Opportunities and Challenges of Digital Data Applications in Transportation Project Delivery and Management
Introduction

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Webinar Sponsors
AFH10 - Construction Management Committee
ABJ50 - Information Systems and Technology
AFH10(1) – Information Systems in Construction
Digital Project Delivery
Speakers

Title: *Transitioning from traditional to digital project delivery – a DOT’s and Consultants perspective*
Speakers: David Brown, Parsons, and Eric Kahlig, Ohio Department of Transportation

Title: *Transparent highway Agencies Using digital Data*
Speaker: Stan Burns, Integrated Inventory (former asset management director of Utah DOT)

Title: *Making Big Transportation Data Useful*
Speaker: Jesse Coleman, City of Toronto, Canada
Abstract:

Title: Opportunities and Challenges of Digital Data Applications in Transportation Project Delivery and Management

The delivery of transportation infrastructure by state and local agencies is quickly transitioning to the digital age. Long gone are the days of doing design plans in ink on sheets of mylar, similarly construction field offices cannot function without Wi-Fi and a high-speed internet connection. The digital revolution presents a host of opportunities to improve the efficiency of communications within the delivery team as well as tighter control of budget and schedule. This revolution also has a tendency of raising the awareness of antiquated processes and policies that were developed to accommodate the limitations of the analog environment. This presentation will cover the perspective of a SHA as the agency transitions to digital as well as a consultant who is always looking for a better, faster, more efficient way to deliver project scope that is safe, effective and compliant to requirements. Topics covered will include determining what data is really needed, how best to collect data, and what analysis of the data can provide project management with the best information for decision making.
Opportunities and Challenges of Digital Data Applications in Transportation Project Delivery and Management

Flow:

- (2 min) Introduction and brief summary of our experiences with digital data applications
  - David
  - Eric

- (7 min) Status of ODOT’s transition to digital project delivery processes
  - AASHTO-Ware products (software)
  - Digital data collection hardware
  - Consultant/contractor participation on projects
  - What has worked well, what has not been as successful

- (7 min) Parsons’ use of digital data to deliver projects – consultant’s perspective
  - To lead or to follow? Pushing innovation or do what has always been done?
  - Working with SHA’s VS working with construction contractors
  - It’s about the data, not the document.
  - The power of data analysis, not just collecting lots of data.

- (4 min) What is next?
  - SHA perspective
  - Consultant’s perspective
Eric Kahlig, PE – Ohio DOT
- 21 years with Department
- Administrator - Alternative Project Delivery
  - eConstruction Initiative
  - Innovative Contracting
Ohio DOT Transition to Digital Project Delivery

ODOT Transition - Iterative Steps

• Usage of Home-grown database – DOS based CMS – 1992
  ▪ Continued paperwork – payment driven reason

• Advertisement / Distribution of Plan Sets / Electronic Bidding – 2004
Ohio DOT Transition to Digital Project Delivery

• SiteManager by AashtoWare – 2011
  ▪ Continued paperwork

• Mandate of all documentation to be stored electronically - 2014
  ▪ Scanned data or created Digital Data

• EDC eConstruction Initiative - 2015
Ohio DOT Transition to Digital Project Delivery

- Acceptance of Digital Signatures – 2015
  - Digital Project Records / Change Orders
- Digital Information – Contractual July 2015
  - 3D Pilot Project – Grades/X-sections
- Full use of Mobile Inspector – July 2016
  - No other project record by Inspector
  - Grass Roots expansion
Ohio DOT Transition to Digital Project Delivery

• Full commitment from IT: Complete Mobile Workforce – June 2017

• Electronic Only Quality / Performance Documentation – June 2017
  ▪ Electronic Documentation – automated storage
Ohio DOT Transition to Digital Project Delivery
Ohio DOT Transition to Digital Project Delivery

• Recent Drivers

  ▪ Feasibility

  ▪ Necessity
Commitments / Decisions to Date

- Use it if we have it
- Support / Expand the inclusion of Consultants and Contractors into the Systems
  - Virtual Desktops
  - Inclusion into systems
- Agnostic Approach: Comfort Level = Usage Level
Biggest Hurdle: Acknowledging the benefits

- Efficiency
- Equivalency
- Acceptance
Ohio DOT Transition to Digital Project Delivery

• Philosophy to Digital Delivery

- Try it until you Break It

- Leadership by Example by Leadership
Ohio DOT Transition to Digital Project Delivery

- **Next Steps**
  - Fully Digital Inspection Database – not just electronic
  - Fully Digital Plan
David Brown, PE – Parsons
- 16 years with firm, 35+ years as Engineer
- Currently VP Performance Improvement
- First fully digital project in 2008
To Lead or to Follow?

