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# IN 2021, THE global automotive industry generated re

IN 2021, THE global automotive industry generated revenue estimated to total \$2.7 trillion. That makes those who hold its levers incredibly powerful, even if overall profits might not match those of, say, the tech industry.

The sheer size of the workforce needed to equip, assemble and distribute new cars and the money generated from them give those at the top power at an almost state level. But the balance of that power is constantly changing, and never more so than now, as the swing to electrification shifts influence to suppliers and new geographical hubs, particularly China. And while automotive newcomers may not generate the revenues of the established behemoths, their share of voice and their ability to move markets in their direction give them sway that goes far beyond mere income.

In our first Power List, we have endeavoured to identify the 100 biggest power brokers in the automotive industry in the first half of 2022. It's a very different list than we would have created five years ago, and no doubt it will look very different five years hence.

Arguably, this business has never moved as fast as it is doing right now. Those currently in power had better enjoy it while it lasts.

Nick Gibbs, business correspondent, Autocar



# **POWER LIST 100**



### **CARLOS TAVARES CEO. Stellantis**

CARLOS TAVARES WON this top spot by achieving the improbable, if not the impossible, as head of Stellantis, the company formed a year ago combining the PSA Group with Fiat Chrysler Automobiles. He has taken this sprawling collection of 14 brands, many unprofitable, and managed to post €13.4 billion (£11.2bn) profit for the year, with a mind-boggling 11.8% margin.

It was a good year for many car makers, granted, as they prioritised more profitable models amid a shortage of semiconductors, but Tavares has long shown an ability to create profit where others have failed. Notably, he achieved this with Opel and Vauxhall, which PSA took over in 2017 and turned a profit in 2018 after almost two decades of losses under General Motors.

Tavares's success comes partly from a forensic attitude to cost-cutting (except perhaps when it comes to his own salary, a mighty €19 million in 2021). In an industry known for its ability to spend money, Stellantis is frugal, almost painfully so sometimes. A 2017 report published by the bank Bernstein compared Tavares's approach with that of the investment firm beloved of American investor Warren Buffett, 3G. It practised 'zerobased budgeting', meaning that in each financial period, all expenditure must be justified over again. Tavares is obsessed with cost synergies, and that's why the Stellantis deal made such good sense to him: the cost of development can be spread over so many more brands.

So far, this has worked, partly due to his refusal to scrimp when it comes to vehicle design. A Citroën, a Vauxhall and a Peugeot might share underparts, but visually they all exist independently. That has meant so far Tavares

has given all the brands in the Stellantis stable, even unpromising ones such as Lancia, breathing space to reinvent themselves. Despite what must be a huge cost, underperforming factories have also been given the same chance.

Tavares, a Portuguese national with a love of classic car racing, cut his teeth in the Renault Group and at Nissan under Carlos Ghosn, 'Le Cost-Cutter', who went on to undermine his good work with a financially crippling growth-at-allcosts strategy before being toppled. Tavares switched to PSA in 2013 after publicly saying he wanted to run his own car company. With Stellantis now on firm footing, Tavares has to become less of a chief operating officer and more the inspirational CEO, who can convince investors and potential job candidates that he can propel this stable of brands into one that doesn't just exist in the new automotive world but defines it.



**ELON MUSK** CEO, Tesla

ELON MUSK HAS single-handedly accelerated the development and market for EVs in the years since 2008, when Tesla launched the Lotus Elisebased Roadster. He overcame many struggles to scale up production, and last year Tesla built almost a million cars. In the process, Musk has helped make Tesla the world's most valuable car company, based on a stock-market valuation that's back past \$1 trillion - almost five times more than the second-highest-valued, Toyota.

If Tesla is Musk, then Musk isn't just Tesla: he also runs SpaceX, Neuralink and The Boring Company. In April, he moved to buy Twitter, too, leading some to complain that his attention isn't focused enough on his automotive operations, which are currently too reliant on just two models: the Model 3 and related Model Y.

The South African-born entrepreneur has in his leadership of Tesla made every single legacy car maker reassess how it does business in the transition to EVs. Whether Musk can continue to keep ahead of the pack as his rivals attempt to blend Tesla's digitally led speed with their more rigorous development approach is one of the key automotive questions of the decade.

# **HOW IT WORKS**

THE POWER LIST 100 details the achievements of all the major movers and shakers in the automotive industry, based on the following criteria: global reach and influence, spending power, share of voice, technological influence, future growth potential and market capitalisation.

The top 10 are ranked and the remaining 90 names on the list are grouped into categories, including executives from more traditional car makers to the rising powerhouses from China, the latest technology and mobility companies and heavyweight political figures.

The top 100 were chosen by the editors of Autocar Business, the new B2B product from the publisher of Autocar, designed to bring industry readers even closer to the inner workings and key players of the global automotive industry.







## **AKIO TOYODA** President, Toyota **Motor Corporation**

AKIO TOYODA IS the opposite side of the coin to Elon Musk. Since assuming the presidency in 2009 of the Japanese company founded by his grandfather, still the world's largest car maker, judged by 2021 sales, Toyoda has focused very much on the cars themselves. One of his missions has been to make them more interesting to drive while retaining the quality Toyota has long been known for. Under Toyoda, the company has thrived on its leadership in hybrids while moving more cautiously to electric vehicles, mindful of the huge disruption to Japanese suppliers that Toyota supports the world over.

A keen racer, Toyoda is the voice of automotive common sense where Musk might be seen to overpromise. Like Musk, however, Toyoda is masterful when it comes to projecting his image, which has moved a long way from that of staid corporate Japan presented by previous company heads.



## **EUISUN CHUNG** Chairman, Hyundai **Motor Group**

IN 2020, EUISUN Chung finally took the reins of the firm founded by his family, and he has since worked to continue the modernisation that he has been pushing through since joining in 1999. Seen as more nimble and quicker to experiment than Toyota, Hyundai's equivalent in Japan, the Korean firm has a global perspective largely due to Chung, who studied in San Francisco.

He was the driving force behind the formation of the Genesis premium brand, which is now rolling out across Europe. Hyundai's moves to invest in EV start-ups including Canoo, Arrival and Rimac weren't the decisions of a company hampered by its size and legacy, while the addition of newer technology such as the 800V electrical set-up mated to fresh designs such as the Hyundai Ionia 5 and Kia EV6 marks the latest reinvention from a firm that doesn't like to hang about.



## HERBERT DIESS Chairman. Volkswagen AG

HERBERT DIESS PRESIDES over the world's second-largest car company after Toyota and Europe's biggest. He joined the Volkswagen Group from BMW in 2015 and was made chairman in 2018 in the wake of the Dieselgate scandal.

Diess's single-minded drive to embrace electric has led to an overhaul of the company's business unmatched elsewhere among rival legacy makers, and his public admiration for Tesla's Elon Musk is just part of that desire to rethink how VW operates. Diess has so far managed to tread the delicate line between appeasing VW's workers and the stock-owning state of Lower Saxony that supports them while also shaking up manufacturing to move away from internal combustion engines.

