strategy&

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Future Automotive Scenarios – Managing complexity and

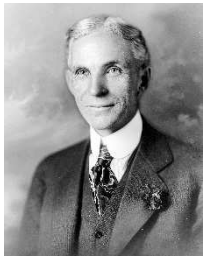
PLCAV Workshop

pwc

The auto industry has historically been at the cutting edge of innovation, management science, and societal change

Business Innovation

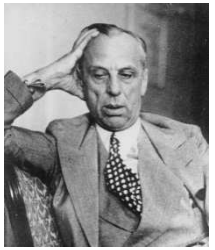
- Parts interchangeability (Durant)
- Moving assembly line / mass manufacturing (Ford)
- JIT / Lean manufacturing (Ohno)



Henry Ford

Management Science

- Labor relations / $5 wage (Ford)
- M-form organization (Sloan)



Alfred Sloan

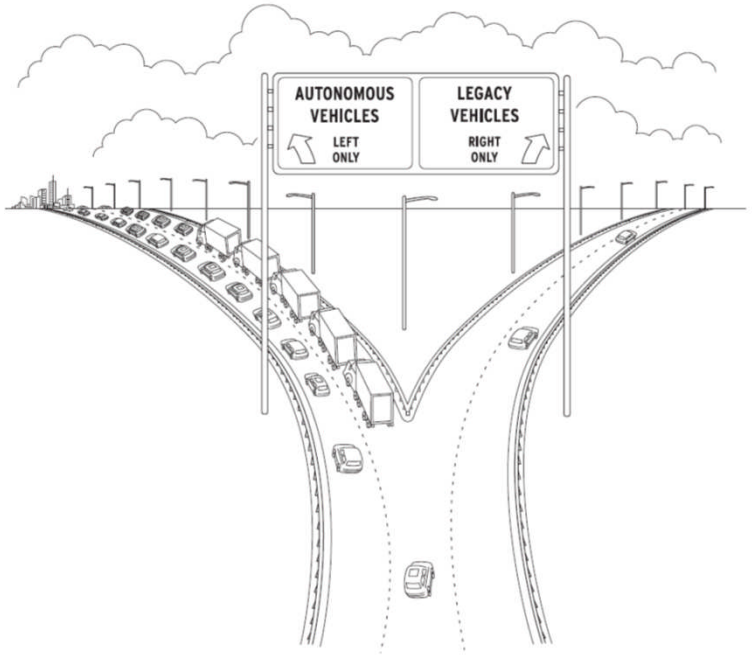
Societal Change

- Mobility for the masses (Ford, Model T)
- Consumer lifestyles (suburbs, motels, roadside diners / fast food restaurants, tourism, etc.)

Charles Wilson

Today, the auto industry is once again at a crucial inflection point - poised to transform itself and society in general

Impending Revolution of the Automotive Industry



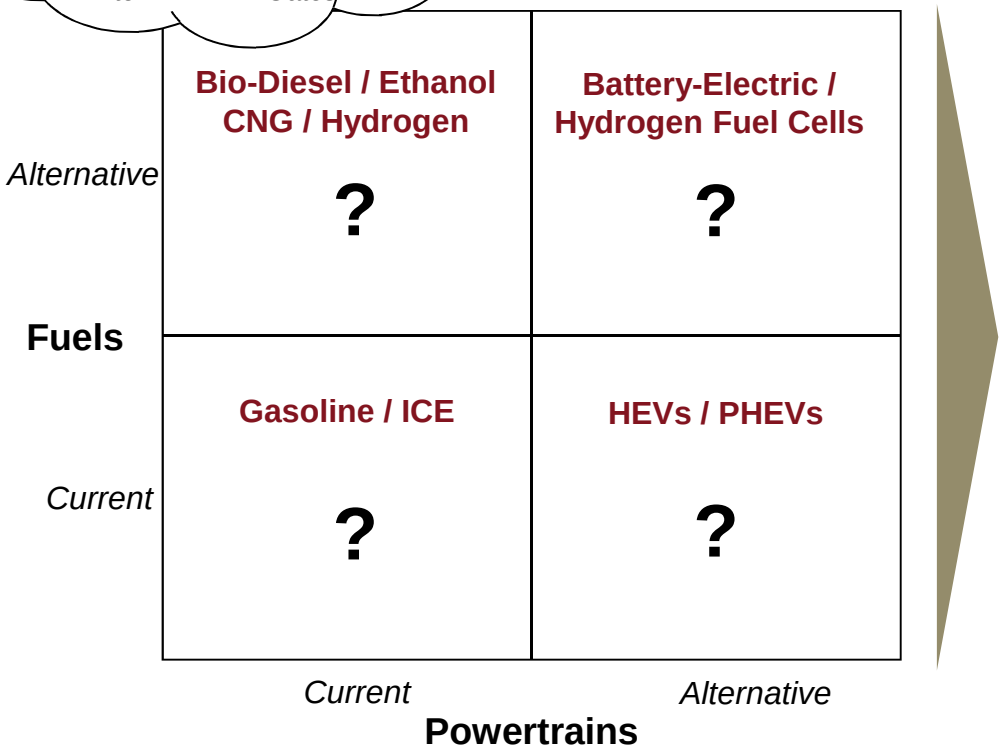
- The automotive industry faces several potential transitions simultaneously
  - Electrification
  - Autonomy
  - Shared mobility
  - Connectivity
- The eventual convergence of these transitions will revolutionize the automotive industry
- However, these trends are also interdependent as well as dynamic complements and substitutes