What is the consultant’s reward VS cost for going to digital project delivery.

Similar situation as transition from ink and mylar for plan sheets to CAD workstations.
Consultant's Perspective to Digital Project Delivery

Working for DOT or for Contractor?

DOT – “We have to do it this way because the FHWA require it.”

Contractor – “Will it save us time and money in getting the work done? It will! Then let’s go.”
It is about the Data – not the Document!

PDF version of a ‘form’ isn’t digital.

Collected digital data can be analyzed and published in any format necessary.

Need to actively think digital.
The power of Data analysis!

Trending performance.

Risk based prioritizing.

Graphical presentation.
What is next?

Agency perspective

Consultant’s perspective
Questions? Want to know more?

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Transparent Highway Agencies

Collect, Organize, Analyze, Save

Stan Burns
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Transparent Agency:

*Can Demonstrate and Measure where to Allocate the First & Last Dollar*
“Collect Once for Everyone”

- Maintenance
- Traffic & Safety
- Structures
- GIS
- IT system
- Motor Carriers
- Both directions
- Preconstruction
- ROW
- Regions
- Programming

3 HD Images (2400 X 3200) every 26.4 ft.

LiDAR – Geospatial Location of Features
Automated Pavement Distress

- Highway Speeds
- Data Extraction and Processing
- Turn Key Operation

Wheel Path
Fatigue Cracking
Longitudinal Cracking
Transverse Cracking
High Volume Pavement Condition

High Volume Pavement Condition (3,080 Mi/11,845 SA)
Forecast with 148 Million / Yr

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<th>Fair: IRI 95 to 170 in/mi</th>
<th>Good: IRI &lt; 95 in/mi</th>
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<th>Long Range Goal: &gt; 50 % Good</th>
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<td>35%</td>
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Feature Extraction
Organized Information
Know Everything About a Section of Road

Welcome...
This portal provides spatial and non-spatial UDOT data.
Go to the Download section to download enterprise data in a variety of formats including:
- ESRI shapefile
- KML (used by Google Earth and Google Maps)

UDOT Data News
New 6" Statewide Aerial Imagery from Google
In collaboration with other state agencies, UDOT has recently acquired access to 6" imagery for the state of Utah through Google. An initial draft of the imagery has been released for us to review. To access this data, please email Corey Unger (coreyunger@utah.gov)

New Open Data Guide
Please see a copy of the Open Data Guide for a detailed list of layers. Click Data Assessment Form links for more information about each layer.

Project Design & Asset Query App and Safety App
Project Design & Asset Query App and Safety App
• Inventory Fencepost to Fencepost
• Pavement Distress
• Environmental Data
• Past and Future Projects
• All Crashes
Safety Program to Replace Texas Turndowns

- Solution – Business Apps
  - Location
  - Speed Limits
  - Clear Zone
Design and Safety Applications

### SR 190

**Route:** 0190P, 5 - 15  
**PIN:** 15345  
**Project Number:** STP 190 (232)  
**Year:** 2017  
**Engineering Defaults:** Region 2

#### Roadway

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<tr>
<td>Rumble Strips</td>
<td>0 ft</td>
<td>$0</td>
</tr>
<tr>
<td>Rotomilling</td>
<td>2 in</td>
<td>$900,164</td>
</tr>
<tr>
<td>Soft Spot Repair</td>
<td>0%</td>
<td>$0</td>
</tr>
<tr>
<td>Manholes</td>
<td>6</td>
<td>$4,656</td>
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<tr>
<td>Valves</td>
<td>8</td>
<td>$3,991</td>
</tr>
<tr>
<td>Catch Basins</td>
<td>0</td>
<td>$0</td>
</tr>
<tr>
<td>Monuments</td>
<td>0</td>
<td>$0</td>
</tr>
<tr>
<td>Emulsified Asphalt CSS-1</td>
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<td>$192,967</td>
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<tr>
<td>HMA - 3/4 Inch</td>
<td>21,575 ton</td>
<td>$1,895,975</td>
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</tbody>
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Total Cost: $3,182,072
Benefits

- Single Source of Truth
- Breaking down “Silos”
- Savings - Time & Efficiency
- Staff Safety – Less Time in Traffic
- Public Trust – Decisions based on Engineering Experience but also Information

Thanks
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Big Data Innovation Team

Making Big Transportation Data Useful

Jesse Coleman, Big Data Innovation Team Lead, City of Toronto

TRB Webinar: Opportunities and Challenges of Digital Data Applications in Transportation Project Delivery and Management
AGENDA

• Why is Big Data Important?
• Big Data Innovation Team
• Current Project
• Next Steps
WHY IS BIG DATA IMPORTANT?
PAST TRANSPORTATION/TRAFFIC DATA COLLECTION
WHAT HAS CHANGED?
WHY IS TORONTO FOCUSED ON BIG DATA?

