Business Model Innovation: Imperatives for Plug-in Vehicles

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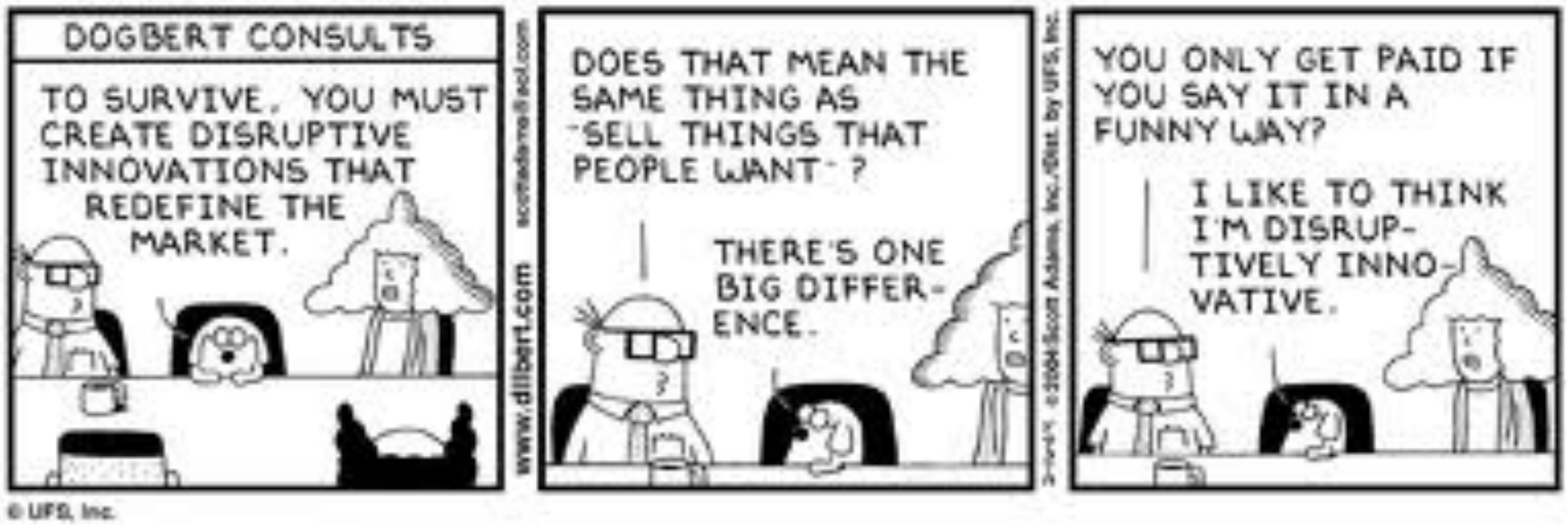
Opening Thoughts



Overview

- Limits of ‘Classic’ Business Models
- Innovation Typology
- Opportunities for New Models
- Some Frameworks
- Examples (time permitting)
- Summary

Technology Recap

- First gen PEVs arriving to market
- Diversity of implementations
- Level 1 and 2 capable; limited DCFC
- High incremental retail price
  - Vehicle + battery
  - Charger
- Purpose-built and shared platform

