More Stuff, More Problems.....but also Opportunities: Perspectives on the Supply Chain Crisis

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The E-commerce Growth Facts

“More than 10 years ago, e-commerce accounted for 5.1% of total U.S. retail purchases. On-line sales now account for 21% (2020), a striking jump from 16% in 2019.”

“Consumers spent $861B on-line in the U.S. in 2020, up an incredible 44% compared with 2019. That’s the highest annual U.S. e-commerce growth in two decades.”

Source: www.digitalcommerce360.com
What are the Implications of Next-day Deliveries?

- Strain on supply chains and logistics
- Strain on the multi-modal transportation system (world-wide)
- Bottlenecks in the system

- Need for transportation projects, programs and policies to mitigate the impacts
Other Challenges (to Truck Deliveries)

• Increased demand & not enough trucks
• Semiconductor shortage (tiny silicon chips)
  • Car and truck production stalled/stopped (driver-assistance systems, smartphones, home appliances, etc.)
• Perennial driver shortage
  • Worse now (pandemic)
  • Transportation costs are going up (generally, more dollars chasing fewer goods)
• The battle for the curb….
Curb Management – the battle for the curb

• “Curbside management exists at the nexus of transportation, land use, and economic development” Institute of Transportation Engineers, Curbside Management Practitioners Guide

• Curb has tremendously-high value in urban environments….and lots of competition
The Curb Dilemma(s) & Opportunities

• Competition is fierce along urban curbs, balancing
  • Transportation Network Companies
  • Parking (eliminated in large urban areas–space too valuable)
  • Loading/unloading – deliveries (“fast” and “slow”)
  • Waste collection/removal
  • Other modes – bus, non-motorized
  • Connected/automated vehicles

• How to facilitate curb use for multiple users (and enforce it)?
• The curb clearly has value - how do we value that?
• Curb management is (increasingly) critical
Who is using the curb?
Curb Management – solutions

• Relocate – curb spaces to better use the curb zone
• Conversion – of curb space to different uses to better use the curb zone
• Flexibility – convert curb spaces to flexible time-of-day zones to meet demand-based uses throughout the day

• *Curb Productivity Index* – to measure the amount of passenger activity (number of people using the curb) – per hour, per 20 feet of curb (about the size of one parking space)
  • Puts value on higher number of persons using the curb

*Source: Kittelson & Associates*
Private-sector Demands/Solutions

• Carriers (and shippers) must make their delivery windows!

• “Next-day delivery” or “same day delivery” means must get product closer to customers before you click “add to cart”
  • Warehouse and/or distribution centers closer to customers

• More trucks to “make their turns”

• Access to the curb

• The retail/grocer dilemma: How to get customers (back) to the store? Then the customer provides the transportation, they pick the products, etc.
Neuro R2 Robot and Pizza Delivery – Woodland Heights (Houston), CA, AZ

- Neuro – founded in 2018 by 2 former Google engineers
- “Select customers” pay online for order and get unique PIN
- First driverless vehicle with regulatory approval from US DOT
- Also - CVS pharmacy store deliveries

Source: https://reporterdoor.com
Amazon Patents – a glimpse into the future?

“Multi-level fulfillment center for unmanned aerial vehicles”
Amazon Patents – a glimpse into the future?

Source: www.businessinsider.com
Amazon Patents – a glimpse into the future?

An accordion-like drone chute

Source: www.businessinsider.com
Technological Solutions are Coming Here

• Delivery robots
• Autonomous vehicles – beginning in the freight delivery, long-haul being tested (showing promise)
• “Space-age” deliveries

• What about technology xx?...

