C companies by market value globally. [2] Top 20 companies by market value

# Workforce Challenges




Sources: BLS JOLTS & American Trucking Association

# The Coming Challenge

- 41% of the Workforce set to retire in the next decade

- New Graduates looking to tech companies

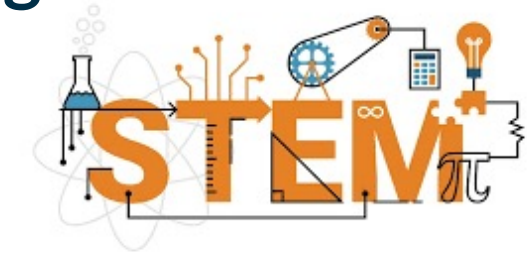
**The top 10 jobs new grads are applying for, and what they pay**

1. **Software engineer,** $94,111 per year
2. **Data analyst,** $60,508 per year
3. **Business analyst,** $65,267 per year
4. **Data scientist,** $100,793 per year
5. **Administrative assistant,** $34,375 per year
6. **Sales representative,** $28,188 per year
7. **Financial analyst,** $64,807 per year
8. **Project manager,** $55,583 per year
9. **Graphic designer,** $41,347 per year
10. **Software developer,** $70,000 per year

**The top companies new grads are applying to**

1. **Amazon,** technology
2. **Microsoft,** information technology
3. **The Goldman Sachs Group,** finance
4. **Apple,** technology
5. **TikTok,** technology
6. **Google,** technology
7. **Ernst & Young,** accounting and legal
8. **Facebook,** technology
9. **Randstad US,** human resources
10. **Salesforce,** technology

- Fortunately, STEM in high school provides a great foundation for success in the era of high-tech construction



# Quickly Growing Ecosystem of Solutions

Created by Lauren Weston

Read more at blog.thomvest.com

# Digital Delivery

*Digital Construction is defined as commercially proven digital technologies and processes for management of construction and engineering activities, including systems for infrastructure project procurement, planning and coordination, construction, digital as-builts, e-Ticketing, operations and maintenance, modernization and management, asset management systems for machines, site equipment, and personnel.*

***Digital construction technologies will provide mechanisms and processes to decrease and more properly allocate project risk, reduce schedule uncertainty, increase productivity and efficiency, lower cost, and deliver safer, higher quality, and environmentally sustainable infrastructure projects.***

***In order to accelerate innovation in the U.S. transportation design and construction industry, ARTBA supports the adoption of open data standards, the model as the legal document (MALD),*** *and modern, commercially-proven, and competitively acquired digital construction technologies and processes for infrastructure projects.*

ARTBA American Road & Transportation Builders Association

*Digital Construction Policy Statement – May 2021*

# Federal Support for Digital Delivery

"(5) ACCELERATED IMPLEMENTATION AND DEPLOYMENT OF ADVANCED DIGITAL CONSTRUCTION MANAGEMENT SYSTEMS.—

"(A) IN GENERAL.—The Secretary shall establish and implement a program under the technology and innovation deployment program established under paragraph (1) to promote, implement, deploy, demonstrate, showcase, support, and document the application of advanced digital construction management systems, practices, performance, and benefits.

