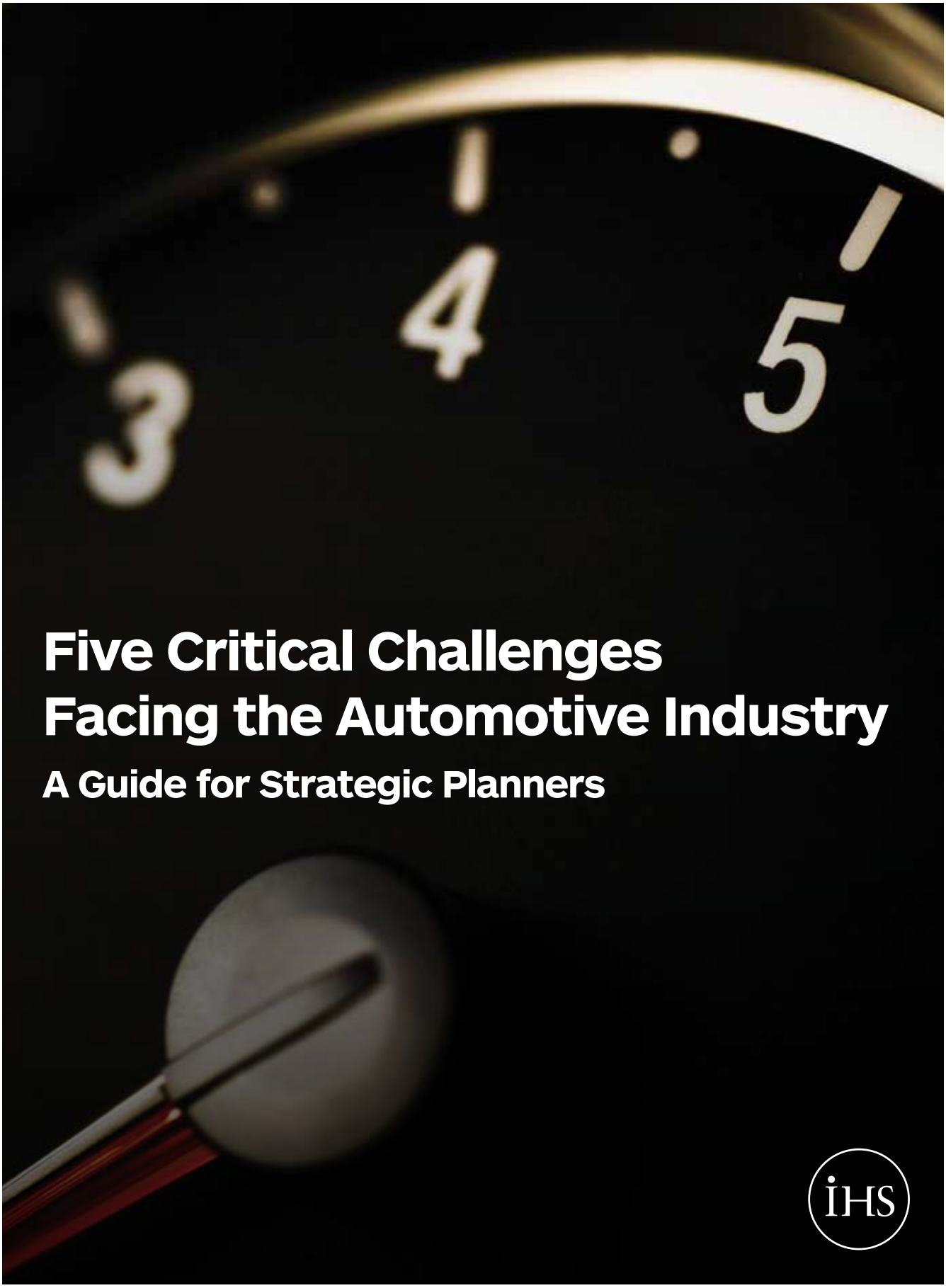


Five Critical Challenges Facing the Automotive Industry

A Guide for Strategic Planners

IHS

The Top Five Challenges Facing Automotive OEMs in 2015 and Beyond

Amid wrenching changes in global economies, technologies, government regulations, relative prices, and market dynamics, the task of strategic analysis and planning in the automotive business has become increasingly fraught with uncertainty. Planners now must prepare for the most fundamental transformations that their industry has ever seen.

