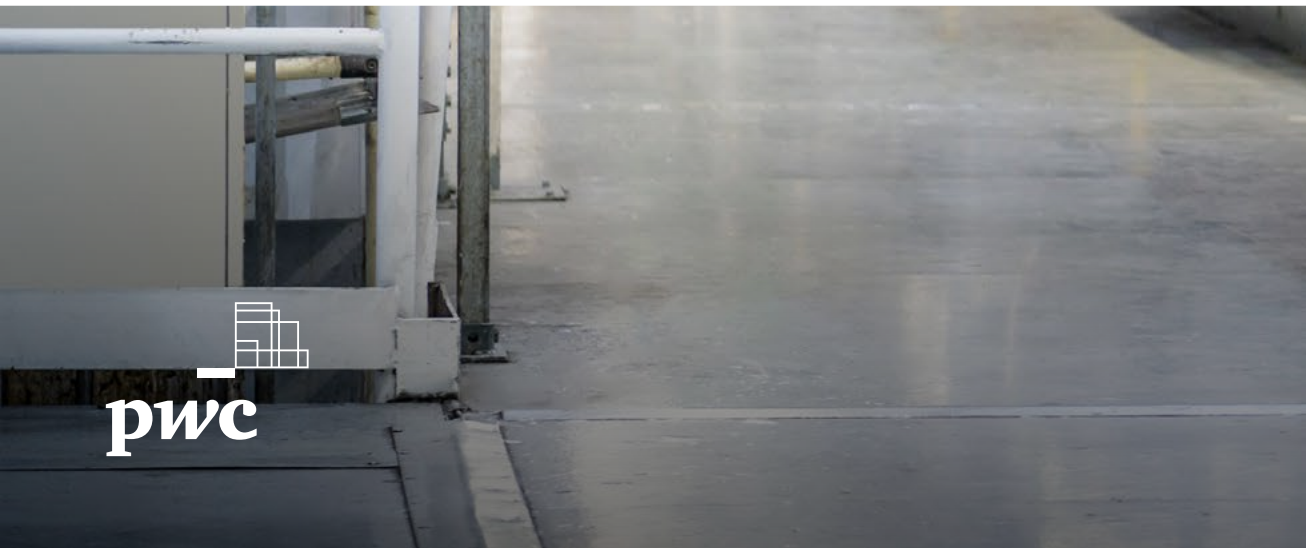
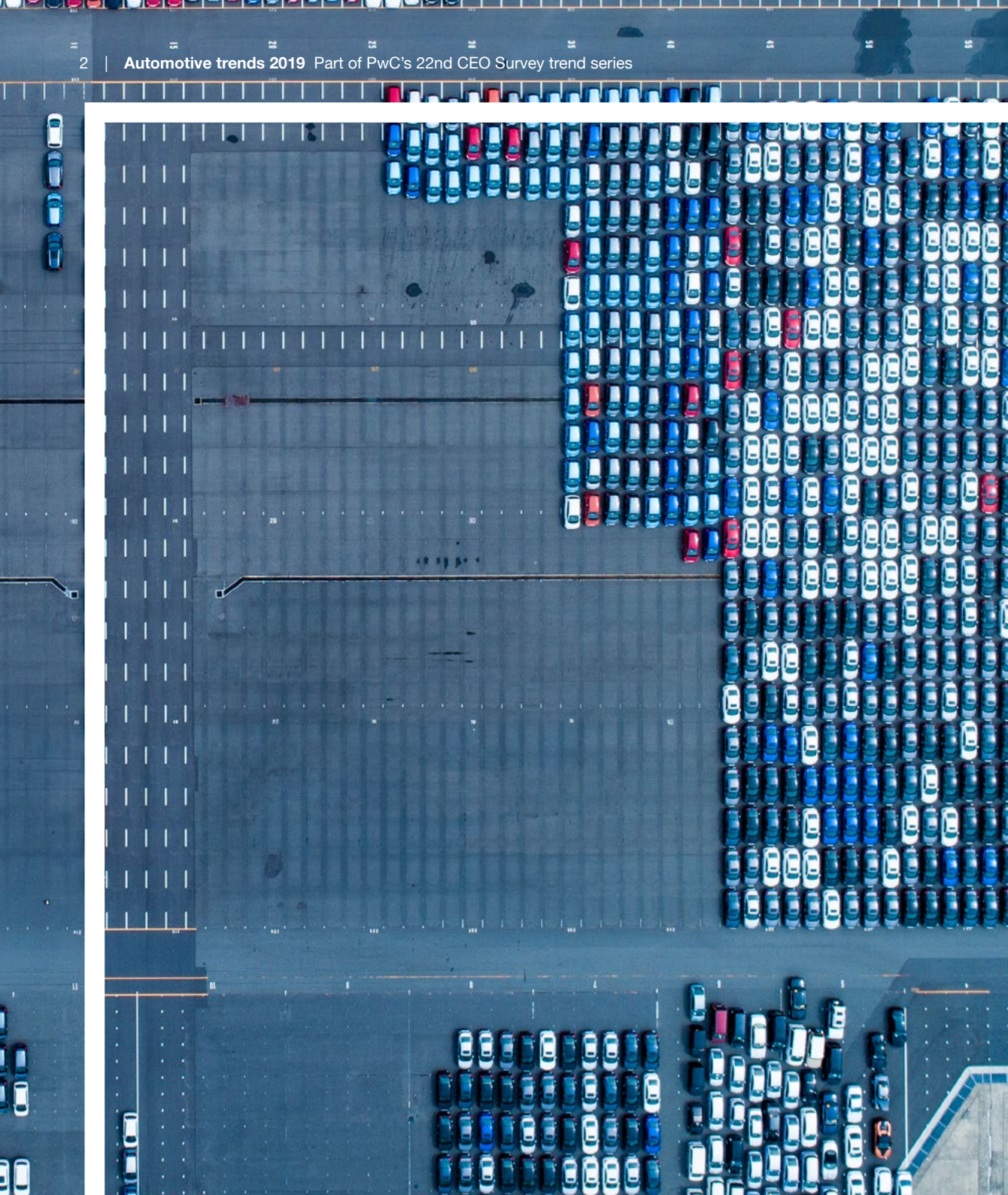