Source: PwC Strategy& analysis

However, it remains unclear if, when, and how each of these three trends will develop - e.g., alternative fuels & powertrains

"We always overestimate the change that will occur in the next two years and underestimate the change that will occur in the next ten …" – Bill Gates

Alternative Fuel / Powertrain Migration Paths



- There are several potential future fuel / powertrain combinations
  - Improved gasoline ICE engines
    Alternative fuels
  - Alternative powertrains
- Each combination offers different benefits, costs, technological challenges, and required R&D / infrastructure investments
- It is currently unknowable which combination(s) and migration path(s) will eventually prevail

As a result, automotive firms must plan and invest under conditions of significant and irreducible uncertainty

Market Conditions

- How much uncertainty exists? What is knowable and unknowable?
- Which factors will drive alternative future scenarios?
- What would our strategy be under each scenario?
- Are there investments that we would make under any scenario?

Strategic Posture

- What should our strategic posture be relative to each major uncertainty?
  - Shape the future?
  - Adapt to the future?
  - Reserve the right to play?

Product Development

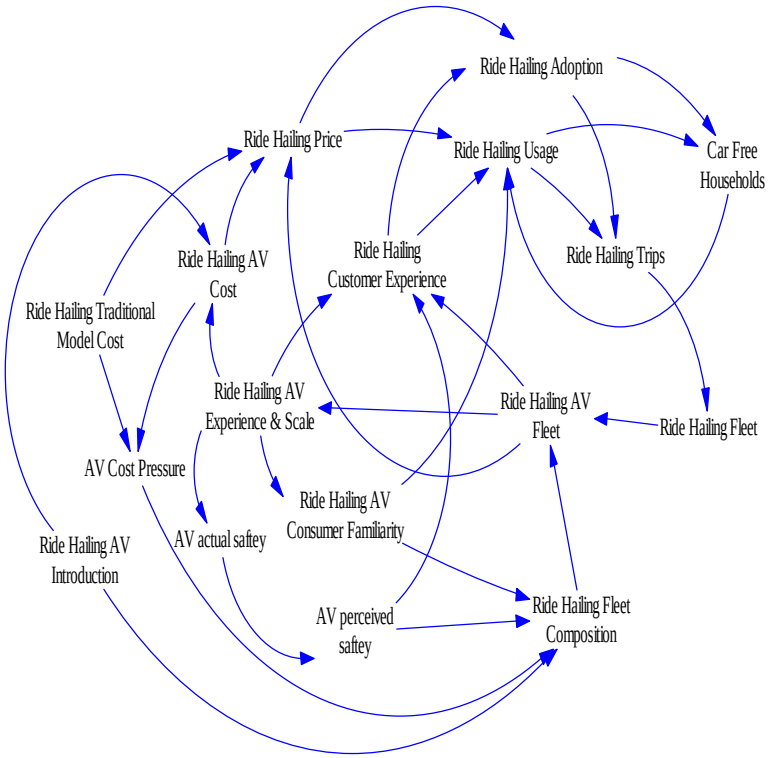
- Which technologies should we invest in?
- How much should we invest?
- Which technologies should be developed in-house?
- Whom should we partner with? Should we insist on exclusivity?