1. Opportunity with growing amount of probe data across all modes

2. Historical reliance on models and small samples of (infrequent) data

3. Current methods don’t reflect the day-to-day variation in conditions

4. Challenges in evaluating the impact of policies / programs / projects
BIG DATA INNOVATION TEAM
TORONTO’S BIG DATA INNOVATION TEAM

• Within Transportation Services Division
• Transportation Services is responsible for building and maintaining the City’s transportation infrastructure
• Eventual composition: 4 FTE + 2 interns
• Sits within Traffic Management Centre
• Unique group among peer cities
INTEGRATION OF SKILL SETS

Statistics / Data Analysis  

Computer Science  

Design & Visualization  

Database / Data Management  

Transportation  

Cartography / GIS
HOW WE THINK WE CAN USE BIG DATA

1. Describing: Understanding how the system is performing.

2. Evaluating: Assess the impact of a policy / program / project

3. Operational: Identifying and responding to issues in real-time

4. Predicting: Shorter-term predictions based on incidents, weather etc.

5. Planning: Smarter prioritization of policies and investments
WHAT ARE SOME OF OUR DATA SOURCES?

- GPS Probe Data
- Bluetooth/Wifi Probe Data
- Traffic Counts
- Vehicle Detector Data
- Collision & Incident Data
- Weather Data
WHAT ARE SOME OF OUR POTENTIAL DATA SOURCES?

- Cycling App Data
- Bike Share Toronto Data
- Special Events
- Transit GPS Data
- Parking Authority Data
- PRESTO
DEVELOPING CONGESTION MONITORING TOOLS
What drives congestion frustration in Toronto: Is it travel times or a lack of reliability?
GPS PROBE DATA – TRAFFIC SPEEDS

• Real-time and historical disaggregate speed data across the city
• Contract with HERE starting in April 2017
• Facilitates better congestion monitoring, more comprehensive before/after studies, etc.
What arterial roads in Toronto are the most congested?
And what roads are the least reliable?
PM Peak Period
Travel Time Index
(Peak Time / Free Flow Time)

- 1.00 – 1.18
- 1.18 – 1.25
- 1.25 – 1.50
- 1.50 – 1.75
- 1.75 – 2.00
- > 2.00
MOST CONGESTED ROADS
MAPPING RELIABILITY

PM Peak Period Coefficient of Variation
(SD Time / Mean Time)

- 0.05 – 0.13
- 0.13 – 0.16
- 0.16 – 0.25
- 0.25 – 0.32
- 0.32 – 0.38
- > 0.38
LEAST RELIABLE ROADS
TOP 10 CONGESTION HOTSPOTS
John Tory reveals plan to ease congestion in 10 Toronto 'hotspots'

The city will study problematic intersections to come up with ways to get traffic moving

CBC News  Posted: Jun 06, 2019 12:58 PM ET  |  Last Updated: Jun 06, 2019 1:11 PM ET

The city is planning to tackle the problem of congestion in 10 "hotspots" in Toronto. (City of Toronto)

The city is planning to take new measures to alleviate traffic congestion in Toronto, Mayor John Tory announced on Wednesday.

The plan is made up of a series of initiatives, including identifying "hotspot" intersections, upgrading the city's traffic signal system and developing a road safety plan to reduce traffic fatalities.

"We have to keep people moving," Tory said at a downtown news conference. "But we also have to keep them safe."

One of the measures being introduced within the first six months of 2016, Tory says, are signals that will respond to traffic volume at 20 intersections across the city.
WHAT’S NEXT?
NEXT STEPS

• Working with University of Toronto to improve traffic volume data collection
• Building analytics for Vision Zero

• Building an internal analytical culture
• Develop a network of practitioners and share best practices
• Continue development of data warehousing tools
• Developing and automating standardized methodologies for common problems & requests
• Show tangible impacts from this work:
  • Congestion monitoring dashboards
  • Before/after analyses for on-going projects
Big Data Innovation Team

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