• …if it reliably and safely helps the private-sector hit delivery windows, it will likely be in the running.
Taking a Step Back: Understanding System Performance to Improve Planning and Investment Decisions

With improved understanding, we can…

• …identify when, where, and how people and goods are moving
• …identify congested locations & bottlenecks in the system
• …inform policy, program, and project prioritization/selection
• …identify impacts of situations & solutions
• …inform performance management (system monitoring)
• …and because it’s the right thing to do!
  • Accountability and transparency
# 100 Most Congested Roadways

<table>
<thead>
<tr>
<th>Rank</th>
<th>Rank Truck</th>
<th>Roadway</th>
<th>From</th>
<th>To</th>
<th>County</th>
<th>Annual Hrs of Delay per Mile</th>
<th>Annual Hrs of Truck Delay per Mile</th>
<th>PTI</th>
<th>CSI</th>
<th>Annual Congestion Cost (M)</th>
<th>Annual Truck Congestion Cost (M)</th>
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<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>IH 610</td>
<td>IH 10 / US 90</td>
<td>US 59 / IH 69</td>
<td>Harris</td>
<td>1,112,917</td>
<td>68,892</td>
<td>2.45</td>
<td>3.89</td>
<td>$90.63</td>
<td>$20.99</td>
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<td>2</td>
<td>1</td>
<td>IH 35</td>
<td>US 290 N</td>
<td>SH71</td>
<td>Travis</td>
<td>1,085,136</td>
<td>108,645</td>
<td>2.71</td>
<td>4.73</td>
<td>$215.22</td>
<td>$72.33</td>
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<tr>
<td>3</td>
<td>3</td>
<td>US 59</td>
<td>IH 610</td>
<td>SH 288</td>
<td>Harris</td>
<td>870,291</td>
<td>51,604</td>
<td>2.12</td>
<td>3.36</td>
<td>$105.83</td>
<td>$23.64</td>
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<td>4</td>
<td>44</td>
<td>Woodall Rodgers Pkwy</td>
<td>US 75</td>
<td>N Beckley Ave</td>
<td>Dallas</td>
<td>748,546</td>
<td>14,976</td>
<td>2.03</td>
<td>3.06</td>
<td>$21.31</td>
<td>$1.81</td>
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<tr>
<td>5</td>
<td>5</td>
<td>IH 10 / US 90</td>
<td>N Eldridge Pkwy</td>
<td>Sam Houston Tollway W</td>
<td>Harris</td>
<td>659,595</td>
<td>48,865</td>
<td>1.95</td>
<td>3.33</td>
<td>$50.23</td>
<td>$13.43</td>
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<td>6</td>
<td>9</td>
<td>IH 45</td>
<td>IH 610</td>
<td>Sam Houston Tollway N</td>
<td>IH 610</td>
<td>656,582</td>
<td>39,713</td>
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<td>$135.37</td>
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<td>7</td>
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<td>IH 635</td>
<td>IH 35E / US 77</td>
<td>US 75</td>
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<td>555,861</td>
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<td>1.72</td>
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Truck Mobility for Metropolitan Planning Organizations (MPOs)

The Roads by County
In the Austin MPO

Stats by Road by County
Select Link Analysis - Heat Maps

Truck Trip Patterns (for All Trucks Using I-35W Northbound in Downtown Fort Worth)

- Density of truck trips that used northbound I-35W between SH 183 and I-30 between 5:00PM & 6:00PM
- Texas 100 Section delay per mile rank:
  - Truck only: 11, All vehicle: 23
- Data time range: 11 JAN 2016 to 9 APR 2016

Analysis Section | Trip Density
-----------------|--------------
                 | Many Trucks  |
                 | Few Trucks   |

*55W selected area coordinates (-97.323 32.78 to -97.318 32.77)
Truck Delay in Texas Triangle on Freight Network

Statewide Truck Congestion Map

- Delay per mile (color) and
- Volumes (line width)
Truck Delay in Austin, Texas
FHWA Freight Mobility Trends (FMT) Tool


Freight Mobility Trends and Highway Bottlenecks

The Federal Highway Administration’s (FHWA) Office of Operations has created a Freight Mobility Trends Analysis Tool to present national freight statistics and identify freight highway bottlenecks on the Interstate System, National Highway System (NHS), National Highway Freight Network (NHFN), and Strategic Highway Network (SHRN). This page provides information on Freight Mobility Trends.

Freight Mobility Trends Report

The Freight Mobility Trends Report provides high-level, national trends in freight mobility and assesses freight movement over a range of locations based on truck travel data:

- Measures of freight mobility at the national, State, regional, or corridor level.
- Freight mobility around major ports, intermodal facilities, and border crossings.
- Identification of freight highway bottlenecks.