The imponderables have transcended the conventional issues that automakers faced in the past, such as identifying the products that will be popular in the years to come, focusing on regions that will generate the strongest growth and investing in technologies that will appeal to consumers.

Automotive strategic planners now must address much bigger and more basic concerns, such as:

- Will the prevalence of car ownership begin to decline, given the rise of autonomous driving?
- How will governments' increasing focus on raising fuel efficiency change the technology mix of new powertrains?
- As the pace of growth in unit sales slows in mature markets, and consumer demand and demographics shift, how should automakers adjust their strategies to thrive and grow in this new environment?

To break down these tough questions, leading automotive experts from IHS have weighed in on the five key challenges facing the car market in the coming years:

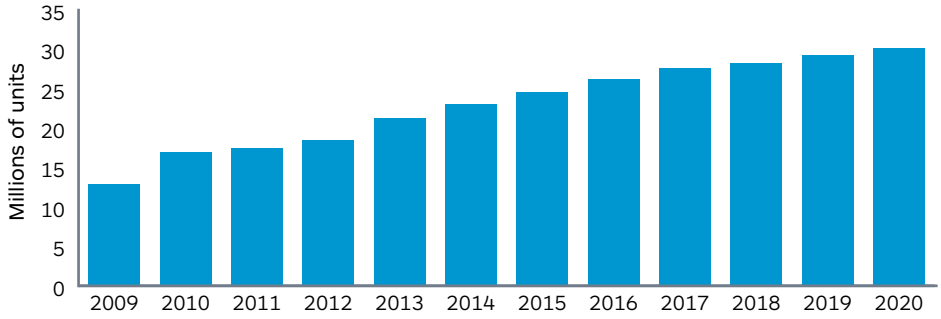
- The Chinese Market–Potential Opportunity and Risk
- The Connected Car –Industry Evolution or Transformation?
- Increased Competition–How Can Automakers Find Growth?
- New Powertrains and New Regulations–Balancing the Demands of Technology and Government
- Globalization and Consolidation of Platforms–Welcome to the Age of the Megaplatform

Challenge 1

The Chinese Market: Potential Opportunity and Risk

For global automakers, the only risk greater than competing in China, is not competing in China. Over the last 15 years China has been a one-way winning bet for the automotive industry. The opportunities for soaring volume growth outweighed the structural and competitive challenges. The next decade will bring very different challenges in China as high double-digit sales growth is expected to be replaced by a complex combination of low single-digit growth, intense competition, extreme market fragmentation, more city restrictions, regulatory pressure on air pollution and fuel efficiency standards, and the development of a viable used car market in the country

Forecast of Light Vehicle Sales in Greater China



Source: IHS

For planners in the automotive business, the key to building a successful strategy in 2015 requires an understanding of China's economic outlook, the structure and capacity trends of its manufacturers, and the factors that compel its consumers to buy cars. Planners must also prepare for different scenarios of economic expansion, government policy, and car ownership models, as well as anticipate the influx of domestic competitors in their home markets.

Still, China will remain the engine of global automotive unit volume growth in the coming years, despite its moderating economic expansion. China's real GDP is expected to hold steady at 6.5% in 2015 and 2016, down from 7.4% in 2014, according to IHS Economics. Car sales in China are estimated to surge to 30 million units in 2020, up 30% from 23.1 million in 2014. In comparison, the North American market is estimated to generate a scant 2-3% growth during the same period.

At a time when the other three large emerging markets—Brazil, India, and Russia—have seen their markets relapse, this combination of expected volume growth and market size has reinforced China's importance for global automakers for the foreseeable future. As a result, global automakers will most likely continue to invest in China by establishing more factories in the country.

Capacity for disruption

There are risks, however. Because of China's rapid expansion, foreign investment, and anticipated growth, auto manufacturing capacity in China has outpaced both production and demand. Total automotive capacity utilization in China amounted to less than 71% in 2014, down from nearly 74% in 2012.

Nonetheless, these overall utilization figures can present a skewed picture of China's car manufacturing glut. The highest levels of overcapacity are concentrated within the ranks of domestic carmakers. Operations that involve foreign automotive firms—run as 50/50 joint ventures with Chinese firms—have higher capacity utilization rates at an average of approximately 90%, while the total for Chinese firms operate at just under 59%.

The joint ventures have managed to keep their utilization rates relatively high by making capacity decisions based on fundamental market supply-and-demand conditions.

In contrast, the strategies of domestic OEMs are determined by China's provincial governments and bankrolled by the share of profits from their mandatory joint ventures with international OEMs. As a result, there is less incentive for them to match capacity with near-term production levels, which has resulted in the structurally lower utilization rates.

