Welcome to the Future!
Autonomous & Connected Vehicles

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

• Potential to reduce fleet size by 90 percent
• Shared auto-ownership impacts
• Internet of things – big data
Smart Cities

• Endless possibilities for a connected future
Science or Fiction?

- Straddling Bus
- Transit X
- Helium Airships
- Hyperloop
- Carbon-free Autonomous Mass transit
Science or Fiction?

Space Tourism – Vacation of the Future

Drone Hub ▲ ▼ Space Colony
Sorting Facts from Fiction

- Optimal adoption point for best value
- Cutting edge vs. bleeding edge
Why Now?

- Moore’s law – computing power doubles every 2 years
Market Readiness

- 78 cities participated in Smart Cities challenge
- 34 States enacted autonomous vehicle legislation since 2012
- Most new vehicles sold today have advanced features
Market Readiness

Florida Initiatives

30A Mobility Project
Tallahassee CV Test bed
I-75 AV Pilot
Tampa Streetcar Expansion
Tampa AV Shuttle
THEA/Tampa USDOT Connected Vehicle Pilot Deployment
MobilEye’s Advanced Driver Assistant System (ADAS) Testing
SunTrax (FTE / FL Polytechnic University)
Babcock Ranch Development

JTA Skyway Modernization
UF Smart Campus Initiative
USDOT AV Proving Ground
Driver Assistive Truck Platooning
Orlando CV Test bed
Disney World Pilot
Connected Vehicle Pilot on SR 434

Research Projects

FSU - Enhanced Mobility for Aging Population Using Automated Vehicles
Embry-Riddle Aeronautical University - Autonomous Service Vehicle Project
FSU - Envisioning Florida’s Future: Transportation and Land Use in an Automated Vehicle World
HDR – FDOT D5 TransFuture
Decision Making Challenge

- Traditional tools and methods are falling short of answering policy questions of tomorrow
- How to prepare for the unknown?
Introducing TransFuture

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

Traditional planning for most likely future

Considering multiple futures and uncertainties

Acknowledging uncertainty

Composite Uncertainty Cone
Development Approach

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

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<th>Shifting User Preferences</th>
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<td>Aging population</td>
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<td>Improved user information &amp; navigation</td>
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Sample Literature

- 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
Automated Vehicles

- Capacity and demand increase

Market penetration
Early adoption - trucks?
Connected features in cars
Shared Mobility

- Reduction in auto ownership
- Potential increase in trips
- Fleet size reduction
Workplace Automation

- Jobs at risk for automation
- Transformation of the labor force
Conceptual Framework

**Frontend**
- Regional travel demand model files
- Define scenarios

**Process**
- Probabilistic results and confidence intervals - AADT, VMT, VHT, etc.
- Scenario comparison
- Facility footprint

**Backend**
- Regression analysis
- Elasticity analysis
- Monte Carlo Simulation

**Input**

**Output**
Methodology Framework

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

Jointly Determined Probabilities

\[ F = f (A, B, C, D, \ldots) \]

- Joint probability distribution

Impact of Aging on Demand, %
Impact of AV on Effective Capacity, %
Impact of Telecommuting on Demand, %
Impact of Enhanced Navigation, %

A strike zone is not a single point.

2035 LOS
Hypothetical Corridor Analysis

**Baseline Scenario**

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

**AADT**

- 8 lane by 2045;
- 10 lane by 2056

10-lane capacity
8-lane capacity
6-lane capacity
Two emerging trends considered:
Aging population - Reduced demand
Automated vehicles - Capacity increase, Demand increase

AV/ CV Market penetration = 2035 – 10%; 2060 – 50%
Hypothetical Corridor Analysis

Build Scenario

- We are 90% confident that the 2060 AADT will be <170,000
Hypothetical Corridor Analysis

Build Scenario

AADT

6-lane capacity

8 lane by 2048

Baseline
Capacity - 6 Lanes
New Paradigm

• Don’t over build – cost savings
• Preserve ROW for potential future need
• Invest in technology – future proof investments
  • Cable, power, machine vision (reference markers), data management
New Paradigm

• Design flexibly – modular lanes
  • Dynamic lane markings
  • Right pavement design
  • Full depth shoulder

• Technology roadmap
“The best way to predict the future is to invent it”
- Alan Kay, Computer Scientist
CONTACTS

John Zielinski  
SIS Administrator  
FDOT District Five  
John.Zielinski@dot.state.fl.us

Santanu Roy, PTP  
Vice President  
HDR Engineering, Inc.  
Santanu.Roy@hdrinc.com