The future of the automotive industry

Britain’s intelligent motor industry
Jesse Norman

The 30,000-piece puzzle
Shefali Kapadia

Tomorrow’s car
Ben Oliver
YOUR DRIVING EXPERIENCE TOTALLY TRANSFORMED

Getting behind the wheel of the All-New Focus has never been more comfortable or less demanding thanks to its new driver assistance technologies such as Adaptive Cruise Control with Stop & Go, Intelligent Speed Assist and Blind Spot Information System (BLIS).

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Official fuel consumption figures in mpg (l/100km) for the All-New Ford Focus range: urban 36.7-74.3 (7.7-3.8), extra urban 55.4-85.6 (5.1-3.3), combined 46.3-80.7 (6.1-3.5). Official CO₂ emissions 137-91g/km.

The mpg figures quoted are sourced from official EU-regulated test results (EU Regulation 715/2007 and 692/2008 as last amended), are provided for comparability purposes and may not reflect your actual driving experience. Information correct at time of going to print.
Here comes the future

Jay Elwes

The UK car industry faces challenges—and opportunities. The biggest bump in the road is of course Brexit, a political change that brings with it the possibility of huge disruption. As Shobhika Kapadia points out in these pages (p7), the average car is made up of around 30,000 parts, many of which are shipped in from overseas. Any interruption to the free flow of parts would pose a very substantial challenge.

Even when the vehicles have been made, the issue then becomes one of export. A full 80 per cent of cars made in Britain are exported and the effect of Brexit on that outflow is very uncertain. Such is the immediate foreground.

But further ahead a new set of challenges arise, many of them bringing opportunities. As Ben Oliver makes clear (see opposite) the automotive industry is confronting a period of profound technological change, the potential effects of which are only just becoming apparent. The most immediate challenge is for the industry to get on with the mass manufacturing of electric vehicles and to a certain extent that it already happening. The Prius is old news now. Even so, the need to create new propulsion systems and, more specifically, battery units, could well change the nature of the industry and the profitability of the car companies. The lithium ion battery is the most expensive part of an electric car and if the maker has to buy that technology from another firm, its profitability will be greatly affected.

So though a now-familiar technology, the electric car will bring substantial changes. Further on down the track, other more dramatic shifts will occur—perhaps. For when it comes to autonomous vehicles—that is, self-driving cars—there is still a good deal of scepticism about whether the technology can truly be mastered. But even if that “brain off” technology proves impossible to create, it seems likely that cars in the coming decades will come to rely more on data. Satnav systems will gather up more of it to plan the best route, and your car will constantly be checking itself for faults.

And as the onboard computer takes an ever more important role, the question will become where manufacturers get their vehicle’s operating systems. In other words, will Google end up running your car for you? And if car makers do end up giving that area of the industry up to the big tech companies, precisely what would they have handed over?

There are huge opportunities here and the collection of pieces that follow makes clear that, if the industry gets it right, the opportunities will be substantial. But a gear change is coming. Hard work and some careful consideration will be required to ensure that there is a smooth transition between the cogs.

Jay Elwes, executive editor, Prospect

Shifting gears

It’s time for the British industry to put its foot down

Ben Oliver

Change is coming to the global car industry. Karl Benz patented the first motor car 132 years ago and, since then, the fundamentals of the industry that makes them have changed little. Cars are still overwhelmingly powered by internal combustion engines and sold to private owners—individuals or corporations—for their exclusive use, and stand idle when not required.

The car industry has been subject to the effects of war, recession and oil crises—just like other sectors of the global economy—but it has largely made its own weather. The fortunes of individual carmakers and national car industries have waxed and waned, but consumer behaviour has mostly been led by what the industry has given us. The rise of the Japanese car industry in the 1970s, for example, though helped by the oil crisis, was largely down to the fact that it made better, more efficient, more reliable cars than the British or the Americans.

