Won’t You Be My Neighbor?
A discussion about the great communities of tomorrow and the future of mobility

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People on the move is the history of our civilization....and very little will change...but we must adapt to a new paradigm
A motorization “saturation” level is emerging in mature economies

Canada

2014 motorization rate (Vehicles / 1000 inhabitants)
655
12.9%

2004-2014 motorization rate variation

USA

2014 motorization rate (Vehicles / 1000 inhabitants)
816
-1.6%%

2004-2014 motorization rate variation

CHINA

2014 motorization rate (Vehicles / 1000 inhabitants)
84
418%

2004-2014 motorization rate variation

Sources: U.S. Department of Energy - FACT #962, Statistic Canada – CANSIM (Table 405-0004)

But the global motorization trends are still evolving
Ride hailing is increasing (doubling?) every year...a business & tech trend

More than 5 bn trips / year (despite regulatory constraints in many Countries), mainly sourced by 5 big players

<table>
<thead>
<tr>
<th>Company</th>
<th>Cities</th>
<th>Countries</th>
<th>Trips / Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uber</td>
<td>592</td>
<td>70</td>
<td>900 M</td>
</tr>
<tr>
<td>Lyft</td>
<td>300</td>
<td>1</td>
<td>160 M</td>
</tr>
<tr>
<td>Grab</td>
<td>30</td>
<td>6</td>
<td>840 M</td>
</tr>
<tr>
<td>DiDi</td>
<td>400</td>
<td>1</td>
<td>2,4 bn</td>
</tr>
<tr>
<td>Ola</td>
<td>110</td>
<td>1</td>
<td>300 M</td>
</tr>
</tbody>
</table>
Complication comes with urbanization: variability of trips is increasing

**USA**

% of commute vehicle miles of travel (VMT) on total VMT

<table>
<thead>
<tr>
<th>Year</th>
<th>% of trips</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1969</td>
<td>34%</td>
<td>NHTS, 2011</td>
</tr>
<tr>
<td>2009</td>
<td>28%</td>
<td></td>
</tr>
</tbody>
</table>

**ITALY**

% of trips repeated 5 days / week (urban mobility)

<table>
<thead>
<tr>
<th>Year</th>
<th>% of trips</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>40%</td>
<td>Isfort, 2017</td>
</tr>
<tr>
<td>2014</td>
<td>27%</td>
<td></td>
</tr>
</tbody>
</table>

**LONDON**

% of trips to “usual workplace” on mechanised trips

<table>
<thead>
<tr>
<th>Year</th>
<th>% of trips</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>56%</td>
<td>Travel in London, Rep.6</td>
</tr>
<tr>
<td>2012</td>
<td>29%</td>
<td></td>
</tr>
</tbody>
</table>

share of stable “home <-> work/school” trips less dominant in the total mobility
Trends: How we move (US DOT)

Population Increase
2015: 320 million people
2045: 390 million people
In 30 years our population is expected to grow by about 70 million... that’s more than the current populations of NY + TX + FL.

Older Americans — Redefining Longevity
By 2045, the number of Americans over age 65 will increase by 77%.

About one-third of people over 65 have a disability that limits mobility. Their access to critical services will be more important than ever.

Millennials — Shaped by Technology
There are 73 million Millennials aged 18 to 34. They are the first to have access to the internet during their formative years and will be an important engine of our future economy.

Millennials are driving less. By the end of the 2000s, they drove over 20% fewer miles than at the start of the decade.

Income Inequality
10% of the population takes home one-third of our national income. Transportation is the second-largest expense for U.S. households.

Bumper-to-Bumper
On average, we spend over 40 hours stuck in traffic each year.
The annual financial cost of congestion is $121 billion.

Megaregions and Shifts in Population Centers
11 megaregions are linked by transportation, economics, and other factors.
They represent over 75% of our population and employment.
In 2014, 365,000 people moved to the South—up 25% from 2013—and moves to the West doubled.
More and more, the transportation sector is relying on data to drive decisions, and on technology to reimagine how we move people and goods.

Connected Vehicles
Vehicles that communicate are the latest innovation in a long line of successful safety advances.

The motor vehicle fatality rate has dropped by \textbf{80\%} over the past 50 years.

Connected vehicles and new crash avoidance technology could potentially address \textbf{81\%} of crashes involving unimpaired drivers.

Robotics
Advances in robotics are changing transportation operations and will impact the future transportation workforce.

Robots will perform vital transportation functions, such as critical infrastructure inspection.

NextGen
GPS and new technologies are leading to a safer, more efficient U.S. airspace.

By 2020, one-second updates will pinpoint the aircraft location and speed of 30,000 commercial flights daily.

Real-time Travelers
Mobile access to everything from traffic data to transit schedules informs our travel choices.

90\% of American adults own a mobile phone.

20\% use their phones for up-to-the-minute traffic or transit information. Smartphones are regularly used for turn-by-turn navigation.

Big data is all around us. Global data generated is projected to grow by \textbf{40\%} annually.

Data enables innovative transportation options, such as car-sharing, ride-sharing, and pop-up bus services, and more rapid delivery of goods.
Trends: How we adapt (US DOT)

Our changing climate is disrupting transportation systems in the U.S. and abroad.

