THE EFFECT OF DATA AND ANALYTICS ON SMART MOBILITY AND TRANSPORTATION SYSTEM

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FORD MOTOR COMPANY

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Urban Challenges

- Air Pollution
- Traffic Congestion
- Efficiency
- Stress Levels

https://youtu.be/WbxV6uR9sjE
Business Opportunities

$2.3 TRILLION
TRADITIONAL AUTO

$5.4 TRILLION
TRANSPORTATION SERVICES

6% 0%
Business Opportunities

Traditional Automotive Revenues
Vehicle Sales Dominant

In U.S. Billions

Today

<table>
<thead>
<tr>
<th>Traditional Automotive Revenues</th>
<th>720</th>
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<tbody>
<tr>
<td>Vehicle Sales Dominant</td>
<td>2,750</td>
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<td>~3,500</td>
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2030

<table>
<thead>
<tr>
<th>New Automotive Revenues</th>
<th>~6,700</th>
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<tbody>
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<td>Recurring Revenues</td>
<td>4,000</td>
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<td>Significantly Increasing</td>
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Recurring Revenues (Shared mobility, data connectivity)

Aftermarket

One-time Vehicle Sales

Ford's vision

• MAKING PEOPLE’S LIVES BETTER

Working Both Our Core Business And Emerging Opportunities Allows Us To Build An Even Stronger Future
"Software is eating the world."
- Marc Andreessen

BUT Analytics is eating software
Analytics Reference Architecture

Metadata Management

Data Sources
- Application
- Transactional System
- Other Internal
- Other External

Data Layer
- DW MPP RDBMS
- Analytic MPP RDBMS

Data Integration

Analytics Layer
- Classification
- Prediction
- Optimization

Integration Services

Client/App Layer
Ford Smart Mobility Analytics

Providing Analytic Solutions and Advice to Help Support the Future of Smart Mobility (FordPass & Connected Vehicle)
Ford is aggressively pursuing emerging opportunities through Ford Smart Mobility, the company’s plan to be a leader in connectivity, mobility, autonomous vehicles, the customer experience and data and analytics.
Mobility Solution Landscape

Individual Ownership
- Traditional Buy/Lease
- Pay-as-you go lease
- Fractional ownership

Vehicle Sharing
- B2C / B2B
- P2P
- Commercial vehicle sharing
- Bike (e-Bike) sharing
- Closed community sharing

Ride Services
- Ride hailing
- Autonomous ride hailing
- Shared delivery
- Car pooling
- Dynamic shuttle

Other Mobility Products & Services
- e-Bikes
- e-Scooter
- Accessories
- Journey planning
- Parking
- Payment systems
- UFC air quality control

Mobility Solutions Range From Private Ownership To Shared Solutions And Require A Mobility Services Platform
Mobility Solution Service

City as a partner

(e) Bike Sharing

Personal car driving/Pay per use (driver behavior, air quality, etc.)

....

Corporate Car Sharing

Ride Hailing

Dynamic Shuttle

Multi-modal
Walking ➔ Public transit ➔ Walking ➔ Biking...

Machine Learning

Big Data Analytics

Optimization

Forecasting

Visualization

Image Processing

Travel Patterns and Insights
Payment/dynamic pricing
• Big Data Drive was the “first” mobility experiment. Designed to inexpensively collect massive quantities of naturalistic vehicle data, the experiment has instrumented over 600 vehicles and collected more than 45 Terabytes of data.

• Successes

• BDD provided unique detailed data on driving behaviors across different Ford vehicle lines and model years and generated insights in:

  - OBD2
  - Car
  - OpenXC
  - Phone/Tablet
  - Public Cloud
  - Ford Hadoop
  - Analysis Toolbox
  - Parking Space Prediction
  - Cruise control Feature Usage
  - Fuel Economy Analytics
Bike Sharing

Ford Media Center, 2015
On demand Dynamic Shuttle

- Dynamic shuttle is to provide efficient on-demand, shared-ride mobility shuttle service, e.g. Go Ride Dynamic Shuttle

1. Request
   - ID: 007
   - From: RIC
   - To: WHQ
   - Pickup Window: 2:10pm - 2:20pm

2. Offer
   - From: RIC
   - To: WHQ
   - Pickup: 2:15pm

3. Instruction
   - Pickup: 007
   - Location: RIC
   - Time: 2:15pm
Pain point: First/last mile commute

- Terrible experience taking public bus
- Difficult to get taxi in rush hour and rainy day
- High taxi cost for commuting
- Black cars or motorbikes are illegal and dangerous.

High Demand Verified by Big Data & On-Site Observation

- Convenient
- Flexible
- Affordable
- Smart
- Customer
Shanghai Last mile demo
Go Park in London

Go Park is an integrated parking management solution that uses connected vehicle technology to improve the parking experience by providing accurate, understandable information for both drivers and the City.

Go Park app will give users information on parking restrictions, allow them to pay for parking and advise on most likely places to find spaces.
Go Park experiment in London

https://www.youtube.com/watch?v=LrczfZneJzE
Go Park experiment in London

**Hardware**
- Instrument Vehicles with PIDs
- Install App on customer cell phone
- Register customer with city

**Data**
- Real Time Data
  - Plug-in device data
  - Pay-by-Phone data
  - Parking enforcement car (optical character recognition of plates)
- Historical Data
  - Historical data from above sources plus:
  - Payment data from app fed back into system
  - HERE cell phones-as-probes data

**Predictive Algorithm**
- Queuing theory Markov model
**System architecture of parking system**

- **Business Logic Server** – assist the resident in finding a suitable parking space based on their profile preferences, the real-time parking situation in their target locale, and GPS location.

- **Smart Parking Algorithm** – based on user’s request, the engine will run the algorithm in cloud and return ‘best fit’ recommendation for the driver based on both historical and real-time data.

- **Smart Parking App** – allow drivers to poll for available spaces at their chosen destination. While driving the application will dynamically re-route them if spaces become occupied.

- **Feedback and Verification** – Provides the feedback of the parking availability and driver behavior to the parking engine to update the real-time database and continuous learning.
Questions?

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THANK YOU