Mega trends impacting the future of mobility

Presented by
Mubarak Moosa
Director - CEE
# Changing Urban Demographics

<table>
<thead>
<tr>
<th>Factors</th>
<th>Impact To Mobility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Urbanisation</strong></td>
<td>• Over 54% of the World’s population lives in cities, expected to rise to 67% by 2050; urbanisation exceeds 80% in OECD countries</td>
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<tr>
<td><strong>Travel Problems</strong></td>
<td>• Drivers spend 50 hours per year in congestion which stifles the economy of 1% of GDP</td>
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<td>• 7 million lives are lost prematurely each year due to air quality; mobility is the largest sector contributor</td>
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<td><strong>Insufficient Solutions</strong></td>
<td>• Private cars are utilised 4% of the time and account for 29% of transport trips on average, but account for 85% of our mobility expenditure</td>
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Global transportation market needs new type of mobility services.

Sources: World Bank, World Health Organisation, Inrix, European Commission, Eurostat
Paradigm Shift from Vehicle Ownership to Vehicle Usage

Transport = Door-to-door Mobility
- New Vehicles: BRT, EV, High Speed Rail
- New Business Models: Vehicle Sharing, Car Pooling
- Inter-Connectivity: Inter-modality
- Urban Planning: Transport Integration
- Integrated Mobility: Mu, Multicity, NS Business Card, Mobility Mixx, Avego

Mobility Integration: Paradigm Shift from Vehicle Ownership to Vehicle Usage

- Population Growth
- Connectivity
- Pollution
- Automation
- Natural Resources
- Virtualization
- Social Responsibility
- Urbanization
- Congestion
- Gen Y

Transport = Private Vehicle
- Freedom
- Convenience
- Status
- Progress
- No Real Alternative

Connectivity

Paradigm Shift from Vehicle Ownership to Vehicle Usage

Gen Y

Congestion

Virtualization

Social Responsibility

Urbanization

Pollution

Automation

Natural Resources
Revenue from the global carsharing market is expected to grow at a CAGR of 15% to around $8 bn in 2025 from the current $3 bn in 2017.
Market Trends in P2P Carsharing

<table>
<thead>
<tr>
<th>2017</th>
<th>2025</th>
</tr>
</thead>
<tbody>
<tr>
<td>Members</td>
<td>Members</td>
</tr>
<tr>
<td>16 million</td>
<td>31 million</td>
</tr>
<tr>
<td>Fleet Size</td>
<td>Fleet Size</td>
</tr>
<tr>
<td>741k</td>
<td>1.7 Mn</td>
</tr>
<tr>
<td>Revenue</td>
<td>Revenue</td>
</tr>
<tr>
<td>~ $1.2 bn</td>
<td>~ $3.4 bn</td>
</tr>
</tbody>
</table>

Expansion of Value Chain

- **Getaround**
- **Ford**
- **Toyota**
- **Athlon**
- **SnappCar**
- **Leasing Companies**
- **OEM’s**
- **Used Car Sales**
- **Individuals**
- **Ridehailing Operators**
- **Participants**

Significant Increase

Source: Frost & Sullivan
China and Europe ACE markets for EVs. Pure Battery EVs still holds fort accounting for 65.5% of total EV sales globally – BEV domination comes from China, supported by government.
Hybrid and Electric Vehicle Sales Mix

According to Frost & Sullivan estimates over 21 million xEVs likely to be sold globally by 2025 which will account for approximately 21% of the total passenger vehicle market.