“The self-driving car: nobody knows when and to what extent they can be introduced”

Until now, the car industry has largely avoided the external digital disruption that has affected so many others, from the media sector to mobile. But change is coming, and it is likely to arrive in three waves that together will upturn every century-old industry certainty.

The three changes

First comes the rise of the electric vehicle. Between a third and a half of the material cost of an EV is the battery. Most carmakers will have to buy these battery units, rather than making their own. This alone will profoundly alter the structure of carmakers’ businesses, and the uneven rate at which existing carmakers are developing affordable, practical EVs will allow new entrants to gain a foothold. Despite the problems it has faced of late, Tesla is the first carmaker of substantial volume to be established in the US since Jeep in the Second World War, and there is a long list of new Chinese EV makers with credible plans to export to Europe and the US.

Second comes the self-driving car. Nobody really knows when and to what extent they can be introduced. We may never be able to engineer full, “brain off” autonomy, in which vast fleets of on-demand driverless cars shuttle us from home to office and back as we doze. But even the partial adoption of autonomy will create huge new sources of value, such as the artificial intelligence systems which will co-ordinate autonomous cars, or the data which is captured about us as we travel.

Unsurprisingly, the big tech companies want to capture that value. Google’s
Waymo project is the most advanced of various attempts to create operating systems for self-driving cars. Privately, many car industry executives expect to see the brains of their cars to Google. The third big change will be the shift from personal to shared ownership, or use, of cars. This is already happening. In cities, Uber and the other ride-hailing apps are encouraging a shift from owning a car to simply summoning one when needed. (“One investor described Uber as an autonomous car “with a meat-based control algorithm”—you summon it by app, look at your phone while aboard, and it disappears when you’re done with it.”) On-demand cars could become a compelling alternative to owning a car. As with autonomy, shared use will never be universal if you live in a rural area you’ll still need a car outside your door which you drive yourself. Even so, any increase in shared use creates problems for car manufacturers. Fewer cars will be needed, because more of them will be operating more of the time. Our loyalty to brands may be undermined. After all, you don’t care who made your Uber—or your bus, train or plane—even as long as it’s clean, safe and reliable, and you won’t care if the autonomous car you summon was made in the UK, Germany or China.

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The case for optimism

The optimist may see some good omens already. The industry strategy White Paper published a year ago identified four priorities. Three of these—Brexit, skills, and digitalisation, including the
Reddy Brennan is a founding partner at Trucks, a seed-stage venture capital fund specialising in transportation start-ups, and he lectures in transport and entrepreneurship at Stanford.

“Computer scientists and electrical engineers were less associated with the automotive business in the past—they’re hugely important now”

“We don’t see a lot of startups from the UK,” he says. “Frankly I wish we saw more, because the few that I’ve met have been very high quality. But having a healthy supply of engineering talent is one of the best ways to have a durable part of this future. The UK is already known for that, so that’s what I would double down on.”

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The road to zero

We are in the throes of a technological revolution

Jesse Norman

If there were a prize for the industry that has done most to boost the UK’s economic growth over the past decade, the automotive sector would be a serious contender.

In 2009, in the aftermath of the financial crisis, fewer than a million vehicles rolled off UK assembly lines. Since then, however, motor manufacturing has enjoyed a remarkable resurgence, with production increasing to a high of 1.72m units in 2016. Great British marques like Jaguar, Mini, Bentley and Range Rover are in huge demand around the world. Nissan and Toyota’s UK plants remain among the most efficient in Europe. And automotive exports have changed little over generations. The vast majority of cars produced today are still powered by internal combustion engines burning fossil fuels, directly controlled 100 per cent of the time by human beings. Just as they were a century ago.

By 2030, we want ultra-low emission vehicles (ULEVs) to make up at least half of new UK car sales. By 2040, we want all new cars and vans sold here to be effectively zero emission. Under 2 per cent of new cars were ULEVs last year, so that’s a huge pace of change.

But the cars of the future will be intelligent too, a fact that has triggered a huge race between established manufacturers, new entrants and disruptive software and other technology companies to define what intelligent motoring will be. Autonomous, yes—in time. Connected, yes—this is already happening. Offering new transport services—ditto.