Marketing

- How do different customer segments perceive the benefits/costs of new technologies?
- How should we position each new technology (e.g., rational vs. emotional appeal)?
- Does our current brand image support or hinder customer adoption rates?
- How can we influence other stakeholders' decisions (e.g., government, energy sector)?

Dynamic scenario planning and advanced analytics can be helpful for dealing with extreme complexity and uncertainty

Dynamic Scenario Planning / Analytics
– *ride hailing adoptions example* **–**

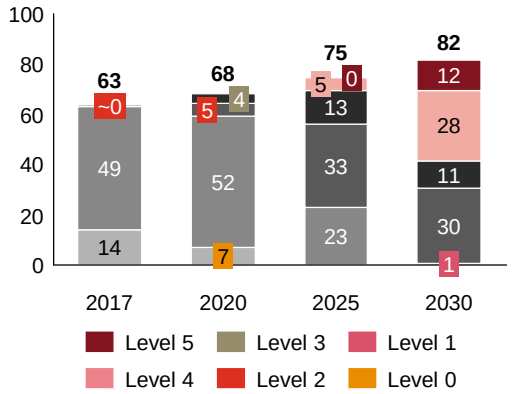


PwC / Strategy&'s Dynamic Scenario Planning Tool

- **Internally consistent over time and across different scenarios** – it is difficult to maintain similar consistency with a mental model
- **Incorporates complex interdependencies**, feedback processes, time delays, and non-linear relationships
- **Provides quantitative estimates of important variables**. Even rough quantification can clarify the likelihood and desirability of different scenarios.
- Simulation combined with qualitative scenario analysis can create a "**bootstrapping" process** in which simulation and qualitative analysis mutually improve each other

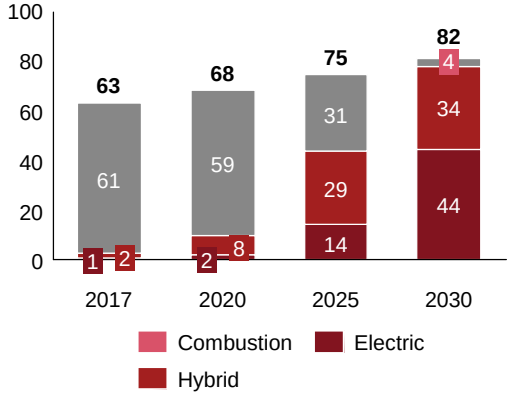
Our own forecast suggests significant penetration of autonomous, electric, and connected vehicles by 2030

New car sales: Autonomous
(U.S./E.U./China; in millions)



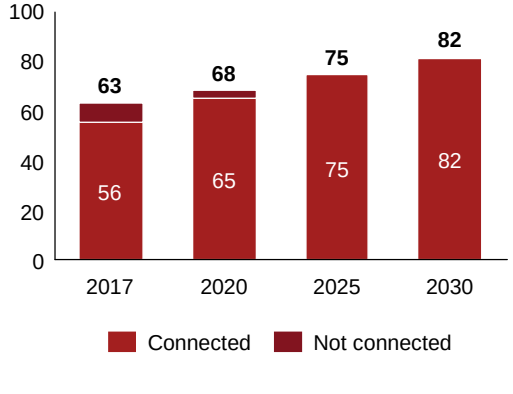
- Tech will allow level 4/5 adoption from 2028 on
- Pull from launch of robotaxi models from 2025 on

New car sales: Electric
(U.S./E.U./China; in millions)



- Strong legislative push from 2020 on
- Price tipping point and sufficient charging infrastructure ~2025
- Potential prohibitions for combustion engines from 2030 on

New car sales: Connected
(U.S./E.U./China; in millions)