[Graph showing hybrid and electric vehicle sales mix with key points:
- New Energy Policy Shows results
- Decline in ICE Sales due to higher adoption of hybrid vehicles
- xEVs surpass 10 million unit sales
- FCEVs surpass 100,000 unit sales
- Witness EV growth and shrink in HEV and ICE market]

<table>
<thead>
<tr>
<th>Year</th>
<th>ICE</th>
<th>MHEV</th>
<th>FHEV</th>
<th>PHEV</th>
<th>BEV</th>
<th>FCEV</th>
</tr>
</thead>
<tbody>
<tr>
<td>2015</td>
<td>79.0%</td>
<td>6.4%</td>
<td>5.5%</td>
<td>4.0%</td>
<td>5.0%</td>
<td>0.1%</td>
</tr>
</tbody>
</table>

Passenger Vehicle Market by Type

- ICE: 79.0%
- MHEV: 6.4%
- FHEV: 5.5%
- PHEV: 4.0%
- BEV: 5.0%
- FCEV: 0.1%
## Autonomous Cars

$60bn per annum market opportunity in 2030, 50% of which will be in software

<table>
<thead>
<tr>
<th>Level</th>
<th>Change in Responsibility</th>
<th>Current Level</th>
<th>Machine</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Assist</td>
<td>Human</td>
<td>Change in Responsibility</td>
<td>Machine</td>
</tr>
<tr>
<td>Early Warning Systems</td>
<td>Traffic Control</td>
<td>Awareness for Takeover</td>
<td>General Awareness</td>
</tr>
<tr>
<td>Level 0</td>
<td>Level 1</td>
<td>Level 2</td>
<td>Level 3</td>
</tr>
<tr>
<td>40 million</td>
<td>15 million</td>
<td>5 million</td>
<td>2 million</td>
</tr>
</tbody>
</table>

- **2011**: Current Level
- **2016**: No Assist
- **2018**: Awareness for Takeover
- **2025**: General Awareness
- **2030**: Full Autonomous Driving

*Note: The image also includes a蝴蝶 diagram showing the transition from human to machine responsibility in levels 0 to 5, along with new vehicle numbers for each level.*
Autonomous Cars

$60bn per annum market opportunity in 2030, 50% of which will be in software

<table>
<thead>
<tr>
<th>Level 0 New Vehicles</th>
<th>No Assist</th>
<th>Early Warning Systems</th>
<th>Traffic Control</th>
<th>Awareness for Takeover</th>
<th>General Awareness</th>
<th>Full Autonomous Driving</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2011</td>
<td>2016</td>
<td>2018</td>
<td>2025</td>
<td>2030</td>
<td></td>
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<tr>
<td>Feet Off</td>
<td>Level 1</td>
<td>Level 2</td>
<td>Level 3</td>
<td>Level 4</td>
<td>Level 5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>40 million</td>
<td>15 million</td>
<td>5 million</td>
<td>2 million</td>
<td>1 million</td>
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</tr>
</tbody>
</table>

Human  
Change in Responsibility  
Machine  

Eyes Off  
Mind Off  
Brain Off  
Hand Off  
Feet Off
Fleet Management in Shared Mobility

- Streamlined Administration/Customization
- Greater Visibility and Utilization
- Smarter and Safer Fleets (Data Collected)
- Shifting costs from TCO to TCM
- Predictive Maintenance and Repair
- Fleet Cycling (Replacement of Vehicles)

Source: Frost & Sullivan
Data Monetisation: Types of Data and Data Productisation

Data productisation takes many formats ranging from aggregated data to individual data and from basic lists to high-end analytics for trends forecasting and predictive modelling.

### DATA FORMATS
- Video
- Image
- Audio/Voice
- Text
- Sensor Data

### DATA ATTRIBUTES

#### Personal and Demographic Data
- Unique ID number
- Subscriber name
- Phone number
- Email address
- Gender
- ZIP code
- Date of birth

#### Browsing and Social Data
- Mobile app usage
- Mobile features usage
- Mobile web browsing
- User contacts

#### Location and Movement Data
- Signaling data
- GPS data
- Wi-Fi data
- Accelerometer movement
- Gyroscope movement

#### Sentiment and Trends
- Browsing patterns
- Shopping patterns
- Social Listening

#### Usage and Diagnostic Data
- Machine performance usage
- Hardware diagnostics
- Usage history

#### Financial and Economic Data
- Invoice / Payment history
- Transaction details
- Credit score
- Billing rate
- Income level
- Employment status