Automotive trends 2019

The auto industry must find a way to balance accelerating innovation and financial survival

Part of PwC's 22nd Annual Global CEO Survey trends series





The case for collaborative CASE

Much of the news coming out of the automotive industry these days concerns a new wave of collaboration. Honda, which in the past generally preferred proprietary technology and in-house engineering, has agreed to join with General Motors' Cruise Automation unit on autonomous vehicle (AV) development. The two automakers were already working together on advanced batteries for electric vehicles (EVs). Ford and Volkswagen — which had each previously earmarked billions for solo EV and AV design efforts — are discussing a joint arrangement to share future costs. Also reportedly in talks to share R&D efforts for autonomous vehicles are BMW, Volkswagen and Daimler. Fiat Chrysler Automobiles (FCA) is collaborating with Google self-driving car affiliate Waymo. And, of course, the newly proposed merger between Renault and FCA represents in part an effort to combine the companies' innovation efforts and raise their EV–AV profile together.

Although this sudden flurry of activity was not widely anticipated, it was inevitable: it's a way to share the ballooning costs of vehicle innovation. For the past decade, many automakers have based their strategies on the idea that a revolutionary change in the automobile is imminent. Original equipment manufacturers (OEMs) have invested many billions of dollars to design vehicles for connected, autonomous, shared and electrified (or, in industry parlance, CASE) mobility. Development time lines for these technologies have varied — connected cars are already ubiquitous and electric cars are gaining in popularity, and although autonomous and shared vehicles are still a futuristic bet, the rosy forecasts assume rapid and widespread adoption.

But so far, most automakers and suppliers have been disappointed by the ROI from these investments, even when their expectations were conservative. Nissan introduced the Leaf plug-in EV automobile in 2010,

and targeted 1.5m global EV sales for the Renault-Nissan Alliance by 2016. Yet only 400,000 had been sold by the end of 2018. In 2010 J.D. Power and Associates predicted that global hybrid and EV annual sales would top 5m units within a decade. However, the cumulative total of all electric vehicles (including hybrids) sold up through early 2019 is just 4m.