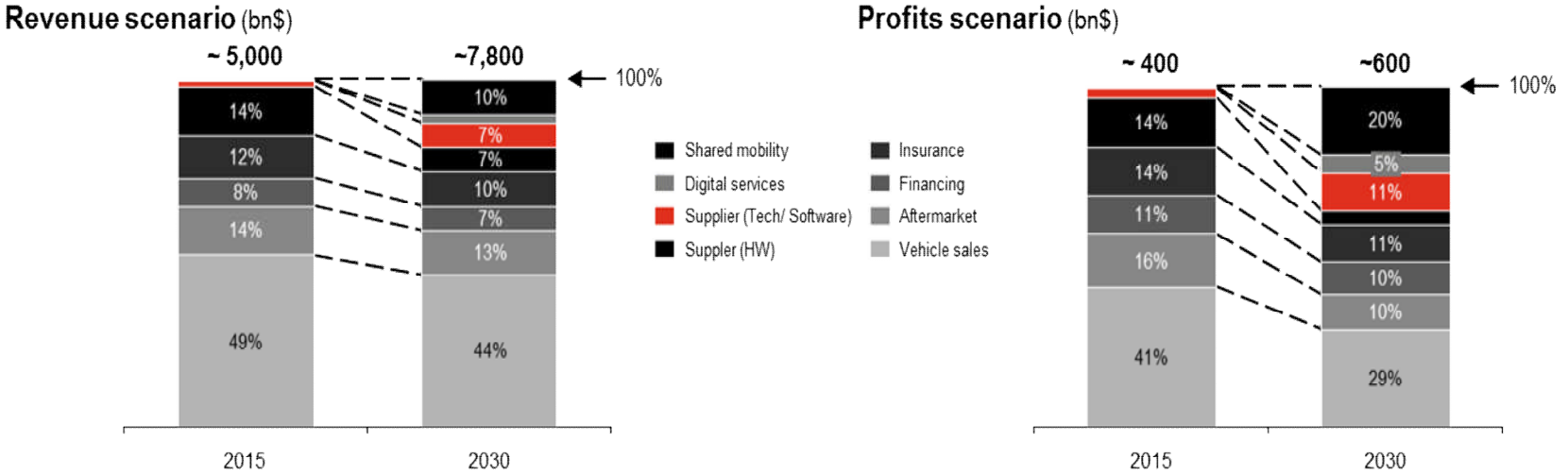


- Legal and customer pull for connected cars means 100% of new cars in U.S./E.U./China will be "connected" beginning ~2022

Note: Totals may not equal sums shown due to rounding.
Source: PwC Autofacts; Strategy& analysis

Profits will likely shift from hardware to software, products to services, and from the old to the new economy

Automotive Industry – Global Value Pool Shifts



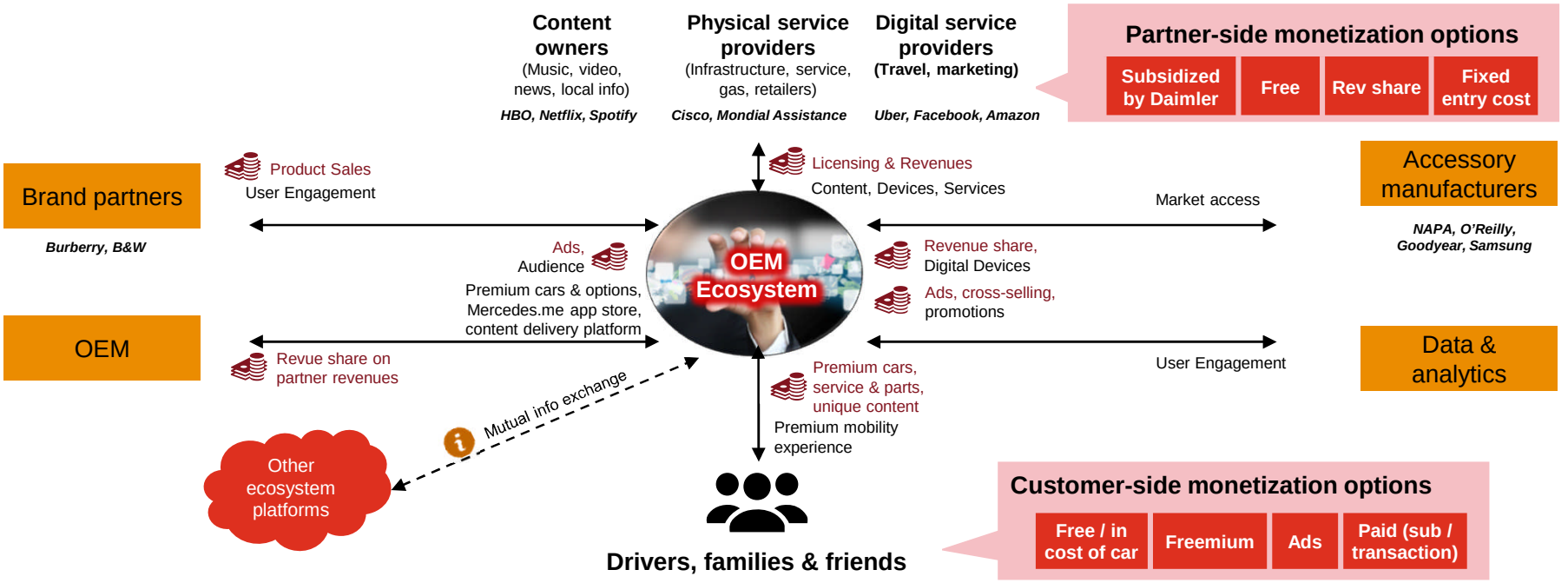
REVENUE:
- Share addressable by (today's) OEM model **declining to < 70%**
- Share addressable by new entrants (digital services, mobility, new technology supply, fintech, start-up EV players) **growing to > 45% or 3.5trn$**