All eyes on the "New Normal"

In addition to the low assembly plant utilization levels, there are three other structural issues plaguing the China auto market: too many domestic vehicle manufacturers, too many products on offer, and intense competition.

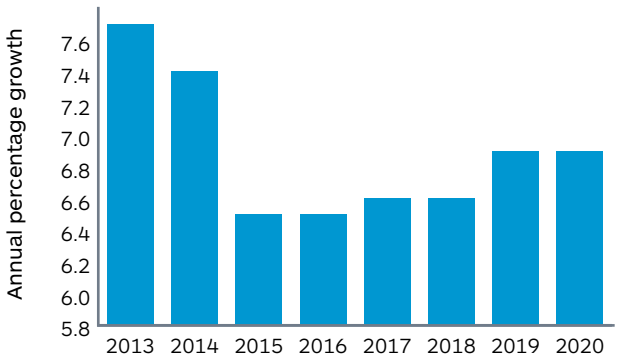
In 2014, IHS estimated there were almost 800 separate brand-model nameplates on offer in China, which is more than double that offered on the US auto market. As a result, a correction and consolidation of market players is inevitable. However, the timing of the correction depends heavily on the outlook for China's GDP growth and whether the economy undergoes a hard or soft landing.

If China's economy maintains growth in the 6.5-7.0% range—the soft landing scenario—then the shakeout in Chinese car production will most likely be delayed. In the case of a hard landing, China's expansion could decelerate to 3-4% in the coming years. This occurrence would accelerate the restructuring of the Chinese automotive industry and turn the inefficiency of industrial capacity into a major issue in China. How this plays out will be critical for component manufacturers and the supply chain.

Automotive strategists evaluating expansion plans in China this year should pay close attention to automotive capacity utilization and developments in the Chinese economy that could signal the onset of a hard landing, while any fall in vehicle sales in China would get the world's attention.

But even without a significant shock to economic growth, there is uncertainty about the long-term motorization track that China could take. Sustainable transport and pollution policies of its cities, energy security policies, the drive to invest in public transportation infrastructure, new connected technologies, and the high-density living of its urban population all point to a decline in the desire to own a vehicle even as real income levels rise. This diverges from the trend seen in the West, where car ownership has increased in step with higher income levels. The real question is, how much lower is lower?

China's New Normal: Lower Real GDP Growth



Source: IHS

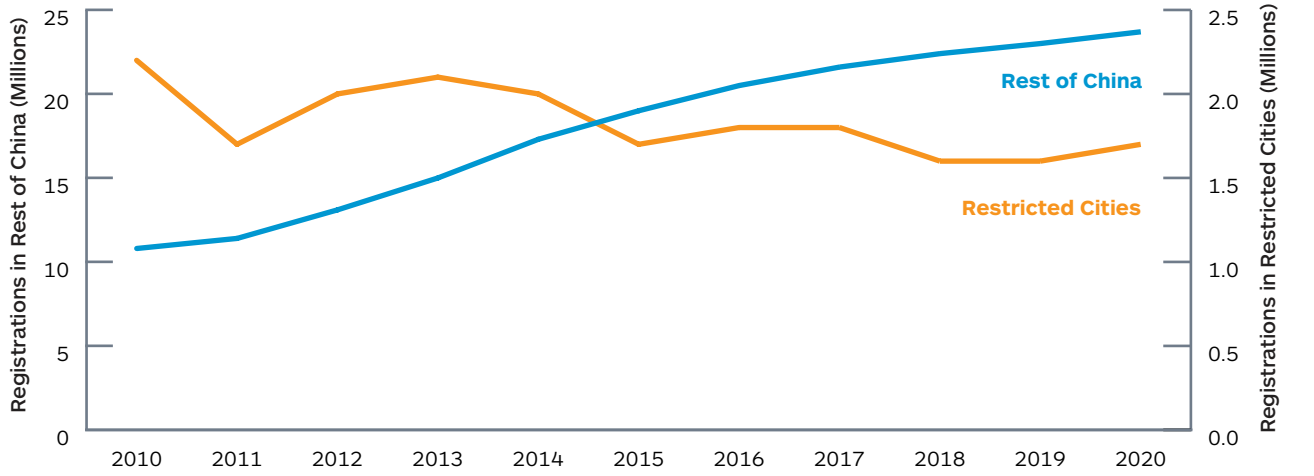
The 13th five-year plan

Early next year, the Chinese government is expected to release a new five-year plan covering the period 2016-2020, which will be important for the development of the Chinese auto industry. IHS expects the new plan will prioritize pollution control as well as environmental protection, and reset targets for economic development and reform.

