

# Clearthought

## Engineering Services

Increasing e-mobility, connectivity and autonomous driving are demanding new relationships between OEMs and engineering service providers.

### *Inside:*

- Industry summary
- Leading players
- M&A activity
- Ricardo Automotive interview

# Market overview

**Specialised Engineering Service Providers (ESPs) have always played a role in the automotive industry however, as a recent report notes<sup>1</sup>, in the past they were mainly used for specific tasks such as creating drawings, designing components and modules, calculating specifics, and for conducting testing procedures.**

Today the picture is very different as OEMs outsource a huge range of engineering activities to ESPs, including the development of systems and derivatives, and even complete vehicles. They have also sought ESP support for services such as quality assurance, supplier and project management, and for training programmes.

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In turn, ESPs now need the capability to work on completely new development projects which demand expertise in all aspects of product development. As the report concludes, the ESP will “make or break” the success of an outsourced product development project which makes it imperative for the OEM to carefully assess the competencies of an ESP partner.

## Services

Engineering services across the automotive sector break down into five core areas<sup>2</sup>:

- **Design services** – design and surfacing, virtual reality, design modelling
- **Simulation** – crashworthiness, occupant safety, structural add-on parts, stiffness/vibration, fluid dynamics
- **Modelling/Rapid tech** – CAD/CAM, milling technology, gauge building, toolmaking, measuring technology
- **Testing** – interior/exterior testing, engine chassis and tank system, vehicle safety, acoustics, electric mobility, vehicle construction
- **Engineering services** – project management, quality management, process validation, logistics

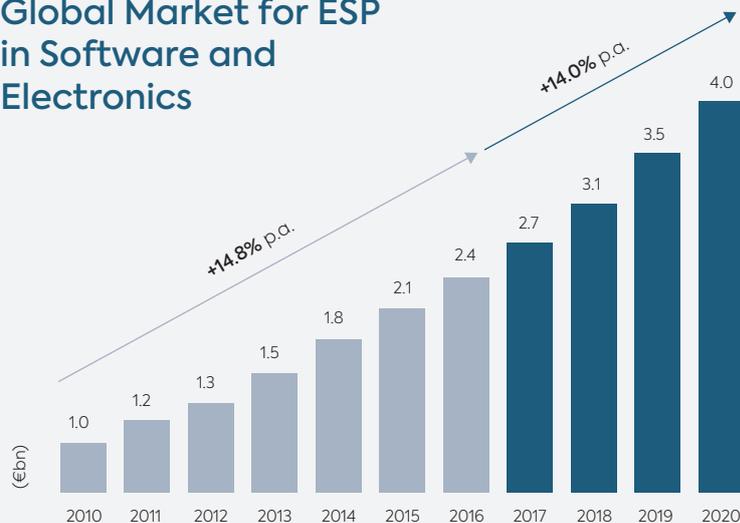
*The overall benefits for individual ESPs depends on the degree of specialisation that they can offer to OEMs and the types of services that they provide.*

## Market growth

Although demand for engineering services will continue to rise triggered by an increasing number of models and variants, especially in areas such as electric vehicles, the actual number of vehicle platforms is decreasing as OEMs seek to make efficiencies.

For instance, Volkswagen’s MQB platform is used across a whole range of vehicles including the VW Golf and Polo, Audi A1 and A3, and the Skoda Octavia. This trend towards sharing platforms was also the driver for the recent announcement by Daimler and BMW that they would pool their mobility services in a move which brings together 14 different brands.

## Global Market for ESP in Software and Electronics



Source: McKinsey Center for Future Mobility in: ATZ Special Issue May 2018 (Automotive Engineering Partners)

The overall benefits for individual ESPs depends on the degree of specialisation that they can offer to OEMs and the types of services that they provide. For instance, whether they focus on interior/exterior engineering as opposed to powertrain engineering.

That said, the need for R&D efficiency among OEMs will require them to outsource all non-core competence tasks and lead to the outsourcing of ever larger work packages. One forecast<sup>3</sup> predicts that the engineering services market will increase from €11.1bn in 2017 to €18.3bn by 2023 at a CAGR of 8.7%, while another<sup>4</sup> predicts that the global automotive ESP market will see a CAGR of 6.3% between 2018–2022.