PROFITS:
- Share addressable by OEM **declining from ~70% to <50%**
- Share possibly captured by new entrants **growing to 60% or 360bn$**

Note: Non-consolidated view: supplier value pools not eliminated from vehicle/aftermarket revenues to show full industry value pools
Source: IHS, Autofacts, Frost & Sullivan, KPMG, HBR, Bain, McKinsey, NHTSA, Technavio, National Automobile Dealers Association, OEM reports, Capgemini, Thomson Reuters, Gartner, Oxford Economics, Strategy& analysis

A crucial question is whether, and to what extent, OEMs will be able to leverage and monetize their digital ecosystems

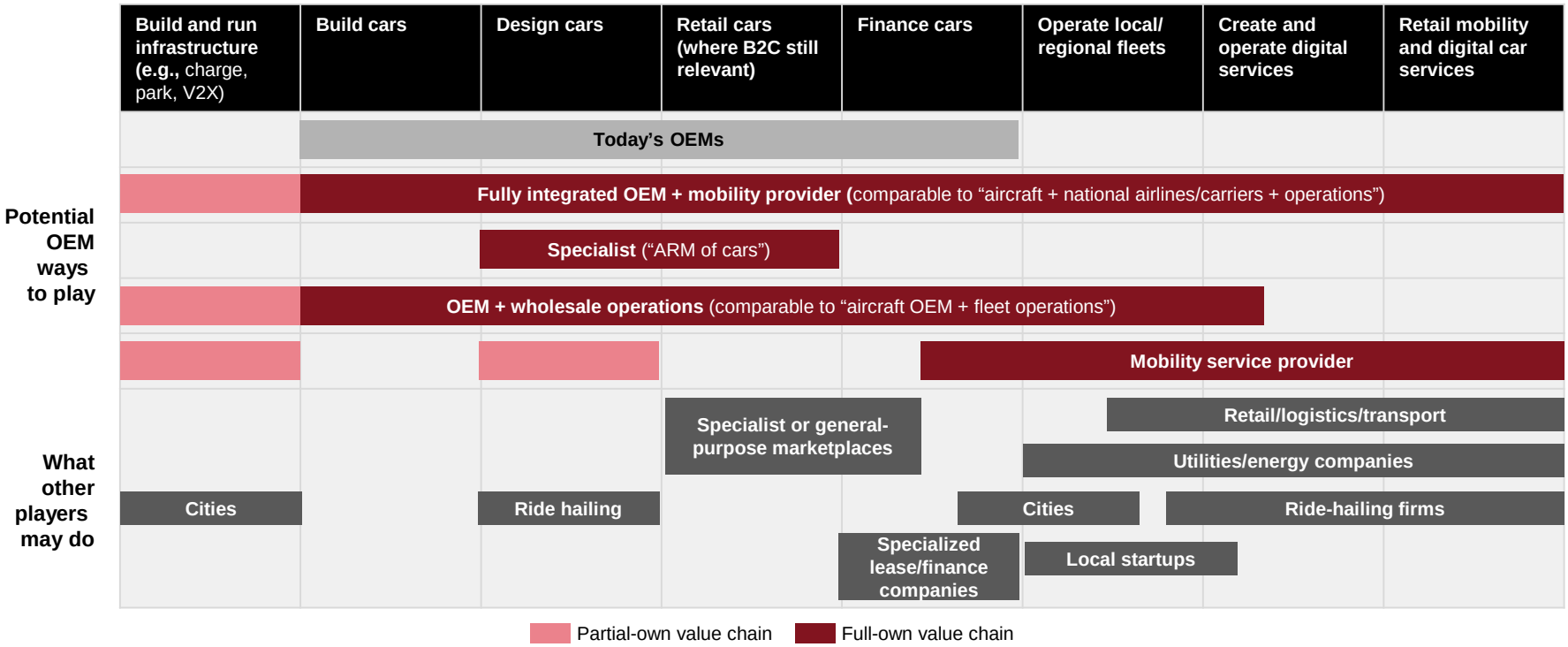
Initial hypotheses ecosystem commercial model



