

THE OLIVER WYMAN
AUTOMOTIVE MANAGER

IDEAS TURN INTO STRUCTURAL CHANGE

Dear Readers,

Several revolutionary ideas shaped the development of the automotive industry over the past decade, but until recently none had reached mass market status. Now, the thoughts show signs of turning into reality and unleashing unprecedented change on the industry and on people's way of moving. This year's *Automotive Manager* maps out the most exciting areas of structural change.

Electric vehicles are overcoming users' doubts over their practicality, as batteries become cheaper and their range increases. So far, they have taken off in one small European market, Norway, and sales are increasing in China. We explain why they are about to become a mass product elsewhere. New models of use such as car-sharing and ride-hailing are gaining popularity in cities throughout the world, and still others, such as car subscription, are being invented and rolled out. The flow of investment funds points to the most promising areas.

In an interview, Oliver Blume, CEO of Porsche AG, told us that the company systematically scouts the international startup scene for innovative technologies and business models that will provide it with external expertise.

The market changes are expected to shake the industry's foundations. Most of the evolving products depend heavily on digital technology, leading to cooperative relationships with new partners. There are also signs of a shift in industry power to China, by far the biggest producer of electric cars and a leader in lithium-ion battery technology.

The new technologies will have less-obvious impacts too. They will demand on-top efforts for cost savings across the value chain, for example in R&D through frugal engineering. And if automakers run their own mobility services, they will have to start managing fleets of cars, which implies mastering new skills such as maximizing residual value.

None of this sounds reassuring for established auto industry participants: Today's leaders might not be tomorrow's. But there will be winners, and we expect them to come from the players that embrace change with the most enthusiasm.

Yours sincerely,



AUGUST JOAS
Partner, Head of Automotive Sector

CONTENTS

COVER STORY



04 BUILDING THE AUTOMOTIVE INDUSTRY OF 2030

INTERVIEW



10 OLIVER BLUME, CEO AT PORSCHE AG

CUSTOMER



12 WHY ELECTRIC VEHICLE SALES ARE ABOUT TO TAKE OFF

RESEARCH & DEVELOPMENT

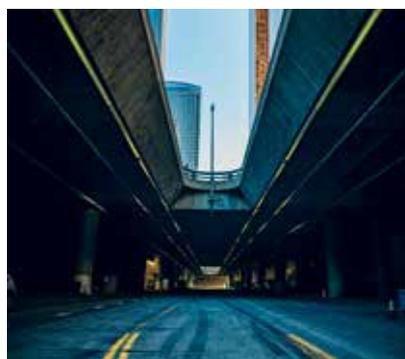


16 DOING MORE, BETTER, WITH LESS

PRODUCTION



22 DESIGNING A PATH TO BETTER VEHICLE LAUNCHES



26 COPING WITH EV ADOPTION UNCERTAINTY



30 CAR DESIGN GOES ELECTRIC

SALES



34 A CAR WITHOUT
THE COMMITMENT



38 A BETTER APPROACH TO
RESIDUAL VALUE

SERVICES



42 AUTOMOTIVE STARTUPS
GROW UP

OPINION



46 WHERE CHINA IS LEADING THE
MOBILITY REVOLUTION

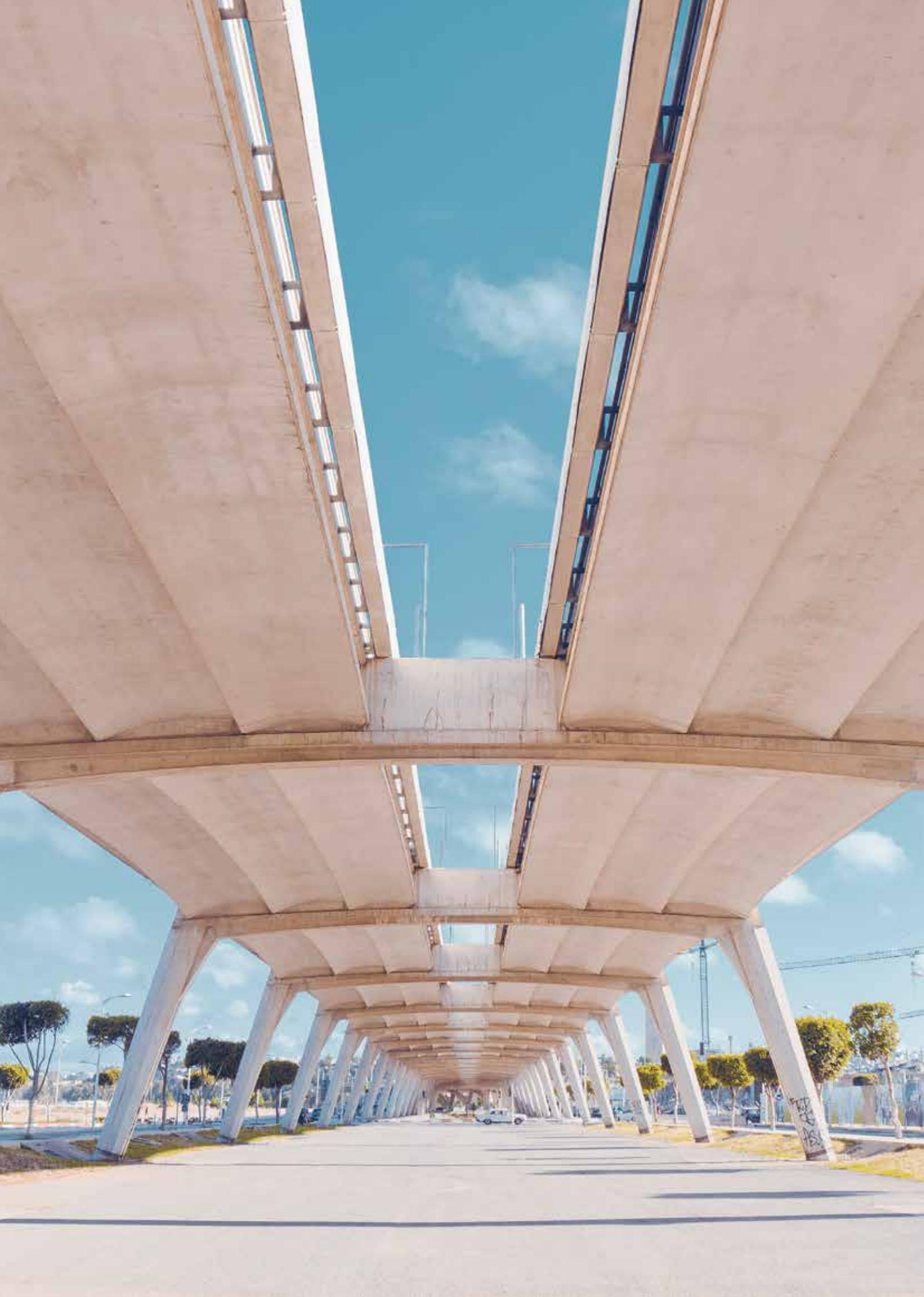


50 CREATING THE CAR
BRAND OF THE FUTURE

BUILDING THE AUTOMOTIVE INDUSTRY OF 2030

Customers, cars, the industry – all will look different

The automobile is arguably the most successful product of the past century, and there is little evidence that people want to give up what it offers: fast, autonomous mobility over long and short distances at an affordable price. But the industry is about to be transformed by multiple revolutions – from drivetrains that power vehicles to digitally connected ecosystems, which are reinventing driving and the customer experience.



First, vehicles will run on different power sources. Electric vehicles make up an increasing proportion of new models sold, and other new technologies such as fuel cells are being developed. But for some time to come, many vehicles will continue to be powered by conventional combustion engines. Second, connected systems mean that humans play a diminishing role in actually driving cars, as autonomous vehicles navigate roads, reducing accidents and freeing up people's time by converting them from drivers into passengers. Third, a greater focus by customers on mobility – and reduced emphasis on ownership – will change the way cars are used, especially in big cities.

These upheavals will be accompanied by broader challenges. The shift to less-complex battery power, combined with improvements in design and manufacturing, will make vehicles more robust, and many components will need to be replaced less often. The growth of battery power and digital driving systems will mean a place in the industry for both new automotive players and other companies, in particular from China and the digital world. Meanwhile, the re-emergence of protectionist trade barriers will push manufacturers increasingly to base production in the region where the cars are sold, making large-scale exports harder, including those of German premium producers.

These changes will shake up the structures and systems on which the auto industry is based. As well as their traditional suppliers, automakers will need to work with new digital firms. Operations will be simplified dramatically, as rival automakers share more components such as electric powertrains and vehicle platforms. We also expect hyper-efficient mega-factories to emerge. As a result, stable market shares and supplier relationships will be replaced by winner-takes-all markets for specialist technology products that are essential for making or using cars effectively. These shifts will mean the industry needs a workforce with different skillsets from today.

However, the industry's primary focus should be on its customers and the products it makes for them. Here are three major trends that will dominate the products and solutions of the new era.

ONE – THE NEW CUSTOMER

Until recently, customers have mostly picked a single car to fulfill an array of requirements. (See Exhibit 1.) The choice was primarily a function of mobility needs: commuting, business trips, and family errands. But drivers of means could opt for a model that was more fun to drive and accorded them social status.

In the future, the majority of people will be “mobilists” who simply want to get from point A to B and are not emotionally involved in cars. They might want to go from a station or airport in a foreign city to a business meeting, buy furniture and ferry kids around, or take the occasional trip to the beach or mountains. Though the driver of the past might have chosen a model that can fulfill each of these needs, the car user of the future will seek the best solution for each task. Depending on the local options, that could mean a ride-hailing service, taxi, rental car, car-sharing service, public transport – or, of course, their own car.

These new patterns will create natural customers for mobility services, which are already growing fast, and could accelerate the shift away from traditional ownership. Some people will cease to own a car due to the expense, as tighter regulation increases the cost of powertrains, taxes rise for political reasons, and raw material prices go up. Others will be put off buying a car because of urbanization: Driving in cities involves extra costs such as parking and is generally no longer a pleasure; many people simply want to get around with as little hassle as possible. As populations age, a growing number of people will just need ways to stay mobile – in some cases because they can no longer drive themselves – and they will not care whether they get around by way of traditional driving. In these cases, flexible pay-per-use models will provide an alternative. We think that in Germany and the United States spending on car-based individual mobility services will double by 2040, while in China it could triple.

To cope with these new patterns of demand, brands need to become leaders in specific use cases to regain importance – automotive heritage and history no longer mean much to many people. At one extreme, vehicles used in mobility services will have a large number of different users, perhaps more than 100 per year. They will be on the road for a greater proportion of the time than current vehicles. And they will generate demand for new options, such as parking assistants and massage seats. So automakers will have to design cars with these changes in mind. Vehicles will need to be damage-resistant and low-maintenance so that they can easily be used by multiple users. This usage pattern could drive demand for frugal vehicle concepts that are suited for multiple users – a bit like the aircraft interior of a discount airline. Automakers will have to deal with the new mobility fleet operators as customers. Fleet operators will be better negotiators than individuals, and they will demand tailored products, as well as favorable conditions and pricing. They will have far greater market power than traditional, individual customers, and they will put pressure on prices and margins.

EXHIBIT 1: CUSTOMERS: FRAGMENTATION OF USE CASES

The customer experience is changing over time



Source: Oliver Wyman analysis

That said, traditional car ownership is not about to vanish. Many of these mobility services will run into their own problems of feasibility – and, when the services do work, they will often tempt people away from public transport rather than from car ownership. Moreover, there will remain a solid core of automobile connoisseurs, especially in the countryside but also among wealthy city dwellers. These consumers love cars and driving and will hold out against anything – from battery power to ride hailing – that diverges from the traditional experience, so long as this remains legally possible. They want speed and acceleration, the sound of a V8 engine, heightened comfort, and classic looks, and are ready to pay for it.

TWO – NEW TECHNOLOGY, NEW CARS

As customers demand new functions in cars, new technology will push other changes. Electrification is happening, but its rate is hard to predict. Environmental considerations are the driving force behind electric vehicles, but these are a relatively minor factors in most car purchase decisions. Without government legislation or incentives, electric vehicles might only make up 10 percent of new vehicle sales by 2030. A complete ban on sales of new cars with internal combustion engines could turn some markets almost 100 percent electric. Current moves by cities

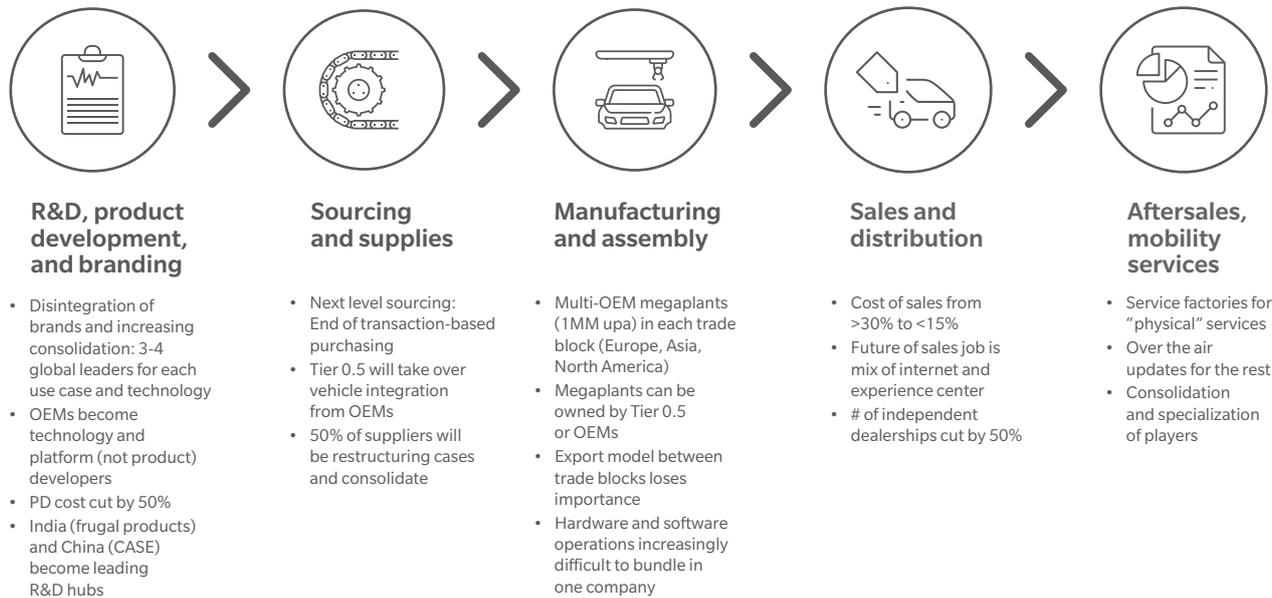
to gradually increase their restrictions on internal combustion engines suggest a scenario that could lead to electric vehicles representing 30 percent of sales by 2030. So, for the next decade or more, automakers will need to produce cars with different powertrains – probably adding fuel cells to internal combustion engines and battery-powered vehicles.

Modular design will enable automakers to continue to manufacture large numbers of variants around a single platform and in a single plant, increasing flexibility and reducing overcapacity. The same principle will apply to infotainment systems, for which the industry will increasingly use standard displays, operating systems, software layers, and input devices.

Electronic systems – and mobile communications in particular – will enable drivers to spend less time driving while in their cars and more time doing other things. Technology shifts can also be expected in safety, with progress in braking, steering, crash protection, and advanced driver-assistance systems. In all these areas, automakers will have to build up competence in technologies where other industries have already set the standards. However, many components of the new systems will be made by market-leading specialists. These leaders will supply automakers, which will find it more economical to buy in these specialist technologies than to develop them in-house.

EXHIBIT 2: AUTOMOTIVE INDUSTRY 2030

The changes in the automotive industry will affect the whole value chain



Source: Oliver Wyman analysis

THREE – THE STRUCTURE OF THE AUTOMOTIVE INDUSTRY IN 2030

Technology advances and increasingly varied demand will mean that automakers themselves develop less and less of what they produce. One area where the traditional auto industry lacks skills is software, and much of the new technology that will go in cars is first being developed outside the automotive world, in particular by digital companies.

The fastest – in some cases the only – way for automakers to develop their own mobility services and electrically powered, self-driving vehicles is through strategic partnering with specialist technology firms. Those companies that fail to do so are likely to lag rivals in developing sophisticated products such as self-driving cars and end up falling far behind the pack. In contrast, first movers may become the standard setters in an area of new vehicle technology, adding a new business to their traditional one. There is an incentive for the technology firms too, many of which are startups: To get their technology to market, they will need strong relationships with automotive industry players.

Another reason to form alliances is to share the huge cost burdens of developing the next generation of mobility. Automakers need to make big technological leaps in both propulsion – electric vehicles and more-efficient internal combustion engines – and in the digital transformation of the driving experience. In particular, the development of fully autonomous driving will be too expensive for a single automaker to do by itself. In the race to develop the car of the future, those that collaborate will win.