As for self-driving cars, five years ago some analysts had forecast that the AV market share would approach 80% by 2035. But more recently Waymo's CEO conceded that it could be decades before autonomous cars are routinely seen on roads. He added that AVs may never be able to drive without human assistance in difficult conditions, such as bad weather or areas crowded with construction or emergency equipment.

To be sure, CASE mobility will ultimately remake the auto industry. No one doubts that. But what automakers need most now is not a grand CASE-related dream. They need a clear-eyed look at their own prospects and capabilities, and a plan for navigating the pressures of the next



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few years. They shouldn't abandon their long-term strategies, but they should temper them with short-term realism. Then, when the time comes, they will be equipped for the radical new business models that eventually will be required. Thus, this year, all successful approaches should involve the same overarching principles: a more specialised portfolio, a more focussed value proposition, more rigorous financial management, and more willingness to collaborate with other companies, particularly in CASE-oriented innovation and capital investment.

Adding up the costs

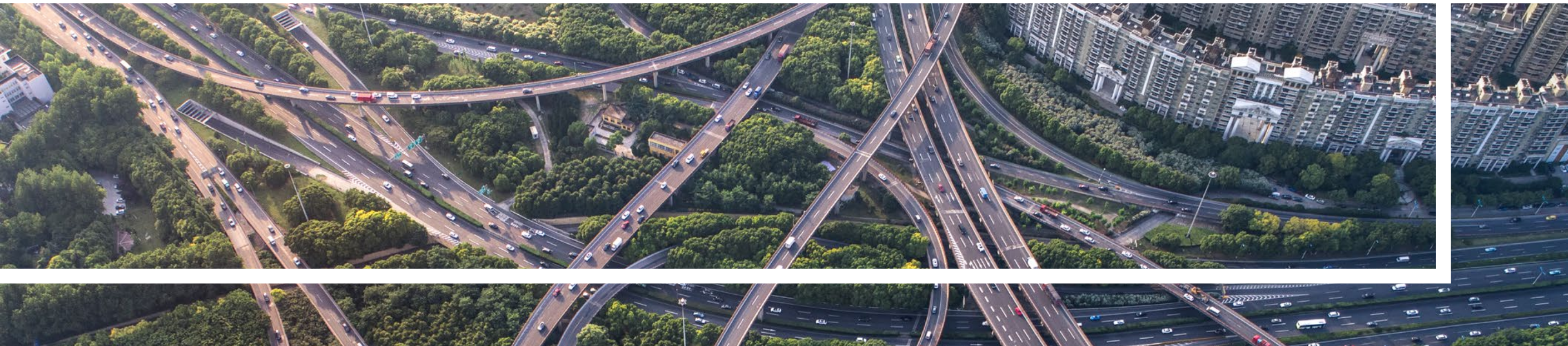
Return on capital (ROC) gives a sense of how deeply the spending on CASE innovation has already cut into automaker performance. Between 2015 and 2017, OEMs of non-premium motor vehicles produced a relatively anaemic 4% ROC, and premium car manufacturers did just a bit better at 5%. That's below the cost of capital and lags behind most other major industries, including information technology (13%), consumer staples (11%) and telecommunications services (7%).

Although returns have not met expectations and despite the recent flurry of partnerships, investment in innovation and product introduction is projected to continue to rise an estimated 59% through 2023, with the fastest growth by far in EVs and AVs. There also will be additional tooling and launch costs for electric and autonomous vehicles. All of this could drive up OEM annual spending on new EV and AV models by as much as 140% by 2022.

Automotive OEMs and suppliers generally argue that the shift to electric

and autonomous vehicles represents a huge revenue opportunity, as does the possible ancillary cash flow from infotainment and shared mobility. Consequently, the short-term pain of large R&D expenditures will more than pay off in the end, they say, and if they don't participate, they risk being marginalised by the companies that do.

Unfortunately, that logic overlooks a number of other factors that could constrain revenue gains and reduce profit margins. For one thing, a good deal of the value in these next-generation vehicles will be captured



by nontraditional suppliers and other service providers — for instance, companies that make sensors, batteries, propulsion software, and infotainment and connectivity programmes.