### Research and development

R&D spending in the automotive industry will continue to rise as OEMs need to invest in new technologies.

Much of this spending is in Europe where in 2016/17, 24% of all R&D spend<sup>5</sup> went on the automotive sector, while in Asia the automotive sector accounted for 19% of R&D spend. VW is by far the largest R&D investor in the sector. In late 2018 it announced<sup>6</sup> that, in order to accelerate its pace of innovation, it would increase its investment in R&D in the areas of digitisation, autonomous driving and electric mobility to €44bn over the next five years, up from an initial estimate of €34bn.

At present, VW the company has six battery-powered models in its product range, but by 2025 it has plans for more than 50 models and to produce approximately a million electric cars annually. VW has reached strategic

# €7.2bn

## *Increase of engineering services market by 2023*

supply agreements with a number of Korean and Chinese battery manufacturers to fulfil its ambitions.

ZF Friedrichshafen, the German vehicle technology provider, is another good example of the investment taking place across the industry. In recent years it has significantly expanded its development capabilities in autonomous driving and plans to invest €12bn in electromobility and autonomous driving over the next five years. In early 2019 it opened a new test centre for driveline technologies, creating additional testing capacities for electric, hybrid, and internal combustion engine drives.

### R&D spend in the automotive industry

| Company        | R&D spend 2017/2018 (€bn) |
|----------------|---------------------------|
| Volkswagen     | 13.14                     |
| Daimler        | 8.66                      |
| Toyota Motor   | 7.86                      |
| Ford Motor     | 6.67                      |
| BMW            | 6.11                      |
| General Motors | 6.09                      |
| Honda Motor    | 5.40                      |
| Fiat Chrysler  | 4.28                      |
| Nissan Motor   | 3.66                      |
| Denso          | 3.30                      |

Source: 2018 EU Industrial R&D Investment scoreboard



## Industry challenges

A recent report<sup>7</sup> cited a number of key challenges facing the engineering sector:

- **Polarisation of engineering skills** – On the one hand, the increasing technical complexity of products requires more highly skilled systems engineers and architects. On the other, the increasing technical sophistication of products will require more scientific specialists. Between the two the more simple and detailed design tasks are likely to be supported by IT tools and Artificial Intelligence (AI) systems
- **Work in open ecosystems** – A growing and open ‘ecosystem’ brings several challenges. For example, car manufacturers must maintain control of all developments done by external suppliers and must be able to prove the robustness of their design in case of prosecution. Working efficiently with external players requires a common language and standard IT tools

- **Product Data Management** – Product Data Management (PDM) tools should promote company wide data sharing and can drastically accelerate new product development. But a gap exists between functionalities offered by IT engineering tools and the low adoption rate by engineers who are often reluctant to adopt new tools
- **Fully agile and digital development process** – As the graph on page 2 shows, the global market for ESP in software and electronics is forecast to grow from €2.7bn in 2017 to €4bn in 2020 at a CAGR of 14%. The growing importance of software for engineering new products has promoted agility in old fashioned engineering organisations. The next challenge is to convert hardware engineers to become more accustomed to digital development, and synchronise hardware and software development
- **Use of product data to optimise design** – With the cost of sensors and data processing rapidly decreasing, almost any object will be able to produce

actionable data. Such data will provide valuable information to engineers on how their products are used in real life and the constraints they experience

- **Customer-centric product design** – B2B suppliers are increasingly focusing their innovation efforts on the needs of the final customer and are acquiring more and more user experience capabilities. New engineered products must not only match technical and functional specifications but also provide a unique ‘emotional’ experience

- 1: McKinsey & Co: Development Excellence – ‘Capturing the full value of collaboration with engineering service providers’
- 2: Bertrand/Clearwater International
- 3: Berylls Strategy Advisers, ESP market update 2018
- 4: ResearchAndMarkets.com: Global Automotive ESP Market 2018–2022
- 5: Oliver Wyman analysis: EU Industrial R&D Investment Scorecard
- 6: eeNews: November 2018
- 7: Oliver Wyman Engineering 2030