As automakers reach out to new kinds of partners, the traditional industry structure, based on vertical supply chains, is being replaced by an array of new relationships – for example between automakers and digital companies and between different automakers. The successful industry participants will increasingly be those that master particular skills or specialize in specific areas of technology. There will be three or four global specialists in each of the major technologies the industry depends on, such as electric powertrains, vehicle connectivity systems, and autonomous-driving hardware and software. The markets for these products will be dominated by the winners, and the number of independent companies will be significantly reduced, including carmakers, suppliers, dealers, and aftersales companies. Moreover, the total number of traditional jobs required in the industry will be reduced as technologies become less hardware-driven and more standardized. (See Exhibit 2.)

UNPRECEDENTED CHANGE

Carmakers have managed to master an impressive range of challenges over the past decades. However, the stakes are higher than they used to be, and the coming upheavals will be on a much greater scale. For companies that grasp the new realities, there are opportunities to position themselves innovatively so that they prosper in the market of the future. One thing is certain, the changes will be fast, and only those players that move quickly and make bold decisions will be able to thrive. •





OLIVER BLUME

Oliver Blume (51) is Chairman of the Executive Board at Porsche AG. Following his studies in Mechanical Engineering at the Technical University of Braunschweig, Blume began his professional career at Audi AG. After various roles in the production department, Blume moved to SEAT in 2004. In 2009, he became head of production planning for the Volkswagen brand. Four years later he was appointed as Member of the Executive Board for Production and Logistics at Porsche AG, and became Chairman of the Executive Board in 2015. Since 2018, Blume has been a Member of the Executive Board of the Volkswagen Group and in this role is responsible for Group Production. Blume also heads up the “Sport/Luxury” VW brand group, which includes Porsche, Bentley and Bugatti.

1. THE DRIVING EXPERIENCE IS A HUGE PART OF THE PORSCHE BRAND'S SUCCESS. WHAT DO YOU THINK WILL BE THE IMPACT ON PORSCHE WHEN IT COMES TO AUTONOMOUS DRIVING?

A Porsche is defined above all by the exclusive, sporty driving experience. That is why the driver always wants to be the one actually doing the driving. In everyday traffic, however, there are situations when even a Porsche driver will gladly avail of autonomous driving modules, for example in traffic jams or stop-and-go traffic. Not to mention the convenience of getting out right in front of the restaurant and having the car look after finding a parking space. This is very much in line with the exclusivity of our brand. In addition, we are working on innovative concepts that put a Porsche spin on autonomous driving. Here, we are thinking about a Mark Webber app, for example. This guides the driver around the track on the perfect racing line – as a virtual instructor.

2. IN THE CONTEXT OF EMISSION REGULATIONS, HOW DO YOU MANAGE THE TRANSFORMATION TO ELECTRIC VEHICLES? AND HOW DOES ELECTRIFICATION ALIGN WITH THE SPORTIVE DNA OF PORSCHE?

Electromobility and Porsche go together perfectly. In combination with high-performance batteries, the electric drive offers outstanding performance values. Porsche is also very emphatic in its commitment to the ambitious climate targets. This is another reason why electromobility is essential. Porsche started electrifying the powertrain already years ago. For example, Porsche was the first manufacturer to offer models with plug-in hybrid drive in three premium segments simultaneously. Now, more than 60% of Panamera customers in Europe choose the hybrid variant. Electrification has therefore been very well received. That is why we plan to invest six billion euros in electromobility by 2022 and will be launching our first purely electrically powered sports car, the Taycan, later this year. Even though no customers have been able to drive it yet, demand for this model is already so high that we have increased our initially planned production capacities.

3. PORSCHE'S CORPORATE CULTURE: YOU MAKE PREMIUM CARS BUT STILL VALUE THE SPIRIT OF A FAMILY COMPANY. HOW DO YOU SECURE THIS SPIRIT FOR THE FUTURE?

Porsche is known for its special corporate culture. It has played a significant role in our brand's success story. That is why it

is so important to us to carry this culture into the future. As part of the Porsche Strategy 2025, we have developed a clear cultural mission statement. It is anchored in four key values: pioneering spirit, sportiness, a sense of family and something we call "Herzblut" – our passion aligned with the needs of our customers. The focus here is on people. We want this to be our guiding principle in the future as well.

4. WHAT MEANS INNOVATION FOR PORSCHE IN THE NEXT COUPLE OF YEARS?

Innovation has always been part of the brand core of Porsche. A central pillar of our strategy is strengthening this further. That means having a very systematic and structured approach. We are concentrating on fields where Porsche is particularly strong and will also lead the competition in the future, such as design, drive systems, vehicle dynamics and vehicle architecture. At the same time we are developing new business fields and focusing more and more on cooperations, especially in the digital segment.

5. WHAT PARTNERSHIPS DOES PORSCHE NEED IN THE FUTURE?

Partnerships are increasingly gaining importance for Porsche, particularly when it comes to topics of future relevance like connectivity, artificial intelligence or new mobility concepts. That is why we systematically scout the international startup scene in order to be able to identify innovative technologies and business models that are a good fit for Porsche at an early stage. We then make them available to us by providing investment. By cooperating with competent partners, also in the form of participations, we are building a strong ecosystem that enables us to target external expertise we want to bring into the company.

6. OUT OF ALL PORSCHE MODELS: WHAT IS YOUR FAVOURITE AND WHY?

That is a tough one to answer. I can get as excited about the 911 GT3 as I can about the Panamera Turbo S E-Hybrid or the Cayenne. And of course it also depends on what I will be using it for. No matter what, I will always be a big 911 fan. And I am particularly looking forward to the Taycan, which is being launched in autumn. I have already been able to try it out a few times, and I am completely hooked: our first pure electric sports car is fantastic to drive – a true Porsche, through and through.

WHY ELECTRIC VEHICLE SALES ARE ABOUT TO TAKE OFF

Consumers are not yet aware of gains in economy

Electric vehicles are the proverbial cars of the future, rather than the present – but will that always be the case? Despite all the talk during the past decade, e-vehicles make up less than half a percent of the billion cars on the world's roads. In France, for example, just 2 percent of the cars sold in 2018 were either pure electric or plug-in hybrid, and there were just 160,000 electric cars on the road at the end of the year, or 0.5 percent of the total fleet. The main reasons: Most consumers worry the battery will die on long journeys; and they find the vehicles simply too expensive.



An Oliver Wyman study indicates that the market is finally ready to take off, and it provides clues as to how automakers, dealers, energy providers, and other related players should position themselves. The study – based on two focus groups of 10 people and a web survey with 1,060 respondents – was conducted in France, but its lessons apply to other major markets, too.

Many people are extremely positive about electric vehicles: 76 percent declare an interest. But they are hesitating because of a belief that the cars are not yet ready and will only achieve mass-market status in another five years. Drivers question manufacturers' promises on range and fear restrictions on the seemingly limitless travel they have grown to expect. And they doubt governments' commitment to measures supporting electric-vehicle adoption and the rollout of charging infrastructure, suspecting a short-term reaction to recent news about diesel engines.

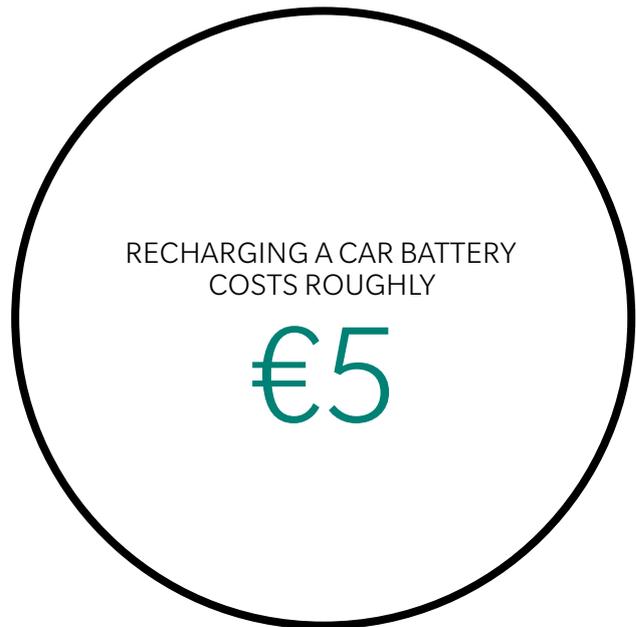
However, recent progress in batteries and charging infrastructure has brought electric cars close to the performance and economy drivers now demand. The problem is that few people realize this. Most tend to underestimate the latest vehicles' ranges and to overestimate their overall cost. In particular, the total cost of ownership is surprisingly low, as the upfront price of the battery is outweighed by cheap recharging, while maintenance costs are also relatively low. Thirty-eight percent of respondents say they did not know about these low costs and that they have changed their perceptions after being informed of them.

PERSUASION IS NEEDED

Electric cars are a consumer revolution with a difference. Some market upheavals are driven by a product with new capabilities – think of the smartphone. Others come from technologies that improve on an existing task – consider music/video storage formats.

But battery-powered vehicles are different in that they do not do much more for their owners than traditional cars. Instead, the motivation is to reduce pollution and greenhouse gas emissions. To succeed, their performance and price must be competitive with existing options.

Currently, electric cars are more expensive: For a new, midrange traditional car costing €18,000 in France, the electric equivalent is about €32,000 – or €26,000 after government subsidies. Consumers underestimate these costs: They think an equivalent e-car costs an extra €2,800 after government subsidies are thrown in, and they do not expect the prices to align until after 2025.



However, people overestimate the cost of recharging. Typically, recharging a battery costs roughly €5. But consumers think it to be much higher, anywhere from €20 up to €50. Over the first four years, the total cost of owning and running a new, midsize electric sedan is estimated to be 3.4 percent less than that of a diesel, according to UFC-Que Choisir. While the electric model will depreciate nearly €3,000 more than the diesel car, this is more than outweighed by cheaper fuel. As the cars get older, the electric versions become even better value, because of the fall in depreciation costs and the relatively low cost of maintaining an electric vehicle.

Perceptions of the driving distance on a single charge are also incorrect: Most people guess 250 km, when it is more than 300 km for midrange vehicles. Drivers say they want a distance of 500 km per charge, even though most rarely drive that far, and fast-charging stations on motorways will be available. As a result, electric vehicles are still seen as an option for niche or specialist users. In fact, the UFC-Que Choisir study shows, greater cumulative distances are the key to getting value from an electric vehicle, so rural drivers benefit more than urban.

LACK OF INFORMATION

The lack of knowledge has several causes. New products typically are embraced by early adopters, who blaze the path for the rest. Currently, there are clusters of pioneers around the world: In Norway, for example, 48 percent of new cars sold in 2018 were electric. But overall, few people have any experience with electric vehicles. Just 47 percent of our respondents know someone who drives one and only a third have ridden in one.

The lack of familiarity makes people hesitant over – or even opposed to – electric vehicles. Accustomed to filling up with diesel and gasoline, drivers have trouble understanding the management of electricity as a fuel – how and where to recharge. They want their own charge point at home, but are under the impression that installing one will be complicated. Questions from our focus groups include, “Do you need a second electricity account?”, “Can I plug into a normal socket?”, “Where can I buy a charger?”, “Can the same socket be used for different cars?”, and “What if other people plug into my charger?” Dealerships are seen as the most credible source of information on batteries, while utilities are viewed as the best providers of charging services.

and the “rational uninformed” who view cars as a means for mobility and are open to persuasion but have reservations about battery range and the total cost of ownership. The other consumer groups – the “well-informed family head” and “demanding city dwellers” – are interested in the economies of electric cars and are generally receptive but worry about range and charging infrastructure.

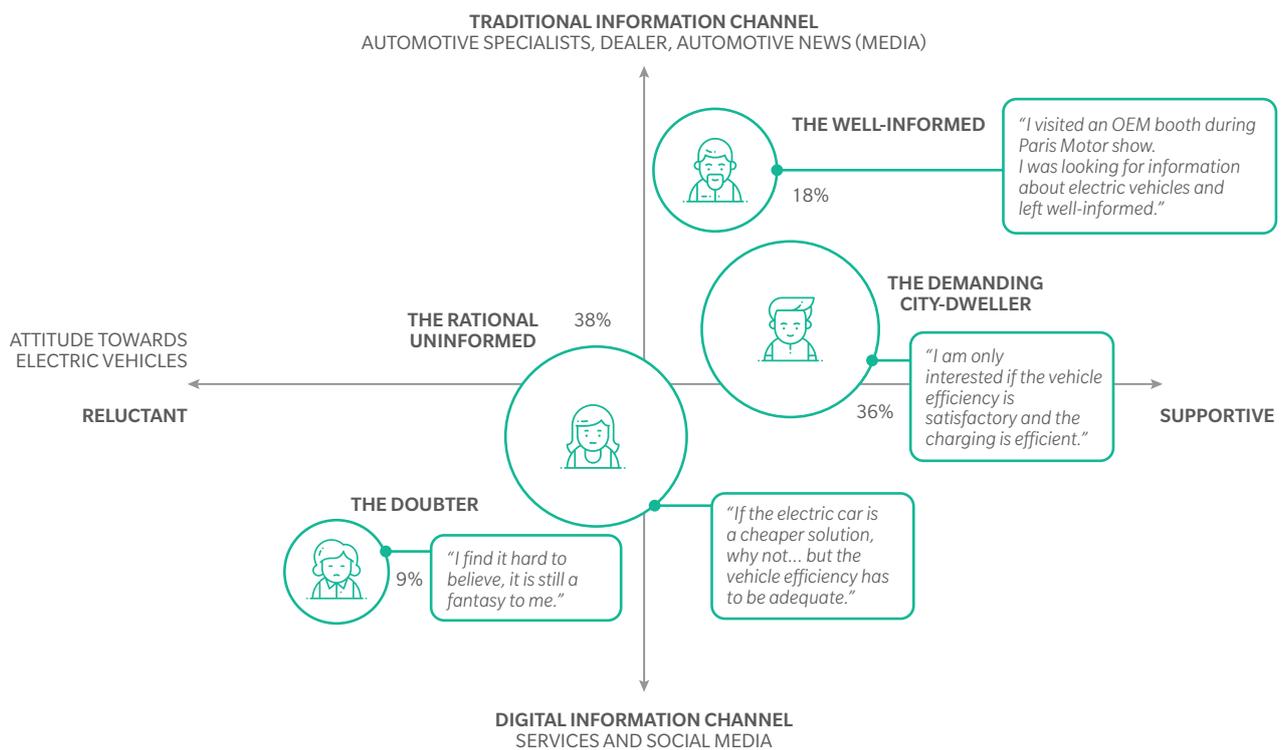
Electric vehicle players need to move fast. Consumers trust power suppliers and established car brands for electric vehicles, especially those manufacturers making an effort to commercialize the technology. Several big automakers have recently announced they are ramping up production. Some are also experimenting with new ways of marketing for electric vehicles, including targeting groups of potential customers. They are setting up dedicated sales channels and offering use of a car as a service rather than just a one-off sale. Public policy is making a push too, as numerous cities impose low- or zero-emission zones. Electric vehicles are becoming more than just the car of tomorrow – they are quickly turning into the car of today. •

IDENTIFYING THE FIRST CUSTOMERS

Some consumers are easier to persuade than others. Our survey identified four types of consumers: (See Exhibit 1.) In one category are the “doubters” who are unreceptive to arguments about economic performance and mistrust marketing pushes

EXHIBIT 1: THE RESPONSES TO THE QUESTIONNAIRE REVEALS FOUR PROFILES WITH DIFFERENT NEEDS AND EXPECTATIONS

The attitude towards buying electric vehicles and the level of knowledge are important influencing factors



Source: Oliver Wyman analysis



DOING MORE, BETTER, WITH LESS

Putting Western R&D organizations on a value-driven cost diet with frugal engineering

A severe cost crunch could turn the auto industry's transformative dreams into a nightmare. Even the industry's largest, most resourceful players face sticker shock when they look at the projected costs of remaining competitive into the future, as shown in the recent profit warnings and cost-saving plans from across the automotive sector.

SIMON SCHNURRER
SRINATH RENGARAJAN

Granted, some of this urgency is reflective of the business cycle downturn. But the greater threat comes from the need to finance the new products, services, and business models spawned by multiple converging disruptive forces. These range from electric, autonomous, and increasingly digital vehicles, to new models of personal transport. This convergence is driving the need for wide-ranging increases in spending on new technologies: for example, the R&D spending of ten major automakers has increased 17 percent over the past four years, exceeding revenue growth during the same period. Across the sector, including OEMs and suppliers, the increase in R&D expenditure is even higher, at 22 percent. And the future looks even more expensive.

With so much money needed to finance tomorrow’s cars and business models, the industry is currently seeking cost-cutting opportunities that go far beyond ordinary measures. Automakers are looking to reduce costs across the board, given the investments needed for future mobility solutions. Consequently, every major automaker is looking to partner or collaborate to reduce their development costs. However, that will not necessarily move the needle in the current environment. Instead, some companies are embracing frugal engineering as a particularly effective way to address this challenge.

UNDERSTANDING THE PRINCIPLES OF FRUGAL ENGINEERING

Frugal engineering seeks to develop products “better, with less,” while finding ways to reduce complexity in all aspects of new product development. It requires companies to take a disruptive approach to products, processes, and most of all, decision making. This includes making product and process innovations,

allowing late concept and design freezes, setting hard cost targets, and organizing autonomous engineering units with the freedom to break the rules.