In addition, most of the plans for EVs involve smaller, lighter vehicles — the type that automakers are already struggling to make profitably. Moreover, many EVs and AVs are destined to be low-margin fleet purchases by commercial entities, such as ride-sharing services, cutting further into OEM profit opportunities.

To put real numbers to the auto industry's product development conundrum, we analysed three different future scenarios for the sector, varying by level of investment in EVs and by market penetration of these new vehicles. We found that the industry's financial metrics worsened in all cases. Under all three scenarios, operating margins fell to between 2.8% and 5.1% from the current level of 6.2%. Return on invested capital dropped to between 1.7% and 3.1% from the current level of 4.6%. Given the risks involved, the cost of capital for the industry would likely rise at the same time.

EXHIBIT

Three scenarios for the auto industry in 2023

In the most plausible optimistic alternative future (Scenario 1), electric vehicle (EV) development is fast-paced. In Scenario 2, automakers delay investment, cutting their current EV production plans by about half, and Scenario 3 represents a future with difficult market conditions. None of the projections would lead to a winning end-state for the entire auto industry.

	2018 Global automotive industry (top 20 OEMs)	Scenario 1: High investment	Scenario 2: Delayed investment	Scenario 3: High investment with reduced gross margin
Revenue	US\$2.2tn	US\$2.6tn		
Earnings before interest and taxes (% of revenue)	6.3%	4.0–4.4%	5.1–5.5%	3.0–3.4%
Return on capital (ROC) as %	3.9%	2.3–2.7%	3.0–3.4%	1.7–2.1%
Change in ROC from 2018	n/a	(1.2%)–(1.6%)	(0.5%)–(0.9%)	(1.8%)–(2.2%)
Battery-powered electric vehicle (BEV) / plug-in hybrid electric vehicle (PHEV) model launches (%)	~12%	33%	16%	33%

Today's action for tomorrow's gain

None of these scenarios — and in our view, no plausible scenario that maintains the current pattern of investment — leads to a viable future for the industry as a whole. But neither will a 'business as usual' strategy of ignoring CASE innovation altogether. Mobility is

indeed on a threshold of change, and transformation of the industry will happen. Moreover, there is likely to be further consolidation before the direction of the auto industry becomes clearer. Today, there are more than 20 global automakers; by 2025, there may be only half that number.

What actions, then, should an automaker (or supplier or other major auto industry company) take this year? Although there are no one-size-fits-all approaches to suggest, there are a few precepts to consider as the revolution approaches:

1. Embrace specialisation.

No matter how the specifics play out, only a few automakers will be able to profitably produce a wide variety of vehicles for a broad base of consumers. Successful auto companies probably will have to focus more closely on particular types of vehicles or excel at narrower value chain roles in order to compete. Starting with a comprehensive analysis of your organisation's skills, assets, scale and financial condition, you must develop a reasoned view of the areas in which your company can best compete.

Some companies may reorient themselves around branded design and the marketing of vehicles while outsourcing technology development to companies that are digitally proficient. Others might expand into full-scale manufacturing, using their mastery of the factory of the future. Automakers that have already invested heavily in EVs and have a leading position in the nascent market may go all in, withdrawing from other product segments to do so, or cutting back in geographies in which they find themselves slipping.

Be particularly rigorous in analysing CASE-related endeavours, as your company may not have the capabilities to succeed in those realms. New technologies and potential new revenue streams — such as connected services that offer shopping and entertainment through the Web, accessible directly from the vehicle — may seem enticing. But no more than a few OEMs can actually generate profits from these features. The same caution applies to new business models, such as those related to shared mobility.

2. Focus your value proposition.

Having chosen a path to follow, calculate the required investments and potential payoffs, as well as the risks and flexibility needed to take that course. In some cases in which capital is at a premium, automakers may decide to be fast followers rather than innovation leaders, tailoring and retrofitting new technologies from other companies for their particular market niche.

3. Manage costs zealously.

No matter what scenario unfolds, returns will be slim and competition will be fiercer than before. Think about spending strategically as the centrepiece of what we call a *Fit for Growth** programme. Invest only in the critical capabilities required to deliver on your strategy, while cutting costs in the 'table stakes' areas in which every automaker must invest (such as insurance and legal costs).