But there is also a huge industrial opportunity here. So we also want to pioneer the development of automated vehicles, and their service models and use, in both urban and rural areas.

To achieve this, the government announced its “Road to Zero” strategy and hosted the first ever international Zero Emission Summit.

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But there are big questions about where the value will lie for investors in tomorrow’s motor industry. Will it be in manufacturing vehicles, or in components—even though there are far fewer moving parts in electric cars than the petrol models of today? Will it be in power, electronics, motors and drives? Or will it be in the platforms that emerge to bring together services for consumers? Or will the brands of mobility providers become the motoring giants of the future, usurping those of the car manufacturers?

From a national perspective, there are huge challenges and opportunities. A key industrial challenge is to increase the value of UK content in many of the cars built here. That’s why we have made a major investment in battery technologies through the Faraday programme.

But the opportunity is enormous: to make the UK the best country in which to develop and manufacture the cars of the future. This country already offers a superb balance of automotive talent, a strong safety culture, capital and technology, and superb testing environments. Now we need to work with industry to make the most of this potential.

Jesse Norman MP is Minister of State at the Department of Transport, and the author of acclaimed books on Edmund Burke and Adam Smith.
An industry in numbers

Britain’s car industry makes a substantial contribution to GDP and is widely dispersed across the UK. Few industries can boast a comparable geographical spread. This makes it especially sensitive politically, especially when the value of the industry’s exports are factored in. The overwhelming majority of British cars are exported to the EU.

80% of cars produced in the UK are exported

£20.2bn in value added to the UK economy by the automotive industry in 2017

25% Reduction in time taken to get a vehicle to market due to digitisation of production

25,000 jobs in automotive manufacturing will be created by 2030 due to connected and autonomous vehicles

Key UK manufacturing sites
1. Alexander Dennis
2. Aston Martin
3. Bentley
4. BMW
5. Caterham
6. Cummins
7. Dennis Eagle
8. Euromotive
9. Ford
10. Honda
11. Infiniti
12/13. Jaguar Land Rover
14. John Dennis
15. Leyland
16. Lotus
17. LEVC
18. McLaren
19. Mclaurin
20. Mini
21. Minibus Options
22. Morgan
23. Nissan
24. Optare
25. Plaxton
26. Rolls-Royce
27/28. Toyota
29/30. Vauxhall
31. Warnerbus
32. Wrightbus

Top export destinations for UK cars

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<tr>
<th>Country</th>
<th>% of Exports</th>
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<tr>
<td>European Union</td>
<td>53.9%</td>
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<tr>
<td>United States</td>
<td>15.7%</td>
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<tr>
<td>China</td>
<td>7.5%</td>
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<tr>
<td>Australia</td>
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<td>Turkey</td>
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Tata Steel UK: Driving innovation for the future of mobility

Deirdre Fox is Director of Strategic Business Development Tata Steel Europe.

From the pioneering car producers of the 1900s, to the mass-production techniques of the war years and the first of Issigonis’s Minis of the 1960s, the automotive industry is rightly regarded as being central to the UK manufacturing economy. The West Midlands, long a heartland of UK engineering, is host to some of the country’s leading manufacturers and specialist supply chain players. It is also home to Tata Steel’s flagship automotive service centre at Wednesfield and its Warwick Technology Centre, both synonymous with long-term and continuous innovation and investment in the automotive sector.

An ever-evolving industry, the automotive sector has seen its fair share of historic turning points, from the development of the diesel engine to the first hybrid car. Today, the industry finds itself at its latest crossroad—the transition to ultra-low and zero emission vehicles.

The Industrial Strategy published last year made clear the government’s vision for transformation in this industry, with its focus on support for maximising opportunities across electric, connected and autonomous vehicles. It also brings with it some key questions—how should government and industry work together to build a viable supply chain which in turn can deliver maximum value to the wider UK economy? How can capacity keep up if the uptake of electric vehicles surges, as the government to work together to seize the opportunities offered by another historic era for British transport.