Unlike the automotive industry’s standard ways of developing products that require high-quality functional organizations and lots of available resources, frugal engineering works readily with slack or sub-optimal functions and thrives under severe resource constraints. It uses a bottom-up approach to engineering instead of the traditional top-down method, and relies on an open, distributed innovation process in place of the industry’s typically closed, proprietary one. Furthermore, while standard innovation practices concentrate primarily on components, frugal engineering seeks architectural solutions – a critical step that considers how everything integrates at a vehicle platform level.

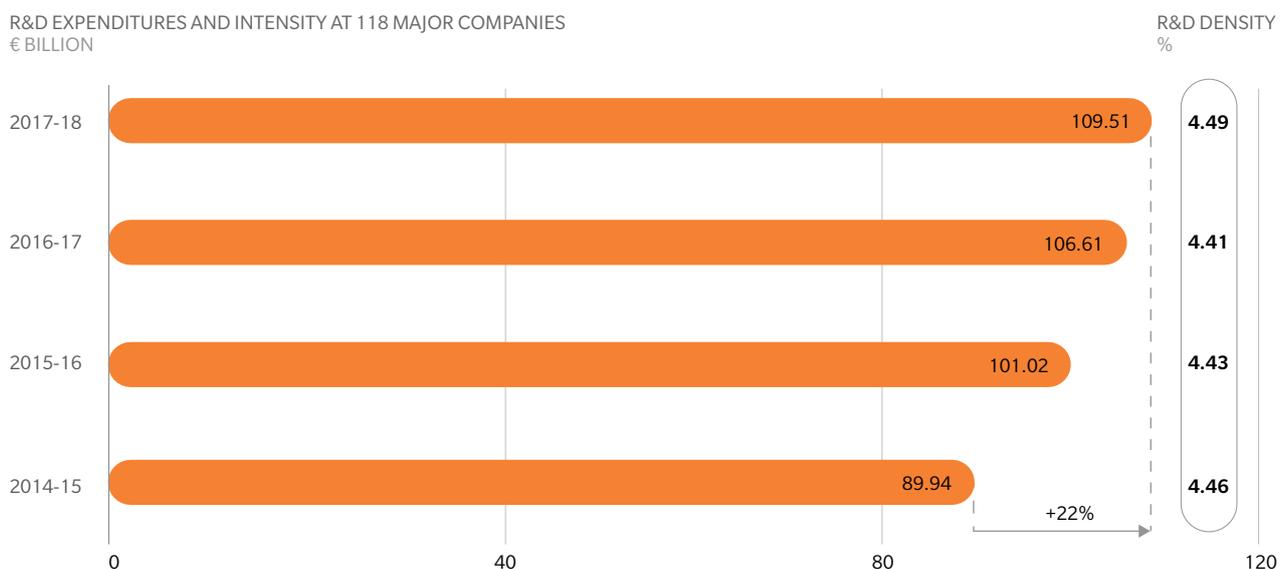
THE THREE PRINCIPLES BEHIND FRUGAL ENGINEERING

Rethinking Product Development. Frugal engineering emphasizes back-end innovation and a market focused, agile R&D model. It employs dynamic portfolio management tools, uses just-in-time design techniques, and works around supply chain constraints to deliver optimal products at the lowest possible cost. To achieve this, organizations must align their R&D strategies with their corporate business goals, break up traditional high-cost R&D programs, tear down silos, and reduce bureaucracies. In addition to integrating technical designs with business plans, they must make incentive systems more effective.

Furthermore, frugal engineering requires automakers to engage customers from the outset and throughout the product and

EXHIBIT 1: GROWING R&D EXPENDITURES

Western OEMs under pressure: Need to reduce R&D cost while building up new competences at the same time



¹Source: Company financials, EU Industrial R&D Investment Scoreboard, Press research

ownership lifecycles. This provides the ability to adapt rapidly to unforeseen changes in major areas while implementing cheaper solutions in less important ones. Companies use crowdsourcing, social media, and deep immersion techniques to identify latent needs. They also employ big data analytics to surface insights and, if possible, involve end users in the prototype stages.

Creating more inclusive networks. A second key principle of frugal engineering is “hyper-collaboration.” This encourages organizations to create global R&D networks while also working together intensely with suppliers with a knack for innovation and seeking inspiration from disruptive startups. Working with these partners can help to develop solutions that marshal digital data, refined analytics, and real-time, multiplatform interactions to put the customers at the center of a product and service ecosystem. Hyper-collaboration compels automakers to engage with their industry peers to set and achieve bold goals that they could not otherwise reach, and to share assets and resources with other companies to capture major cost savings. Organizations can gain a competitive edge by using diverse traditional and digital channels to gain insights into future trends, and to engage with a range of players including entrepreneurs, white-hat hackers, startups, inventors and tinkerers, and suppliers from other industries. To make this happen effectively, they must increase their internal agility, monetize intellectual capital, and create an innovation-brokering function.

Fostering a frugal culture. Companies introducing frugal engineering also need to plant the seeds for a frugal culture, which requires bold commitment and dynamic goal setting. This calls for an integrated and systematic approach that can establish bold, credible, and aspirational goals, secure strong top management commitment, and adopt a consistent yet personalized approach to customers and products.

It also requires a disruptive business model capable of supporting autonomous development teams. Concurrently, frugal teams must work closely with their business unit sponsors to keep them informed – and then deliver results. They must build on a strong business case, coupled with audacious goals, and employ a process that is focused on engaging consistently with others in the ecosystem and iterating designs and concepts all the way through to user acceptance. Companies should implement frugal engineering on a cross-functional basis across geographies and even seek to test products in complex, resource-constrained emerging markets before deploying them globally.

Furthermore, successful frugal engineering must also adopt the right cognitive models. The emphasis shifts from focusing excessively on complex products with top-shelf features and specifications to satisfying real future customer needs and demands for eco-awareness in developed markets. Then, frugal engineers need to accept that customers in emerging markets will have equally high aspirations and expectations. Adopting a frugal mindset and seeking legitimate innovations thus involves far more than simply finding low-cost solutions.

Taken together, companies need to make frugal engineering initiatives a top priority, use the new frugal customer orientation to motivate employees, and incentivize progress to goals.

APPLYING FRUGAL PRINCIPLES IN THE AUTOMOTIVE SECTOR

Introducing frugal engineering concepts in an established global automaker’s core R&D organization can be traumatic because it tips most established paradigms – flood the zone with resources, rely on legacy processes, set target prices – on their collective ear. Instead, companies should consider a new list of “Dos and Dont’s”. (See Exhibit 2.)

Set and meet audacious goals. There are three things that should matter to the frugal program manager: customer value, time to market, and cost. Frugal teams should have clear-cut objectives for each of these dimensions, with strong follow-through. If companies are not ready to give the program unprecedented autonomy to bend and break the rules to reach these goals, frugal is not the right approach for them.

Staff frugal programs for success. A frugal program requires the full-time deployment of highly experienced staff with good existing networks in the organization. It also needs full autonomy to make decisions on the spot. A group of young, inexperienced engineers tasked to “do something frugal” will never gain the acceptance of the rest of the organization.

Innovate with and for the customer. The best way to learn frugal engineering involves pursuing a disruptive growth program focused on understanding and targeting future and new customer needs. Involve customers as much and as early as possible in the development process and let them decide if the project is on the right path.

For instance, a European company wanted to introduce a vehicle that could compete with the long-time market leader in India. Several other automakers had tried and failed to dislodge this player due to high prices. The company used frugal engineering to design a car with features Indian customers valued highly, such as roomy interiors to haul large families, strong air-conditioning, and advanced navigation and entertainment systems. To keep costs down, the company sourced nearly all parts for the car in India. The vehicle debuted to strong initial sales and received enthusiastic early reviews for targeting Indian consumers at a competitive price point, hitherto deemed unrealistic in the OEM organization.

Hyper-collaborate with new partner networks. A successful German startup that is developing battery-electric delivery vans began an intense open-collaboration approach with more than 80 partners across a whole spectrum of competences and positioning – from price leaders to premium partners. The partners had the freedom to design the product and process at the same time, while following the targets and timeline set upfront by the startup company.

Apply frugal concepts beyond special programs. Frugal engineering is ideal for developing successful growth platforms for emerging markets worldwide, but its benefits and applicability go beyond that. Automakers should identify technical areas where a frugal engineering approach can yield substantial product cost benefits, such as challenging their existing overpriced modular kits in nondifferentiating areas. Ideas might include a frugally-engineered trunk cargo net, rearview mirrors, glove boxes, and much more.

“Frugalize” noncore engineering processes. Not everything in established “Western” automotive product development needs to follow the same product development process. While deadlines and quality gates are generally here to stay, our research suggests that anywhere from 30 percent to 40 percent of a given program’s workload could benefit from a frugal engineering approach, yielding substantial cost and time-to-market benefits.

Foster competition. One automaker needed a car that would deliver high value for the money. To engender a competitive spirit among its global product development organization, it tasked three R&D teams – two in developed countries, one in an emerging market – to solve the same technology problem. The emerging market team came back with a solution that cost only 20 percent as much as the others. One reason for the emerging market team’s success was that it tapped into partners with reputations for excelling by innovating more with less.

Avoid half-hearted efforts. Perhaps equally important are the things companies should not do when employing

frugal engineering principles in their product development organizations. For instance, do not attempt to implement bits and pieces of frugal engineering across the existing organization using “light touch” approaches such as putting posters in the company cafeteria. Do not compromise key performance indicator (KPI) targets to follow through with standard processes, or use existing carry-over parts from other programs or modular kits to save costs and time. Frugal engineering is not about matching customer affordability via target pricing or “down-specing” existing products. Instead, it seeks to deliver the expected customer experience from scratch in a disruptive way.

Other warnings include not attempting to apply standard validation and quality control processes, and to avoid working in existing central R&D centers – frugal teams need to learn across geographic boundaries. Of course, to do these things means not following existing reporting lines and assuming a more entrepreneurial stance. As much as possible, act like a startup.

MAKING FRUGAL ENGINEERING A PRIORITY

The age of gold-plated car design is fading as more automakers recognize the need to conserve the resources and cash needed to meet the many disruptions heading their way. But traditional cost-cutting alone will not do the job, given the highly emotional nature of the car-buying experience. People worldwide seek the best value for the money, not the cheapest possible ride. That reality makes frugal engineering the only real antidote to the overpriced, overengineered vehicles that automakers can no longer afford to make. •

EXHIBIT 2: BEST PRACTICES

Eight proven practices to succeed in frugal engineering



GOALS

Strongly pursue clearly defined objectives.



STAFFING

Experienced staff empowered with full autonomy are crucial.



CUSTOMER-FOCUS

Closely engage with prospective customer base to innovate.



HYPER-COLLABORATION

Work together with a wide range of partners across dimensions.



WIDER APPLICATION

Not only major programs, but even smaller components benefit from frugalization.



PROCESS PERSPECTIVE

Noncore processes also have significant potential for optimization.



FOSTER COMPETITION

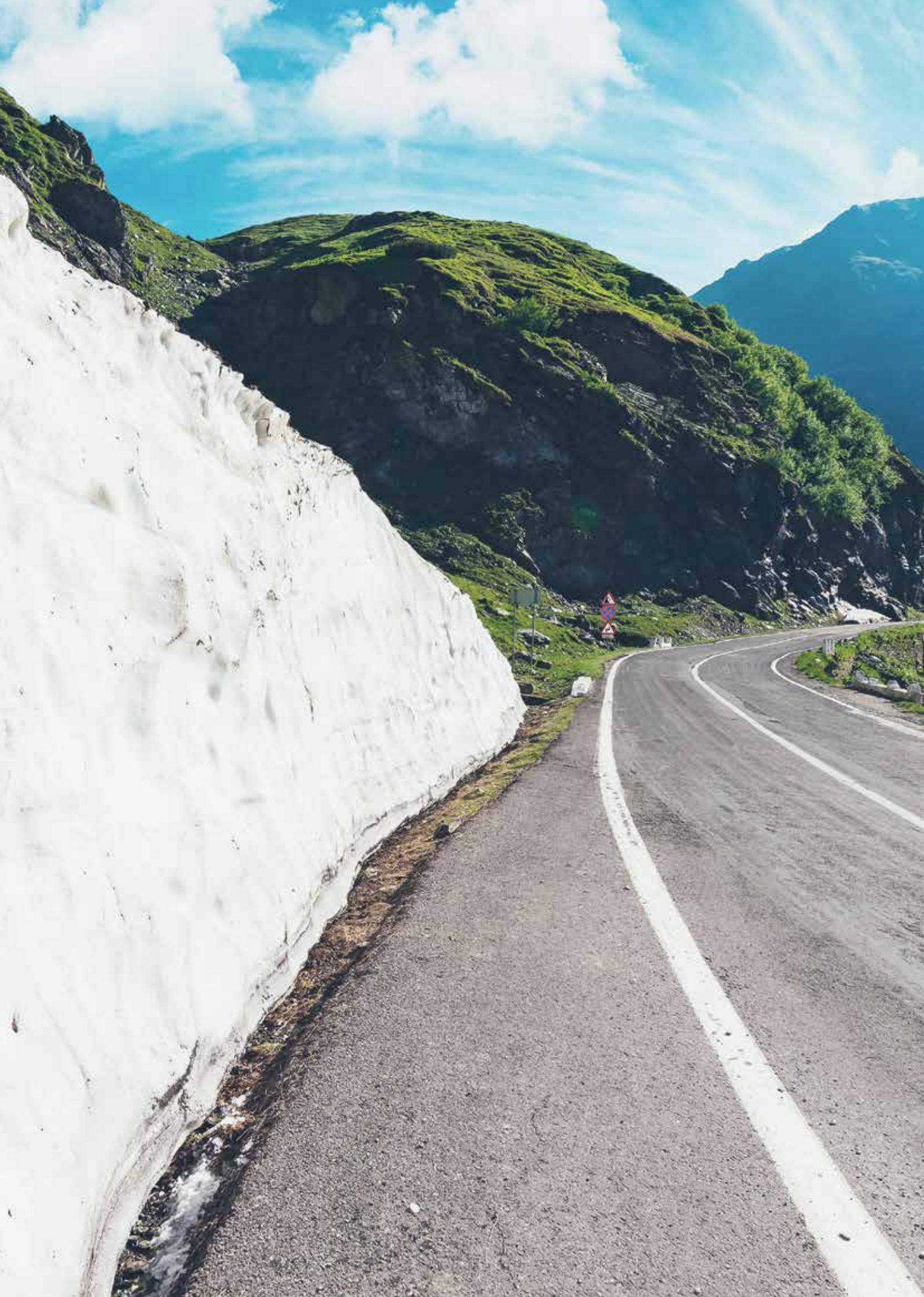
Foster healthy competition between teams across geographies.



ALL-IN-APPROACH

Full implementation instead of cherry-picking implementation initiatives.

Source: Oliver Wyman analysis



DESIGNING A PATH TOWARD BETTER VEHICLE LAUNCHES

Next-generation DFMA can tighten integration between automakers and their multiple suppliers

Car design teams today face product launch overload. From resolving classic quality problems to integrating advanced new technologies, launching a new car has never been tougher or more complex.

RICHARD HELL
DANIEL PARTSCH
HANNES ENGELSTAEDTER





What is more, even as these difficulties increase, new vehicle programs must become faster and more efficient to remain competitive, and accommodate more ecosystem partners. Regarding the latter, automakers are increasingly working together on vehicle projects, complicating an already convoluted process that involves Tier 1 suppliers, digital giants, and other players. Major European, American, and Japanese automakers are currently hammering out agreements to share the development and production of everything from new autonomous vehicle technologies to complete cars. Product launch performance represents ground zero for this trend, and success mandates tighter upstream integration among automakers and their key suppliers.

One proven way to draw these bonds closer centers on a new configuration of design for manufacturability and assembly (DFMA). A tool employed by the automotive industry for more than 40 years to develop more “buildable” products, “next-generation DFMA” can help build stronger relationships among automakers and other ecosystem players. The primary differences between traditional and next-generation DFMA involve the former’s focus on experience while the latter relies more on advanced analytics. (See Exhibit 1.)

In action, next-generation DFMA analyzes manufacturing processes across six dimensions: scrap and waste, parts, tooling, time, labor, and equipment. It ranks each from low to high performance, then analyzes areas with performance issues and identifies root causes. Next, teams perform a DFMA-driven

redesign to resolve issues and improve productivity. In one case concerning the installation of a safety-related component, a company discovered major problem areas included excessive labor intensity driven by high numbers of parts and difficult ergonomics, and extended processing times. The next-generation DFMA team successfully analyzed and identified the root causes of performance gaps and developed a new design along with a more efficient installation process. Consequently, the company significantly reduced the product’s production costs and captured a sizeable improvement in productivity.

MAKING ROOM FOR MORE COOKS

The trend toward involving more than one automaker in the platform development process will require much greater flexibility and agility. Ecosystem players need to adapt their product platforms and manufacturing processes to handle more variants and manufacturing process derivatives. Furthermore, while products and their variations remain strong competitive differentiators, companies also need to master agile manufacturing to drive crucial cost advantages and synergy-derived savings.

