TRANSFORMING AND DISRUPTING PERSONAL TRANSPORTATION OPPORTUNITIES FOR DATA SCIENCE

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Enable development of connected and automated vehicle systems by *rapidly* processing vast amounts of data from thousands of individual vehicles across an entire region.
In 2030, 37% of the world’s population will be under the age of 25 (over 3.1 billion)

Significantly lower percentage of those aged 16-30 have driver’s licenses compared to 30 years ago

A study of global youth revealed a common set of values: family, friends, money/status, education, travel, stability, and freedom
By 2030, countries with large populations ages 65+ include:

- Japan 38%
- Germany 33%
- Italy 32%
- Canada 27%
- U.K. 26%
- U.S. 24%

Aging isn’t what it used to be... “mature” citizens more active, healthier, and live longer than ever before.
In 1950, two-thirds of the world’s population lived in rural areas... by 2030, almost two-thirds will live in cities.

There are 28 megacities today with populations exceeding 10 million.

Hypercities: Tokyo (38M), Delhi (25M), Shanghai (23M), Mexico City, Mumbai and Sao Paulo (21M)
Mobile-cellular subscriptions approaching 7B, the number of people on the earth

3B use the Internet

Facebook has over 1.4 billion active users globally; 85% are mobile users

90% of the world’s data has been created in the last two years – 2.5 quintillion bytes of data created every day!
CUSTOMER EXPECTATIONS

Bring their digital life into their vehicle

Bring their vehicle into their digital life
CUSTOMER EXPECTATIONS

SELF-DRIVING VEHICLES
TECHNOLOGY INNOVATION

CADILLAC 360°-SENSING
- 1 Long-Range Radar
- 2 Short-Range Radars
- 1 Front Camera
- 8-10 Ultrasonic Sensors
- 3 Short-Range Radars
- 1 Rear Camera

ELECTRIFICATION

SUPER CRUISE

ROBOTIC MFG

ONSTAR 4G LTE

FUEL CELL VEHICLES

FUEL CELL VEHICLES

FUEL CELL VEHICLES

FUEL CELL VEHICLES
TECHNOLOGY INNOVATION
VALUE OF ELECTRONICS AND SOFTWARE

2000
- $400
- 20 ECUs
- 1M lines of code

Today
- $1,200
- 75 ECUs
- 100M lines of code

- Mechanical: 76%
- Electronics: 13%
- Other: 9%
- Software: 2%

- Mechanical: 55%
- Electronics: 24%
- Other: 8%
- Software: 13%
GM SPEEDS UP WITH ONSTAR 4G LTE

- Built-in Wi-Fi hotspot
- Connect multiple mobile devices at once
- Faster, more reliable connection
- Connect to vehicle remotely
- On more than 30 GM vehicle models

NEW FOR 2016: PROGNOSTICS; ANDROID AUTO/APPLE CAR PLAY
CHEVROLET PROGNOSTICS: PREDICTING WHEN CERTAIN COMPONENTS NEED ATTENTION – 2016 CHEVY MODELS

DIAGNOSTICS AND PROGNOSTICS

Vehicle Data Transmitted

Real-time Notification

IN-VEHICLE MONITORING

Starter Motor
Fuel Pump
Battery

RemoteLink
Text
email
In-vehicle

The Next Evolution: Prognostics

Solving Problems Before They Happen

HOW IT WORKS WITH YOUR BATTERY

Battery Alert
Your 2016 Equinox has a Battery Charge Issue – Run Vehicle. See email for more info.

Issue Avoided
ROADMAP TO AUTOMATED DRIVING

TECHNOLOGY ENABLERS:
- Perception and Algorithms
- Integrated Sensing with Maps, GPS, V2X
- Driver State Knowledge

Driver Info & Alerts (No Control)
Emergency Intervention (Limited Control)
Limited On-Demand Automation (Monitored Control)
Complex On-Demand Automation (Transferred Control)
Autonomous Driving (Chauffeured Driving)

“SuperCruise” Concept
Today’s Driver Assist Package

Increasing Capability

Today
Future
**HOW IT WORKS**

**LANE FOLLOWING:** Using a combination of GPS and optical cameras, Super Cruise watches the road ahead and adjusts steering to keep the car in the middle of its lane.

**COLLISION AVOIDANCE:** A long-distance radar system detects vehicles more than 300 ft. ahead. The vehicle will automatically accelerate or apply the brakes to maintain a preset following distance.
V2X TO DEBUT ON 2017 CADILLAC CTS

Technology allows cars to communicate with each other (V2V), the infrastructure (V2I), and pedestrians (V2P)
INTELLIGENT TRANSPORTATION IN THE NEXT DECADE (2025)

- Automated Highway Driving
- Partial/Full Urban Driving
- Extensive V2V (and V2P) capability
- Acceleration of Intelligent Infrastructure
- High-Volume/High-Speed Integrated Connectivity
- Efficiency/Electrification
- Shared Mobility
## TRANSFORMING DATA INTO INSIGHT FOR MAKING BETTER DECISIONS

<table>
<thead>
<tr>
<th>Prescriptive Analytics</th>
<th>Optimization</th>
<th>Simulation</th>
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</thead>
<tbody>
<tr>
<td><strong>What should we do?</strong></td>
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</table>

- Identifies and evaluates potentially *new* ways to operate
- Targets business objectives
- Balances all constraints

<table>
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<tr>
<th>Predictive Analytics</th>
<th>Predictive Modeling</th>
<th>Data Mining</th>
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<tbody>
<tr>
<td><strong>What could happen?</strong></td>
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- Predicts *future* probabilities and trends
- Finds relationships in data not readily apparent with traditional analysis

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<th>Descriptive Analytics</th>
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- Prepares and analyzes *historical* data
- Identifies patterns from samples for reporting of trends
Combining “Big Data” with Subject Matter Expertise

- Significant opportunities to leverage trends of increasing available data
  - Transactional data
  - Unstructured data
  - Data from individuals
  - Sensor data
  - Publicly shared data
- Keep the risks (and ‘hype cycle’) in mind
- The haystack has gotten bigger
- Combining insights with deep subject matter expertise is critical to success

**Big data is changing the whole equation for business**

*The Wall Street Journal*

March 11, 2013

**“Big data” has arrived, but big insights have not. The challenge now is to solve new problems and gain new answers – without making the same old statistical mistakes on a grander scale than ever.**

*Financial Times*

March 29, 2014
AREAS OF OPPORTUNITIES AND EXAMPLES

- Customer Insights
- Product Insights
- Operations
AREAS OF OPPORTUNITIES AND EXAMPLES

- Customer Insights
- Product Insights
- Operations
AREAS OF OPPORTUNITIES AND EXAMPLES

Operations

Customer Insights

Product Insights
AREAS OF OPPORTUNITIES AND EXAMPLES

- Customer Insights
- Product Insights
- Operations

- Marketing Analytics
- Customer Choice Modeling
- Safety Analytics
- HMI Development
- Supply Chain and Logistics Optimization
- Warranty Policy, Part Stocking
- Vehicle Health Management
- Vehicle Health Management