- Infrastructure Investment and Jobs Act (IIJA) - H.R. 3684
- Section 5113

# BIM for Infrastructure

## Stepping-Stones: Preexisting BIM Activities

EDC-6 — e-Ticketing + Digital As-Builts

EDC-4 — e-Construction: Electronic Data Capture and Automation

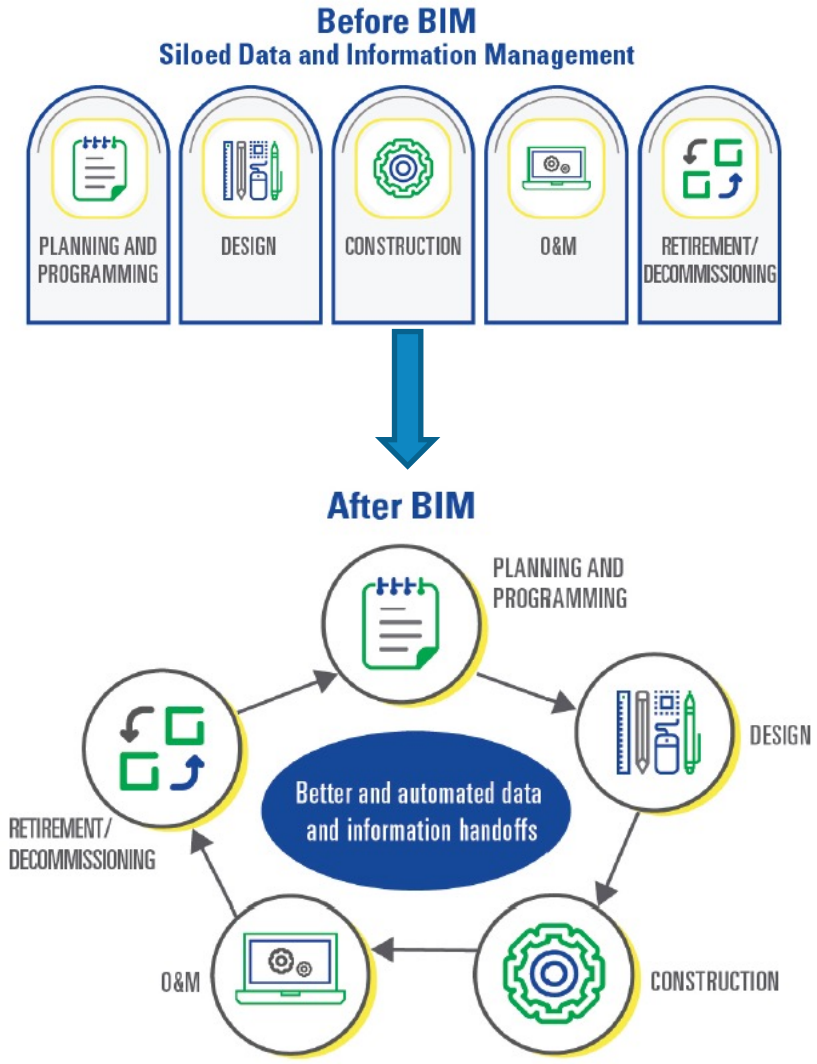
EDC-3 — Three-dimensional (3D) Model + Schedule (4D) + Cost (5D) + Postconstruction

EDC-2 — 3D Engineered Models for Construction

Every Day Counts
Innovation for a Nation on the Move



U.S. Department of Transportation
Federal Highway Administration
Turner-Fairbank Highway Research Center




*O&M: Operations and Maintenance, which includes Asset Management*

© HDR 2019.

# BIM Efforts Across the Transportation Sector

## FHWA

- Research Projects
- EDC-6: e-Ticketing and Digital As-Builts
- Advancing BIM for Infrastructure – National Strategic Roadmap
- Global Benchmarking Program Report
- Lifecycle BIM for Infrastructure: Making the Business Case

## buildingSMART International

- IFC Infra Extensions Projects (Road, Ports, Bridges)
- buildingSMART USA Chapter

## American Road and Transportation Builders Association (ARTBA)

- Innovation and Technology Forum
- Digital Construction Policy Statement

## National Institute of Building Sciences (NIBS)

- U.S. National BIM Program Steering Committee
- AASHTO, FHWA, and several consultants are part of 13 committee members
- Goal - Enable digital processes that will streamline industry practices and procedures on a national scale

Source: IHEEP Annual Conference Presentation: 3D Models as Legal Documents and Open Data Standards: Paving the Way Forward to Digital Delivery