With two automakers sharing a production environment, launch performance takes on much greater importance. The intensive collaboration among multiple automakers and their supply bases must begin much earlier in the product development phase and support significantly more flexible processes and assembly lines.



STRUCTURAL CHANGES AND NEW METHODS NEEDED

To launch tomorrow’s complex, innovative vehicle programs successfully, automakers and their critical suppliers need to make next-generation DFMA a touchstone, employing it consistently, from the first minute of a new program to the last. However, capturing the greatest value possible from the next-generation DFMA paradigm will demand structural changes to the contracts between players, the ways they organize, and the methods they employ.

For example, automakers must expand the methodology they use to launch new vehicles, moving beyond the current focus on traditional “perfection”. The traditional continuous improvement (CI) activities have their boundaries; therefore, automakers would need to use more data-driven, advanced analytics solutions and processes. They need to take many more parameters into account, such as the overall connectivity of more complex systems, designing the product differently to enable better integration into an existing assembly line and tooling strategy.

Uniquely, next-generation DFMA relies on information taken directly from the manufacturing process; nothing else, including the experience-based DFMA approach of the past, delivers the same level of performance.

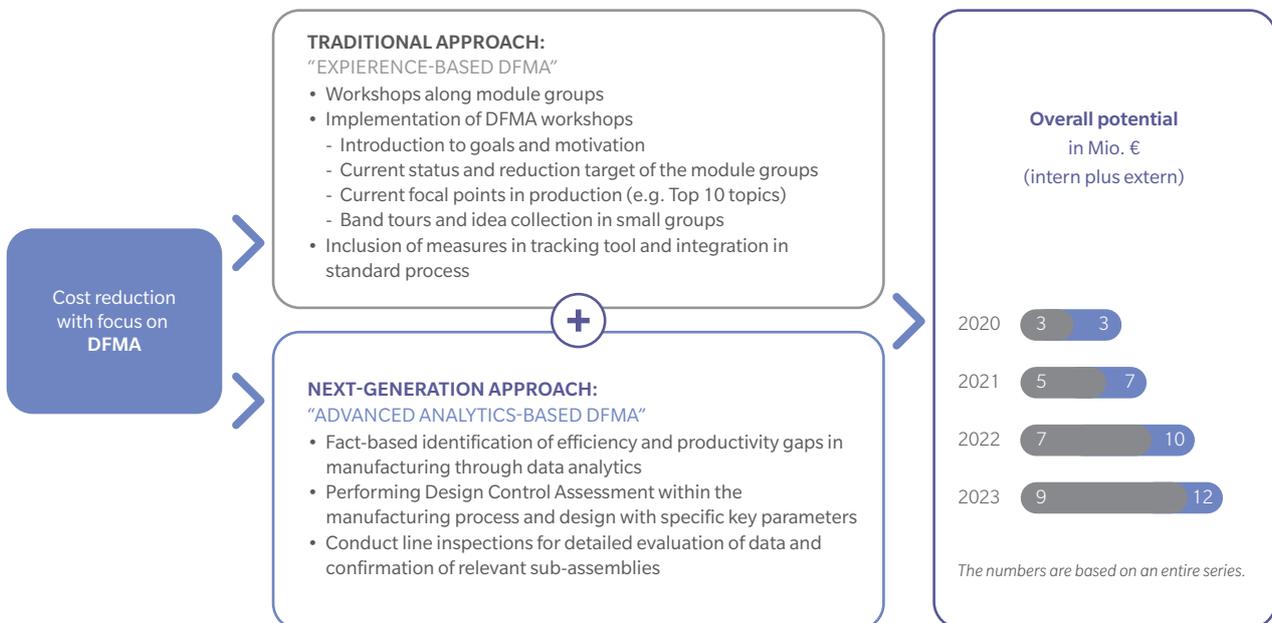
ADDING DIGITIZATION AND ADVANCED ANALYTICS TO THE MIX

Several sophisticated tools and techniques can help companies augment their launch performance and optimization potential, and predict high-risk launch elements. These tools include digital platforms that feature advanced analytics, artificial intelligence, and machine learning, which will become key differentiators for a successful launch and help to establish strong co-ownership among the involved automakers and key suppliers.

Going forward, digital manufacturing platforms will capture most of the information necessary to analyze and predict process and product performance with different operational parameters, thus providing the basis for a next-generation DFMA approach. Consequently, users will be able to simulate manufacturing performance with different designs and process parameters, enabling them to arrive at an optimum configuration using data-driven iterative procedures. •

EXHIBIT 1: TRADITIONAL VS. NEXT-GENERATION DFMA

How advanced analytics will change the automotive industry

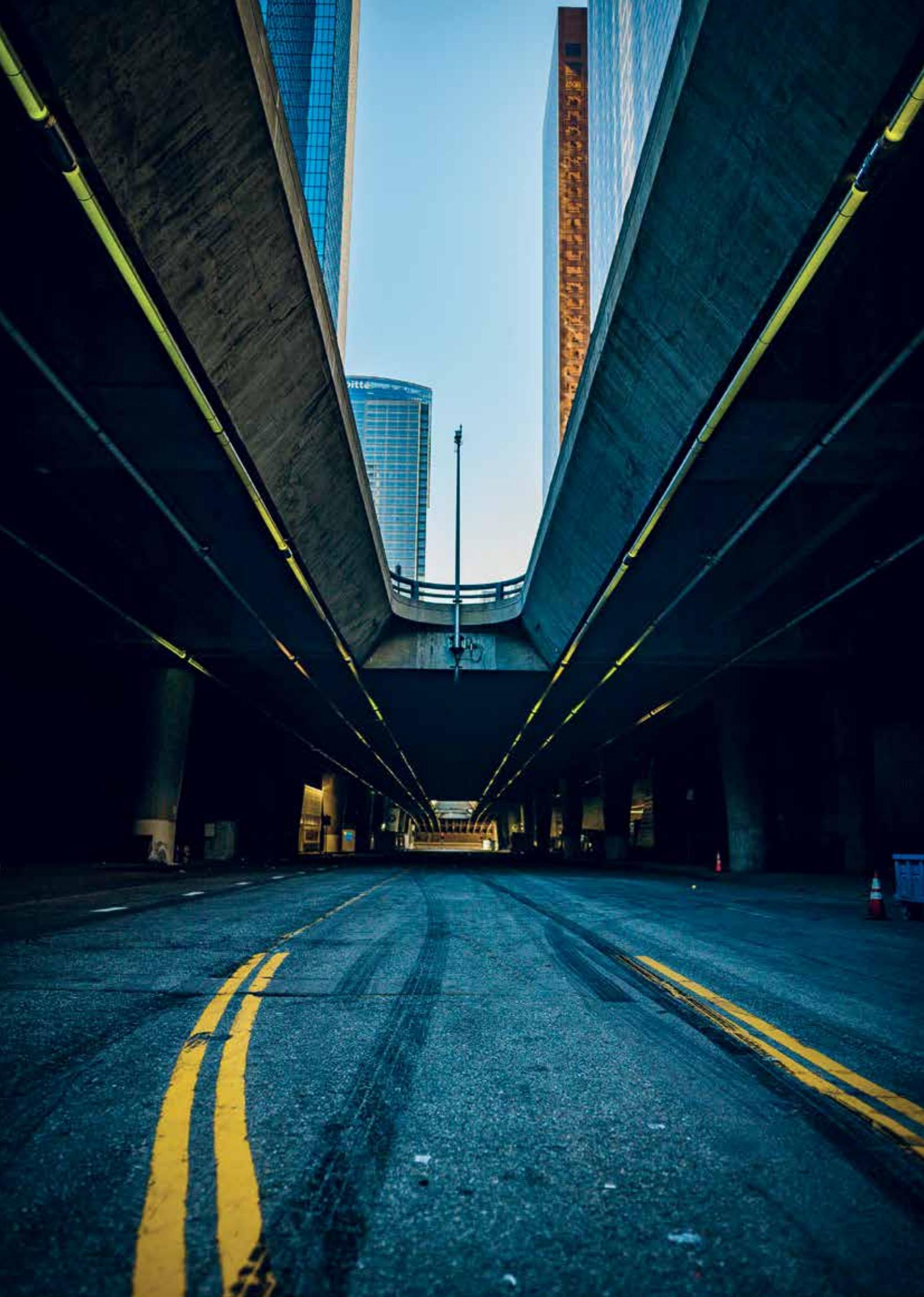


Source: Oliver Wyman analysis

COPING WITH EV ADOPTION UNCERTAINTY

Automakers will need agile production and design to accommodate a changing market

Most automakers readily acknowledge that the next 10 years are likely to encompass more change than their industry has seen in the past 50. The sweeping acceleration of automotive and mobility trends that include electrification, autonomous driving, connectivity, and ride-hailing are at the forefront of the industry's imminent transformation, but there is no telling where artificial intelligence and other new digital technologies will take us next, once all cars can be changed overnight with a download of software.



The immediate question that trips up car manufacturers is how long the transition to a future of fully connected electric and driverless cars will take. Indeed, it is in this no man's land of risk and reward where car companies sometimes struggle to find the appropriate balance between commitment to the future and satisfying the demands of today's customers. Here, success will go to players who understand the need to incorporate agile manufacturing and design as they create a new market in electric vehicles (EVs) while remaining competitive in their core.

While no one knows for sure when consumers will warm to electric cars, there is no doubt enthusiasm for the new propulsion system is growing. Globally, there were more than five million of them on the road at the beginning of this year, up almost 67 percent from the year before when the EV count crossed the three-million mark.

GROWTH SPURT

Just look at the expansion of models available in plug-in EVs. Where there were only two models available in 1997, there were 98 entering 2019. In 2018, global plug-in deliveries were close to 2.1 million, a majority of which were battery electric vehicles – an increase of 64 percent over the preceding year. (See Exhibit 1.)

More than half of those sales were made in China, where a solid commitment has been made to investment in EV startups and encouraging EV ownership through extensive subsidies. Substantial sums are also being invested in Chinese lithium-ion battery production and research efforts to improve battery

technology. China is currently the biggest producer globally of the batteries used in electric vehicles.

China is expected to become a key player as the new electric vehicle market evolves. It is also the largest producer of EVs in the world, with a reported capacity of some 20 million vehicles. While its plethora of automakers have been focusing on the domestic market to date, the biggest players are talking about going global in the next couple of years.

THE UNITED STATES: A COMPLEX MARKET

Probably the most ambiguous market is North America. Despite its love affair with the SUV and pickup truck, the United States has been one of the fastest-growing markets for EVs. US sales grew by 79 percent last year. Yet, government policy has not been supportive of EV market growth, and cheap gasoline prices may hinder market development.

The automotive sales market is likely to get increasingly regional, facing different regulatory crosswinds that will make it difficult for manufacturers to deliver the right mix of vehicles in the right places at the right time. In this environment, car companies will need to be on top of market trends and proactively analyze consumer preferences like they never have before. To stay ahead of the competition and market trends, product development teams also must move faster and be more agile. And manufacturers will have to aggressively work to keep their workforce skill sets up to date with the changing mix of models.



Still, sales do not equate to market penetration, which remains in the low single digits worldwide. As quickly as the market may feel like it is shifting, it is arguably some years away from a real tipping point toward electric. In fact, it is likely that the industry will continue producing internal combustion cars in relatively large quantities through 2030.

NO CHOICE BUT TO MOVE

The problem for car companies: They cannot afford to wait for a clear signal from the market to make an investment in electric vehicles. Anticipating an acceleration in sales in the near future, car manufacturers are investing more than \$300 billion over the next five to 10 years in EV technology, while still maintaining their current gasoline-powered portfolio.

In this balancing act, aligning production with anticipated demand represents one of the biggest challenges for the industry. While a few automakers have designated EV plants, most electric cars are currently built alongside internal combustion vehicles. This means car makers need to be able to switch assembly lines efficiently from production of traditional light trucks to electric vehicles and back again, the way they used to alternate between producing SUVs and smaller sedans, depending on sales.

Complicating the situation further is the fact that the value proposition for car companies is lower with EVs than with traditional vehicles, given that the most expensive component is

a battery – which most car companies do not produce – rather than a powertrain.

THE IMPACT OF CHEAP GAS

Customers also are not ready to switch to EVs when gasoline is so relatively cheap. Since the 2016 plunge in oil prices pushed down the cost of driving bigger vehicles, car buyers – particularly in the United States – have been clamoring for SUVs and other light trucks. In 2018, a record 69 percent of the US market was light truck sales.

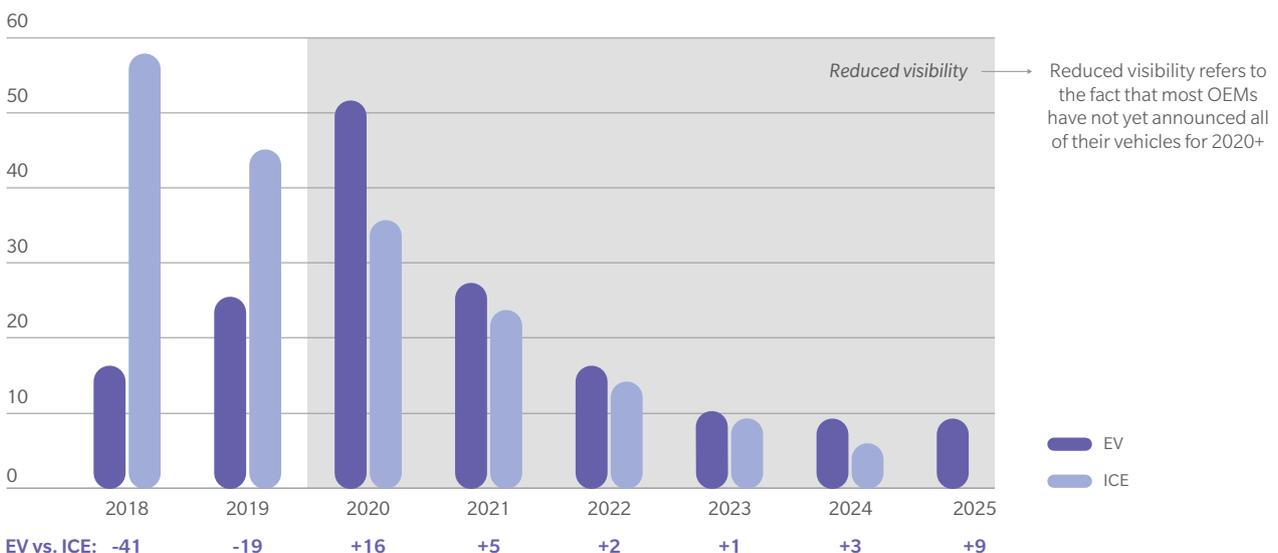
What would happen if oil spikes again to above \$100 a barrel like it did in 2008 and again in 2011? External factors like rising oil prices or government regulation could push car buyers to turn in their SUVs for EVs rather than a smaller gasoline-powered sedan as they used to – a possibility for which the industry needs to prepare. In fact, the sales patterns for EVs show the first big bump up in demand happened in 2010, in the midst of very high oil and gasoline prices.