## Leading players

Worldwide 15 top-selling ESP companies

| Ranking | Company                 | Automotive sales 2017 (€m) | Total sales 2017 (€m) | Employees | Engineering focus  |
|---------|-------------------------|----------------------------|-----------------------|-----------|--|
| 1       | AVL List                | 1,550                      | 1,550                 | 9,500     | Drive systems, testing technology, simulation                                    |
| 2       | Bertrandt               | 894                        | 993                   | 11,800    | Total vehicle, environmentally friendly mobility, autonomous driving             |
| 3       | IAV                     | 798                        | 798                   | 7,000     | Powertrain, electronics and vehicle development                                  |
| 4       | Edag Engineering        | 717                        | 717                   | 8,404     | Total vehicle, production equipment, lightweight construction, e-mobility/car IT |
| 5       | Akka Group              | 559                        | 1,334                 | 4,734     | Total vehicle, digitisation, autonomous driving, e-mobility                      |
| 6       | Horiba Automotive       | 543                        | 1,448                 | 3,002     | Test systems, emissions measurement, vehicle tests, cyber security               |
| 7       | FEV                     | 529                        | 529                   | 4,743     | Engines, alternative drives, E/E measuring and testing technology                |
| 8       | Bosch Engineering       | 520                        | 570                   | 2,100     | Software and function development, networking, E/E systems, IoT                  |
| 9       | Altran                  | 500                        | 2,282                 | 7,800     | Total vehicle, driver assistance, connected car, powertrain                      |
| 10      | Alten Group             | 491                        | 1,975                 | 6,000     | E/E systems, car2X, interior, drive, validation                                  |
| 11      | Magna Steyr Engineering | 380                        | 380                   | 2,100     | Total vehicle, engineering services, E/E, alternative drivetrain                 |
| 12      | Assystem Group          | 274                        | 700                   | 4,200     | E-mobility, connectivity, driver assistance, safety/security, lighting           |
| 13      | ETAS                    | 235                        | 235                   | 1,100     | Embedded systems, engineering, consulting/training                               |
| 14      | Applus IDIADA           | 198                        | 198                   | 2,335     | Total vehicle, module and component development                                  |
| 15      | Continental Engineering | 175                        | 185                   | 1,500     | Chassis, drive and interior electronics systems, prototype construction          |

Source: Automobilwoche

# M&A activity

**The business models of OEMs and tier one suppliers – the customers for ESPs – are rapidly changing as they deal with the opportunities and challenges posed by e-mobility, digitalisation, increased connectivity, and autonomous driving.**

A particular feature of these global megatrends is that they are leading to increasingly complex project assignments and a focus on integrated vehicle competence, a trend which only further drives the need to form new partnerships.

In order to accelerate their design and engineering capabilities in the automotive growth areas, OEMs and tier one suppliers, as well as ESPs, are turning to M&A to acquire the relevant know-how.

## Multiples

A measure of the significant interest in the ESP sector is that it is seeing above average multiples compared to other areas of the automotive industry. For instance, listed comparable companies generally trade between 6–8x EBITDA, depending on the type of services offered. The more software-based the product offering is, the higher the multiples too.

## Recent trade deals

- **ZF Friedrichshafen**, a German manufacturer of automotive components, acquired a 35% stake in German engineering services provider **ASAP Holding**. ASAP has extensive expertise in the areas of autonomous driving, e-mobility, connected cars and vehicle software

- **Altran**, a leader in engineering and R&D services, acquired **Benteler Engineering**, a German specialist in design and engineering services for the automotive industry
- **Honda**, the Japanese automaker, acquired a €665m stake in **Cruise Holdings**, the self-driving unit of General Motors (GM) which the US OEM acquired in 2016. The two companies will now collaborate on a purpose-built autonomous vehicle and Honda has also committed a further €1.75bn to the project over the next 12 years. GM is aiming to develop a vehicle, based on its electric Chevrolet Bolt, with no steering wheel or pedals that can be used in driverless taxi and delivery services
- French technology consulting and engineering company **AKKA Technologies** acquired a controlling interest in **MBtech Group**, a German engineering and consulting services provider to the automotive, rail, and aerospace industries. The deal creates one of Europe's largest

engineering consultancies. AKKA has its main focus in France, Italy, Spain and the UK, while MBtech has a strong market position in Germany, China and the US