Classic Business Models

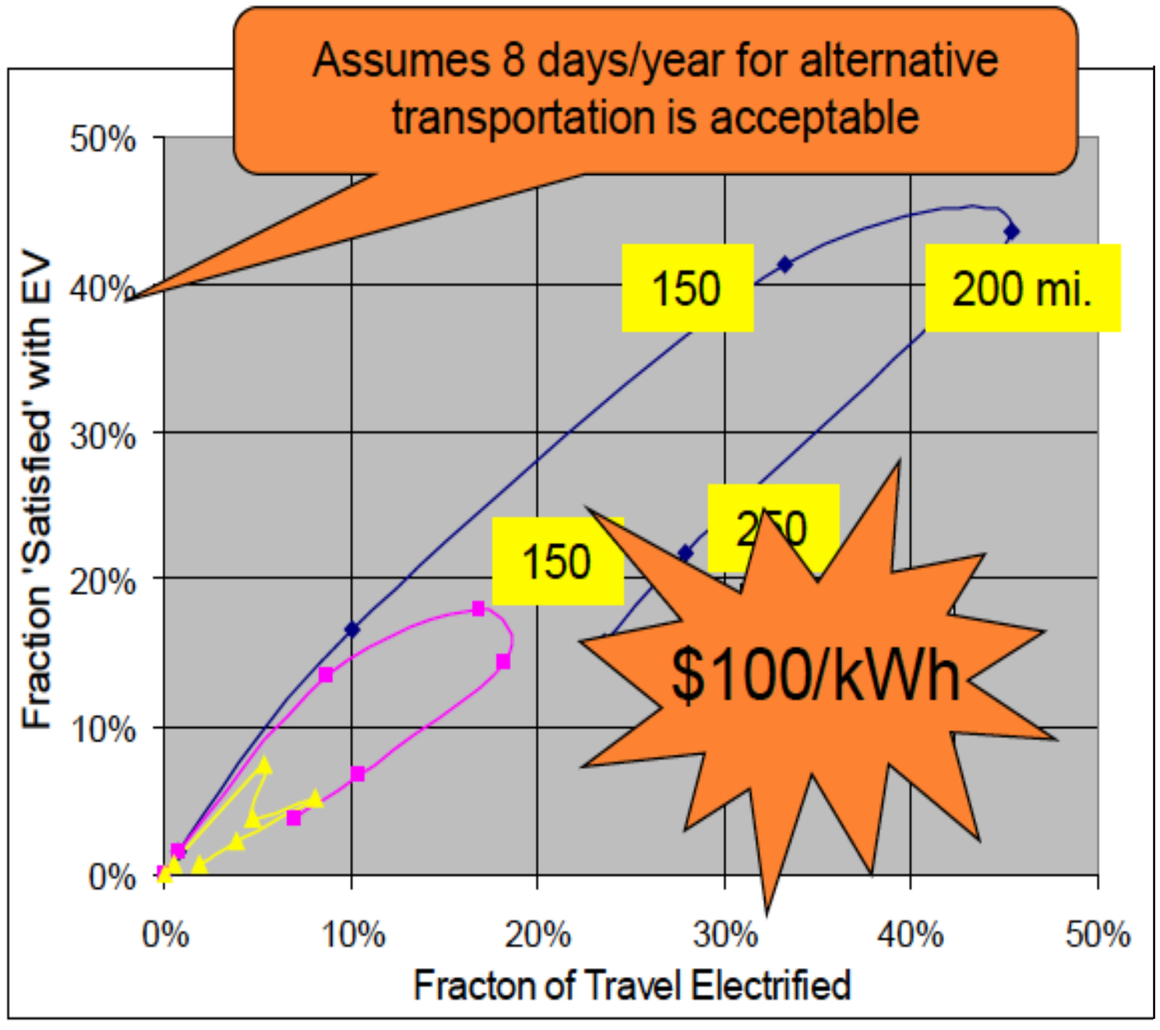
- Dealer-to-consumer/fleet sales and rental agencies
- Product oriented → "moving metal"
- One customer, one car
- Same distribution channels
- Same value chain players
- Historical performance attributes

Typical Comparison

Conventional Vehicle	**'Electrically-fueled' Vehicle**
300+ mi range	< 100 mi range (real world)
Ubiquitous fuel availability	Limited 'Ecosystems'
< 5 minute refuel time	8-30 mi range per hr (Level 2)
<< $30K	$40K++ (unsubsidized)

These differences present a strong challenge to auto dealers serving core customers…

What Customers Want



- Focus is on closing performance gaps
- Historical Attributes
- Core customers

Source: Tamor (2011)

Given a minimum level of 'mobility assurance' consumers could be satisfied with 150-200 miles of range… But that means $100/kWh!!!

Continuum of Electrification

ICE → Mild Hybrid → Full Hybrid → Short AER PHEV → Long AER PHEV → Full BEV

Sustaining

Radical or Disruptive?

Potential for Disruption

- Different/new system behaviors
- Re-ordering of Value Chain Relationships
- New Entrants at Interfaces
- New contexts of use
- New sources of value
- Shifts in consumer preferences

Potential Sources of Value

- Instant torque
- Home ‘refueling’ [new context]
- Improved ride quality
- More interior & cargo space
- Cabin Pre-heating/cooling
- Certainty in fuel cost
- Less frequent servicing
- Mobile connectivity
- Personalization
  - Sounds
  - Skins
- Zero carbon mobility (“RE2EV”)
- Integrated home energy management

