Views on the Automotive Industry’s Direction and OEM/Supplier Relations
May 15, 2018
Traditional View of Automotive Value Chain

The traditional view of the automotive value chain has focused on designing, engineering, manufacturing, selling, financing and servicing a vehicle.
Where is the Automotive Industry Going?

**Megatrends to Understand**

1. Autonomy

2. Mobility

3. Electrification

4. Making of the Vehicle
Autonomous Vehicle Timeframe
*Over 3 Extended Phases*

**Current State**
**Phase 1 2017-2020**
Build Capability, Test & Validate Autonomous Technology

**Geo-Fenced Autonomy**
**Future State**
**Phase 2 2020 - 2025**
Launch Geo-Fenced Autonomous Rideshare Networks and Private Vehicles

**Full Autonomy**
**Future State**
**Phase 3 2025-2030+**
Full Autonomy beyond Geo-Fences Rideshare Networks, and Private Vehicles

Testing & Validation in Select Cities

New York City Geo-Fenced Area With Corridors

Full Autonomy beyond Geo-Fences
U.S. Mobility Projections

**Vehicle Miles Traveled will Drive Production**

- Growth in miles traveled will be driven by autonomous vehicles capturing competitive and untouched markets.
- Vehicle parc decreases over time due to the increased utilization and efficiency of shared autonomous vehicles.
- Introduction of autonomy increases annual sales and shifts customer base from private ownership to shared ownership.

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**Vehicle Miles Traveled**

**Vehicle Parc**

**Annual New Vehicle Sales**

Vehicle Type Key:
- Non Autonomous
- Shared - Autonomous
- Private - Autonomous
Electrified Vehicle Projections – U.S. Adoption will Accelerate

Mix of electrified powertrains steadily replace internal combustion engines over the next 20 years until cost, regulations and technology advances drive the rapid adoption of battery electric vehicles.

### Model Inputs

#### Market Dynamics
- Lower fuel and electricity cost
- Improving electric infrastructure
- EVs available in most vehicle segments

#### Government Regulations
- CAFE requirements
- Government incentives for infrastructure and EV purchases
- 11 States adopting Zero Emissions vehicle standards

#### Technology Advances
- Electrification cost becomes comparable to ICE over time
- ICE cost grows due to fuel efficiency requirements

#### Customer Perception
- Social pressure to reduce emissions
- Range anxiety declines with increase battery efficiency and reduced costs

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Note: Hydrogen fuel cell propulsion technologies did not have significant volume in projections, due to uncertain infrastructure for fueling and product costs.
**Automotive Manufacturing**
**Impact on the OEM/Supplier Relationship**

<table>
<thead>
<tr>
<th>Business Model</th>
<th>Now</th>
<th>Future</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Vehicles produced</td>
<td>Miles driven</td>
</tr>
<tr>
<td>Customers</td>
<td>Private owners</td>
<td>“MaaS” fleet operators</td>
</tr>
<tr>
<td>Value Proposition to Customer</td>
<td>Differentiated, personalized products,</td>
<td>Commodity product, convenience, availability</td>
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<tr>
<td>Product Design</td>
<td>18+ platforms requiring major redesign 7-8 year development cycle</td>
<td>Skateboard platform requiring refresh design 2-3 year development cycle</td>
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<tr>
<td>Research Development &amp; Engineering</td>
<td>OEM internal R&amp;D – duplicative, costly, viewed as a market differentiator</td>
<td>OEMs outsource R&amp;D to proven, capable suppliers</td>
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<tr>
<td>Manufacturing</td>
<td>Manufacturing is core competency and OEMs control end-to-end process</td>
<td>OEMs focus on mobility and customer experience. Will need to partner or outsource vehicle manufacturing</td>
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Future Mobility Industry Value Chain

Manufacturing, MaaS, Mobility Operations and Energy Management will be required to enable the future mobility industry, as well as to be tightly integrated.

### Vehicle Manufacturing

**OEM**
- Market Research & Analysis
- Product Development & Engineering
- Purchasing
- Manufacturing
- Distribution
- Sales

**Tier Suppliers**
- Market Research & Analysis
- Product Development & Engineering
- Purchasing
- Manufacturing
- Distribution
- Sales

**Systems/Components**
- Powertrain – ICE and EV
- Chassis
- Interiors
- Exteriors
- Electronics & Autonomous
- Other

**Key Vehicle Manufacturing Characteristics**
- Utilitarian styled vehicles
- Common platform architectures
- Modular design for component replacement
- High volume production for cost efficiencies
- Electrified powertrains
- Autonomous capability
- Connected technology

### MaaS and Mobility Operations

**Ownership & Financing**
- Mobility Services Provider
  - Pay per ride/sharing
  - Freight/package service
  - Specialized mobility services
  - Mobility technology broker/interface
- Vehicle Owners
  - Fleets
  - Private
  - Fractional
- Financing
  - Loans
  - Leases
  - Subscription
  - Pay per mile
- Insurance
  - Personal
  - Vehicle
  - Ride

**Connectivity**
- V2V communications
- Telecommunications access
- Vehicle data – OTA updates, monitoring
- In-vehicle infotainment services

**Mobility Operations Services**
- Vehicle maintenance and repair
- Vehicle staging – cleaning, charging, storage
- Passenger roadside assistance
- Passenger biometrics support

**Mobility Infrastructure**
- Parking location, availability, price
- Traffic flow, route optimization
- Vehicle to infrastructure (SmartCity)