To simplify an otherwise muddled future, some automakers have abandoned small vehicle production or stopped making pure internal combustion vehicles. But ultimately, automakers will simply have to learn to live with a much more complicated portfolio and a much more challenging value proposition that include EVs, while they navigate a much less predictable marketplace – at least for the next five to 10 years. After that, things get really exciting as autonomous vehicles begin to enter the mix in earnest. •

EXHIBIT 1: ELECTRIC VEHICLES' LAUNCH ROADMAP – TOP OEMs

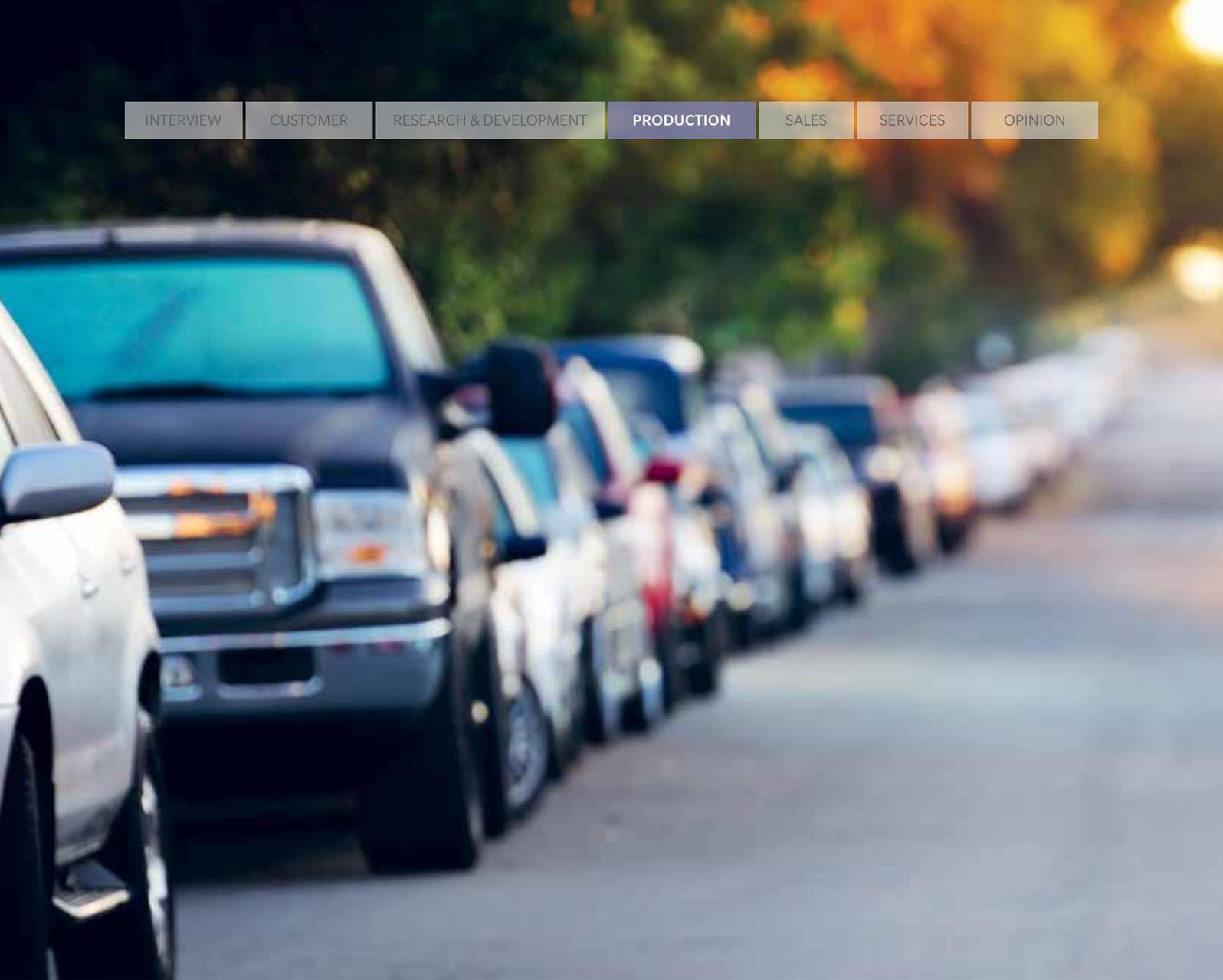
EV model launches are expected to exceed ICE model launches in the near-term driving OEM R&D spend

ANNOUNCED MODEL LAUNCHES OF 10 TOP OEMs – ILLUSTRATIVE EXAMPLE



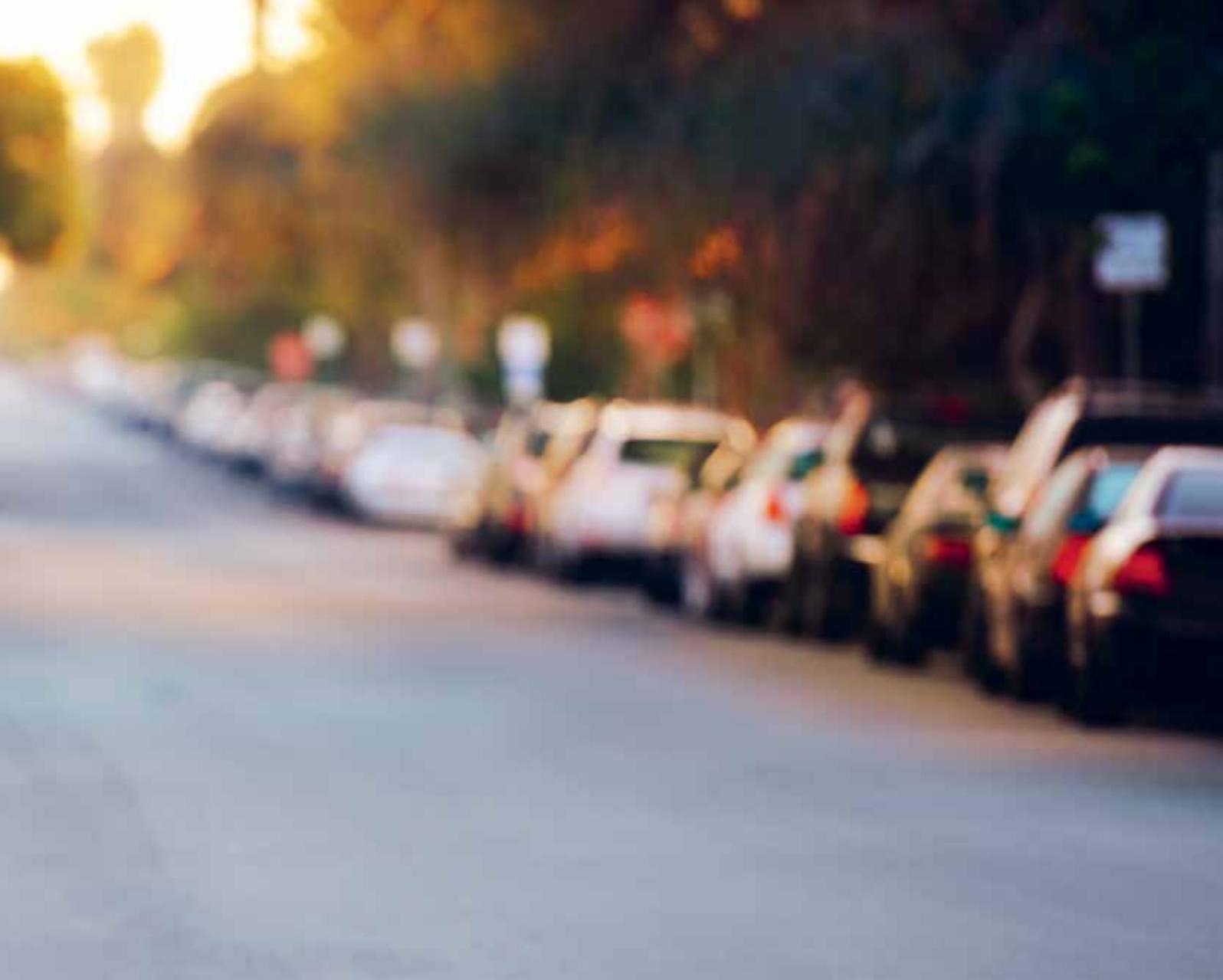
1 Defined as vehicles powered partially or entirely by a battery incl. hybrids, plug-in hybrids, and fully-electric vehicles

Source: LMC Automotive, PLDB, Oliver Wyman analysis



CAR DESIGN GOES ELECTRIC

Incumbents need a new development archetype to compete with EV natives



Electric vehicles (EVs) could transform the entire automotive industry. The need to cost-effectively design, develop, source, and produce EVs in greater volumes is changing the dynamics in the industry's core value chain. New companies are making significant investments to enter once-exclusive incumbent automotive markets. And investor interest in the potential to transform mobility has sparked a flurry of startups in Europe and the US, with an even greater outbreak in China.

ALAN WILKINSON
ANDREW CHIEN

These changes could lead to a head-on collision between traditional automotive companies – which have long prized caution and remain risk-averse to unproven technologies – and new players willing to take risks and move faster to exploit new value pools.

TRANSFORMING THREE CRITICAL AREAS

To handle the EV surge, incumbents must redesign how they develop new products; recalibrate their cultures; and reskill their workforces.

Product strategies and partnerships

During the transition from internal combustion engines (ICE) to EVs automakers must decide how best to integrate advances in electric propulsion. Until the technology matures, costs come down, and volumes reach the scale needed to make EVs profitable, the transition from ICE to EV could follow multiple paths. Oliver Wyman forecasts battery powered vehicles to reach a quarter of the new vehicle global market by 2030 with over 60 percent of vehicles having some form of electrification by then, but there will be significant differences by region.

Players are already making major investments in critical new technologies, especially electric propulsion and autonomous vehicles. Sharing these costs makes sense, but choosing the right partner could be challenging: Companies require partners that share a similar culture and vision or else disagreements will impede progress and lead to higher development costs. Nonetheless, a well-executed strategic partnership can reduce risk and enable success by allowing new ventures with access to alternative funding sources to push the innovation envelope.

Technology-wise, industry players must choose among mild hybrid (such as 48-volt systems), full hybrid (HEV), plug-in hybrid (PHEV), or battery EV (BEV) propulsion systems, and whether to use unique EV platforms or shared ICE and BEV approaches. They must also decide which components to outsource and which to produce in-house – choices that will affect their manufacturing strategies. For example, while building an HEV or PHEV on an existing ICE platform requires few trade-offs, the jump to a full BEV on the same platform can be more difficult. One premium European player is building full-electric versions of existing vehicles by modifying the original ICE platforms, potentially enabling greater manufacturing flexibility but at the potential cost of building a sub-optimal product. Other automakers are hybridizing ICEs and building dedicated BEV platforms. This strategy could move too far ahead of the market, however, which may remain small until the technology matures and costs come down, leaving BEVs unprofitable for some time to come.

Because BEVs have fewer parts that are exposed to wear and tear, they could prove more durable than ICE vehicles, and experience suggests well-designed battery systems could potentially last hundreds of thousands of miles. Also, over-the-air (OTA) software updates could extend vehicle lifetimes beyond what they are today. Consequently, if automakers also design other vehicle systems more durably, BEV residual values could stay higher longer. Elevated residual values and lower operating costs could help to justify higher BEV purchase prices compared to ICE vehicles.

Operationally, companies need to decide how to convert their factories from ICE to electric propulsion. The chosen design strategy will affect the ease with which companies can flexibly swing output to meet changes in demand between ICE and electric propulsion.

Global and regional considerations will also play roles. China is the largest EV market in the world. But will it also be the first to achieve the necessary scale and cost profile to become profitable? If so, should China become the lead region for EV production?

Other questions have longer-term implications. Can carmakers design new technologies for future reuse and interchangeability, given how quickly newer technologies are evolving? How will these decisions affect the cost of ownership, residual values, and other considerations?

Culture change

Traditional OEMs work on the “mature” side of the technology curve, where changes evolve incrementally and slowly. When pursuing the new technologies where change happens faster, they must take greater risks, or fall behind. This requires mindset and culture changes that well-established organizations find challenging. Company leadership must become more willing to accept failure and the knowledge it brings rather than viewing it as another lost opportunity.

Work processes must evolve to improve speed to market and the development of more innovative products. Traditional automotive manufacturers need to adopt agile and lean development principles to get faster feedback from downstream customers, batch information in smaller sizes, improve information flows, and reduce non-value-added work. The goals are frequent, high-quality team interactions and information exchanges, faster design-build-test learning cycles, and empowered teams focused on eliminating non-value activities.

As an example, new EV startups may forgo traditional engineering strategies that focus on scale, common solutions,

and ways of working to achieve faster time-to-market performance and learnings they can quickly incorporate into next-generation products.

Automakers must also learn to work with new, tech-focused suppliers, which likewise have to understand automotive requirements and engineering specifications better. While many companies have carved out new technology business units separate from their “mature” development units, they still need to integrate the output into saleable end products.

Workforce reskilling

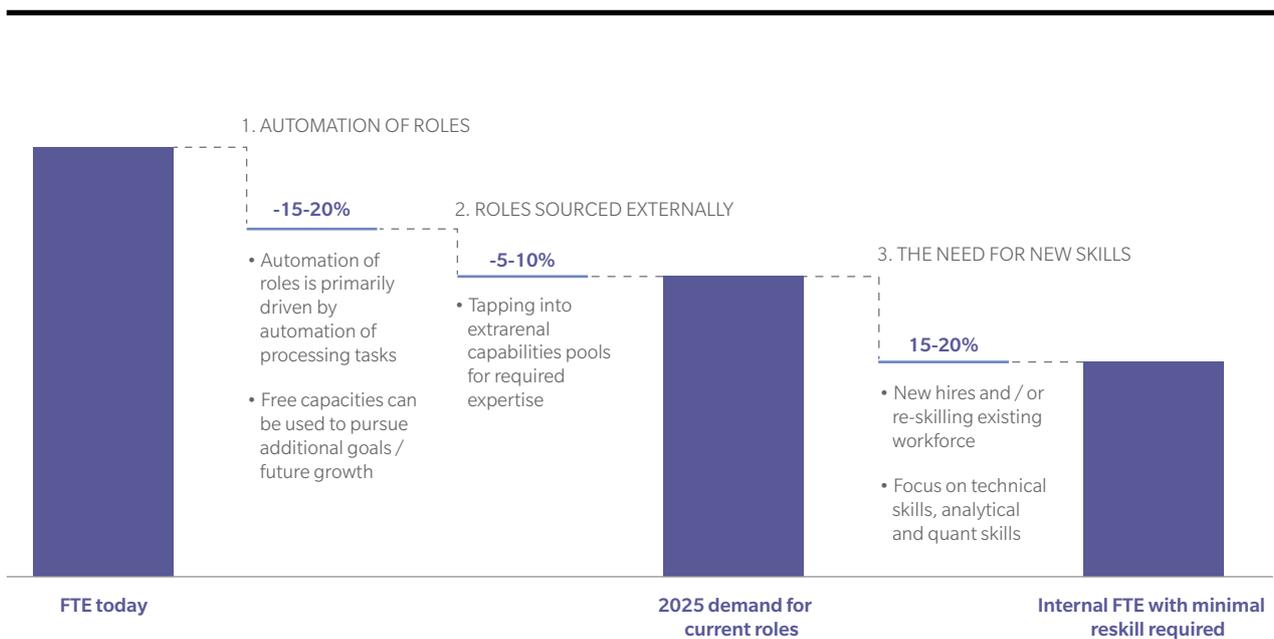
Most incumbents need to reshuffle their product development talent and hire more skilled electrical, electronic, and software engineers, as well as computer scientists, who can enhance traditional code to achieve more sophisticated outcomes. Such

talent remains in short supply, making it challenging to attract and retain good people. (See Exhibit 1.) Beyond attractive pay, it means setting the right corporate vision that customers and employees can stand behind, actively promoting the company’s green brand, building a globally recognized EV ecosystem, partnering with the best and brightest peers, challengers, and startups, and providing the quality of life elements this talent seeks.

Converging forces are compelling automakers to reassess their product development strategies. With EVs, autonomous vehicles, and other innovations in the pipeline, the future belongs to those who can capitalize on the changes coming. That means creating new development strategies constructed around changing technology and market dynamics, choosing compatible and effective partners, making the right technology bets, and building the best mobility business models. •

EXHIBIT 1: THE AUTOMOTIVE WORKFORCE WILL SHIFT DRAMATICALLY – IN SIZE, SHAPE AND REQUIRED SKILLS

Demand evolution of the automotive workforce in the next 5-10 years

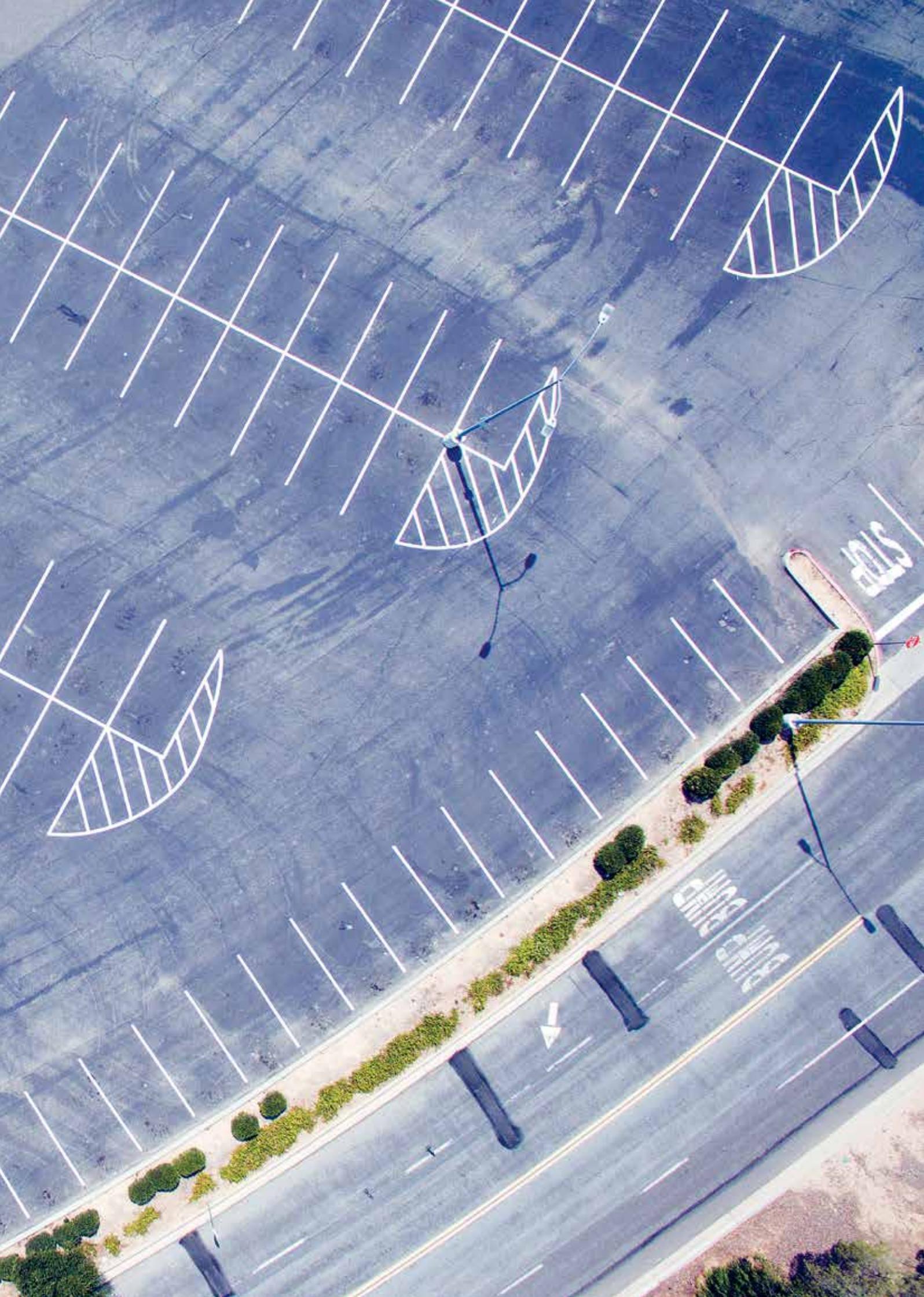


Source: Oliver Wyman analysis

A CAR WITHOUT THE COMMITMENT

Automakers need to advance their business model

The world of mobility is moving – and changing – swiftly, and over the past 18 months, car subscriptions have suddenly become an option to owning or leasing. Automobile subscription services let a driver choose a car from a portfolio of models so that they can use it as if it were their own. As with leasing, the customer pays a monthly fee that covers insurance, tax, repair, and maintenance. But subscription services provide the option of replacing the car every so often: Another battle for the customer interface.