- **Beijing BDStar Navigation**, the listed China-based specialist in satellite navigation positioning equipment, acquired a majority stake in **in-tech**, a German company which develops and tests automotive electronics systems
- **Minda Industries**, an Indian automotive company, acquired an 80% stake in **iSYS RTS**, a German hardware and software developer for OEMs. The deal helps Minda expand its electronic control units' offerings and technology solutions
- **Dana Incorporated**, a US designer and manufacturer of cars, automotive components and technologies, acquired a majority stake in **TM4**, a Canadian designer and manufacturer of motors, power inverters, and control systems for electric vehicles. **TM4** is a subsidiary of Canada's largest electricity producer, Hydro-Quebec



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- **FEV Group**, a German powertrain and vehicle engineering company, acquired **B&W Fahrzeugentwicklung**, a German vehicle development company which also provides professional engineering services. FEV's expertise ranges from consulting to the development and testing of innovative vehicle concepts, and it is investing heavily in the development of hybrid and electric powertrains, as well as in alternative fuels

#### Recent private equity deals

- **3i** acquired **Formel D**, a global service provider to the automotive and component supply industry. As part of the deal CITIC Capital also invested in the company in a move which helps Formel D further build its presence in Asia. In another deal involving the private equity group, 3i also sold German drivetrain testing company **Atesteo** to industrial holding company IHO Holding
- **Abris Capital Partners**, a Polish private equity firm, took a majority stake in **CADM Automotive**, a fast-growing design office specialising in the development of individual components as well as entire modules and systems for the automotive sector. CADM was founded in 2012 and has clients across Europe, the US, China and Japan including leading automotive brands such as Bentley, Porsche, Jaguar, VW and BMW
- The Saudi Arabian sovereign investment fund **Public Investment Fund** acquired **Lucid Motors**, a US manufacturer of battery chargers and battery-monitoring

software for the automotive and aerospace sectors. The deal provides Lucid with the necessary funding to commercially launch its first electric vehicle, the Lucid Air, in 2020. Lucid will use the funding to complete engineering development and testing of the Lucid Air, build a factory in Arizona, and begin the global rollout of its retail strategy

- **Meti Holding** acquired a 35% stake in **TM Performance**, an Italian provider of components and services to the motor sports industry. TM offers production, engineering, and problem-solving services for major brand names across the industry such as Automobili Lamborghini, Dallara, JAS Motorsport, Abarth (FCA Group), and AUDI Sport Italia

# Interview with Ricardo Automotive



**While shared mobility, electrification and automation present huge challenges for OEMs, they are all opportunities for engineering service providers, says Markus Doerr, Managing Director of Ricardo Automotive (EMEA).**

Not since the very creation of the automotive industry has it faced such huge challenges. As Markus Doerr says, right now not only are OEMs dealing with the headwinds of Brexit, trade wars and a slowing Chinese and global market, but also grappling with the need to completely transform their businesses and invest in shared mobility, electrification and automation.

“It all makes for a particularly challenging time. OEMs need to decide where to put their money, yet at the moment it is difficult because the market overall is going down, the volumes are dropping, and China is extremely difficult. All these factors make it difficult to absorb the R&D investment needed right now,” he says.

“We are talking billions of euros of investment in powertrain, billions in autonomous driving and connectivity. And then there is also the investment

needed into shared mobility concepts and subscription models which some OEMs actually don't really like that much because it is a threat to their business model.”

## R&D

Doerr says in the past the strength of the market would have ensured that the higher R&D cost could be absorbed.

“But right now the music has stopped playing and OEMs realise they have substantial R&D costs and capital expenditure, and need to absorb that. We have a combination of a market that is going down in key geographies, and at the same time spending commitments that are very difficult to cut.

“Some OEMs have deep enough pockets to play, but there are others that may find it very difficult, and what you see is that even those with deep pockets are now coming together to jointly stem the investment needed. A good example was BMW and Daimler recently saying they would invest €1bn in a mobility joint venture.”