Source: Strategy& analysis

OEMs must decide whether to pursue broad diversification into mobility or refocus on individual value chain links only

Potential value chain integration plays



Source: Strategy& analysis

Managing such a transformation will not be easy for traditional OEMs and their suppliers

Why So Challenging?

- Explosion of digital technology-enabled features, functionality and possibilities - although only a small portion of automotive content, these features have an outsized impact on customers' vehicle choices and brand perspectives
- Requires more, better connections to other companies, new mobility offerings, and customers themselves, to make their experiences richer and more seamless
- Requires unified merging of two radically different worlds – automotive and consumer high tech…with conflicting cultures, product development models and business operations

Key Questions

- Assuming widespread adoption of connected and autonomous vehicles is inevitable, when will it happen?
- How will this connected and autonomous vehicle world be different?
- What will the likely path from here to there be like?
- What should incumbents do to prepare for this new world?

For example, there are major implications for the corporate strategy function – few, if any, OEMs are ready

New Organizational Capabilities

Incumbents must develop or acquire entirely new organizational capabilities and other resources

- Alternative ownership models
- Ventures and partnerships with non-traditional players
- War for talent – can Detroit compete with Silicon Valley?

Strategy Under Uncertainty

Yet, it remains unclear if, when, and how each of the technological and other trends will develop and intersect

- Latent demand analysis, technology diffusion
- Scenario planning, real options, etc.

Required Strategy Capabilities

In addition, the corporate strategy function of most, if not all, OEMs is simply not designed for these new requirements

- Far too HQ-centric
- Focused on the strategic planning process instead of corporate strategy itself
- Organized around traditional annual strategic and budget planning cycle
- Not enough hard-core strategists in house

Many, if not all, OEMs must adapt their organizations and cultures to the requirements of a new business environment