He has made all the right moves to put the company seemingly at the forefront of software and autonomous driving, although the result of these efforts won't be seen until at least the middle of the decade.

## 'Li Shufu has been dubbed the Henry Ford of China for his appetite for growth'



## **JIM FARLEY** President and CEO. **Ford Motor Company**

AFTER JIM FARLEY took over as Ford CEO in 2020, the company's stock doubled and at one point was valued at more than \$100 billion. It seemed an unlikely success for a traditional 'car guy' CEO who rose through the Ford ranks and on weekends is found racing his Ford GT40 sports car, but his arrival at the top has re-energised a company that had been reforming but not nearly fast enough for investors.

When in charge at Ford of Europe, Farley championed the Puma compact SUV that has become the firm's best-seller over here, and he's now busy putting his weight behind electrification.

Specifically in the US, that means the F-150 Lightning electric pick-up truck, a totemic vehicle for a new Ford era in which the electric division (Model E) is split from the internalcombustion-engine one (Ford Blue).



## **OLIVER ZIPSE** Chairman, BMW AG

OLIVER ZIPSE WAS BMW's production head before being promoted to the top job in 2019, and he has had to find the right line between pushing into EVs and keeping plants flexible enough to continue building profitable internalcombustion-engine models. This he has done, posting record profits in 2021 and outselling rival Mercedes-Benz for the first time since 2015.

BMW also managed to outperform its CO<sub>2</sub> emissions target in the European Union by 10g/km - an impressive feat.



AUTOCAR BUSINESS

Zipse, who trained as a mechanical engineer and joined BMW in 1991, has also kept a focus on digital tech while ensuring that development has kept pace with the customer experience.



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## OLA KALLENIUS Chairman, Mercedes-Benz Group AG

OLA KALLENIUS ISN'T the flamboyant showman that his predecessor Dieter Zetsche was, but the softly spoken Mercedes-Benz stalwart has made a real impact since taking over in 2019.

He split the company last year from its truck division, changing its name from Daimler to Mercedes-Benz Group in the process, and secured the first accreditation from the German authorities to run cars with level-three autonomy, allowing hands-free driving. Under Källenius, Mercedes' stock price has recovered, and it's currently the fifth-highest-valued car company, above key rival BMW.

His stated aim to enact a less volume-fixated strategy with more focus on luxury models is so far paying off in terms of profits, but it remains to be seen if those goals waver as the semiconductor-imposed constraints start to loosen.



MARY BARRA CEO, General Motors

MARY BARRA IS one of the longest-serving CEOs of the major global car companies after being promoted to run General Motors in early 2014 from her previous position as head of product development and purchasing.

Barra's thorough experience of GM and its people (she was the company's head of HR for a while, too) has allowed her to navigate internal divisions as well as giving her the authority to make dramatic changes, including pulling out of Europe, India, Russia and Australia in an attempt to stem losses and focus on core regions such as the US and China.

She has poured money into future tech like EVs and autonomous driving, albeit with little to show for it so far, but not at the expense of profitability.

Barra has long since banished initial suspicions that she was appointed as a friendly face after GM came out of partial US-government ownership following the 2008 financial crash and has navigated the firm through structural changes and headwinds equal to, if not more daunting than, those dark days.



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## LI SHUFU Chairman, Zhejiang Geely Holding Group

A STANDARD RESPONSE on social media to news that a car brand is financially ailing is to ask if Geely will buy it. The Chinese company started by Li Shufu first produced refrigerator parts before moving to motorbikes and only made its first car in 1997. Since then, it has acquired brands as diverse as Volvo, London cab maker LTI (now LEVC), Proton and Lotus, while taking a near-10% stake in Mercedes-Benz and a 50% share of its Smart division.

A rare privately owned company in China, rather than state-run, Geely has also built up a stable of home-grown brands, such as Lynk&Co, that between them clocked up sales of more than 1.3 million last year. Li Shufu has been dubbed the Henry Ford of China for his appetite for growth, but even the Ford founder would boggle at the complicated corporate structures built to divide up ownership of the various brands.

The affable poem-quoting boss inspires an almost cult-like following among his employees, but Geely-owned companies are encouraged to work autonomously, rather than to a corporate diktat, allowing them to move quickly.





MAKOTO UCHIDA PRESIDENT AND CEO, NISSAN MOTOR COMPANY

MAKOTO UCHIDA WAS the long-time Nissan executive chosen in 2019 to restore the company's pride following the rise and dramatic fall of his predecessor, Carlos Ghosn. Restructuring and kinder winds in 2021 have helped Uchida return Nissan to profit after a truly disastrous 2019 and 2020.



TOSHIHIRO MIBE PRESIDENT AND CEO, HONDA MOTOR COMPANY

IN THE SHORT time since Toshihiro Mibe took control last year, Honda has already ditched its conservative, rather aloof attitude and announced a series of groundbreaking partnerships, including collaborating with Sony on a new EV brand and vastly expanding its relationship with GM to build affordable EVs.



LUCA DE MEO CEO, RENAULT GROUP

ITALIAN-BORN LUCA de Meo has perhaps the widest experience of European car makers, with stints at Toyota, FCA (including Fiat) and the VW Group, where he rose to head Seat before moving to Renault in 2020. He joined in a year the firm posted an €8 billion loss, but initial restructuring helped de Meo return Renault to profit in 2021.



TOSHIHIRO SUZUKI Chairman. Suzuki motor corporation

TOSHIHIRO SUZUKI'S PROMOTION to chairman in 2021 completed the handover of power from his father, who retired after 40 years in the role. Already president and CEO, the younger Suzuki now fully presides over a company that, while strong in core markets such as India, is increasingly leaning into partner Toyota to make the change to electric vehicles and the digital era.



THIERRY BOLLORE CEO, JAGUAR LAND ROVER

HIRED BY JLR in 2020, Frenchman Thierry
Bolloré immediately made far-reaching decisions
to clamp down on costs at the loss-making
company and reset programmes, including
repositioning Jaguar as a luxury EV brand. The
former Renault CEO, ousted in 2019, aims to
return JLR to profitability with fewer, higherpriced models better targeted at customers.



AKIRA MARUMOTO
PRESIDENT AND CEO,
MAZDA MOTOR CORPORATION

AKIRA MARUMOTO JOINED Mazda in 1980 and was promoted to the top spot in 2018 following a stint in the US, its biggest market. He has yet to properly define the brand's electrification path for its 1.2 million sales but remains focused on squeezing more mileage from its efficient ICEs.



JIM ROWAN
PRESIDENT AND CEO. VOLVO CARS

SCOTSMAN JIM ROWAN was a surprise choice to replace Håkan Samuelsson in March after the latter's 10 years of nimble manoeuvring to push Volvo to new heights. However, Rowan's non-automotive background, most recently as CEO of the Dyson Group between 2017 and 2020, gives him a fresh perspective on an industry that needs to think about things differently.