The Freight Mobility Trends Report uses vehicle probe-based travel time data from FHWA’s National Performance Management Research Data Set (NPMRDS). The report is produced annually and compares data from the most recent year to the previous year.

Freight Mobility Trends Tool

The FHWA Freight Mobility Trends Analysis Tool is an interactive dashboard that presents national freight statistics and identifies freight highway bottlenecks on the Interstate System, NHS, NHFN, and SHRN. This program uses a Freight Mobility Trends dashboard with indicators to assess freight movement based on truck travel data. The three dashboards are as follows:

- National, State, and Urban Area Freight Statistics: This view provides a national overview of freight performance measures, and a comparison tool to view State and urban area/HPD trends.
- National Freight Bottlenecks: This view provides a ranked list of specific freight bottlenecks nationally or by state in addition to more detailed information. The visualization also includes a separate view of the freight bottlenecks around airports, border areas, intermodal facilities, and ports.
- National Freight Commodity Corridors: This view provides an overview of national freight corridors.

General instructions are available at: Freight Mobility Trends instructions.

Freight Highway Bottlenecks

The Freight Mobility Trends Analysis Tool has been used to identify major freight highway bottlenecks and congested corridors based on annual truck-hours of delay per mile. Delay per mile is calculated for each Interstate segment using the NPMRDS travel time data. The delay per mile measure compares performance over the entire Interstate System and across all States for corridors of different lengths.

The following Freight Highway Bottlenecks Reports list the top 100 Interstate bottlenecks and congested corridors in the United States. FHWA conducts this analysis on an annual basis to update the list, track trends, and gain insight into successful transportation management techniques to address congestion at major bottlenecks.

2019 National List of Major Freight Highway Bottlenecks and Congested Corridors [HTML .pdf 638Kb]

2018 National List of Major Freight Highway Bottlenecks and Congested Corridors [HTML .pdf 510Kb]

This analysis uses delay per mile to assess bottlenecks over the entire Interstate System. Individual State Departments of Transportation (DOTs) and HPDs use a variety of bottleneck identification methods based upon their local traffic characteristics, infrastructure constraints, and impediments to efficient freight movement. These methods include congestion, delay,
The Concept of “Freight Fluidity”

*Freight Fluidity is the performance of the trips for goods moving in your state or region*

- Awareness of goods moving in the region
- Understanding of current economic conditions and supply chain opportunities
- Use of awareness and economic/supply chain intel to identify key trip routes for freight
- Assessment of freight mobility and bottlenecks along these trip routes
What are the key goods and how are they transported?
- Texas Freight Mobility Plan
- Regional Freight Transportation Plans
- Freight Analysis Framework

Where Is the Economic Opportunity?
- Census Bureau Commodity Flow Survey
- Bureau of Economic Analysis (industries, production, consumption)

How Well Are Freight Corridors Moving Freight?
- ”TX100”, TCAT, UMR
- In-Depth, Location-Specific Information using NPMRDS
- Multimodal: Port and Border Crossing Analysis

https://mobility.tamu.edu/project/texas-freight-fluidity/
Developing and Implementing a Freight Fluidity Management Framework for U.S. Ports (U.S. Army Corps of Engineers)
Dwell Time at Terminal Areas (Port of Baltimore)
Some Final Thoughts

• There’s a tremendously large (and global) supply chain behind the person delivering your package
  • …and a lot of things must go right for it to get to you!

• Clicking “Add to Cart,” “Next Day Delivery,” “Same Day Delivery” has implications

• Several stakeholders involved (and responsible) as we (all) tackle these transport problems
  • Public agencies (federal, state and local)
  • Private companies (businesses, shippers, carriers, technology, etc.)
  • Non-profits
  • Customers (and general public)
  • ….and anyone else who eats or buys anything

• There are demonstrated methods and measures to define the freight transportation problems – with an eye toward solutions
Contact Info & Selected Resources

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Texas A&M Transportation Institute Mobility Division
http://mobility.tamu.edu

- Transportation Research Board, Urban Freight Transportation Committee
  - http://urbanfreight.tti.tamu.edu
  - “Urban Freight Transportation Committee Centennial Paper: Embracing the Future with Insights from the Past”


- TTI 2021 Urban Mobility Report, https://mobility.tamu.edu/umr/