THE BEST OF ALL WORLDS

The main advantage of the subscription model is that it reduces the cost of commitment while increasing flexibility. Sharing and rental do not lock in the driver for a long period – either to a particular car or through a large outlay of cash; the hassle and downside, however, is that a car may not always be available. Ownership, on the other hand, provides the convenience of a car always ready for use, but it comes with long-term commitments – either through a big onetime payment or by financing, which means carrying debt for several years. Leasing provides the customer with a car for a fixed period of time after which they can either purchase the vehicle for its residual value or return it to the leasing company; but, again, leasing arrangements lock consumers into lengthy stretches of continuous payments.

Car subscriptions are in harmony with the broader trend of consumers subscribing to a service rather than purchasing a product, similar to streaming movies rather than buying DVDs. Such plans often feature flat-rate agreements that offer flexibility and appeal to all age groups. A recent Oliver Wyman survey showed that 26 percent of Germans are interested in the idea of car subscriptions – though Americans are less keen, at just 14 percent. (See Exhibit 1.)

If automakers do not set up subscription offerings themselves, the services could become a potential threat. When startups buy up fleets of cars and lend them out to subscribers, they – not the car producers – are the main point of contact for customers. In a worst-case scenario, automakers could end up as mere suppliers to independent subscription services – a danger they face from the rise of other mobility services, too.

Manufacturers need to set up their own subscription services and learn from customer feedback how to turn them into viable businesses. Making such a business work will require building or deepening additional capabilities, such as customer-specific offerings that go beyond a particular car model, pricing oriented to customer value, and fleet management. Subscription services should focus on three main points: attractive plans, competitive prices, and effective operations.

THE LUXURY PLAN AND THE ECONOMY PLAN

Though the market is still in its infancy and the basic structure of subscription services is constant, our study shows a significant split in the market. Some people are willing to pay for a selection of top-grade cars; others are primarily interested

in the subscription model's lack of hassle. More than half our survey respondents – 55 percent in Germany and 54 percent in the United States – preferred a relatively low-cost package: less than €500 a month in Germany and under \$500 in the US. In Germany, 23 percent were prepared to pay more than €1,250 a month, while in the US, 26 percent would pay more than \$2,000.

One clear advantage of the subscription model is that customers can – depending on the frequency allowed by their package – switch cars according to the season: for example, a cabriolet for the summer and an SUV for ski trips and bad weather in the winter. Around one-fifth of German respondents give their preferred frequency for model switching as either weekly, monthly, or quarterly.

That said, the most popular switching frequency is yearly, both in Germany (29 percent) and the US (34 percent). Moreover, the option for shifting more frequently is not seen as an important feature by respondents in either country: In Germany, 16 percent say it is the most important aspect of the subscription model, and in the US, 15 percent. More important to consumers is the availability of desired models, which was the number one concern for 35 percent of German respondents and 50 percent of those in the US.

COMPETITIVE PRICES

Many potential customers will get out their calculators and decide that, given their needs, a subscription will turn out to be considerably more expensive than traditional car ownership. Automakers, in our view, should use the leasing rate as their benchmark: If they can match that, then their offer might become an attractive alternative for, say, a household's second car.

Automakers' subscription services should also offer a variety of plans to cater to the needs of individual customers. Some consumers are simply interested in hassle-free mobility and will not want to pay more than they have to. Others are car enthusiasts who will want to try out different top-end cars, even if this costs much more. City dwellers, in particular, might be interested in intermodal offerings that combine a car and an electric bike.

EFFECTIVE OPERATIONS

Fleet management is essential for holding prices down. Subscription services offer their customers relatively new cars – usually less than one year old. But a vehicle's first year is

the period when its value sees the greatest depreciation, so the fleet should include younger used cars instead of new cars. Classic leasing price points will be the benchmark to compete with, and a holding period slightly longer than that for leasing generates additional subscription fees. Identifying the best time to sell the car requires strong skills in residual value management. Once vehicles get too old, they can be put into established remarketing channels, or other mobility offerings. Another solution will be to allocate the used cars to a car-sharing operation.

Fleet cars should be kept in use as much as possible and managed to minimize the depreciation in their residual value. Flexible pricing for peak and off-peak periods is one way to help vehicles surpass the breakeven utilization. One option would be to allow users additional switches (beyond the regular vehicle exchange schedule) at a lower price so that pooled cars are used more. Another would be to shift vehicles between different mobility services, for example by reallocating in-demand assets from rental to subscription. To maintain a car's value, the service operator needs to monitor its condition as it passes between different users, and to refurbish it when necessary. Overall, subscription services should aim for a system of integrated asset management, where each vehicle is used in different mobility

modes, from subscription to rental to car share. An efficient operation will lower the costs of holding a car – and, therefore, lower the costs that have to be passed on to customers.

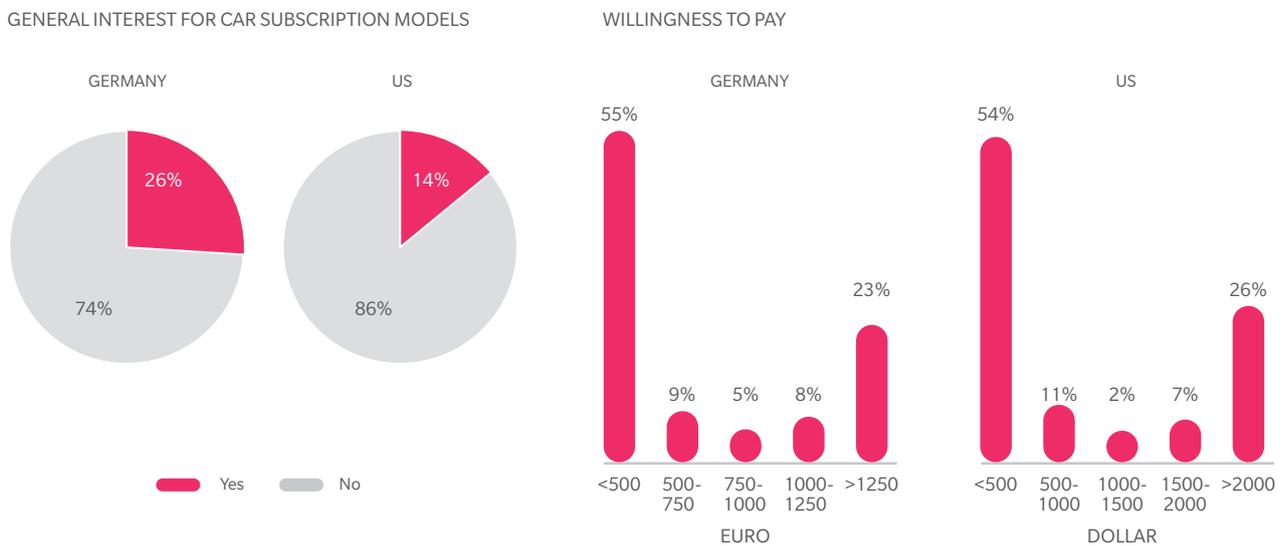
START LEARNING

Subscriptions may never be right for certain types of driver. One reason why the shift away from ownership has not been able to take hold among consumers is that people often have an emotional bond to their car, which is cemented by ownership. While many young people are no longer very interested in cars, that could change once they have families of their own and leave the city for the suburbs. So automakers should focus their subscription services on segments of consumers whose lifestyles are most likely to fit subscription services.

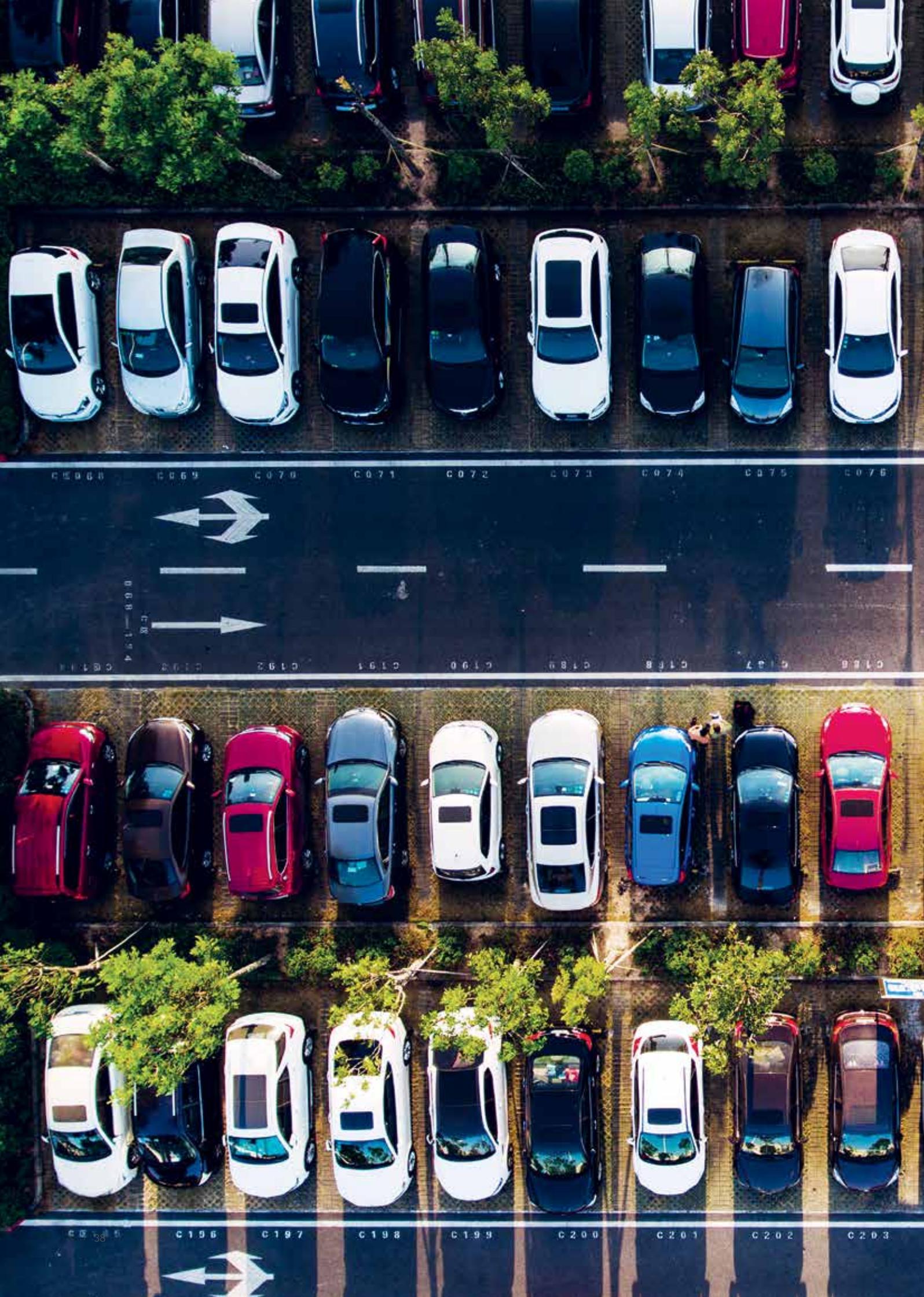
If subscription-service offerings are not done right, they could easily fail. Therefore, turning them into a successful business will be a learning process. As a first step, automobile manufacturers should set up their own subscription services and begin working out the kinks in them. If they do not, then someone else will instead – and it will be the other service that talks to the customers. •

EXHIBIT 1: GENERAL INTEREST FOR CAR SUBSCRIPTION MODELS

The offer of more flexibility for customers and how it gets accepted



Source: Oliver Wyman analysis



C5968 C069 C070 C071 C072 C073 C074 C075 C076



C194 C193 C192 C191 C190 C189 C188 C187



C188 C187 C188 C189 C190 C191 C192 C193 C194

C196 C197 C198 C199 C200 C201 C202 C203



A BETTER APPROACH TO RESIDUAL VALUE

Traditional residual value business models are on their last legs; it is time to upgrade

As consumers continue to move toward ride-hailing services, automobile subscription plans, and other models that allow them to use cars instead of owning them, automakers and mobility providers are expected to hold more and more vehicles as assets on their balance sheets – vehicles whose value is predicted to triple, to more than €2.2 trillion (\$2.5 trillion) by 2030.

MATTHIAS BENTENRIEDER
SASCHA COCCORULLO

To make the most of their holdings, it is vital for manufacturers to take two key steps: First, they need to achieve the greatest possible accuracy in predicting residual value (RV) – what the vehicles are worth at the end of the lease period – to enable optimal pricing of leases. And, second, they need to realize the best possible return when they deal with vehicles returned at the end of the lease period, whether by selling, reuse in mobility offerings, or further leasing cycles.

The past few years, however, have seen current residual value models reaching the limits of their ability to produce accurate results. Traditional modeling and forecasting techniques cannot keep up with a market that is constantly being roiled by changing customer preferences, economic swings, greater transparency in the used-car market, new technologies such as electric cars, or the regulatory uncertainties created by the diesel crisis and the Worldwide Harmonized Light Vehicles Test Procedure (WLTP).

RESIDUAL VALUE GETS (VERY) COMPLICATED

It should come as no surprise that residual value models are breaking down. In today’s market there is far more to RV than a simple calculus of age, mileage, and maintenance.

One key factor: Consumers today face a greatly expanded array of choices – not just one model or brand versus another, but large versus small cars, internal combustion versus hybrids and all-electric vehicles, and so forth. Personal taste and shifting fashions affect some of these choices, but many are driven by various social, macroeconomic, and regulatory factors. If the price of gasoline shoots up, demand for used SUVs may plummet; if a state or nation bans or restricts internal combustion engines

(much the way some German cities have attempted to ban older diesel vehicles), hybrids may suddenly have a significantly higher residual value in those geographies.

None of these things are easy to predict three or four years in advance. What will future model changes and facelifts, as well as comparable substitution models from other manufacturers, do to supply and demand in the used-car market? Will today’s crop of rear-facing cameras, anti-collision devices, and other gadgets hold their value, or will new technology leave them behind? These sorts of questions have long been part of how companies thought about selling new vehicles; now, they need to become part of how they approach the vehicles that are not sold – at least not yet.

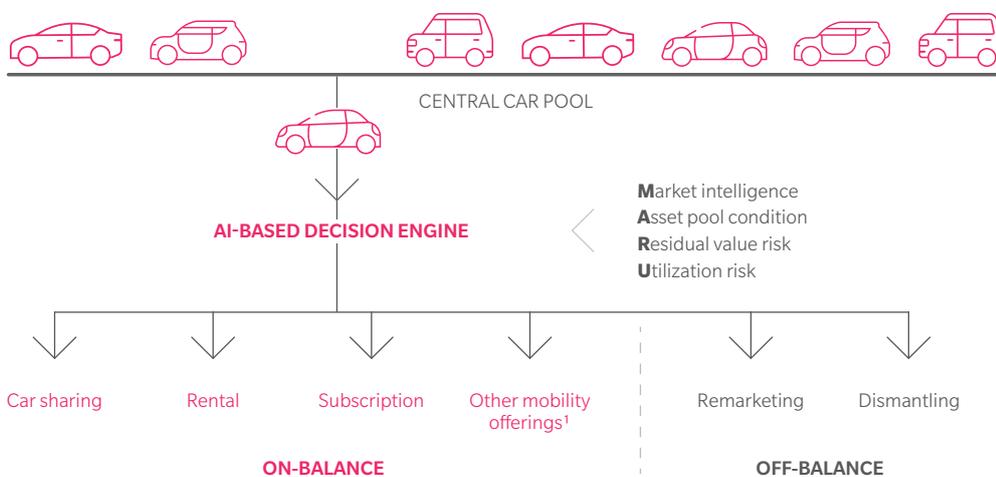
In the future, it will be necessary to calculate residual values down to the level of individual vehicles, using a wide array of internal and external data, including data collected during vehicle maintenance and inspections, as well as additional data points from connected services. (See Exhibit 1.) Meanwhile, records of used-car transactions online can provide better understanding of market demand and buying intentions. For example, the volume and duration of individual advertisements on used-car platforms can help identify supply/demand imbalances for certain models.