JOHNELKANN Chairman, Ferrari and Stellantis

JOHN ELKANN IS the great-grandson of Fiat cofounder Giovanni Agnelli and was instrumental in the successful merger of FCA and PSA to form Stellantis, a move that has kept the Fiat name alive. Elkann is also the chairman of Ferrari by dint of his leadership of Exor, the Agnelli family holding company that owns a controlling stake in the brand along with a host of other businesses.



MAXIME PICAT CHIEF PURCHASING AND SUPPLY CHAIN OFFICER, STELLANTIS

MAXIME PICAT HAS been a driving force behind the successful merger of 14 Stellantis brands in Europe, helping to streamline business structures and extracting impressive profits. Talked about as a possible replacement for CEO Carlos Tavares, he has just taken charge of the group's purchasing.



UWE HOCHGESCHURTZ CHIEF OPERATING OFFICER, ENLARGED EUROPE, STELLANTIS

UWE HOCHGESCHURTZ JOINED Stellantis from Renault in September 2021 as Opel CEO and less than a year later got Maxime Picat's old job as the group's chief operating officer. CEO Carlos Tavares's target of being the leader in Europe and double-digit profitability will be top of the former Ford and Volkswagen man's to-do list.



JAEHOON CHANG President and Ceo, Hyundai Motor Group

JAY CHANG WAS given this key role supporting the chairman in 2020 after running the group's Korea region and more recently the Genesis luxury brand. His global outlook has helped transform Hyundai's rather stiff, top-down management structure to something more agile and better equipped to deal with a fast-changing automotive landscape.



JEAN-DOMINIQUE SENARD CHAIRMAN, BOARD OF DIRECTORS, RENAULT GROUP

THE VETERAN FRENCH industrialist was parachuted in as Renault chairman in 2019 by the French state, its largest shareholder, with a brief to save the Renault-Nissan-Mitsubishi Alliance – and this he achieved against all odds following the dramatic ousting of Carlos Ghosn.



GILLES LE BORGNE EXECUTIVE VICE-PRESIDENT, ENGINEERING. RENAUIT GROUP

GILLES LE BORGNE, one of France's most eminent engineers, was dramatically announced as Renault's new vehicle development head in 2020 after 30 years at its PSA rival. His arrival has helped slashed model development times, shaved engineering bills and given Renault the model pipeline needed to ensure its survival.



ASHWANI GUPTA COO. NISSAN MOTOR CORPORATION

ASHWANI GUPTA JOINED the Renault-Nissan-Mitsubishi Alliance back in 2006 as purchasing manager for Renault India and is now one of the world's most high-profile Indian automotive executives as Nissan's number two, a position he took up in 2021. With experience in the US, in China, in vans and in helping to reset Mitsubishi, Gupta is a next-generation CEO-in-waiting.



HANS DIETER POTSCH CHAIRMAN, SUPERVISORY BOARD, VOLKSWAGEN AG

AS CHAIRMAN OF both the supervisory board of VW AG and the executive board of Porsche SE, Hans Dieter Pötsch is a key figure in the VW Group and indeed was seen as brokering peace between the unions and CEO Herbert Diess in 2021. He was appointed in 2015 after the Dieselgate scandal.



MURAT AKSEL BOARD OF MANAGEMENT MEMBER, PURCHASING, VOLKSWAGEN AG

PURCHASING MANAGERS ARE becoming increasingly important in the electric age as car makers pin down battery supplies, and Murat Aksel holds arguably the most powerful purchasing position in the automotive industry. Aksel, who joined from BMW in 2021, also chairs Skoda's supervisory board.



WOLFGANG PORSCHE CHAIRMAN, SUPERVISORY BOARD, PORSCHE AG AND PORSCHE AUTOMOBIL HOLDING SE

A GRANDSON OF Ferdinand Porsche, Wolfgang Porsche holds enormous sway over the Volkswagen Group as chairman of its holding company, Porsche SE, as well as of Porsche AG itself, the group's most profitable entity. He also acts as the Porsche-Piëch family's spokesman.



FRANK WEBER MEMBER, BOARD OF MANAGEMENT, DEVELOPMENT, BMW AG

FRANK WEBER WAS nominated the board member responsible for development at the BMW Group in 2020 after impressing with his engineering management of Rolls-Royce as well as BMW's top-end models. He joined BMW in 2011 after rising through the ranks at GM in Europe.



NORBERT REITHOFER Chairman, Supervisory Board, BMW AG

WHEN HE RAN BMW from 2006 to 2015, Norbert Reithofer oversaw one of the most profitable periods in its history, and as chairman of the supervisory board, he continues to hold enormous sway. He was re-elected in 2020 with the promise to reform the board following accusations that only a few members, including Reithofer, had any oversight influence.



MARKUS SCHAFER
MEMBER OF THE BOARD OF MANAGEMENT,
DEVELOPMENT AND PROCUREMENT; CHIEF
TECHNOLOGY OFFICER. MERCEDES-BENZ AG

MARKUS SCHAFER IS the de facto number two at Mercedes-Benz, with oversight of development and purchasing, both crucial positions as the firm transforms into an EV powerhouse. Schäfer has held numerous roles since joining the company in 1990, including heading its US operations.



WILLIAM CLAY FORD JR Chairman, ford motor company

BILL FORD IS the great-grandson of Ford founder Henry Ford and its executive chairman since 1999. Ford's clout comes partly from his stake in the family shares, which, due to a two-tier stock structure, give them 40% voting power. However, Ford has long been active in running the business, holding a variety of roles.



HAU THAI-TANG CHIEF INDUSTRIAL PLATFORM OFFICER (HEAD OF RGD), FORD MOTOR COMPANY

IN HIS PREVIOUS role, Hau Thai-Tang was charged with leading the development of Ford's first bespoke passenger EV, the Mustang Mach-E, and an electric version of its best-selling vehicle, the F-150 pick-up. He now oversees engineering, development, planning, manufacturing and purchasing across all vehicle divisions.



DOUG FIELD CHIEF EV AND DIGITAL SYSTEMS OFFICER, FORD MODEL E

AS THE CHIEF engineer behind the Tesla Model 3 and the one-time head of Apple's self-driving car programme, Doug Field is well placed to futureproof Ford's new models with an advanced connectivity and infotainment suite. His work will be crucial in introducing new revenue streams and ushering in next-level autonomous systems.



KUMAR GALHOTRA President, ford blue

FORD BLUE IS Dearborn's new combustionengined vehicle division, and Kumar Galhotra is responsible for sustaining profitability from these legacy products as the Model E arm ushers in EVs. Central to this will be a focus on improving quality while slashing costs and keeping models like the Mustang, F-150 and Bronco up to date.



DOUGL PARKS HEAD OF R&D, PURCHASING AND SUPPLY CHAIN, GENERAL MOTORS

DOUG L PARKS is best known for launching GM's Tesla Autopilot-rivalling Super Cruise system and leading the engineering of the Cruise AV driverless concept. He's now overseeing the roll-out of a new generation of electric cars and working with Honda to launch a series of low-cost platform-sharing EVs atop GM's Ultium architecture.