### DATA PRODUCTS
- “Lists” – e.g. contact lists
- 360 Customer & Identity services
- Advertising, Lead generation
- Fraud Detection
- Research and Analytics
## Data Monetization—Key Consumers and Use Cases

<table>
<thead>
<tr>
<th>Fleet Management</th>
<th>Energy</th>
<th>Automotive Tier 1 to Tier n suppliers</th>
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</thead>
<tbody>
<tr>
<td>• GPS vehicle tracking</td>
<td></td>
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<tr>
<td>• Driver safety</td>
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<tr>
<td>• Operational efficiency</td>
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<tr>
<td>• Asset tracking &amp; management</td>
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<tr>
<td>• Vehicle residual value management</td>
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<tr>
<td>• Value added services</td>
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<tr>
<td>• Real time location-based promotion</td>
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<tr>
<td>• On-demand services</td>
<td></td>
<td></td>
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<tr>
<td>• Usage insights</td>
<td></td>
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<tr>
<td>• New Petrol station hotspots</td>
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<td></td>
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<tr>
<td>• Electric vehicle(EV) infrastructure optimisation</td>
<td></td>
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<tr>
<td>• New vehicle features</td>
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<tr>
<td>• Design improvement- Performance data from the actual users</td>
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<tr>
<td>• Data-feedback for R&amp;D optimization</td>
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<tr>
<td>• Car battery downtime algorithm</td>
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<tr>
<th>Insurance Companies</th>
<th>Retail</th>
<th>Smart Cities</th>
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<tbody>
<tr>
<td>• Usage based insurance(UBI)-PAYD/PHYD</td>
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<tr>
<td>• Vehicle usage monitoring and scoring</td>
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<tr>
<td>• Tracking/theft protection service</td>
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<tr>
<td>• In-car offerings and targeted advertising</td>
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<tr>
<td>• Data analytics for store location and opening hours optimization</td>
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<tr>
<td>• Traffic flow management</td>
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<td>• Urban planning</td>
<td></td>
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<tr>
<td>• Parking</td>
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<tr>
<td>• Automated road toll or taxation</td>
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<tr>
<td>• Road, infrastructure maintenance &amp; design improvement</td>
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<tr>
<td>• On demand deliveries</td>
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Source: Frost & Sullivan
Autonomous Vehicles: Disruptive to industries beyond automotive
New Business Models becoming mainstream - How can you monetise the car, driver AND the passenger(s) - Data to play a central role

Urban logistics spending to boom to $5.8 trillion by 2020 - Opportunities exist in marketplace strategy, new customer journey and last mile logistics

Digital technologies are changing consumer experiences across all Industries including transportation Industry

Urban Mobility Issues to Shift Focus from a Country to City Approach - New solutions for longstanding impediments essential and opportune

Technologies—Automated, Connected, And Electric—will Be Key To Enabling New Mobility Solutions In The Future
Who is Frost & Sullivan?
Who is Frost & Sullivan?
Leading Market Intelligence & Business Advisory Firm with a dedicate team of consultants in 43 locations globally

- 43 Offices Around the World
- Over 50 years of Experience
- 250,000+ Clients Worldwide
- Dedicated Industry Focus – Covering 12 Sectors

What we offer

3 Tier Growth System

- Market Intelligence/ Research
- Business Advisory/ Consulting
- Growth Implementation
Our Industry Coverage
We are working within and across our verticals to converging our global expertise to deliver for our clients

- Aerospace and Defense
- Infrastructure
- Consumer Technologies
- Information & Communication Technologies
- Mobility (Automotive & Transportation)
- Energy and Power Systems
- Environment and Building Technologies
- Healthcare
- Minerals and Mining
- Chemicals, Materials and Food
- Electronics and Security
- Industrial Automation and Process Control
Frost & Sullivan’s 12 Mobility Industry Focused Global Research Programs

- Powertrain and EV
- Commercial Vehicles
- Fleet and Leasing
- Auto IoT
- Connected Car and Connected Truck
- Chassis, Safety and ADAS
- Business Strategy and Innovation
- Consumer Research
- Mobility
- Aftermarket & Retail
- Emerging Markets
- Rail
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