# The Vision for 2025

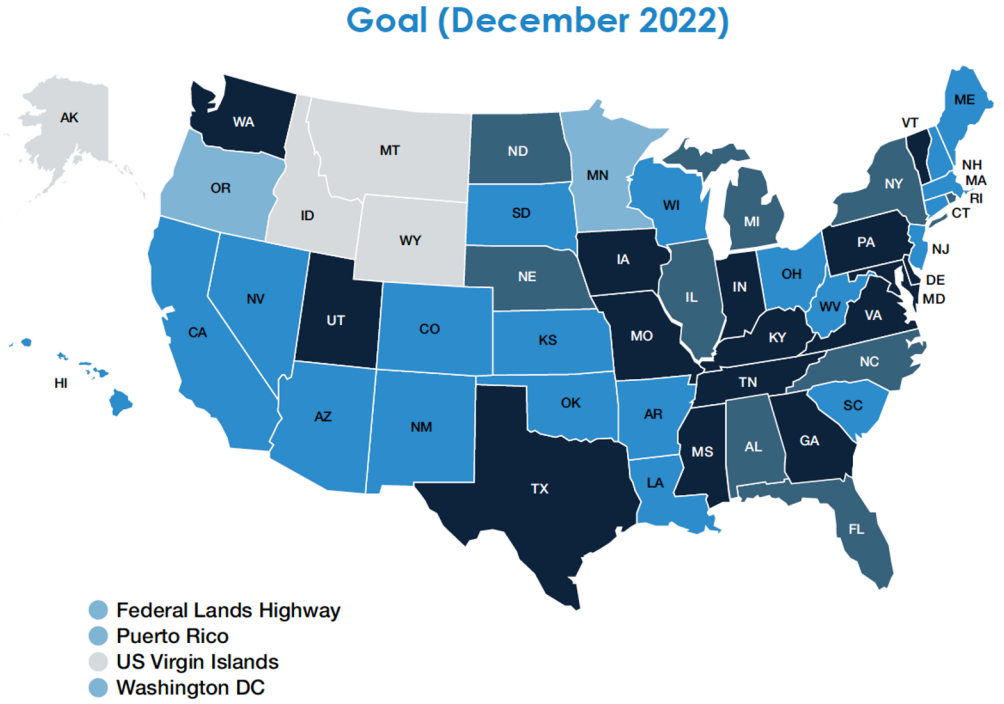
# Current EDC Round (e-Ticketing)

43+ State DOTs Moving ahead with e-Ticketing as an initiative in 2021

- **THE** most adopted EDC Initiatives EVER
- Everybody agrees, paper is a real pain

Immediate value in:

- Transparency Across Stakeholders
- Risk Reduction from Engineers Moving Around Construction Operations to Collect Paper Slips
- Data standardization to build future e-Construction efforts




**Innovation Implementation Stages**

| | |
|---|---|
| Not Implementing | The State is not using the innovation anywhere in the State and is not interested in pursuing the innovation. |
| Development Stage | The State is collecting guidance and best practices, building support with partners and stakeholders, and developing an implementation process. |
| Demonstration Stage | The State is testing and piloting the innovation. |
| Assessment Stage | The State is assessing the performance of and process for carrying out the innovation and making adjustments to prepare for full deployment. |
| Institutionalized | The State has adopted the innovation as a standard process or practice and uses it regularly on projects. |

