TransFuture – Innovate the Future of Transportation

TRB 2017 National Transportation Planning Applications Conference

HDR

May 2017
welcome to the future
Autonomous and Connected Vehicles

- Five-fold roadway capacity increase
- 90% + reduction in crashes
Shared Mobility

- Potential to reduce fleet size by 90 percent
- Shared auto-ownership impacts
Endless possibilities in Smart Cities
How to prepare for the unknown? Decision making challenge
Introducing TransFuture

- Next-gen scenario planning tool
- Prepare for multiple futures
- Consider uncertainty more explicitly
- Support a desirable future by incorporating flexibility
- Add-on lens to improve decision-making
Planning for Multiple Futures

Traditional planning for most likely future

Acknowledging uncertainty

Probabilistic Scenario Planning
Considering multiple futures and uncertainties

Composite Uncertainty Cone

Planning for multiple futures

Source: Adapted from Global Business Network (2007)
A new tool is being developed by HDR to aid in decision-making by exploring multiple futures, evaluating uncertainties and considering potential outcomes.
Development Approach

- Identify Trends
- Quantify Trends
- Deterministic to Probabilistic
- Understand Uncertainties
- Make Informed Decisions
- Implementation Plan
Emerging Trends

Changing Demographics
- Millennial travel behavior
- Aging population
- Generation Z

Improved Technology
- Automated vehicles
- EVs
- Rise of robots
- Improved user information & navigation
- Smart City

Shifting User Preferences
- Urbanization
- Shift from individual ownership to fleet ownership
- Telecommuting
- E-commerce & delivery options

Improved Travel Options
- Better walking and biking options
- Improved public transit
- Shared mobility
Literature Sample

- Autonomous Vehicle Implementation Predictions – VTPI
- NCHRP Report 750, Informing Transportation’s Future – TRB
- Preparing a Nation for Autonomous Vehicles – Eno Center
- Shared Mobility and the Transformation of Public Transit - APTA
- Millennials & Mobility: Understanding the Millennial Mindset – APTA
- City of the Future – National League of Cities
- Shared Mobility and the Transformation of Public Transit – APTA
- Evaluating Carsharing Benefits – VTPI
- Planning for an Uncertain Future: Using Scenario Planning to Add Clarity When the Future Is Unclear - TRB
Conceptual Framework

Frontend
- Regional travel demand model files
- Define scenarios
- Probabilistic results and confidence intervals - AADT, VMT, VHT, etc.
- Scenario comparison
- Facility footprint

Input → Process → Results

Backend
- Regression analysis
- Elasticity analysis
- Monte Carlo Simulation
Methodology Framework

- N-dimensional supply-demand surface
- Quantifying impacts of emerging trends
Accounting for Uncertainty

F = f (A, B, C, D, ..)

- Joint probability distribution

A strike zone is not a single point.
Hypothetical Corridor Analysis – Baseline Scenario

- 6-lane capacity
- 8-lane capacity
- 10-lane capacity

AADT

8 lane by 2045;
10 lane by 2056
Hypothetical Corridor Analysis – Build Scenario

Two emerging trends considered:
Aging population - Reduced demand
Automated vehicles - Capacity increase, Demand increase

AV/ CV Market penetration = 2035 – 10%; 2060 – 50%
We are 90% confident that the 2060 AADT will be 170,000 or less.
Hypothetical Corridor Analysis – Build Scenario

Benefits

Facility Level
- 8 Lanes not 10 (cost savings)
- Invest in technology (technology readiness)
- Modular, flexible design (future proof investments)
- Higher ROI

Systems Level
- Accommodate trends – policy
- Leverage funds
- Improved decision making

6-lane capacity

8 lane by 2048

AADT

Baseline
Capacity - 6 Lanes
Innovate the Future

“The best way to predict the future is to invent it” - Alan Kay, Computer Scientist
QUESTIONS

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