4. Don't do it all yourself.

Share the burden of investments with other companies, syndicating costs and risks through partnering, consolidation and outsourcing across the industry. Dividing up a wide-ranging portfolio among OEMs in a consortium could become much more routine. Outsourcing capital-intensive parts and component development, in which proprietary designs are not necessary, could also be a smart strategy in a cash-starved and cash-demanding environment.

Long-term foresight, tempered by a coherent plan to navigate short- to medium-term challenges, will be crucial. Strategic decisions about how much and where to invest — not just financial expenditures,

but investments of technological skill, organisational capabilities and leadership attention — should be aligned with a thoughtfully reasoned time line for the emergence of electric and autonomous vehicles,

mobility services and cloud-based technologies. Only that approach will enable automakers to get past their immediate challenges and prepare themselves to participate in the auto industry's radically different future.

* *Fit for Growth* is a registered service mark of PwC Strategy& LLC in the United States.

Strategy made real

How will automobile factories change during the next decades as electric and autonomous vehicles come of age? How should auto companies and suppliers prepare strategically and operationally for these changes?

It is impossible to predict precisely what types of vehicles will be leading the market a decade from now, but no matter how successful the shift to electric, autonomous and shared vehicles is, the composition and operations of automobile factories will change in radical ways.

For one thing, during the next ten years and beyond, OEMs will be compelled to corral factory costs, primarily because the fulsome research and development and M&A outlays they made in order to design and develop entirely new kinds of automobiles could cut deeply into potential profits. As a result, the role of robotics and automation in factories will rise exponentially as machines are increasingly relied upon to speed up assembly processes and reduce expenses. Smaller crews

will be needed to build electric vehicles, which have fewer parts and simpler drive trains than internal combustion engine automobiles. The combination of these factors will likely slash the global auto industry workforce at least in half by 2030.

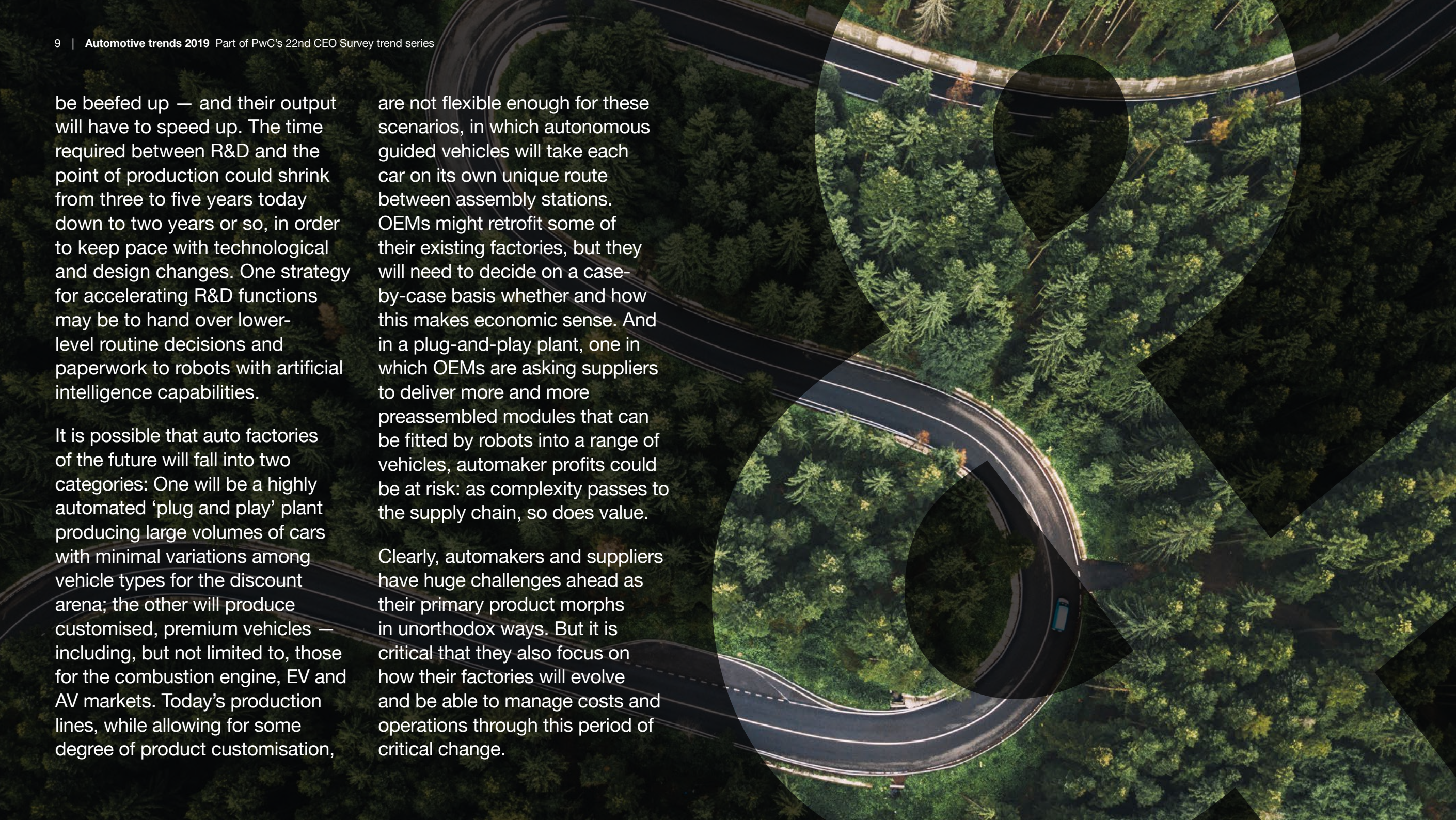
And while automakers and suppliers manage the downsizing and automating of their factories, they will have to turn their attention to recruiting and training workforces unlike any they have had before. This new group of employees will be much more digitally oriented and comfortable with new technologies than prior generations of autoworkers. Indeed, the number of required data engineers will expand by 80% or more in some automobile factories, while the number of software engineers needed will expand by as much as 90%. R&D teams will also have to

