Competing and Co-existing Business Models for Electric Vehicles:

International Case Studies

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Plug-in electric vehicle sales

Source: EV-Sales BlogSpot & SMMT (UK)
* Year to date available figures
Research Questions

Business Model Innovation

• Alternative Models?
• Co-existence?
• How to Improve?
• Focused on OEMs within the business ecosystem

• Alternative business models:
  – For charging: Fast-charging vs. battery-swapping
  – For vehicles: Product sales vs. mobility services

• Comparative framework

• Primary (interview) and secondary data
Business Ecosystem Perspective

BE Intermediaries
- Government
- University Research Centers
- Industrial Associations
- Infrastructure Providers
- Electricity Providers
- Charging Station Manufacturer
- Charging Station Installation
- Charging Station Maintenance
- Charging Station Operators
- EV User Service Providers
- Smart Network Management software Providers

BE Supply
- Extended Suppliers
- Suppliers from ICV Industry
- Electric Power Management
- Core Component Suppliers
- Peripheral Component Suppliers
- Traction Motor
- Traction batteries

BE Demand
- EV End-Users
- Export
- Private
- Domestic
- Public Programmes
- E Buses
- Logistics
- E Taxis
- Fleets
- Commercial Demand
- Authorities Demand

EV Business Ecosystem Mapping (Shang & Shi 2012)
# Case Overview

<table>
<thead>
<tr>
<th>Case No.</th>
<th>Company or Joint Venture</th>
<th>Country</th>
<th>Ecosystem Function</th>
<th>Business Model Strategy</th>
<th>Market Presence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fast-Charging (BYD)</td>
<td>China</td>
<td>OEM</td>
<td>• Partnership with electricity supply company&lt;br&gt;• Technology leadership for fast-charging</td>
<td>Metropolitan area (Shenzhen)</td>
</tr>
<tr>
<td>2</td>
<td>Battery-swapping (WanXiang)</td>
<td>China</td>
<td>OEM</td>
<td>• Joint venture with electricity supply company&lt;br&gt;• Technology leadership for battery-swapping</td>
<td>Metropolitan area (Hangzhou)</td>
</tr>
<tr>
<td>3</td>
<td>EV manufacturer (Tesla)</td>
<td>United States</td>
<td>OEM</td>
<td>• Niche market&lt;br&gt;• Entry in energy supply with fast-charging</td>
<td>Regional (California)</td>
</tr>
<tr>
<td>4</td>
<td>EV Sharing (Autolib’)</td>
<td>France</td>
<td>Mobility-as-a-service</td>
<td>• Public car sharing&lt;br&gt;• Vertical integration</td>
<td>Metropolitan area (Paris)</td>
</tr>
</tbody>
</table>
EVS 27

Case Studies

BYD
- Headquartered in SHENZHEN
- Established BYD auto in 2003
- Collaborating with China Southern Grid

WanXiang
- Headquartered in Hangzhou
- EV Project since 1999
- Collaborating with the State Grid
Case Studies

**Case Study 1: Tesla**

- Luxury sports EV OEM
- Headquartered in Palo Alto in 2003
- From niche to mainstream
- From OEM to energy services

**Case Study 2: Autolib**

- Public EV sharing service
- Started in Paris in 2011
- Managed and operated by Bolloré
Recommendations

• Leverage ecosystem resources

• Be prepared for ecosystem reconfiguration

• Excel in specific competencies, then expand your value proposition
Conclusions and Future Work

- Business models co-existence
- Ecosystem vision
- Expand/Develop new competencies
Questions?

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- Cambridge University Engineering Department
- St Catharine’s College, RADMA, IBM
- Case company interview participants

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Extra slides
Future Implications

• Co-existence vs. competition of alternative business models
  – Sustainable without subsidies?
  – Emergence of a dominant design?
  – Bending the boundaries of traditional value chains
Literature basis of framework

1) Barriers to consumer adoption

<table>
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<tr>
<th>Scale</th>
<th>Description</th>
<th>Implications</th>
<th>Low score (0)</th>
<th>High score (5)</th>
</tr>
</thead>
</table>
| Reduces battery ownership costs (Andersen et al., 2009) | Who owns the battery? | - Technological risk associated with battery degradation and improvements
- Capital costs | Customer fully owns the battery | Company fully owns the battery |
| Reduces vehicle ownership costs (Andersen et al., 2009) | Who owns the vehicle in the BM? | - Vehicle cost risk
- Market risk associated with industry evolution | Customer fully owns the vehicle (-battery). Business-as-usual | Company fully owns the vehicle |
| Reduces customer exposure to electricity prices (San Roman et al., 2011) | Does the BM include the price of recharging, or do customers pay a fixed rate, or market prices? | - Fuel price risk
- Elasticity of demand for electricity
- Incentives for “smart” charging choices
- Pay-back time of initial costs | Customers pay for electricity at market prices. Highest elasticity of demand and price risk. | The cost of electric recharge is fully included/covered by the supplier. |
| Spreads risk across ecosystem (Visnjic & Neely, 2011) | Who bears the risks in this BM – technical, market, financial, infrastructural? | The distribution of risks influences EV adoption and entry strategies | All risks of adoption accrue to consumers. Business-as-usual | Risks are distributed over different agents |
| Advantage for long distances (Andersen et al., 2009) | Does this BM resolve the issue of range limitation? | - Solution to a major barrier to EV adoption | The BM does not address the problem | The BM explicitly offers a solution for long-distance recharging |
| Encourages change in consumer behaviour (Turrentine et al., 2007) | Does the BM change the way people drive and attitudes? | - Market research and modelling: cannot treat driving behaviour as exogenous | No changes in consumer behaviour | Full range of changes: driving habits, attitudes towards personal vehicles and mobility |
## Literature basis of framework

### 2) Enablers of EV ecosystem development

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<tr>
<td>Enables technological innovation</td>
<td>Does the BM allow for innovations in vehicle design, in battery technology, in charging networks?</td>
<td>Technology-based competition drives industry growth</td>
<td>The BM does not require or facilitate technological change</td>
<td>The BM requires significant technological change</td>
</tr>
<tr>
<td>Clear formulation of business model strategy</td>
<td>Does the company explicitly define its strategy as BM innovation?</td>
<td>Emphasis of entry strategy on technical vs marketing aspects may be a determinant of success</td>
<td>The BM and its innovative component are not addressed explicitly</td>
<td>Explicit focus of the company on BMI</td>
</tr>
<tr>
<td>Enables business model experimentation</td>
<td>Is the BM flexible? Can it be adapted to new technological and market conditions?</td>
<td>BM flexibility improves firm resilience in a changing market</td>
<td>The BM requires irreversible actions</td>
<td>The BM can be implemented gradually and adapt to market needs</td>
</tr>
<tr>
<td>Uses intelligent charging infrastructure</td>
<td>Does the BM require smart charging and grid communication technologies to be implemented?</td>
<td>Arguably, ICT allows the full value creation and capture from innovations in the EV sector</td>
<td>The BM uses a “dumb” charging infrastructure</td>
<td>The BM requires smart controls for charging</td>
</tr>
<tr>
<td>Servitized business model</td>
<td>Is EV transportation viewed as a private good, a private service, or a public service?</td>
<td>Changes the value proposition</td>
<td>Vehicles as a product, Business-as-usual</td>
<td>Mobility as a service with maximum efficiency and optimisation</td>
</tr>
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