MARK REUSS President, general motors

WITH A HAND in each aspect of the global operations of Buick, Cadillac, Chevrolet and GMC, Mark Reuss is charged with electrifying and decarbonising some of the oldest and most hallowed names in motoring. In a previous role, he established the GM Performance Division in 2001, spawning the venerable V-Series Cadillacs, SS Chevrolets and ZR1 Corvette.



RATAN TATA Chairman Emeritus, Tata Group

TATA MOTORS ACQUIRED Jaguar Land Rover in 2008, and by 2015 JLR's sales had doubled, 20,000 new employees had joined and more than £13 billion had been invested in new products. Ratan Tata was chairman at the time but refused to take credit. "It's the people at JLR who have turned the company around," he said.



ANAND MAHINDRA Chairman, Mahindra Group

AS THE CHAIRMAN of a multibillion-pound global industrial giant and with a sizeable following on Twitter, Anand Mahindra is Mumbai's answer to Elon Musk. The company's automotive division is among India's largest, and Mahindra himself is regularly cited as one of the country's most influential and transformative businessmen.



ROGER PENSKE CHAIRMAN AND CEO. PENSKE AUTOMOTIVE

RESPECTED ENOUGH IN motorsport circles to merit a celebratory parade of his team's racing cars at Goodwood last year and to have his 2019 acquisition of both the Indycar Series and Indianapolis Speedway celebrated rather than condemned, Roger Penske is one of the biggest petrolheads in automotive retail. The Penske Corporation employs more than 60,000 people.



MASAHIKO MAEDA CHIEF TECHNOLOGY OFFICER, TOYOTA MOTOR CORPORATION

AS HE NEARS his third decade at Toyota,
Masahiko Maeda is one of the masterminds of a
rapid electrification push that will bring to market
some 30 Toyota and Lexus EVs by 2030. He's
also in charge of ZEV Factory, an internal division
devoted to product and business planning for EVs.



LINDA JACKSON CEO, PEUGEOT; MEMBER OF TOP EXECUTIVE TEAM, STELLANTIS

SIX YEARS AS Citroën's global CEO and then a year in charge of brand portfolio development at the PSA Group meant that Linda Jackson was always going to be one of the key people when the Stellantis conglomerate was formed in 2021. She now heads Peugeot, a big contributor to the group's recently posted £11.2 billion profit.



CHRISTIAN MEUNIER CEO, JEEP; MEMBER OF TOP EXECUTIVE TEAM. STELLANTIS

JEEP MAY NOT be the powerhouse it once was, but Christian Meunier still wields considerable influence at Stellantis, especially as SUV sales continue to climb and the Jeep brand is monetised properly within the overall group. Meunier and the brand's importance will only increase once Jeep ramps up its electrification in 2025.



JEAN-PHILIPPE IMPARATO CEO, ALFA ROMEO; MEMBER OF TOP EXECUTIVE TEAM, STELLANTIS

JEAN-PHILIPPE IMPARATO brought 30 years of experience at the PSA Group to Alfa Romeo, a lot of it around sales and quality control – two of the brand's weaknesses. After turning Peugeot around, crucially with healthy profit margins, it's hoped that he can perform the same trick in Italy.



OLIVER FRANCOIS CEO, FIAT AND ABARTH; GLOBAL CHIEF MARKETING OFFICER. STELLANTIS

FIAT'S OLIVER FRANCOIS was one of the few brand bosses to remain in post when Stellantis brought together FCA and PSA. He punched above his and Fiat's weight for nearly 10 years (Fiat was the biggest-selling brand in the group in 2021). Now Stellantis boss Carlos Tavares will be looking for the profits to follow the sales.



FLORIAN HUETTL CEO. OPEL AND VAUXHALL

TALK ABOUT A rapid promotion. No sooner had Florian Huettl started as head of sales and marketing at Opel and Vauxhall than barely six months later he was bumped up to the top job, replacing Uwe Hochgeschurtz. Opel's market share is on the up in Germany (its crucial country), while the brand's renewed market push in China will give Huettl extra clout within Stellantis.



RALF BRANDSTATTER CEO, VW PASSENGER CARS; MEMBER OF THE BOARD OF MANAGEMENT, VW AG

RALF BRANDSTATTER has led Volkswagen Passenger Cars for a number of years now, and from August this year will head the group's China operation. In a country that shifted 3.52 million electrified vehicles last year, Brandstätter's new role will be absolutely vital for both him and VW.



THOMAS SCHAFER
COO. VOLKSWAGEN PASSENGER CARS

THOMAS SCHAFER'S RISE has been impressive. Back in 2015, he was managing director of the Volkswagen Group in South Africa; five years later, he was chairman of the board of management at Skoda; and this year, he became chief operating officer of the Volkswagen brand and will join the group board of management for volume cars. A key player.



OLIVER BLUME CEO. PORSCHE AG

A VOLKSWAGEN GROUP lifer, Oliver Blume has the engineering background that all great Porsche bosses have. Not the most charismatic of CEOs, Blume has nevertheless steered Porsche to unprecedented success, regularly achieving a profit margin of 15% on each car sold. Rumours often point to his continued rise within the Volkswagen Group.



MARKUS DUESMANN CHAIRMAN OF THE BOARD, AUDI; HEAD OF RGD. VOLKSWAGEN AG

MARKUS DUESMANN'S INFLUENCE stretches beyond Audi's impressive numbers, as a result of the brand's visibility around the world. With Audi spearheading VW's future-facing Artemis project, as well as a return to sports car racing and an F1 entry, he holds the keys to a lot of exposure.



HILDEGARD WORTMANN BOARD OF MANAGEMENT FOR SALES, VOLKSWAGEN AG

THERE AREN'T MANY sales bosses on this list, but Hildegard Wortmann is different. That's partly down to Wortmann herself – in corporate Germany, women remain rare on executive boards – but also because of the scope of the brands she markets. VW sold 4.9 million cars in 2021, with an impressive share of voice versus top-spot Toyota.



DENIS LE VOT EXECUTIVE VICE-PRESIDENT AND CEO, DACIA AND LADA

DENIS LE VOT has worked all over the Renault Group since joining in 1990, but it's his background of jobs in Russia that will have helped him in his joint Lada and Dacia role – even if no amount of experience could have mitigated the implications of the war in Ukraine. Dacia looks like it will continue to boom, but Lada is less certain.





HO SUNG SONG
PRESIDENT. KIA MOTORS CORPORATION

HAVING BEEN APPOINTED in March 2020, Ho Sung Song has helped Kia negotiate the global semiconductor shortage that has massively hindered other brands. With his experience across the automotive value chain, he has overseen Kia sales of 2.78 million units in 2021, up 6.5% year on year. Overseas markets grew by 9.1%.