# States Are Moving Rapidly

Kansas Department of Transportation

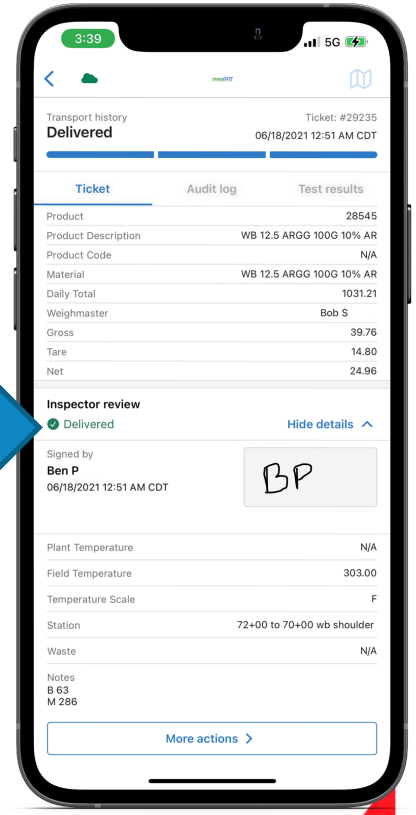
DelDOT

Alabama Department of Transportation

Oklahoma Transportation

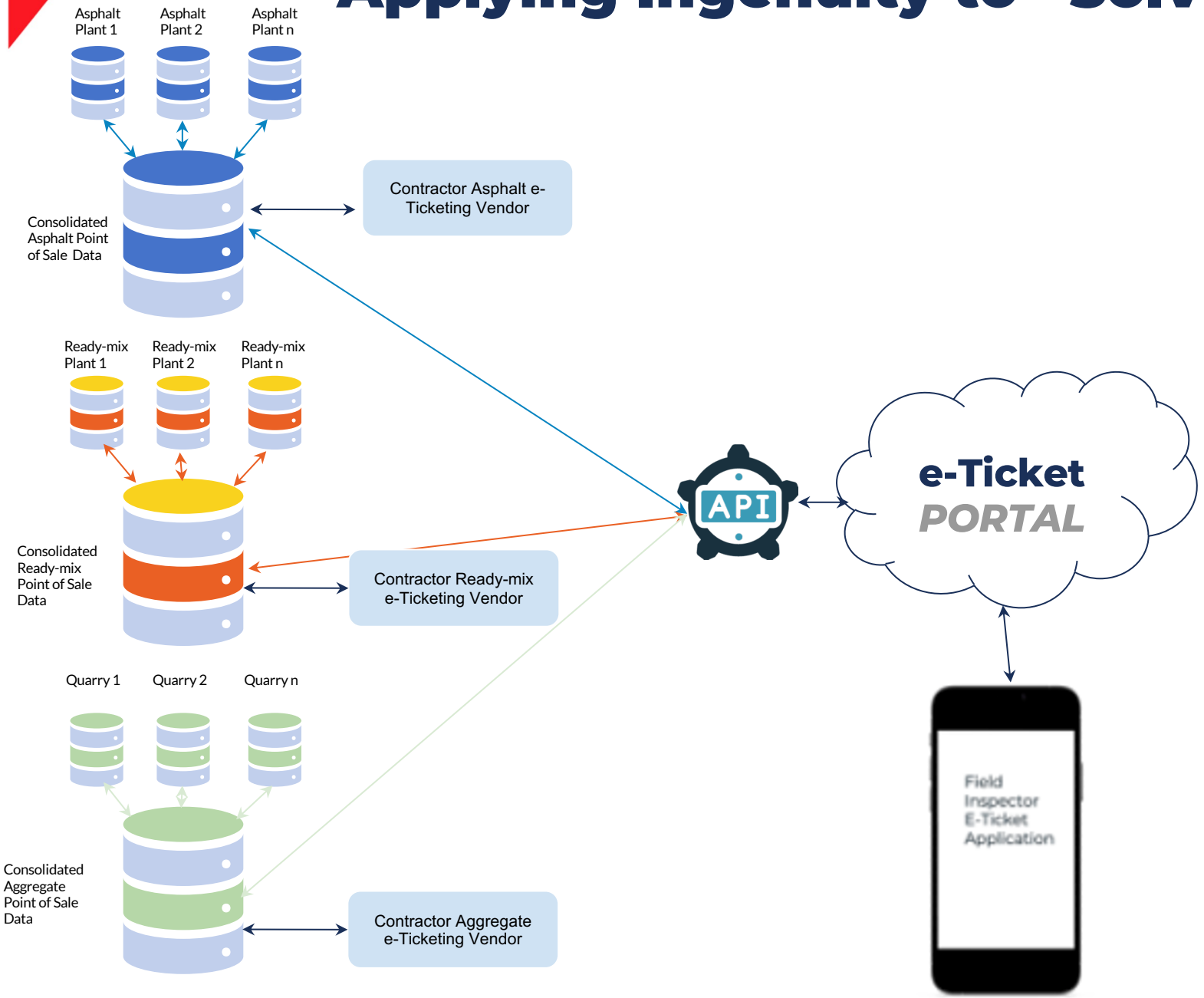
Indiana Department of Transportation

# Construction Materials Undergoing a Transformation...



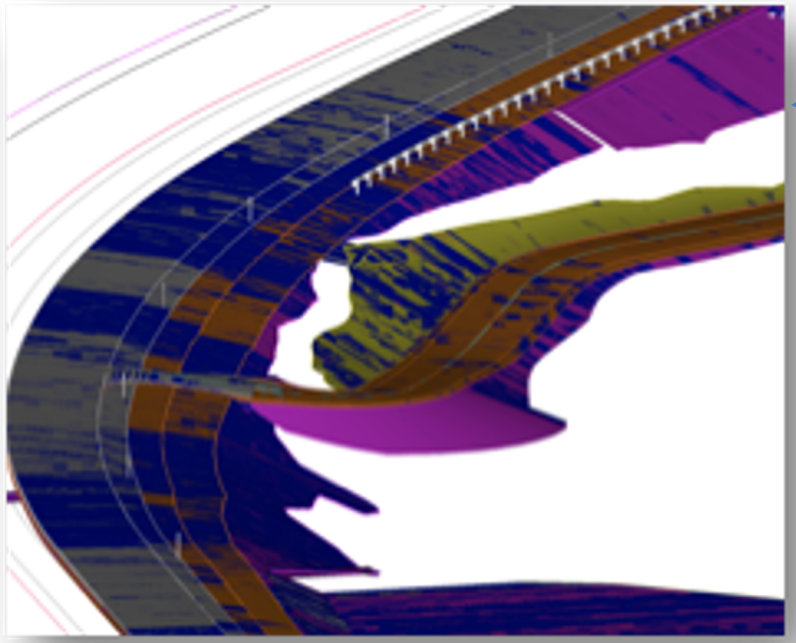

# Look Familiar???

# Applying Ingenuity to “Solve” e-Ticketing




- Silicon Valley Doesn’t Necessarily Understand Construction
- The best ideas on how to do this come from innovative contractors, producers, and owners
- Everyone in this room has a voice and can help shape the future of construction
- The landscape a connected construction is rapidly changing

# e-Tickets: The Tie Between Design and Reality



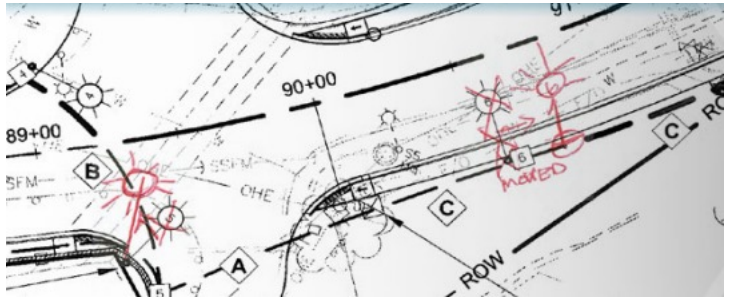
Design embedded with 3D model, cost, and schedule

**e-Tickets**
(the tie from digital design and delivery to what's on the ground)

Properly outfitted plants stream ticket data to the field and provide the data to enhance future performance