Business Model Innovation

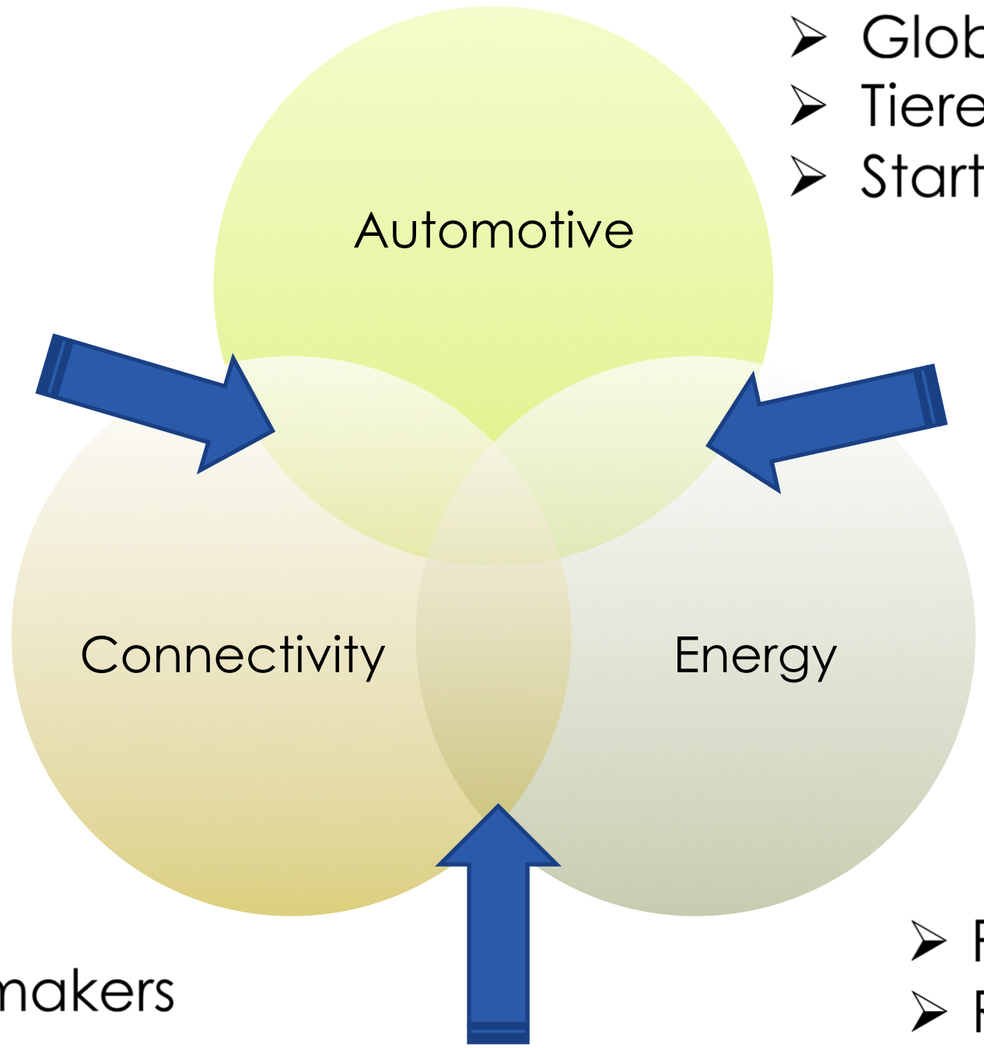
- Technology-enabled
- Draws from non-traditional domains
- Expands the solution space
- Lowers barriers
- Lessens impact of performance shortfalls
- Transform strengths into value added

Business model innovation is key for transforming the inherent advantages of EVs into value added for customers…

Systems Perspective

- Global OEMs
- Tiered Suppliers
- Start-ups

Volvo
Microsoft
Bosch
Delphi
IBM
Siemens



Eaton
Ricardo
Coulomb
AeroVironment
Better Place
NRG Energy

- "Smart" device makers
- Wireless carriers
- Carshare operators
- Electronics retailers

