Managing Opportunities in the IC to EV transition

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How are EV’s different from IC cars?

- Engine
- Transmission
- Fuel Tank

- Battery
- Electric Motor
- Power Module
How does this transition impact parts suppliers?

<table>
<thead>
<tr>
<th>Vehicle System</th>
<th>ICE Parts &amp; Components</th>
<th>EV Parts &amp; Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power system</td>
<td>Engine block, pistons, valves, cylinder sleeves, camshafts, fuel, and exhaust systems</td>
<td>Energy storage, batteries, and ultracapacitors</td>
</tr>
<tr>
<td>Drivetrain</td>
<td>Transmission components and axles</td>
<td>Motors, electrical components and wiring harnesses</td>
</tr>
<tr>
<td>Instrument Panel</td>
<td>Gauges, Navigation, Radio, etc.</td>
<td>Replace dashboard with computer type screen</td>
</tr>
<tr>
<td>Braking System</td>
<td>Mechanical: disc or drum brake</td>
<td>Mechanical: disc or drum brake plus regenerative braking</td>
</tr>
<tr>
<td>Tires &amp; Wheels</td>
<td>Traditional tire and wheels</td>
<td>EV tires also aim to minimise noise as much as possible so tranquil drive experience of an EV would be ruined</td>
</tr>
<tr>
<td>Frame/Infrastructure</td>
<td>Frame based infrastructure to support engine and powertrain as well as body</td>
<td>Battery pack is very heavier, much heavier than the internal combustion engine is.</td>
</tr>
<tr>
<td>Body</td>
<td>Body parts including bumpers, grill, doors, etc.</td>
<td>Grill parts will not be needed for cooling engine</td>
</tr>
<tr>
<td>Driving Assist</td>
<td>Self Driving sensors/cameras</td>
<td>Self Driving sensors/cameras</td>
</tr>
<tr>
<td>Fuel System</td>
<td>Fuel Tank, filling cap, sensors, gauges</td>
<td>Cables and charging components</td>
</tr>
<tr>
<td>Climate Control</td>
<td>Air conditioning, Blowers, Heater, temperature control systems</td>
<td>Air conditioning, Blowers, Heater, temperature control systems. Air some impact due to no radiator or heat from engine</td>
</tr>
<tr>
<td>Electrical and electronics components</td>
<td>Lighting, sound systems</td>
<td>Lighting, sound systems/Power electronics and control equipment and software, including thermal management for battery packs</td>
</tr>
<tr>
<td>Interior Trim</td>
<td>Seats, seat belts, leather, fabric</td>
<td>Seats, seat belts, leather, fabric</td>
</tr>
</tbody>
</table>

Legend:
- **★** Eliminated
- **★** New
- ▲ Still needed but may have significant changes
- ■ Still needed with minor changes
Our study focused companies in 14 counties

- Benton
- Carroll
- Cass
- Clinton
- Fountain
- Fulton
- Howard
- Miami
- Montgomery
- Pulaski
- Tippecanoe
- Warren
- White

1114 companies in the region
528 companies supplying IC components

$10.41 billion revenues, 46,000 employees – consolidated numbers from Dun & Bradstreet
418 companies potential EV suppliers

$ 9.47 billion revenue and 40,691 employees – consolidated

However.....
Venn Diagram of the impact of the IC -> EV

25% of the companies with $0 sales in the EV supply chain

10% reduction in revenues
County Level impact of revenue shifts

![Ratio of Company EV/IC revenues](image)
Do Nothing risk

• Do Nothing Company Risk = 1 - \(\frac{\text{Parts for the EV}}{\text{Parts produced}}\)

• Do Nothing County Risk = 1 - \(\frac{\sum_{i \in \text{County}} \text{Parts for EV}(i)}{\sum_{i \in \text{County}} \text{Total Parts produced}}\) (i)

Average value of 32%
Collaboration to decrease risk

Expand into related parts in a category
Risk Impact of collaboration

- Collaborative Risk = 1 - \(\frac{\text{New Parts} + \text{Parts for EV}}{\text{New Parts} + \text{Initial Parts Produced}}\)

Risk decreases from 32% to 29.4%

But the 130 firms have no benefit
Expand to other industries using same part type

- Agile Risk = 1 - \( \frac{\text{New Industry Parts} + \text{Parts for EV}}{\text{New Industry Parts} + \text{Initial Parts Produced}} \)

Risk decreased to 3.8%
About 22% of Indiana imported items concentrated mostly in one country

Imported Product Country Risk = \( \sum_i \left( \frac{Imports \ Country_i}{Total \ Imports} \right)^2 \)
Dual Source Strategy

• Domestic sourcing albeit at higher prices
• Back-up supplier
• Supply Chain Resilience
• Current supply chain bottleneck issue
• Opportunity to enable onshoring
Summary

• The IC to EV transition will have a significant impact
• But we have quantified 5 strategies
• Do nothing can cause 25% of firms to have no revenues in the industry, 10% drop in overall revenues and 32% parts reduction overall
• Collaborative strategy can decrease risk to 29.4%
• Agile Strategy can decrease risk to 3.8%
• Dual Sourcing also provides opportunities
• In short, we suggest ways to create significant opportunities in the transition from IC to EV
Thank you

Please contact Steve Dunlop at dunlops@purdue.edu

We would love to chat with you