TORSTEN MULLER-OTVOS CEO, ROLLS-ROYCE MOTOR CARS

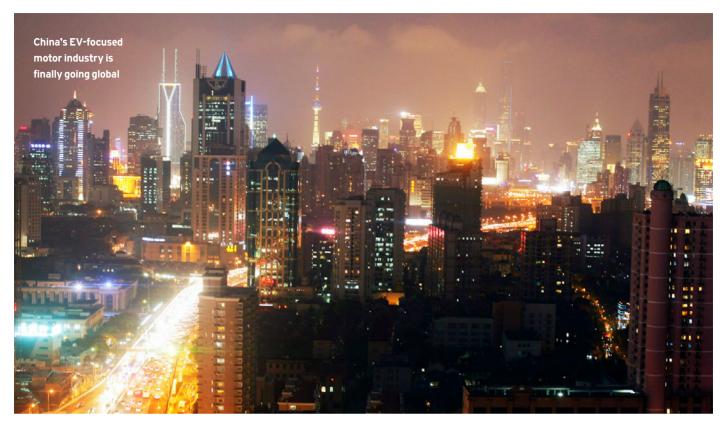
ROLLS-ROYCE OBVIOUSLY doesn't have the sales numbers of other brands but, under Torsten Müller-Ötvös, it continues to punch well above its weight in global exposure. He has been in charge since 2010 and in that time has increased sales virtually every year, thanks to successfully tapping into the global elite's ever-expanding appetite for luxury.



ADRIAN HALLMARK Chairman and Ceo. Bentley motors

IT'S HARD TO overstate Adrian Hallmark's value to Bentley. Not only was he integral to the launch of the 2003 Continental GT during his first stint at the firm, but since his return as CEO, the numbers have been staggering – record sales despite the pandemic and supply issues. With his bold electrification plan, Bentley is set up for the future.





# CHINA: THE BIGGEST COMPANIES

China is comfortably the world's biggest car market with 21.1 million units sold last year, endowing its automotive industry bosses with significant global influence.

Factories run or part-run by state-owed SAIC, for example, make six million vehicles a year, which would qualify as the world's second-biggest car company if every vehicle bore an SAIC badge.
Yet who knows the name of its boss, Chen Hong?
In the UK, best known of China's car barons is
Li Shufu, thanks to Geely's ownership of Volvo and
Lotus, but there are at least nine other CEOs and
chairmen who wield significant power, especially
those deeply into battery-electric vehicles.



CHEN HONG Chairman, Saic Motor Corporation

AS THE BOSS of China's biggest state-owned car company with sales of \$107 billion, Chen Hong exerts power and influence across SAIC's 13 brands, including MG and joint ventures with GM and VW. His current business plan is targeting more than six million global sales and pushing developments in electrification and self-driving.



WANG JUN President, Changan Automobile

THE WANG JUN-run Changan is China's fourth-largest state-owned car company with sales of 2.3 million units in 2021. Business is focused on the domestic market with Changan's own brands, plus long-standing joint ventures with Ford and Mazda. Changan also operates a UK R&D centre in Birmingham.



XULIUPING Chairman, Faw Group

FAW IS BEST known for its 'red flag', or Hongqi, limousines, once reserved for high-ranking government officials, but joint ventures with GM, Toyota and VW have turned it into the second-largest of the state-owned car makers, with 3.7 million units sold in 2020. Xu Liuping's seven-year plan aims to double sales and profits by 2025.



LI DONGHUI Ceo, Zhejiang Geely Holding Group

DANIEL LI IS CEO of Geely Holding and is the sprawling automotive group's de facto number two after Li Shufu. He was chief financial officer before being promoted to the newly created CEO role in 2020. Athough still more finance-oriented, he also has a say over strategic decisions. He has been a director of Volvo Cars since 2012 and is chairman of London cab maker LEVC.



WEI JIANJUN CHAIRMAN. GREAT WALL MOTOR

PRIVATELY OWNED GREAT Wall Motor majors on pick-ups and SUVs, although a new wave of car models include the Volkswagen Beetle-alike Ora Good Cat EV. Great Wall is at the forefront of Chinese expansion overseas, with CKD operations, a global distribution network and R&D centres in Germany, Japan and India. Sales and profits were up last year.



ZHU YANFENG Chairman, dongfeng motor corporation

ZHU YANFENG WIELDS considerable influence through state-owned Dongfeng's joint ventures with Honda, Nissan and Stellantis, reflected in its 3.3 million sales last year, making the car maker the third biggest in China. Zhu has also sold the company's 25% share in a loss-making venture with Kia.



YIN TONGYUE Chairman, Chery Automobile

YIN TONGYUE IS an important figure from a UK perspective, since state-owned Chery is JLR's assembly-plant partner in China, a joint venture that hasn't exactly run smoothly in the past. Chery is also teaming up with Apple supplier Luxshare to develop EVs. In China, Chery sells one million units a year, making it the ninth-biggest car maker, and it assembles CKD vehicles in Egypt and Iran.



AN JIN President, Jac Motors

JAC IS ONE of China's smaller automotive manufacturers, with an output of 524,000 in 2021, half of them cars. An Jin has resisted moves to merge with a larger group, instead pivoting to EVs to secure the firm's future. Like Chery, he has agreed to dilute JAC's holding in its joint venture (with Volkswagen), a move expected to sharpen its focus on home-grown models and brands.



QING HONG ZHENG Chairman, GAC Group

GAC, OWNER OF the Trumpchi, Aion and Hycan brands, has set an ambitious sales target of five million units by 2035 - double last year's total - half of which are to be 'new energy' vehicles. Its joint venture with Jeep has proved less successful, however, with sales declining for four years in succession. Negotiations with Stellantis to take control have so far been fraught.



WANG CHUANFU CEO. BYD

BYD SWUNG DECISIVELY behind electrification under billionaire boss Wang Chuanfu and now forecasts at least 1.5 million EV sales for this year. It also has a significant battery production subsidiary, with a new, slimmer 'blade battery' expected to boost sales. So far in 2022, it has ridden the chip crisis and reported significant sales and profit increases.





# **UP-AND-COMING EV COMPANIES**



THIS NEW BREED of automotive moguls have a single goal: to develop and deploy battery-electric powertrains to revolutionise road transport. Their businesses are incredibly new and growing fast as the transport industry pivots to electric vehicles and, in turn, have attracted billions of dollars of investment. What's interesting is that these three

fast risers operate in different areas of the market: everyday SUVs, \$2 million hypercars and pick-up trucks/delivery vans/SUVs.

Given the history of the car industry, there's one thing in this uncertain period that all three can bank on: competitors of their own will soon be along to try to grab a piece of the action.



WILLIAM LI Founder and Ceo. Nio

EV START-UP NIO has made astonishing progress in its seven-year existence, reflecting the vision of founder William Li. Sales are ramping up towards 100,000 a year, Nio has a credible four-model range, it's pioneering battery-swap tech and it has established an export business to Norway, with five more European markets in the pipeline.