However, Doerr believes this market flux is temporary. “Ultimately these new trends, which are now either in full swing or approaching market entry, are positives for the industry. OEMs will emerge stronger and in the long run will benefit from the investments they are making now. Also, in time, their investment and R&D will be better channelled because they will know more what the customer wants.”

## ESP market

Doerr stresses too that all this change is very positive for a company like Ricardo

and Engineering Service Providers (ESPs) in general.

“Every engineering service company benefits from change because that change means more engineering work. Right now OEMs do not actually know what the mix is going to be between the different powertrain options, but they need to make an investment into hardware and production facilities, and to line up supplier contracts.”

The result, he adds, is that the ESP market has now become very competitive with many new entrants either coming from specialised fields such as connectivity, electrification and autonomous driving, or coming from emerging markets.

Ricardo, a global engineering, environmental and strategic consultancy based in the UK, has been looking at these trends for a long time across the wider transport and energy sectors. For instance, in terms of the automotive industry it has specifically been looking at powertrain electrification and emissions improvement.

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Adds Doerr: “We have a lot to offer OEMs because we have real automotive experience, total powertrain experience, so that they can trust that we can take a project to production, and critical size. One way you de-risk things in a risky world is to have a partner that you can trust and which has proven time and again that it can deliver a programme. What also helps us is our niche manufacturing capability which is relevant to both established OEMs and new entrants.”

Meanwhile he says OEMs are also outsourcing more services in areas such as hardware technology and Artificial Intelligence (AI). “OEMs are also making strategic acquisitions because a lot of the technology they need will come from tier one suppliers.”

He adds that while electrification is something that OEMs will want to do at least partially in-house, when it comes to connectivity and autonomous driving, then functions will be significantly outsourced, especially in terms of hardware. “There are very few OEMs that would produce sensors, cameras or LIDAR for autonomous driving.”

## Electric

So where are OEMs putting their money right now? “I would say electrification is very high on the agenda, but it is also probably closer to what OEMs have always done as they have always done powertrains. Is electrification therefore a safer bet for OEMs? It is still a massive shift, but a lot of them have been looking at this over many years,” says Doerr.

“Electrification may increase the cost of the vehicle as the battery cost is

substantial, so managing the product cost is a key area of focus for OEMs.”

Ricardo is investing in both the electrification and autonomous sectors, having recently set up a technical centre in the US in Santa Clara, in the heart of Silicon Valley, alongside its existing facility in Detroit. “We recognised quite early that the US automotive market isn’t just about Detroit, but that there is a whole new set of players emerging, and many of them are based on the West Coast. We felt we needed to be closer to these players which have acted as a catalyst for the whole industry to embrace these trends. If you take Tesla, it has achieved what many OEMs considered unachievable, and established OEMs are now coming out with vehicles which will compete head on with them.”

Ricardo is also presently engaged in a large number of electric vehicle battery programmes. “We help with the chemistry selection, the cell format selection, the packaging of the cells, and the thermal

management. We can support in a lot of different areas and we can also assemble the battery too.”

## Autonomous driving

What about autonomous driving, where is that market right now?

Adds Doerr: “At the moment there is a lot of talk about achieving level 4 autonomy which is ‘mind off and hands off’ in specific conditions. But if you look in detail at recent announcements it is often just prototype vehicles being deployed in areas under special conditions. If we are talking about real urban driving or long distance driving, I think autonomous driving is still quite far off. The challenges are very significant because the human being is a difficult benchmark to crack. There are also issues around weather considerations, the state of roads and hazards, the fact that sensors need to be clean at all times, not to mention a host of ethical, regulatory and insurance issues.”

## Who is Ricardo?

Ricardo is a global strategic engineering and environmental consultancy that specialises in the transport, energy and scarce resources sectors. Its work extends across a range of market sectors including passenger cars, commercial vehicles, rail, defence, motorsport, energy and environment, and its clients include transport operators, manufacturers, energy companies, financial institutions and government agencies.

In addition to its technical consultancy services, it has in-house engineering

capabilities that enable it to design and deliver high-quality prototypes and low-volume manufacturing of complex products and assemblies, including engines, transmissions, electric motors and generators, battery packs and fuel cell systems.