100-year devastating storms used to occur once a century ...

... but with the climate changing, they could occur every 3 to 20 years (by 2080).

We’re Heating Up
Average U.S. temperatures are rising.

By 2050, our temperature is predicted to rise 2.5°F

Scientists say we need to avert a 2°F increase in temperature to avoid the most catastrophic impacts of climate change.

Globally, the 10 warmest years have occurred since 1998

In extreme heat:
Roads deteriorate faster
Truck tires are prone to blow out
Rail track buckles
Runways soften
Inland waterway traffic is disrupted during droughts

U.S. droughts and western wildfires cost $30+ billion in 2012 alone

Rising Sea Levels Will Disrupt Transportation

Superstorm Sandy’s surge damaged electrical systems, highways, rail track, runways, and port cargo. The cost to the U.S. economy was an estimated $65 billion.

U.S. Airport Elevations
Sea level is projected to rise up to 4 feet (2100)
Sea level is projected to rise up to 1 foot (2045)

The transportation sector is the second-biggest source of greenhouse gases (GHGs) in the U.S.

Transportation emits 28% of GHGs

New stronger fuel economy standards will double the efficiency of our cars and trucks. Corporate Average Fuel Economy Standards have saved 14 billion tons of CO₂ emissions since 1970.

1979 19.0 MPG
2016 54.6 MPG
2021 41.1 MPG
In cities, technological breakthroughs will spur an avalanche of automotive innovation to address mobility issues and create new value chains.
Innovations will change how we view mobility within a few decades

Emerging
Need to accommodate these in the short term

Future
Need to be ready for these in the medium to long term

Modes of Transport

Technologies

Premium Bus Services
Electric Cars
Car Sharing

Autonomous Car
Magnetically Charged Electric Cars
Road Straddling Buses
Vacuum and Loop

Real time Data Analytics
Drones
Internet of Things/E
Real Time Traffic Surveillance

Road/Pavement Energy storage
Intelligent Traffic Systems
Solar Highways
Intelligent Lighting
Connected and autonomous vehicles will fundamentally change the mobility character of the smart“er” city and the user experience.

**Benefits**
- Order of magnitude safety improvements
- Reduced congestion
- Reduced emissions and use of fossil fuels
- Improved access to jobs and services
- Reduced transportation costs for gov’t and users
- Improved accessibility and mobility
EV vehicles integration can further the adoption of a GREEN economy and drive user adoption of beneficial mobility solutions.
Total Eco-System Benefits of Connected Cars Can Be Substantial...

Benefits of Connecting U.S. Vehicles by Penetration ($B per Year)

- **Society**
  - Fewer crashes
  - Lower traffic/road/toll operation costs
  - CO₂ reduction

- **Internet of Cars Service Providers**
  - Traffic guidance, navigation, emergency services
  - “Google on wheels,” PAYD insurance, LBS

- **Auto OEM/OES**
  - Lower service/warranty costs
  - New profit pools
  - Architectural savings

**Benefits Per Car**

- **10%**
  - $35
  - $220

- **33%**
  - $117
  - $750

- **80%**
  - $282
  - $1,750

Vehicle User

- Lower operation cost
- Less time stuck in traffic, more productivity
- Lower cell phone cost
…If implemented correctly a connected car service programs can create value for all players involved…

Value creation across telematics based insurance eco-system

**Benefits**
- Better risk-adjusted pricing
- Access to new customer segments
- Fewer accidents
- Less fraud
- Increased customer touch points/interaction

**Insurance company**

Sales of granular data or universal score

**Telematics service provider**

1) Can be third party providers, auto OEMs or even insurance companies
2) Value creation for this segment is driven by choice of go-to-market strategy (not detailed in this phase).

**End customer**

Value-added services, and feedback on driving behavior

**Insurance products and services**

Fees

**Government and society**

Benefits
- Safer roads, resulting from fewer accidents
- Environmental benefits from decreased driving
- Reduced costs from public property damage
- Government resource reduction (less law enforcement, reduced accidents, etc.)
- Improved driving experience and road safety through real-time accident information

**Benefits**
- More transparent risk-based pricing/discount
- Value-added services
- Improved customer service
- Driving improvement information

**Access to driving data**
... But Key Barriers for Wider Adoption Still Need to Be Addressed

**Consumer Readiness (Demand)**

1. **Consumer Acceptance**
   - HMI / Driver Education
   - Trust in assist / control functions
   - Cost

2. **Privacy**
   - Customer data including location and travel data

**Vehicle/Technology (Supply)**

2. **Technology**
   - Differing vehicle and connectivity lifecycles
   - Unpredictable vehicle operations
   - Cost-effective, scalable, fault tolerant architectures

4. **Liability**
   - Security - Hacking, viruses, hijacking
   - Distraction
   - Safety

5. **End-End Eco-System Integration**
   - Technical Integration – Roads, Vehicles, Data, etc...
   - Business Integration and Profitability
   - Eco-system Roles and Ownership
   - Investment Risk
   - Political/Regulatory Alignment

Legend:
- High Risk/Barrier – Partial/No Solutions
- Moderate Risks - Only Partial Solutions
- Moderate Risk – Plans in Place
Smart Urban Mobility must the SUM of many parts and inclusive for all through equity in development and design