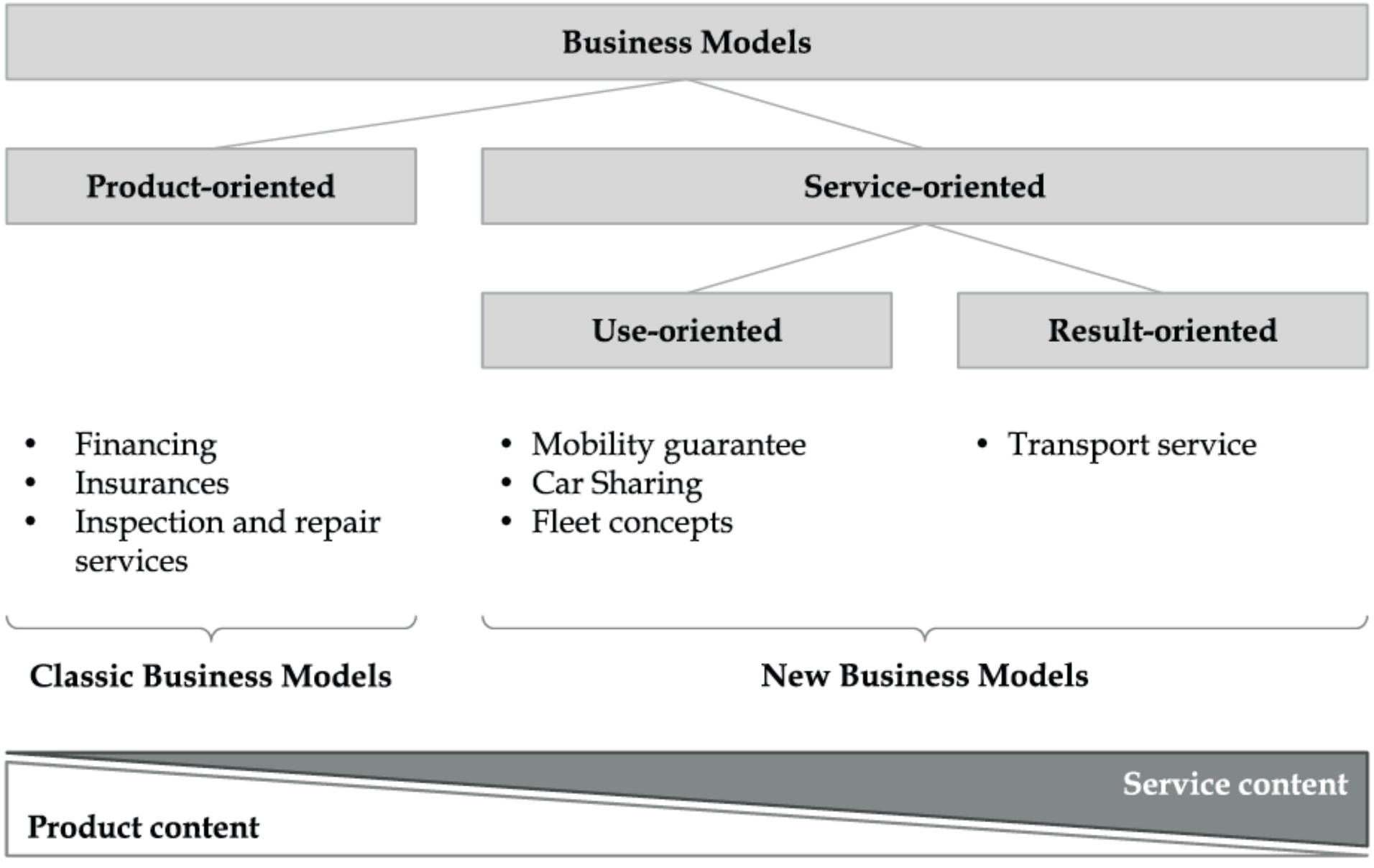
Qualcomm
GE
Best Buy

- Public utilities
- Retail power providers
- EV Supply Equipment Providers
- Commercial/Residential solar

“Problems to be Solved”

- End-Customer
  - Comparable Total Cost of Ownership (TCO)
  - Availability of charging infrastructure
  - Speed of recharge
  - Seamless purchase experience
  - Minimum delay
  - Occasional high utility / long-range trips
  - Plugging in
- Dealer → Closing the sale
- Property Managers

Typology for Mobility Concepts



Source: Kley et al. (2011)

Example: NRG eVgo

- Subscription-based
- Packaged “home and away” charging solution
- Home charging dock and installation
- Unlimited off-peak charging at home
- Unlimited charging at eVgo network stations
- Problems Addressed:
  - Up-front costs, delay, and inconvenience
  - Uncertainty over monthly electricity costs
  - Concerns over limited range

Charging Networks

- Dealers
  - Offers "off-the-shelf" charging solution
  - Allows dealer to close the sale same day on the lot
- Property Managers
  - "Ready for EV" Certification
  - Minimizes capital outlay
  - Minimizes incursion on available parking spaces
  - Reimburses building owner
- Utilities
  - Demand management
  - Peak shaving
  - Load balancing
  - Frequency Regulation

Challenges

- Consumer acceptance
- Assurance of competitive markets
  - Infrastructure subsidies
  - Treatment as a regulated utility
  - Equipment rate-basing
  - Fair rates from utilities
- Consumer protection and dispute resolution
- TOU incentive structure
- Demand charge uncertainty
- Standards agreement
- Parking ordinances

Summary

Business Model Innovation:

- Alternative to performance and price parity
- Enlarges solution space
- Focuses at the interfaces
- Solves problems for customers
- Lowers barriers / Realizes strengths
- Experimentation along Product-Service spectrum

Thank you

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Backup Slides

"Vehicle on Demand"

- Subscription-based and technology driven
- Alternative and/or complementary
- Problems Addressed (End Customer)
  - Affordable access → Eliminates up-front cost
  - Reduced total cost of ownership
  - Availability of charging infrastructure
  - Access to conventional vehicles for high utility trips
  - Right vehicle for the trip
  - No battery degradation risk
  - No resale value risk

Challenges

- Carshare operators – Potential benefits
  - Reduced fuel cost?
  - Reduced operating cost?
  - Branding
- Uncertainties
  - Limited range
  - Availability (turn-around time)
  - Plugging-in
  - Vandalism
  - Flexibility
  - Suburban markets