The study shows demand for advanced steels for the vehicle structure will increase by approximately 2.6m tonnes by 2050. This is contrary to previous speculation suggesting other materials, like aluminium and carbon fibre, would replace it. Cost and sustainability drivers would suggest this as an unlikely scenario. Steel is infinitely recyclable with no loss of quality, making it the world’s most sustainable material.

It is clear that a well-functioning domestic steel supply chain can play a vital role in the successful development of a lower-carbon UK manufacturing economy and make a real contribution to the decarbonisation of supply chains such as automotive. At the same time, the steel industry recognises its own responsibility to continue to develop new technologies in steel making and processing to lower its own carbon footprint— it is a shared challenge.

In anticipating this demand and the challenges it may bring, Tata Steel is doing what the steel sector and the wider automotive industry have always done best—innovating. Tata Steel’s recent UK investments have included a cutting-edge, £5.7m robotic laser welding facility at our Wednesfield site in the West Midlands and a state-of-the-art Automotive Finishing Line at our Llanwern works in south Wales, which support the production of optimised sheet steel with different thicknesses and grades, enabling lighter and ultra-high-strength steel production. Tata Steel remains the only UK based steel maker with this end-to-end capability to service its automotive customers in this way.

Through our extensive R&D programmes which connect us with customers, technology partners and academia, Tata Steel continues to push the boundaries of what is achievable with advanced steel capability and investment in flexible supply chains that can truly add value.

“Demand for lighter vehicle structures is set to necessitate growth in electric and plated steels that improve an electric motor’s efficiency”

Whilst Tata Steel looks to continue to innovate and meet the changing needs of the industry, the UK’s relationship with the EU, its biggest trading partner, is being redefined. As our trading links change post-Brexit it is important that the UK government pursues a strong, cross-sector industrial strategy that develops the whole supply chain for automotive.

If the UK really does want to be at the forefront of the electric vehicle revolution, whilst achieving the target of over 50 per cent local content that the automotive sector has set for itself, then the country needs the supply chain capacity and capability to match. Continued support for innovation and strengthened domestic supply chains will be key to achieving this. Tata Steel is ready, along with the wider steel industry to play its part as a future-looking foundation of the UK economy. Now is the time for both industry and government to work together to seize the opportunities offered by another historic era for British transport.

Deirdre Fox is Director of Strategic Business Development Tata Steel Europe.
Brexit is already having an effect

Christian Wolmar

The future of the automotive industry

There’s a sense of panic developing among car manufacturers about Brexit. And about time too. If any industry should be expressing concern about its fate after we leave the EU, it is the automotive industry which employs 82,000 people in the UK and has a turnover of just under £5bn. But the advent of concerns about air pollution and climate change pose a new question for the sector: can it out-innovate the upstarts from Silicon Valley and Guangdong to own the electric vehicle future? Or will its history, its expertise count against it in the new world?

The car industry relies on supply chains—that brings risk

Phil New

in 1868, Coventry Sewing Machine got an unusual order. A firm in Paris asked if they could use their machining skills to make a new Velocipede, a kind of proto-bicycle that was popular in France. With typical Midlands can-do attitude, they fulfilled the order and more business followed. The firm soon changed their name to the Coventry Machinists.

The lithium ion battery has transformed automotive transport and was mastered in an Oxford lab by Peter Goodenough

The UK certainly has the engineering and design pedigree that will be essential in the future. Firms like Jaguar Land Rover and Aston Martin produce beautiful, aspirational, reliable cars that are sold across the world. And they also have the workforce, since the privatisation of the blasted British Leyland, the sector has transformed itself, attracting investment from across the world since the 1980s. This has brought new techniques and ideas. As a result, UK car manufacturers are among the world’s most productive. But electric vehicles will require new innovations.

Regenerative braking was developed by Formula 1 teams based in the UK, including Red Bull and McLaren, before being adopted for hybrid passenger cars across the world.