MATE RIMAC Founder and Ceo, Rimac Automobili

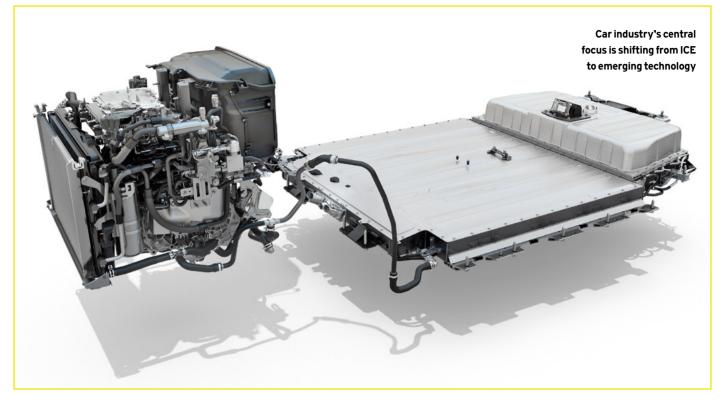
THE CROATIAN ENGINEER and entrepreneur has risen from EV hobbyist to partner of Porsche and co-owner of Bugatti in just 13 years, based on technical mastery of high-performance battery technology. Rimac packs now power its 1888bhp Nevera hypercar and Pininfarina Battista sibling, Aston Martin's Valkyrie and Koenigsegg's Regera.



RJ SCARINGE Founder and Ceo, Rivian Automotive

RIVIAN IS TAPPING into a similar BEV zeitgeist to early-years Tesla, having raised \$13.5bn in IPO funding and a valuation of \$66bn in 2021, despite having delivered only a handful of R1T trucks. The challenge for RJ Scaringe now is to make good on plans for an SUV, an Amazon delivery truck and a charging network across the US and Canada.





# SUPPLIERS: ELECTRIC, FUEL CELL, TECH, NETWORK

NO AREA OF the automotive supply business is moving as fast as the supply of batteries. Several of the main players barely existed a decade ago, yet with recent stock market flotations, most are now valued at billions of pounds.

LG Chem's spinning off of its battery division earlier this year, for example, created South

Korea's second-biggest corporation overnight.

The improvements to come from developments in solid-state battery tech might yet solve issues around raw material supply and mining, too. If the automotive industry is to decarbonise by 2030, these firms will lead the way and that makes their CEOs and chairmen highly influential indeed.

#### **ELECTRIC**



ROBIN ZENG Founder and Chairman, Catl

ROBIN ZENG EXERTS influence as chairman of the world's biggest supplier of automotive lithium ion cells, a company he founded only 11 years ago. Zeng is said to be more open to outside ideas than some Chinese rivals and runs CATL using principles learned from Japanese tech company TDK, which once owned a stake.

'LG Chem spinning off its battery division created Korea's secondbiggest company'



HAK-CHEOL SHIN Chairman, LG Chem

HAK-CHEOL SHIN led the spin-off in January of LG's automotive battery business, LG Energy Solution, which was South Korea's biggest-ever stock market flotation and is now valued at \$92bn. New investments include a \$1.4bn US factory in Arizona, a \$2.1bn GM supply plant and a \$4.1bn Canadian operation for Stellantis.



YUKI KUSUMI CEO, PANASONIC GROUP

YUKI KUSUMI ASSUMED his role last summer, gaining oversight of Panasonic's joint-venture Tesla Gigafactory in Nevada and nickel-metal hydride and lithium ion battery technology. The company is looking for a new US site for a battery factory to open in 2024 and make next-gen lithium ion cells for Tesla and others.



YOUNG-HYUN JUN Vice-Chairman, Samsung Sdi

A PHD ELECTRICAL engineer, Young-Hyun Jun took charge of Samsung's battery unit this year after a decade in senior roles at the electronics giant. BMW, Fiat and Ford are already customers, while projects in Jun's in tray include ramping up solid-state battery development towards a 2027 production date and commissioning a 23GWh factory in the US for Stellantis by 2025.



JAGDEEP SINGH CEO, QUANTUMSCAPE

THIS £5BN BUSINESS is based on an anodeless design that promises faster charging and longer range. Jagdeep Singh studied computer science at Stanford and his R&D team includes former Stanford scientists. The technology has attracted VW, SAIC and Continental as investors, while four OEMs are said to have signed up for R&D testing.

#### **FUFL CFLL**



ANDY MARSH President and Ceo, Plug Power

ANDY MARSH JOINED Plug Power in 2008 as president and CEO of the US-based hydrogen fuel cell maker. He's credited not only with driving forward an industry-leading fuel cell systems firm but also creating the market itself in a world moving further away from internal combustion engines and towards alternative power sources.

#### **TECH**



JENSEN HUANG CEO. NVIDIA

JENSEN HUANG CO-FOUNDED graphics technology firm Nvidia in 1993 and has been its CEO ever since. He has led the firm through the development of graphics processing units (GPUs), but now it's branching out into autonomous vehicle technology. Nvidia says the tech "delivers everything needed to develop autonomous vehicles at scale".



CRISTIANO AMON CEO, QUALCOMM

CRISTIANO AMON JOINED semiconductor company Qualcomm as an engineer in 1995. He became CEO in June 2021, having also served as president. The former NEC and Ericsson exec has guided Qualcomm through a turbulent pandemic, which gave rise to a shortage of chips needed for driver assistance systems and other in-car tech.



MARK LIU Chairman, Taiwan Semiconductor Manufacturing Company

MARK LIU became TSMC chairman in 2018, having already served as its president and co-CEO. The chip maker weathered the supply crisis in 2021 under Liu's leadership, posting revenues of over \$57bn and producing more than 14 million 12in-equivalent wafers. It's now the world's most valuable semiconductor company.



KENICHIRO YOSHIDA CEO, SONY

KENICHIRO YOSHIDA TOOK the role of CEO at Japanese technology giant Sony in 2018. Before that, he was its chief financial officer, having joined the firm in 1987. Sony is ready to enter a growing electric vehicle market, forming a new company with Honda to produce its first car by 2025 and potentially paving the way for more alliances between automotive and tech brands.



STEFAN HARTUNG CEO, ROBERT BOSCH GMBH

STEFAN HARTUNG LANDED the top job at the beginning of 2022 after 17 years with Bosch, most recently as chairman of mobility solutions, its largest business sector. As Bosch repositions itself as a leader of artificial intelligence and the internet of things, he must realise its reinvention in an increasingly digital automotive world.



KOJI ARIMA President and Geo, Denso Corporation

KOJI ARIMA JOINED Japanese automotive electronics specialist Denso way back in 1981, fresh from completing his engineering degree. In 2018, three years into his tenure as CEO, Denso announced that it was expanding into software-based solutions in addition to its hardware operations, with a particular focus on electrification and automated driving.



SEETARAMA KOTAGIRI CEO. MAGNA INTERNATIONAL

SWAMY KOTAGIRI RUNS one of the automotive industry's largest overarching suppliers.