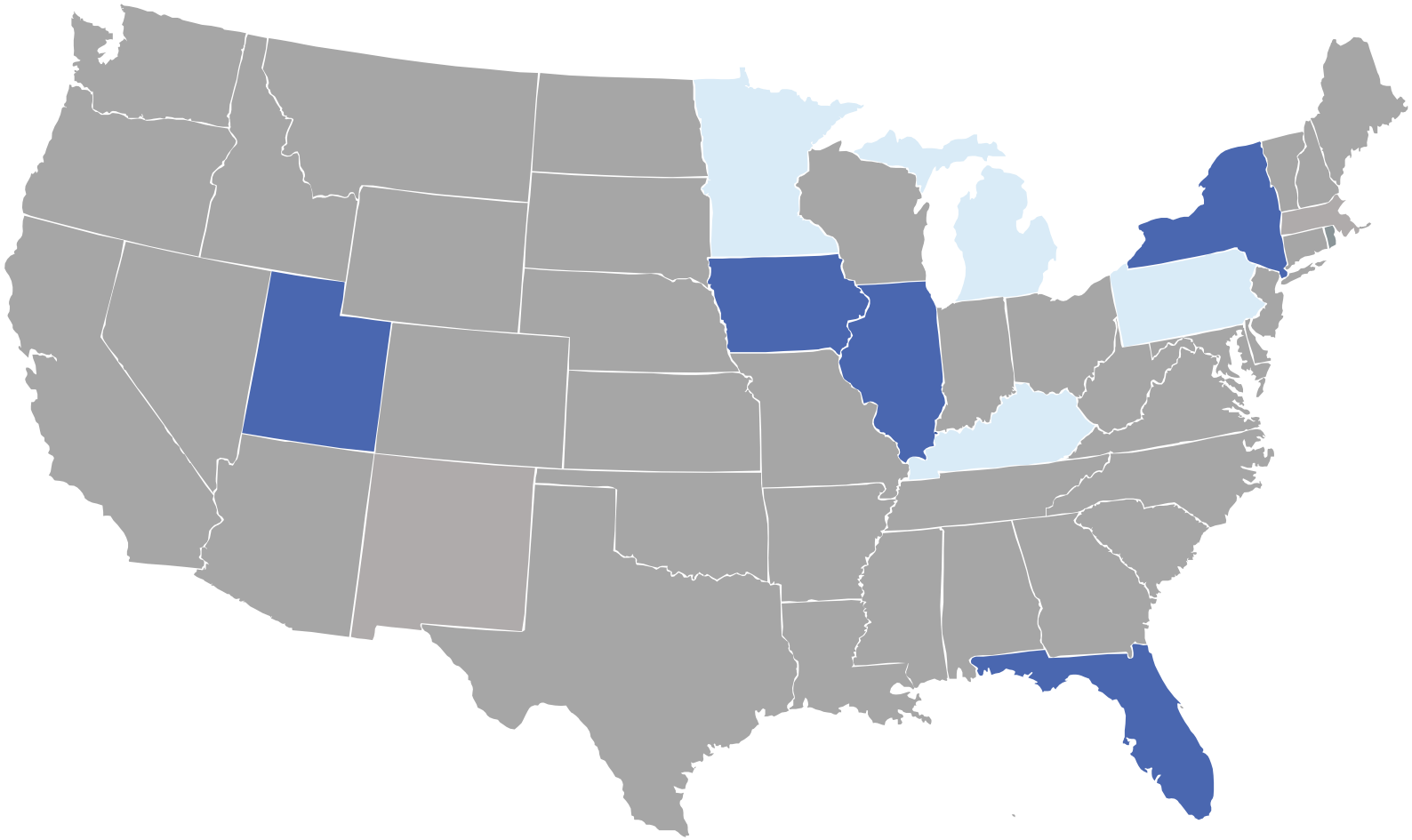
Construction material data captured in the field to inform the digital model (as-built)

# Digital As Builts




***Living records*** updated during construction to support ***effective life cycle asset*** and ***performance*** management

# Model as Legal Document



New Tradition Builds…

- Engineers Drafting => Professional Drafters
- 1st Generation CADD => CAD in paper format
- 2nd Generation CAD with .pdf delivery
- Contractors building models with plan sets => provided files
- EConstruction
- The beginning of the Data Revolution

- Building a repeatable digital process from design to construction that replaces the traditional plan set and using the MALD
- Developing a digital as-built workflow
- And building a Digital Twin as a repository as the ultimate vision

**LEGEND**

Have conducted Pilot Projects

Currently Piloting first Project

Source: IHEEP Annual Conference Presentation: 3D Models as Legal Documents and Open Data Standards: Paving the Way Forward to Digital Delivery

# The Coming Challenge

- 41% of the Workforce set to retire in the next decade
- Owners More Sophisticated and Requiring More Data to Help Make Better Decisions
- Incoming Pipeline of Talent Insufficient to Bridge the Gap
- Workforce retraining and upskilling

# The Ask

- Find a process that you've recently improved with technology and showcase the results in company communications
- Meet with HR teams and find opportunities to discuss technology and "cool tools" in recruiting chats
- Get your younger leaders involved with industry workforce development groups…. They know what will attract their peers

# Digital Project Delivery – e-Ticketing Focused Webinar
# March 10th 1pm ET

Gregory Nadeau
Former FHWA Administrator
Chairman, Infrastructure Ventures

Kat Weisner
Construction & Contract Admin. Eng.
FHWA EDC-6, e-Ticketing Lead

Doug Perry
COO
Brox Industries

Scott Fernald
Paving Manager
Granite Utah

Janet Treadway
Business Administrator, AASHTOWare Project
Ohio DOT

IV Infrastructure Ventures

U.S. Department of Transportation
Federal Highway Administration

BROX

GRANITE

Ohio Department of Transportation

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