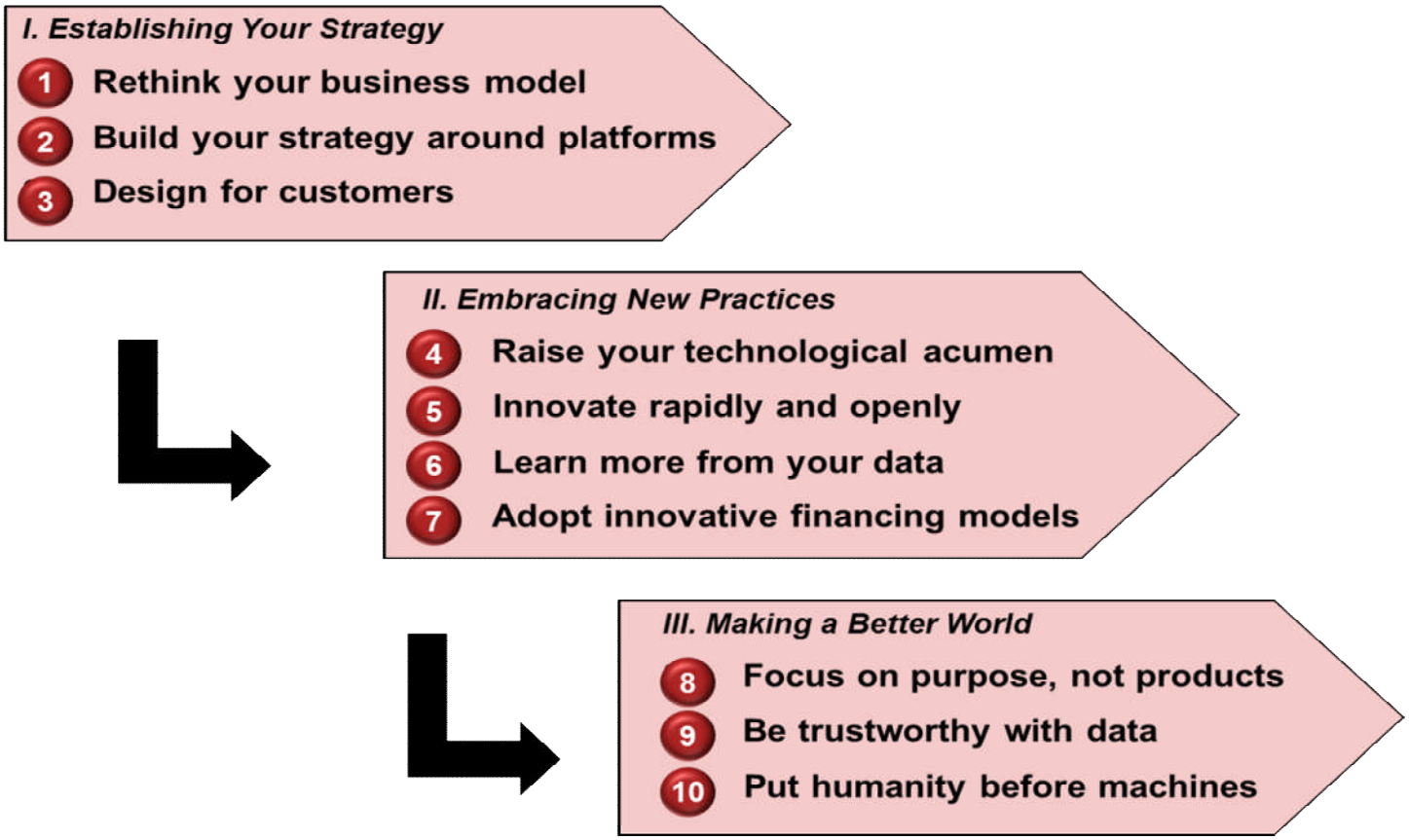
Organizational Implications

- OEMs have very complex, intricately balanced organization models to effectively design, develop, produce and sell vehicles
- Successfully delivering connected car technologies inevitably requires profound changes to the existing organization model
- All OEMs are struggling with this challenge
- The challenge is not simply organization structure itself – instead also focus on decision management, information flows, motivators and culture (behaviors and beliefs)

Cultural Implications

- Given the vital importance and complex challenges of connected car technology, OEMs have to move faster
- Since few OEMs are happy with their progress today there is an imperative for speed and progress
- Traditional approaches are not applicable in a digital world that evolves so quickly…
- …OEMs should launch, learn, adapt – prioritize alacrity, agility and adaptability over precision, perfection and process rigidity

We have identified ten guiding principles that are helpful for successfully managing the required transition



Source: Schwieters and Moritz, "10 Principles for Leading the Next Industrial Revolution", Strategy+Business, Autumn 2017

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Recent Publications (sample)

- "The Demands on Auto Suppliers" – Strategy+Business, November 2016
- "The Auto Industry's Real Challenge" – Strategy+Business, September 2016
- "Deals That Win" – Strategy+Business, July 2015
- "It's a Race to the Bottom in China's Auto Market" – Strategy+Business, September 2014
- "How Emerging Giants Can Take on the World"-- Harvard Business Review, December 2013

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