be beefed up — and their output will have to speed up. The time required between R&D and the point of production could shrink from three to five years today down to two years or so, in order to keep pace with technological and design changes. One strategy for accelerating R&D functions may be to hand over lower-level routine decisions and paperwork to robots with artificial intelligence capabilities.

It is possible that auto factories of the future will fall into two categories: One will be a highly automated 'plug and play' plant producing large volumes of cars with minimal variations among vehicle types for the discount arena; the other will produce customised, premium vehicles — including, but not limited to, those for the combustion engine, EV and AV markets. Today's production lines, while allowing for some degree of product customisation,

are not flexible enough for these scenarios, in which autonomous guided vehicles will take each car on its own unique route between assembly stations. OEMs might retrofit some of their existing factories, but they will need to decide on a case-by-case basis whether and how this makes economic sense. And in a plug-and-play plant, one in which OEMs are asking suppliers to deliver more and more preassembled modules that can be fitted by robots into a range of vehicles, automaker profits could be at risk: as complexity passes to the supply chain, so does value.

Clearly, automakers and suppliers have huge challenges ahead as their primary product morphs in unorthodox ways. But it is critical that they also focus on how their factories will evolve and be able to manage costs and operations through this period of critical change.



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About PwC's 22nd Annual Global CEO Survey

PwC conducted 3,200 interviews with CEOs in more than 90 territories.

Notes:

- Not all figures add up to 100%, as a result of rounding percentages and exclusion of 'neither/nor' and 'don't know' responses.
- We also conducted face-to-face, in-depth interviews with CEOs and thought leaders from five continents over the second half of 2018. The interviews can be found at ceosurvey.pwc.
- Our global report (which includes responses from 1,378 CEOs) is weighted by national GDP to ensure that CEOs' views are fairly represented across all major regions.
- The research was undertaken by PwC Research, our global centre of excellence for primary research and evidence-based consulting services: www.pwc.co.uk/pwcresearch.

You can find other CEO Survey reports here:

ceosurvey.pwc



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