This applies not only to the domestic market; instead, all relevant neighboring markets must be included in the analysis to identify possibly higher transaction prices. In addition, social listening and emotion analytics represent another increasingly relevant input source. Comments and notes about specific car models on relevant platforms can enrich forecasts of their future residual values and provide an even more accurate picture of what customers will ultimately be willing to pay. Software models

EXHIBIT 1: VEHICLE LIFETIME VALUE – DECISION ENGINE

AI-based decision engine to determine next best utilization to maximize vehicle lifetime value

INTEGRATED APPROACH: DECISION TREE AND SETUP OF DECISION ENGINE



COMMENTS

- **Vehicle lifetime value:** Active management of each vehicle (e.g. utilization) throughout its life to maximize benefit
- AI-supported maximization: Decision engine matches – **each VIN²** (asset) based on specific criteria is created, e.g. mileage, condition, value – with **each** available **asset-based mobility services** for each market based on key business metrics – and identifies the **next best utilization** for each asset per market

¹ Leasing, ride-hailing, etc.

² Vehicle identification number

Source: Oliver Wyman analysis

employing artificial intelligence and machine learning can now capture and use all this information and dynamically adapt themselves to new changes in market structures, delivering increasingly robust RV predictions. Reliable and accurate models like these will be a key enabler for future asset-based mobility offerings.

MAXIMIZING VEHICLE LIFETIME VALUE

Lease returns today are mainly remarketed in the domestic market or via online auction platforms for local dealers – a system designed to sell used cars as quickly as possible, not to maximize profits. Hardly any OEMs avail themselves of nationwide direct marketing, much less the possibility of selling used cars in neighboring countries that may have less saturated markets. As a result, value is more often destroyed than saved.

Companies will benefit by developing alternatives to remarketing for cars with highly volatile residual values, such as electric vehicles. For example, lease returns could be “held” in various utilization-based mobility services such as car sharing, rental, subscription, used-car leasing, ride-hailing, or other vehicle-based offerings, and monetized by pay-as-you-drive business models until a more advantageous time to sell them arrives (or until dismantling becomes the best alternative). This approach makes it possible to generate higher lifetime revenues for some vehicles. These new mobility offerings necessitate the management not only of residual value risks, but also utilization risks (such as active management of an internal, comprehensive used-car pool to keep utilization rates high). And it requires additional capabilities to deal with the balance sheet impact, focusing on balance sheet reduction measures and additional refinancing requirements.

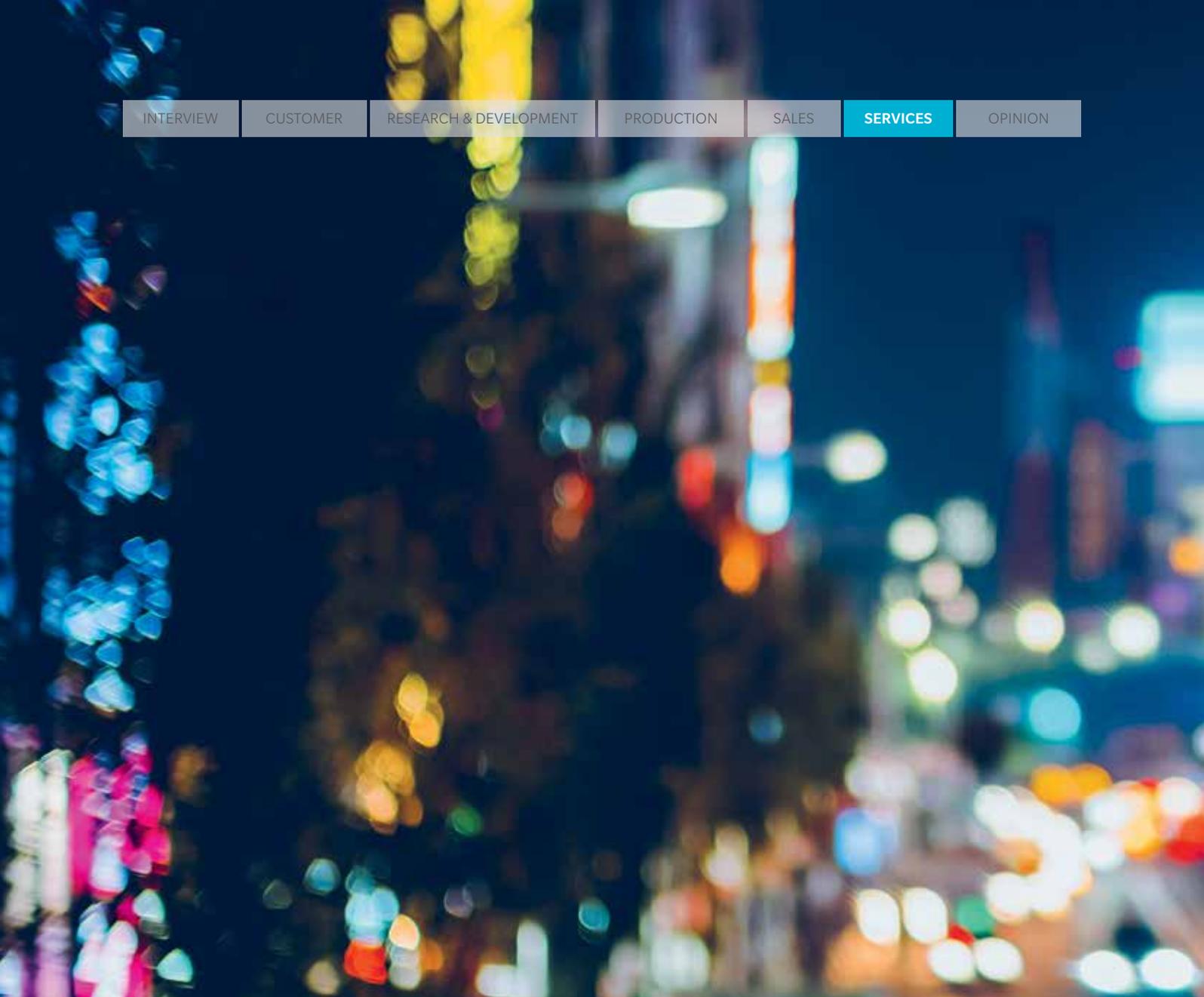
Currently, such mobility offerings are principally used as additional sales channels for new cars by OEMs seeking to achieve their short-term volume targets, whereas the utilization rates of the offerings are a secondary consideration. This will have to change. But to facilitate the change will require suitable capabilities and capacities in utilization-based mobility offerings, especially for those models whose residual values are hard to calculate and decline very rapidly.

SHIFTING GEARS

To the OEMs (and especially their captive finance units) that pioneered auto leasing, the new practice probably looked like just another way of selling cars. In retrospect, it turns out that these companies were dipping a toe into a very different industry that is only now fully emerging: access to mobility. This sort of shift from ownership to usage is not unique to the automotive industry – think of the difficult shift of the music industry in transitioning from selling physical media to selling access. And there is much still to learn about mobility and the business models it will require.

But for the foreseeable future, any OEM-centered mobility play will need to pay close attention to the residual value of vehicles, ramping up the accuracy of predictions and learning to optimize the lifetime revenue of each individual vehicle. A few tools to do this, such as yield management and dynamic pricing, already exist. Others, thanks to machine learning and artificial intelligence, are on the way. What is crucial for auto companies today is to truly understand the business implications of the new, more complex transactions they have created – and undoubtedly will continue to create with further usage-based models – and to get them on the road to success. •





AUTOMOTIVE STARTUPS GROW UP

Investors give record support to ride-hailing, EVs, AVs,
and Chinese startups



Investors have seen the future when it comes to the almighty car, and it revolves around electrification, driverless vehicles, ride-hailing, and China. Maybe those choices are not particularly surprising, but the rate at which backers are throwing money at startups may be.

MATTHIAS BENTENRIEDER
ANDREAS NIENHAUS

This article first appeared in Forbes.

For about a decade, investors have been pouring an increasing amount of money into automotive startups. In 2018, these investments totaled \$27.5 billion. That is 30 percent higher than the previous year, but twice the level of 2015 and 20 times that of 2010, according to our research. (See Exhibit 1.)

Rather than a substantial jump in the number of startup opportunities available, the dramatic expansion reflects how much the size of the average deal has grown in less than a decade. It almost quadrupled to \$39 million in 2018 from \$10 million in 2010, our data show.

PLAYING THE ODDS

Investors are abandoning the scatter-gun approach popular even five years ago. As revolutionary automotive technologies move closer to mass commercialization, investors are becoming more selective, often funneling investment dollars to startups with track records of success. The four trends guiding investment in 2018 are go electric, go autonomous, go ride-hailing, or go China, and our research confirms that investors are increasingly going to certain sure-bet enterprises rather than placing money on long-shot bets on newcomers.

First, there were geographic winners. Almost half of the automotive startups founded since 2000 are based in the United States and China. In 2018, startups in China received more than 41 percent of all the investments made — \$11.4 billion;

\$7.1 billion was invested in US startups. Singapore came in third with \$2.8 billion.

Among the 30 more highly funded startups globally, there is one from Singapore, one from the European Union, one from India, one from Indonesia, and one from Dubai. The rest are either from China, with 13, or the US, with 12.

Seven of the leading Chinese startups make electric vehicles (EV) or EV technology. Much of this success stems from the aggressive support the Chinese government has provided to development of electric vehicle production and sales. Over the past several years, China has nurtured an internal market for electric vehicles by converting its city buses to electric and offering tax cuts to encourage consumers to buy electric cars. Last year, more than half of all electric vehicles sold were sold in China.

NO HANDS

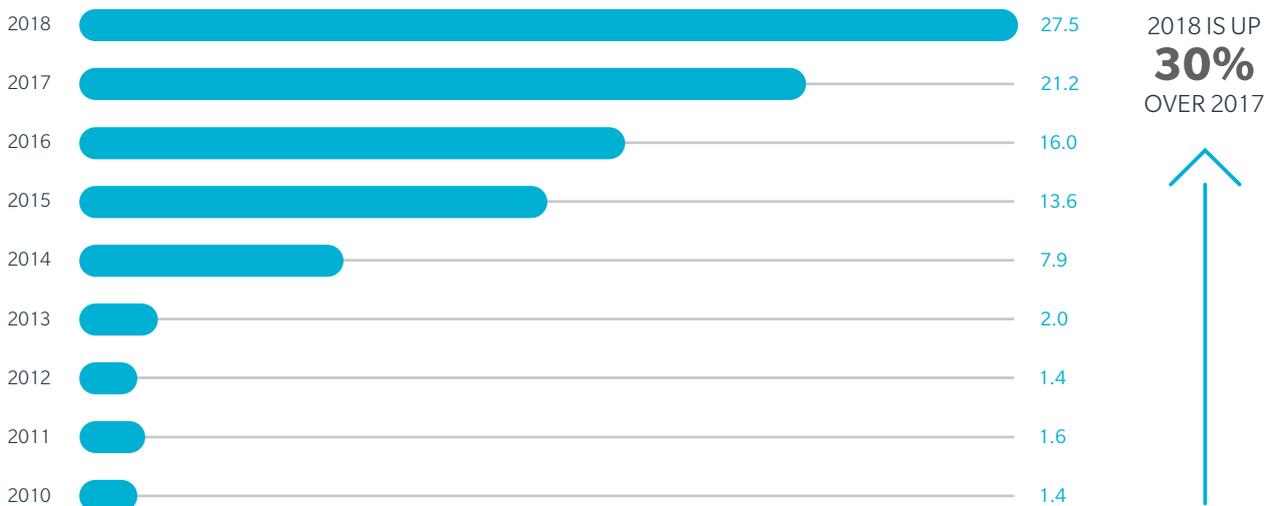
Investors are also showing an interest in companies that are developing self-driving systems that they will license to major automakers. For instance, in 2018, General Motors' Cruise Automation raised \$3.4 billion and was the sixth largest on the list of highly funded startups. (See Exhibit 2.)

Another big player in the autonomous vehicle (AV) space is Waymo, a subsidiary of Alphabet Inc. Waymo, which started life as a project of Google, has driven some two million kilometers in

EXHIBIT 1: AUTOMOTIVE STARTUP FUNDING PER YEAR

In the last decade, investors have been pouring money into automotive startups

FUNDING PER YEAR
US\$ BILLION



Source: Crunchbase, includes financing rounds until "Round H"

2018, more than twice as far as all other self-driving developers combined. Recently, ride-hailing startup Lyft said it would offer rides in suburban Phoenix from Waymo autonomous taxis.

China and the US again dominate the AV startup sphere. In this market, the European Union and any other region governed by the United Nation’s Vienna Convention on Road Traffic operate at a disadvantage because of the treaty’s restrictive traffic regulations that make public road testing of driverless vehicles difficult.

MOBILITY AS A SERVICE

Ride-hailing and ridesharing platforms are also among the biggest winners in 2018 when it comes to funding, attracting \$7.2 billion. Among Chinese startups, the largest round in 2018 was raised by truck-hailing firm Manbang, according to Crunchbase data.

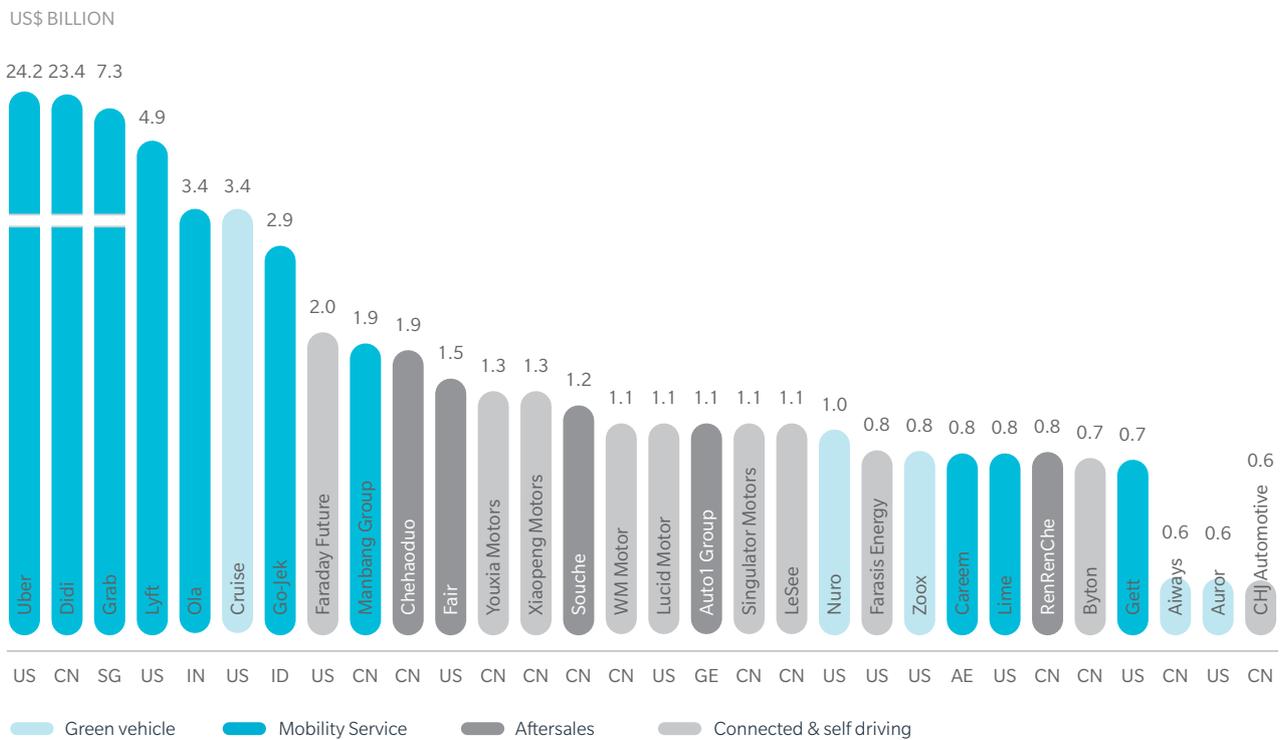
Ride-hailing companies account for the top five among the list of highly funded startups globally — Uber and Lyft in the US, Didi in China, Grab in Singapore, and Ola in India — with \$63.2 billion in startup funding cumulatively. Of that, \$47.6 billion is divided between the two behemoths in the space — Uber and Didi.

While many of the startups represent a challenge to legacy automakers, they are also crucial to the automotive industry as they represent a bridge to the next generation of mobility. As a result, some automakers are among those purchasing direct stakes in startups.