Magna produces body exteriors and structures, powertrains and other components, as well as seating systems, while its services also include whole vehicle creation. At Magna for 21 years, Kotagiri has been instrumental in the company's recent growth as CEO.



NIKOLAI SETZER Ceo and Chairman, Continental Ag

AS THE HEAD of vast German parts supplier Continental, Nikolai Setzer has one of the most powerful jobs in the automotive industry. Setzer is a Conti lifer, having joined the company in 1997 and worked his way up through various divisions, including overseeing tyres, to the hot seat in 2020, following Elmar Degenhart's long reign.



WOLF-HENNING SCHEIDER CEO, ZF FRIEDRICHSHAFEN

WOLF-HENNING SCHEIDER has overseen the acquisition of Wabco to set ZF on course to become a full systems supplier in the commercial vehicles business. The CEO of four years has got ZF's growth and profits back on track following the pandemic and chip crisis, ensuring it remains a leading supplier of cutting-edge electronic and mechatronic systems. He will step down in 2023.



PATRICK KOLLER CEO. FAURECIA

PATRICK KOLLER HAS overseen dramatic changes at automotive tech outfit Faurecia since taking the helm in 2016. It was divested from PSA ahead of the FCA merger that formed Stellantis last year, and has since acquired a controlling stake in parts supplier Hella. The firm can now accelerate plans to develop safe, sustainable, advanced and customised mobility solutions.



CHRISTOPHE PERILLAT CEO, VALEO

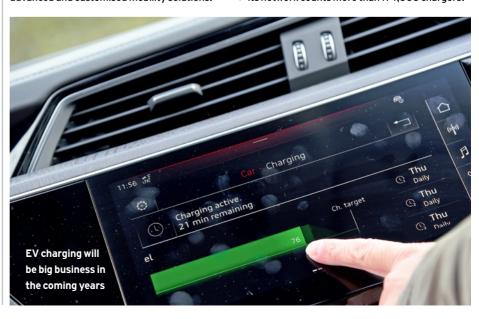
IN CHARGE OF Valeo since January this year, Christophe Périllat has already announced a new strategy for the parts supplier focusing on four megatrends: acceleration of electrification, acceleration of ADAS, reinvention of the interior experience and lighting everywhere – all of which he predicts will help boost sales by 13% by 2025.

#### EV NETWORK



PASQUALE ROMANO
PRESIDENT AND CEO, CHARGEPOINT

PASQUALE ROMANO already had 30 years of technology experience under his belt before joining Chargepoint in 2011. He co-founded telecommunications hardware provider 2Wire, which was sold for £307 million a year before he joined the California-based charging firm. Chargepoint now operates in 14 countries and its network counts more than 174,000 chargers.





# CHINESE AND TAIWANESE TECH GIANTS



IT'S NOT JUST traditional car firms that are pumping money into the automotive industry. Some of the biggest investment is set to come from China and neighbouring Taiwan, where manufacturers from various backgrounds are hedging their bets on a booming technology and electric vehicle market.

The region is particularly important for

semiconductor production. Taiwan alone provided 20% of the world's semiconductors in 2020, which accounted for the equivalent of \$115bn. It doesn't stop there, though. New technologies in the sights of investors include much anticipated – and, importantly, yet to be perfected – autonomous driving systems and other advanced Al capabilities.



RICHARD YU CEO. HUAWEI CONSUMER BUSINESS GROUP

RICHARD YU HAS held various roles since joining Chinese tech firm Huawei in 1993. Now CEO of its Consumer Business Group and of its smart car division, Yu is spearheading the company's Intelligent Automotive Solution 2030 programme. It aims to power up intelligent driving services for an increasingly autonomous world.



ROBIN LI Co-Founder and Ceo, Baidu

A KEY PLAYER in the future of autonomous cars, Robin Li made his name by co-founding Chinese search engine Baidu. The company brought in \$18.6bn in 2021 and is now focusing on autonomous vehicles. Li revealed the Robocar concept last year, which features facial and voice recognition, advanced Al and zero-gravity seats.



MA HUATENG Founder and Ceo, Tencent

TENCENT FOUNDER 'PONY' Ma has helped turn the Chinese multimedia company into one of the biggest in the world. It posted revenues of nearly \$87bn in 2021 and has recently agreed a deal with Chinese car giant Geely to "digitalise the automotive product life cycle", test autonomous driving systems and develop intelligent cockpits.



**LEI JUN** CEO AND CO-FOUNDER, XIAOMI

LEI JUN CO-FOUNDED Xiaomi in 2010, since when it has become the second-largest manufacturer of smartphones in the world.

The company is now planning to enter the electric vehicle market, with four affordable models said to be in the pipeline. A prototype is due to be revealed later this year. Xiaomi has also invested in Chinese EV brand Xpeng.



YOUNG LIU CEO AND CHAIRMAN. FOXCONN

LED BY YOUNG Liu, Foxconn is now the largest electronics manufacturer in the world. The company posted revenues of nearly \$200bn in 2021, as it adopted a new '3+3' strategy exploring three major industries and three major technologies. Importantly, one of those is the growing EV market, while semiconductor production is among the major technologies.

## 'Refocused by Google boss Pichai, Waymo has the potential to change motoring forever'

# **FUTURE TECH**



WHEN CARS AND Silicon Valley cross over, the car industry can discover a new breed of future technology automotive companies, concentrating chiefly on self-driving expertise.

Dominated by Californian start-ups, with a workforce underpinned by PhD grads out of Stanford, they're cracking on with integrating, programming and gathering petabytes of data from sensors, lidars, cameras and controller area networks in the search for the holy grail of driverless cars.

Trials are ongoing in the US and China, but technical hurdles and legal practicalities remain in the way. Solutions might still be a decade or more away, but the progress so far suggests driverless cars will move out of the lab in the not-too-distant future.



KYLE VOGT CEO. CRUISI

KYLE VOGT HEADS GM's mission to develop self-driving cars through Cruise, the firm he founded and sold to the car giant in 2016. Two years later, Honda joined the venture, which has progressed to testing driverless taxis in California. If level-five autonomy is ever commercialised, Vogt will have his fingerprints on the breakthrough.



SUNDAR PICHAI CEO. ALPHABET

ALPHABET'S UBIQUITOUS GOOGLE has sneaked into every aspect of modern motoring through the Auto Services and Android Auto OS infotainment platforms, but self-driving subsidiary Waymo has the potential to change motoring forever. Sundar Pichai, CEO since 2015, was instrumental in refocusing and rebranding the Google Car project.



#### TEKEDRA MAWAKANA AND DMITRI DOLGOV CO-CEOS, WAYMO

LAWYER TEKEDRA MAWAKANA and AI PhD Dmitri Dolgov have together run Alphabet's self-driving subsidiary for just over 12 months. Splitting the role into regulatory and technical might accelerate breakthroughs in legal/ethical and deep learning, which are currently slowing the introduction of self-driving cars. The prize is enormous, but the challenge remains huge.