The company traces its roots back more than a century to when it was founded by Sir Harry Ricardo, one of Britain’s greatest engineers of the early 20th century.

Nonetheless, he still believes that advanced driver assistance systems have a “great future”. “I fully believe that level 4 automation will be something that will happen and be understood under restricted conditions. But I think it’s still quite a long way until we get vehicles that have no steering wheel or brake pedal.”

### Diesel

Meanwhile amid all the excitement about electric and automation, Doerr adds that it is easy to forget that diesel still has a major role to play in the industry. Ricardo has long been a major player in the diesel engine market.

“When you look at diesel you need to differentiate between the different segments. Diesel is still very relevant for sectors such as commercial vehicles, off highway equipment and marine engines where it is still the combustion engine of choice.

“If you look at car manufacturers, yes we have seen a collapse of the diesel share in many markets. But I don’t think it’s a dead market and there will be interest in the medium term for diesel engines in the passenger car market. These engines are still important for CO<sub>2</sub> compliance and it will be very difficult for OEMs and governments to meet environmental targets without the diesel engine. At the same time the diesel technology has improved, while in terms of compliance there is now a lot of scrutiny in the real world, not just on the test stand. The latest emission level diesel cars are clean cars. The reason every premium vehicle manufacturer is very exposed to the diesel market is precisely because it is a very

good powertrain choice from a CO<sub>2</sub> and efficiency perspective.”

### Brexit

Finally, what about the Brexit challenge? While agreeing that it is “very disruptive” to the automotive industry as shown by a number of recent announcements in the UK, Doerr says Ricardo is a lot less exposed to the consequences because only a relatively small fraction of its business is manufacturing. “However it is a different

story if you are stocking up for a 2,000 units per annum engine production run or a much larger-scale engine manufacturing operation. The latter is a different magnitude of challenge.”

Having said that, he says the impact of Brexit on free movement of labour is an issue. “Also, there will be a certain perception that it is more difficult to deal with a UK company. Nonetheless I do believe we are well prepared.”



*“The reason every premium vehicle manufacturer is very exposed to the diesel market is precisely because it is a very good powertrain choice from a CO<sub>2</sub> and efficiency perspective.”*



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Working for many years with leading suppliers and OEMs, and more recently with new digital players, we have built up an extensive network and knowledge of the sector, becoming a trusted adviser for many of the world's leading automotive players. With more than 270 successfully completed automotive deals, our unique automotive transaction experience covers virtually every system and component of a vehicle, all relevant materials and process technologies.

**faurecia**

acquired

**Coagent**  
好帮手电子

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Buy-side  
€180m

**BENTELER**

sold

**BENTELER**  
Automotive  
Forschung

to

**chassisx**

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Sell-side  
Undisclosed

**kap**

sold

**GEIGER**  
FERTIGUNGSTECHNOLOGIE

to

Zhejiang Tieliu  
Clutch Co., Ltd

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Sell-side  
Undisclosed

**ORLANDO**  
MANAGEMENT AG

sold a majority stake in

**BEINBAUER**  
GROUP

to

**H I G**  
CAPITAL

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Sell-side  
Undisclosed

**均胜电子**  
JOYSON ELECTRONICS

acquired

**KSS**  
KEYSAFETYSYSTEMS

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Buy-side  
€815m

**BorgWarner**

sold

**BERU**

to

**Huf**

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Sell-side  
Undisclosed

**SHAFTEC**

received investment from

**Ardenton**

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Sell-side  
Undisclosed

**ALANTRA**

acquired a majority stake in

**MD** **Moldes**

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Buy-side  
Undisclosed

**FEDERAL**  
**MOGUL**

sold

it's interior lighting business

to

**博奥集团**  
BOAO GROUP

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Sell-side  
Undisclosed

# Our international automotive team

With offices in Europe, the US and Asia, our automotive team can deliver seamless, integrated global advice to SME/owner-managed, corporate and private equity clients. Our team is supported by a number of high-profile senior advisers who are all former top tier executives with relevant product knowledge and a far-reaching network of contacts.



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