

TRB Committee on Future of Interstate Highway System – Caplice Talking Notes

Thank you for inviting me to join this panel. My perspective on this panel will be on the future trends that could potentially impact the demand side of freight transportation. I think this will complement the input from Bob Costello from ATA and my other panelists.

Specifically, I will focus on 4 mega-trends and discuss how it might impact shippers and then the implications for future transportation infrastructure or policy in 5, 10 + years.

My take on these mega-trends come from a few sources (to give you my biases and background):

- NCHRP 750 Report – Future Freight Flows
- Scenario Planning with >20 firms and other organizations on FFF
- Work with partners at CTL (>50 firms)
- Work with Chainalytics (Analytical SC and Transp)

The mega-trends in decreasing importance are:

1. Autonomous Trucks
2. Diversification of Retail Channels
3. Digitization & Decentralization of Manufacturing
4. Changing Face of Products & Product Ownership

Autonomous Vehicles

- Question is not if, but to *what and when*, and *where and how* it will impact supply chains.
- What and the When –
 - Tied together and where I am least knowledgeable
 - Boiling a frog – safety [collision mitigation systems, Integrated Safety Systems, Lane Departure Warning, and Blind Spot Detection]
 - No Automation (Level 0).
 - Function-Specific Automation (Level 1).
 - Combined-Function Automation (Level 2).
 - Limited Self-Driving Automation (Level 3).
 - Full Self-Driving Automation (Level 4):
 - When – faster than originally thought:
 - Otto (uber trucking) in Dec for first summit on Uber Freight
 - First paid autonomous delivery occurred in Colorado in Oct (ABI)
 - Initial window was 15 years, but they are releasing SW 2-3x weekly, and hardware weekly. Window shrinking to single years.
- Where – think of three environments for freight
 - Long haul corridors – later – but could be used for pool point distribution (terminal 2 terminal)
 - Shorter haul local moves – shuttle runs (on closed or semi closed links)
 - Intra Facility (Yard) moves – extension of automation in the DC/WH/Factory

Impact on Firms:

- ATs: single day range will increase from 450-500 miles to ~ 1,000
- Many FMCG and retail networks designed for 1 day coverage
- Reduction of 5-6 DCs for National Coverage to 2-3 DCS
 - Larger national DCs
 - Push to many smaller, local DCs
- Able to provide ubiquitousness of TL with low cost of IM
- Lower fuel costs – drop speed [get #] (platooning 4-7%)

Transportation Implications

- Increased demand for truck only lanes
- Significant concentration of feeders to national NW (congestion)
- Increased amount of trucks
- Potential change in nature of trucking firms (why have carriers?)
- Connected to “vanilla” trailer concept

Diversification of Sales Channels (OmniChannel)

- Mixing the 4 key retail tasks (search, order, pay and receive functions) across different formats: at-home, in-store, on-line fixed, and mobile
- Examples:
 - Find in store, order on phone, have delivered to home
 - Find and order on-line, pick up at store pay in cash
 - Find on line, retailer picks from own store, delivers to home

Impact on Firms:

- Facility roles changing:
 - Stores become forward stocking points
 - Employees need mixed skills
 - Dark stores – keeping customers out (like having drunks . . .)
 - Forcing increased size of backroom after decades of shrinking
 - Selected stocking of critical items
 - Pack and sort and prep in-store pick up
- Requires unified and integrated management
 - Inventory management across channels (how much is where – phantom inventory)
 - Common pricing strategy (how much to charge)
 - Merged incentives (who gets credit)
- Added need to provide last mile delivery
 - Lots of experimentation (taskrabbit, instacart, uber, courier, fleet)
 - Swarm routing
 - Portfolio of vehicle types, sizes, and capabilities

Transportation Implications

- Greater last-mile delivery emphasis
- Zoning issues (perverse policies Sao Paulo truck size restriction)
- Vehicle size and implications
- Delivery hours and night-time restrictions

Digitization & Decentralization of Manufacturing

- Lowering cost of automation enables smaller scale operations
 - Example: Kiva now Amazon Robotics (775 M in 2012)
 - Robots that bring product (on shelves/pods) to pickers instead of vice versa
 - Robots handle lifting and are coordinated via integrated software
 - Benefits of automation – at lower costs, enables smaller DCs
 - Example: ReThink Computers (Baxter and Sawyer)
 - Allows use of automation with humans – complement
 - Lower cost – again,
 - Net effect – potentially smaller operations with efficiency of larger scale plants
- Advanced manufacturing – merging of traditional and additive processes
 - Moved through the hype curve – finding correct niches
 - GE – compliments traditional manufacturing and Moved from replacing components to systems
 - Moving into selected manufacturing areas -

Impact on Firms:

- Lower economies of scale mean more smaller plants dispersed across markets
- Able to meet customized demand

Transportation Implications

- Dispersed operations means less concentrated network

Changing Face of Product Ownership

- Economics in many areas are shifting from ownership to renting/sharing
 - AND, products themselves are increasing in value density
 - AND, consumers are connecting products with each other (IoT)
- Common Example: Car Sharing (TCRP Report 108, 2005)
 - Each car in a sharing system replaces ~5 vehicles
 - Millennials moving to more ease of renting vs. ownership
- Example: Recorded Music
 - From 1970 to 2000 format changed from LPs to 8Trk to Cassettes to CDs
 - Density increased from 7 to 24 minutes/ounce (ton-miles drop 65%)
 - 2000-2014 – CD's replaced by downloads
 - 2015 – Downloads flat, CD's 1/10 of peak, and streaming revenue exceeds purchase.
 - Artists starting to move from big album release to smaller more frequent

Impact on Firms:

- Impact on Companies
 - Total output reduced (on a per capita basis)
 - Continuing shift from product to services
- Demand for faster response time
- Advanced signaling
 - Smoother demand – but offset by faster response time requirements –
 - Reduced inventory – OnProcess “Voice of the Machine” project
- If you had guaranteed, readily available mobility – why would you have own assets or make long-term contracts? (Uber Freight question)

Transportation Implications

- Potential reduction in ton-miles hauled
- More responsive, closer to consumer facilities – last mile congestion