Indeed, the lithium ion battery—an invention that has transformed both consumer electronics and new automotive transport—was mastered in an Oxford laboratory by Peter Goodenough. The government has invested £250m in the Faraday Institution to regain the UK’s leadership in batteries and master the electro-chemistry to make electric vehicles not just cheaper than conventional cars, but cheaper and more reliable.

That investment came in Philip Hammond’s 2016 budget, which saw the biggest increase in science and innovation spending for 40 years—something the government does not celebrate enough.

The “B” road

Only one Brexit outcome would truly satisfy Britain’s carmakers

This was quickly followed by Honda which gave details of its production process, highlighting the risks of any disruption. Ian Howells, the European head of Honda, warned, “We’d probably be looking at 60,000 odd additional bits of documentation we’d provide to get product to and from Europe. If we end up with WTO tariffs, we’d have something like 10 per cent of costs in addition on products shipped back into Europe and that would certainly run into tens of millions.”

Finally, that same week, the industry body, the Society of Motor Traders and Manufacturers, waded in saying that the government should rule out a no deal Brexit. “No deal” would undermine the industry’s ability to operate and cannot be an option,” it said in a statement and has an unusual order.

And so started the city and the region’s journey to becoming a cycling and then an automotive powerhouse.

Coventry’s relationship with the bicycle—which became the blueprint for modern bicycles—dates back to 1866, when a Coventrian, John Kemp Starley, developed the Rover Safety bicycle—which became the blueprint for modern bicycles. From there it was a small leap for Midlands companies like Austin to move from two wheels to four, incorporating and mastering the new innovation of the internal combustion engine. The region’s automotive industry began to thrive, providing jobs and a source of pride for both the Midlands and the UK for more than a century.

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Innovation centres such as Warwick Manufacturing Group will benefit, which supports more efficient electrical machines and power electronics. And my own institution, Energy Systems Catapult, which aims to accelerate the transformation of another sector where the UK has historical pedigree: energy.

Traditional silos in the energy sector are breaking down—with electric vehicles needing to complement the electricity system, harnessing the potential of electric vehicles as a store and supply of electricity when system demand is high.

In the future, you should be able to power your television from your Nissan Leaf if it’s cheaper than the grid. But this means rethinking completely how our power and energy markets work. If we get it wrong we will end up having to build many more wires and expensive power stations, pushing up costs for energy consumers and failing to cut our emissions. But getting smart charging right could save around £45bn in extra generation costs alone.

“Electric vehicles are a potential source of store and supply of electricity when system demand is high”

Capturing the economic and industrial opportunity of electric vehicles will therefore require us to think differently about our entire energy system, better understand the new interactions within it, and carry out large-scale testing of how new technology can benefit consumers. Britain’s ability to stay ahead in emerging sectors like EVs depends on our ability to build the economic ecosystems that make it easy to test and develop new ideas.

While Dyson recently decided to manufacture its new electric vehicle in Singapore, much of the high-end and more valuable innovation will stay in the UK. This industrial ecology requires rethinking everything from market design to support for basic science, from product regulation to innovation centres, from deeper skills in engineering and marketing to rethinking early stage finance.

In short, it means a strategic, mission-driven approach to important economic challenges, like cleaning up transport. The government’s Industrial Strategy and the support for innovation that accompanies it was a significant change of direction. The coming years will see if it can work.

Phil New, Energy Systems Catapult chief executive and chair of the EV Energy Taskforce

Steel will be as important to the future automotive industry as it is today. As our customers move to a new generation of low-emitting, environmentally friendly vehicles, Tata Steel will continue to offer many essential solutions:

- Advanced high-strength steels provide cost-effective solutions for vehicle lightweighting
- Advanced coated steel for battery cell construction
- Electrical steels enabling our customers to differentiate their electric motor design
- Steel providing infrastructure solutions—from charging points and grid furniture to transformers and power stations.

For more information please visit www.tatasteeleurope.com