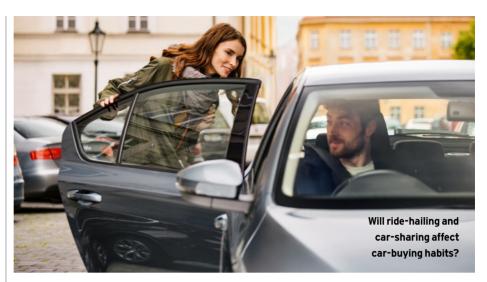
TIM COOK CEO. APPLE

APPLE, 10 YEARS under Tim Cook as CEO, exerts day-to-day influence through its CarPlay interface. There's more to come, in the shape of Project Titan – aka the Apple car – rumoured for launch any time between 2024 and 2028. Cook will decide the scope and the timing, which, given the potential impact on the industry, could be as momentous as the first iPhone launch.



JAMES PENG CEO. PONY.AI

JAMES PENG FOUNDED Pony.ai just five years ago as a vehicle technology company specialising in autonomous driving. This April, it was granted a licence for self-driving taxis in China. Toyota is an investor, but progress hasn't all been smooth; last year, Pony.ai recorded the first US safety-authority recall on an automated driving system.



## **MOBILITY**

THE MURKY WORLD of mobility – essentially how we get around far beyond traditional car ownership – has exploded more than any other area of automotive over the past decade.

Ride-hailing has quickly become the norm in cities all over the world, creating the convenience for people to travel with ease for relatively little money. Uber is the global leader but Lyft and Gett are also huge players, plus there are plenty more localised successes in countries such as India and China.

The world created by these companies is one in which car makers are playing catch-up, as they navigate how to make money beyond car-selling in a fast-changing global economy.



DARA KHOSROWSHAHI CEO, UBER

UBER WASN'T POPULAR when Dara Khosrowshahi took over in 2017. He has not only revitalised its image but also led its IPO and seen growth in its core business of ride-hailing; Uber held a 71% market share in the US in January. Uber's commitment to self-driving cars has also expanded; it took a 26% stake in Aurora last year.

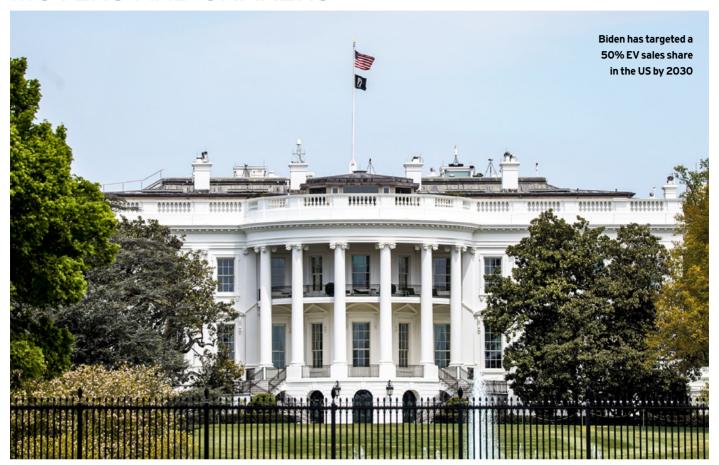


CHENG WEI Founder and CEO , Didi Chuxing

UBER MAY BE the major player in the US, but that's not the case in China. Cheng Wei founded Didi Global, the country's ride-hailing app of choice, and listed its shares on the New York Stock Exchange in June 2021. Before Didi, Wei worked at e-commerce giant Alibaba. Such is its stature, Didi acquired Uber China in 2016.



# **MOVERS AND SHAKERS**



IN A WORLD that's built so heavily around the car, and where cars, lorries or vans seep into most aspects of most people's lives, it's little surprise that big-hitters who aren't directly linked to the automotive industry still have an enormous bearing

on it. Thirty years ago, these movers and shakers would all have been big-name politicians. But in the increasingly fragmented and online world, there are places for people who sit outside the obvious channels. In 2022, more people have louder voices.



JOE BIDEN PRESIDENT. US

EVEN IF THE 'big three' aren't quite what they were, the US is still the market that matters most to brands. Joe Biden has huge sway over that, with his moves to restore environmental protections that were axed under Donald Trump. Although the 'will he, won't he?' debate over the 2024 election gives brands pause for thought.



XI JINPING President, China

IF NOTHING ELSE illustrates the rise of China, it's how big its car market has become. Comfortably the largest in the world, it's now worth 26.3 million cars a year. Xi Jinping has cemented himself a president-for-life role and, with 40% of sales mandated to be EV by 2030, he's the man everyone will listen to for the foreseeable future.



ADAM JONAS HEAD OF GLOBAL AUTO AND SHARED MOBILITY RESEARCH, MORGAN STANLEY

THE FINANCIAL ANALYSTS who pick apart the financial documents of a company to advise investors are often hugely influential, but in the car industry, no one comes close to Adam Jonas, whose recommendations on behalf of US bank Morgan Stanley can move stock prices.



# FIVE KEY CHALLENGES

OUR POWER LIST 100 entrants will have any number of threats, disruptions and unexpected obstacles to deal with in the coming years, but there are five fundamental strategic pressure points that are set to shape the industry in 2022/23. One is a commercial problem that might be resolved with negotiation, planning and more investment. Two are geopolitical issues on a giant scale that only governments can solve. Responding in detail to the other two is now in the in tray of each and every Power List 100 entrant.

#### **WAR IN UKRAINE**

The ramifications of the war in Ukraine for the car industry extend not only to raw material supply – for catalytic convertors, alloys and batteries – but also key components like wiring harnesses. The raw materials are mostly from Russia but will continue to be subject to sanctions and in diminishing supply.

#### COVID-19

The West has mostly got on top of Covid-19, but the chip shortage is an ongoing consequence of the pandemic and China has been enforcing a draconian lockdown in Shanghai, a major car-making region, because of a second wave. A knock-on effect has been the blocking of global logistics operations,



with ships unable to unload there. And more flare-ups can't be ruled out.

#### **RISE OF CHINA**

This isn't just about electrification and the grip that China has on rare-earth metals for batteries and motors, but also its influence on design and product planning, which is turning many models that previously had a Western flavour towards a more ostentatious aesthetic. Takeovers of companies in the West by Chinese car makers are also likely to increase.

#### **CHIP SHORTAGES**

The most dramatic effect on car production through 2022/23 will be the continuing shortage of chips, a consequence of Covid-19 and of manufacturers cancelling orders. Makers of 5G mobile systems stepped in to take production slots, alongside smartphone and computer console



brands. Many OEMs are now looking to the end of 2023 before supply eases.

#### **EMISSIONS REGULATIONS**

The next wave of global legislation will potentially seal the fate of the internal combustion engine in Europe and the UK, while the US and China opt for laws to allow ultra-clean engines to remain in production. The consequences of Europe's car industry pulling out of ICE production completely, for a technology reliant on raw materials not available in the continent, while it's business as usual in China and the US, might not yet be fully understood.