Other car companies have chosen to forge strategic relationships that will help support these nascent businesses and guide the development of their innovative technologies. Ultimately, as investors become choosier and flock to the biggest, most commercially viable startups, car companies and global technology giants may end up buying outright enterprises with promising technologies still far from commercialization to ensure they have sufficient funding to eventually move into the mass market. •

EXHIBIT 2: 30 HIGHLY FUNDED AUTOMOTIVE STARTUPS FROM AROUND THE WORLD

Chinese startups already make up about 50 percent of players



Source: Crunchbase, includes all funding rounds per company until Mid February 2019

WHERE CHINA IS LEADING THE MOBILITY REVOLUTION

The nation once known more for technological imitation than innovation is now an international leader in electric vehicles and other next-generation mobility products

For years, China has been perceived as a nation that relied more on imitation and copycatting than on innovation for economic growth. It appeared to many that China was getting its best ideas working with companies based elsewhere, and there continue to be frequent accusations that its manufacturers do not respect intellectual property laws. While its high-volume, low-cost manufacturing prowess was never questioned, the line on China has been that it could not compete when it came to innovation.

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Those days seem to be behind us. In the 21st century, China is emerging as a leader in many new technologies — especially those related to mobility. The Chinese government has pledged to convert the nation into an international innovation leader by 2030, but in many ways the nation has already reached that status, certainly when it comes to electric vehicles, batteries, drones, and high-speed rail.

Today, China is not only the biggest producer of electric vehicles (EVs) by far, it is also a leader in lithium-ion battery technology that powers EVs as well as smartphones and other mobile devices. Batteries are the power storage of the future as the world moves relentlessly toward the electrification of transportation, and while China controls 60 percent of the world’s production of lithium-ion batteries and nearly half of the world’s global lithium production, it is also hard at work trying to advance them and developing substitutes that could be cheaper and less combustible.

SILICON VALLEY EAST

On multiple fronts, Silicon Valley and other US tech hubs are evenly matched — or trailing behind — the imagination and technical prowess of Chinese companies. As one example, Chinese drone producers are well ahead of competitors in the development of autonomous systems for personal mobility, according to a 2018 World Economic Forum report. A Chinese-Austrian joint venture recently debuted a pilotless air taxi in Vienna that it said it would start producing in 2020.

China also announced its intention to build a national innovation center for high-speed rail in Qingdao and has been actively exploring trackless trams, a cross between a bus and a streetcar that runs on rubber tires. Autonomous versions of high-speed rail have also been in testing for the last two years.

According to a study by the Information Technology and Innovation Foundation, China has closed the gap between itself and the US in areas such as patents and top universities. In some areas like supercomputers, China is pushing ahead.

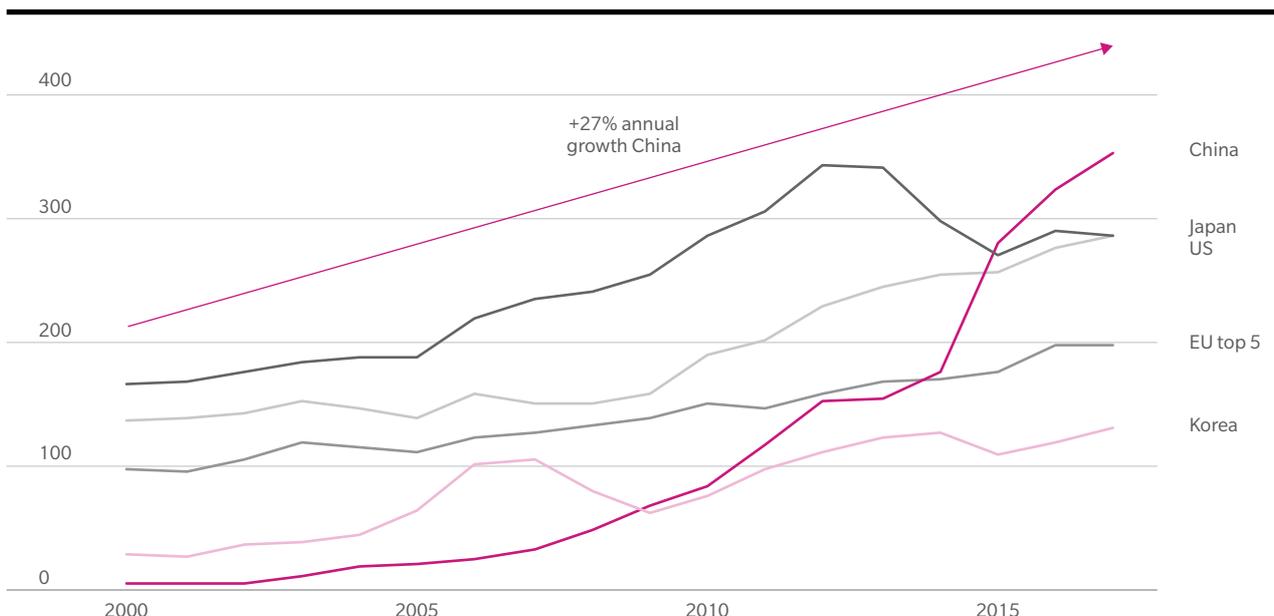
What has changed in China that made this transformation possible? Probably the biggest contribution to the country’s technological surge was the strategic decision to invest heavily in research and development. Between 2000 and 2016, Chinese research and development investment grew on average 18 percent annually versus compound annual growth rates of 4 percent in the US and 5 percent in the European Union.

UNICORN COUNTRY

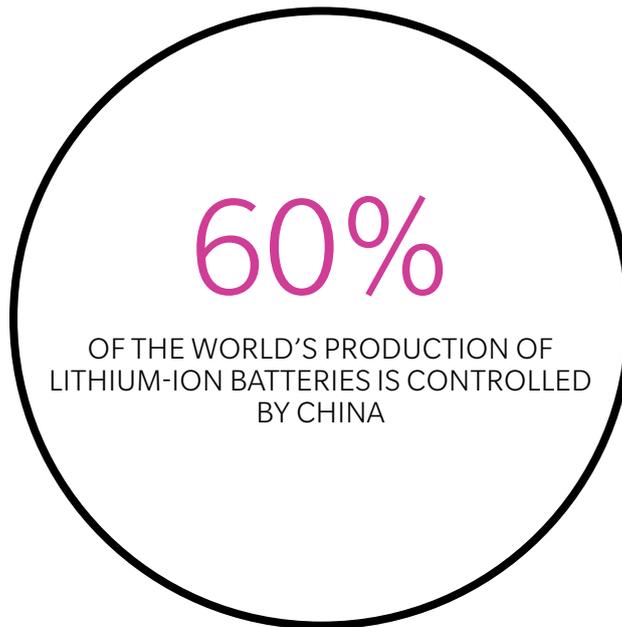
Thanks to this financial commitment to innovation, China has shown a dramatic increase in both its number of patent applications and patent grants. (See Exhibit 1.) Back in 2000, China’s number of patent applications was less than one-tenth the number in the US. However, in 2017, China’s applications equaled the sum of applications in the US, Japan, and the top five nations in the European Union. And since 2015, China has been the worldwide leader in patent grants, based on data from the World Intellectual Property Organization and an Oliver Wyman analysis.

EXHIBIT 1: CHINA HAS BEEN THE WORLD’S LEADER IN PATENT GRANT SINCE 2015

Back in 2000, China’s number of patent applications was less than one-tenth the number in the US.¹



¹ Direct and PCT national phase entries by applicant’s origin (equivalent count)
Source: WIPO, Oliver Wyman analysis



Forty percent of global unicorns — startup companies with a valuation of more than \$1 billion — were based in China in 2018, according to TechCrunch. The 149 unicorns in China even beat out the 146 in the US, its closest rival.

A major enabler of the transformation from copycat to innovator has been provided by the five-year governmental plan “Made in China 2025.” The program, which involves sizable government investment in major industrial sectors and the support of startups, is aimed at turning China into an international powerhouse in such industries as automotive, aerospace, and railcar production. The program wants to mirror the success China has seen in its solar panel industry — where it has become the No. 1 producer internationally — or in its civilian drone production — which in less than a decade has come to dominate the marketplace, thanks to Shenzhen-based drone leader Dajiang Innovation Technology Co. (DJI), which holds a 74 percent global market share.

EV FORWARD

So far, the most progress has been made in the automotive industry where Chinese government subsidies have helped build the largest market for electric vehicles in the world. By 2020, domestic manufacturers will have the capacity to produce 20 million EVs — an example of the enthusiasm with which entrepreneurs have greeted the challenge. The Chinese government was recently forced to stop the creation of new car manufacturing startups because of this overcapacity.

At this point, the nation has not yet started exporting EVs to the US or Europe. Even so, Chinese automakers may be better positioned than other nations to capitalize on expanding global sales. In July 2018, Bloomberg New Energy Finance (now BloombergNEF) reported that 4 million EVs had been sold.

While it took 60 months to sell the first million EVs, it took less than a year to boost sales from 3 million to 4 million.

For certain, China has been helped by its massive population and one of the fastest-growing middle classes in the world. This provides companies a ready-made domestic market that can support innovation and sustain high levels of production without selling overseas. The sizable domestic market allows Chinese producers to become economically viable before taking on the world market.

ENTREPRENEURIAL POPULATION

China also boasts a population that is highly entrepreneurial and hungry for new technology. One of the reasons for the rapid growth in Chinese ride-hailing can be attributed to the number of Chinese who sought to supplement their income by driving.

Chinese consumers also show a willingness to try new technologies. In a 2018 survey on mobility conducted by Oliver Wyman, 33 percent of respondents from China said they were “very likely” to switch from public transport to autonomous vehicles when they became available; another 50 percent said they were “likely” to switch. That compares with only 13 percent of US respondents and 12 percent of German respondents who said they were “very likely” to switch.

For the US and Europe, the transformation of China into an innovation powerhouse means those countries, too, must increase their commitments to R&D and create favorable economic environments for collaborative innovation if they want to compete. This may mean speeding product development cycles or encouraging more joint ventures. But there is no doubt, especially when it comes to mobility, China is moving quickly. •

CREATING THE CAR BRAND OF THE FUTURE

The race is on between the disruptors and the legacy brands to navigate a new reality

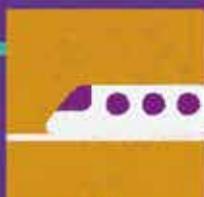
Advances in automotive technology are about to transform the role of the car in our lives. It is time for the automotive industry to take a step back and reassess what personal mobility will mean in the future.

On-demand driver service may have been the watchword for industry disruption over the past few years, but numerous emerging forces are redefining how we think about personal mobility – and transportation as a whole. From apps that integrate all forms of urban travel – from private hire to public transit routes – to advanced high-speed rail systems, companies big and small are reimagining mobility at a fundamental level. Whether the ambition is to whizz passengers cross-country at 800 mph, or simply to fill a hole in existing urban transit networks, disruption is happening to a mode of transport which has remained largely unchanged in its core concept for the past 100 years: the car.

As an industry under pressure from new technology and changing customer expectations, we are due to see automotive brands undergo a radical pivot in the years ahead. And as with any systemic change, the race is on to see who can most effectively and powerfully adapt to the new reality.

AUTHOR:

Dylan Stuart, Partner Brand Strategy at Lippincott





THE OPEN ROAD VS. FLEXIBLE LIVING

The romance of the car is at the very core of how we lived, and what we aspired to, during the 20th century. The freedom of the open road, self-actualization, personal liberty, and self-expression – cars have historically been nothing short of our personal avatars. To this day, there are plenty of enthusiasts who love cars as beautiful mechanical, sculptural, visceral objects.

Note the use of the word *enthusiast*. Mainstream interest in actually owning a car has been on the wane for some time: The UK Driving and Vehicle Standards Agency (DVSA) figures show that new license applications have declined by 28 percent over the past 10 years, while the University of Michigan has found a pattern of decreasing US drivers, going back to 1983. The context for these changes certainly include new economic and social circumstances, but in recent years it is the influence of mobile technology that has fundamentally negated many of the fundamental reasons for car ownership.

Ride-sharing and transit services have reduced the practical need for cars in an urban context, and the emotional ideals that once sold a car – the independence, status, and wealth that car ownership symbolized – are less relevant today than ever before. Flexibility and immediacy are more valuable – from streamed content to flexible working patterns, the immediacy of online shopping, and constant connectivity has redefined our values. In this light, the prospect of owning a car – complete with the responsibilities of insurance, maintenance, commitment to financing a depreciating asset, and, of course, driving it – seems more of a burden than a benefit.

Responding to these shifts, industry figures are starting to articulate a new vision for the future of the car and mobility in general. In February 2018, an executive at one on-demand service based in North America said that it was the goal of his company to create comprehensive transport networks that would connect cars to subway networks, buses, bicycles – and autonomous personal drones.

A Japanese automobile manufacturer shares a similar vision: it is looking to the end of mass-market automobiles. Newly designed vehicles will do away with traditional car components (engine, fuel tank, drivers' dashboard), and be replaced by utilitarian units such as shared autonomous vehicles and goods transporters. Networked mobility will be combined with other types of utility, meeting almost every need. So the future may not be about beautiful bent sheet metal any more.

THE GREAT PLATFORM RACE?

However, this vision of the future presents a new challenge for established auto brands. If the cars of yesterday become the connected, self-repairing, autonomous transport units of the future, what brands and companies will provide them?

In the first instance, we could see a race for partnerships with leading platform apps to form portals for transport services. While this may secure a first-mover advantage, there is a risk of diluting and intermediating automotive brands to a commodity – not unlike the relationship we have with on-demand transport today. When you jump in the vehicle you have just called on your smartphone, do you notice (or care about) the make and model of the car any longer?

That shift in people's priorities puts carmakers at the mercy of commercial contracts for a transport network – a risky proposition. Suddenly, the car is a commodity bought by the thousand at razor-thin margins by mobility operators rather than by consumers willing to pay a premium based on an emotional connection to the product and the brand.

It does not sound like a great future if you are a car brand. But there is hope – and it depends on those brands' ability to deliver a unique end-user experience.

CAR BRANDS AS A SERVICE

There are few brands as well-defined as those in the car industry. Racing heritage, patriotic country ties, engineering standards, and even signature lines and colors are powerful brand attributes, which car marques have carefully cultivated through generations. However, repeating those attributes to future generations risks irrelevance.

But brand characteristics have a role to play. If they are set to compete or partner with platform businesses, strong brands have a chance to lever their reputations for continued relevance in the future.

The answer lies in a fundamental pivot for auto brands, in which they focus less on machines than on how they can help people make progress in their lives. By understanding their core users and the challenges facing them, carmakers may be able to transfigure their products into lifestyle services.

For instance, if leading US carmakers were to decide to build a multipurpose network could they repurpose their current sedan brand as a tool for orchestrating family logistics, time, and resources – a nanny-meets-housekeeper, automated and reliable?

Alternatively, a suite of executive services could live under the banner of a European luxury car manufacturer, providing a sleek platform for international business travel that manages a door-to-door journey in comfort.

In these scenarios, the vehicle itself becomes a nerve center for relaying and parsing information between a passenger and a wider ecosystem tailored to their needs. The engineering and mechanics of the car are married to a uniquely relevant interface that adds value far above and beyond the vehicle alone.



That vision of the future may sound like sci-fi, but it is grounded in today's innovations. First and foremost is data infrastructure being conceived and trialed in smart-city environments, such as the redevelopment planned for Toronto's Quayside district by a North American technology company. The infrastructure, technology, and architectural systems proposed by the tech company are geared to turn the region into a telemetry-rich network for a new wave of services. In the future, plugging into such networks will be crucial for automated cars and their associated services to come to life.

BUILDING ON TRUSTED FOUNDATIONS

But, as some of the backlash to these plans indicate, there is distrust of tech companies and their platforms, particularly when it comes to data. What will these systems gather, how will it be stored, and who gets to use it?

In this respect, auto brands may actually find they have an advantage of trust – we have long since trusted these companies with our lives on the road, after all. While groundwork is being

laid for data to be gathered, arguably more urgent cultural groundwork is required to ensure the public is happy to provide it.

Automotive brands could find strength in numbers here, by drawing on the cumulative trust and benefits of several brands operating in tandem. In the family example mentioned above, an automotive platform could theoretically join forces with a leading retailer for grocery and clothing deliveries, whereas a business-travel platform could include airlines and hotels sharing travel points and offering seamless door-to-door transfers for users, with everything configured to anticipate and deliver exactly what is needed and when.

Suddenly, the car would be back at the center. A trusted, autonomous, intelligent device to enable peoples' lifestyles. A new must-have device: more than just a "car" - much in the same that a smartphone is so much more than a phone. Many car brands are beginning to see the opportunities over the horizon – the new jobs and roles they could perform in people's lives. But it is a leap – and the journey cannot start soon enough. •

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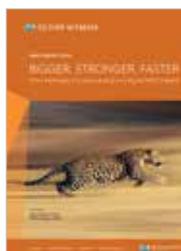
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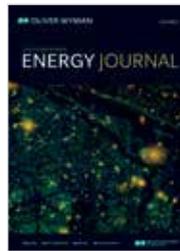
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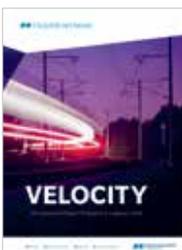
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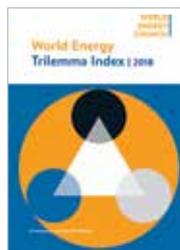
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