It is likely that the existing 2020 Phase IV fuel-efficiency targets of 5 liters per 100 kilometers (km) (approximately 120 grams/km of carbon dioxide [CO2]) will be kept as an already challenging target. However, there could be some surprises on target air-quality levels and additional attempts to accelerate new energy vehicle adoption (NEV). It is also possible that more aggressive pollution control targets could lead to an extension of cities issuing license plate restrictions.

Indeed, a major issue that should concern automotive planners is the sustainability of Chinese demand for cars. Government restrictions may inhibit and distort automotive purchasing in some regions of the country. Car makers operating in those regions may need to shift to a new consumer base and accommodate drivers in other parts of country. As of January 2015, seven cities had license plate restrictions in force. These restrictions

New Registrations of Passenger Vehicles in China in Restricted Cities and in the Rest of the Country



Source: IHS

now cover a wealthy urban population of more than 85 million people.

The number of registered passenger vehicles in Chinese cities in which license plate restrictions have been implemented is set to decline in the coming years. It fell 6% last year and is forecast to drop another 15% in 2015, eventually falling to 1.6 million units by 2020, down from a peak of 2.2 million in 2010. IHS estimates that without these sales restrictions in place, sales recorded in these cities would have been in the 3-to-3.5-million range, implying a gross loss of sales in the range of 1.5 million units or more.

Squeezing the balloon

Nonetheless, these high-profile city license plate restrictions have far less impact on overall vehicle sales in China than is widely assumed. Like squeezing a balloon, many of the "lost sales" in the restricted cities are being sold in other towns and cities where there are no restrictions. Vehicles are then taken back for use in the restricted cities' suburbs or on weekends and off-peak periods. As a result, new passenger vehicle registrations in non-restricted parts of China are likely to soar, increasing to approximately 23.7 million in 2020, up from 10.8 million in 2010.

The main impact of these changes so far has been to disrupt dealer network planning and the long-term viability of the independent "4s"—sales, service, parts, and used car operations—dealership business models in restricted areas. As a consequence, dealer groups may need to adopt a more sophisticated approach made up of larger dealerships operating in both cities and in the adjacent provincial areas.

The complex idiosyncratic nature of China's car market is highlighted by IHS forecasts that show a rapid relocation of demand growth rates across the country. Some of the fastest-growing provincial car markets in 2014—such as Guangdong and Chongqing—will soon flip to become some of the lowest-growth markets over the medium and longer term.

In response, OEMs are shifting their focus to new regions of China. For example, in June 2014, Ford announced the opening of 88 new dealerships in one day—with the primary focus on less competitive tier-4 cities that lack license restrictions.

Against this background, the market situation in China remains positive and the outlook for growth continues to be optimistic. Still, automotive OEM strategic planners and the vehicle supply chain should remain alert and responsive to the increasing multidimensional challenges of operating in the largest automotive market in the world.

By Nigel Griffiths, chief economist, IHS Automotive

Challenge 2

The Connected Car: Industry Evolution or Transformation?

While representing one of the greatest transformational forces in the automotive industry, the connected car is simultaneously one of the greatest unknowns.

The connected car serves as a communications hub that transmits as well as receives data and information from its surroundings. Connectivity makes autonomous driving possible and potentially offers enormous benefits to drivers, automotive industry participants, and society in general. From better customer care, to lower insurance and warranty costs, to lower congestion and safer driving, connected cars create new opportunities for the automotive industry.

However, connected cars and autonomous driving create market uncertainties. How and by whom will connected cars and services be delivered? Will current automakers be able to navigate all the uncertainties and deliver connected cars and services in time to ward off the threat of new industry players?

Right here, right now

Connected cars are not a futurist's dream; you can get into one and drive it away today. In fact, almost all OEMs offer connected services, with General Motors' OnStar service having a history dating back to 1995.

Indeed, the connected car opportunity is already large and growing rapidly. Worldwide sales of connected passenger vehicles are expected to grow to slightly more than 77 million units annually by 2022, rising at a compound annual growth rate (CAGR) of 19% from about 19 million in 2014, according to IHS Automotive. This means that by 2022, 73% of passenger vehicles sold will be connected in some way.

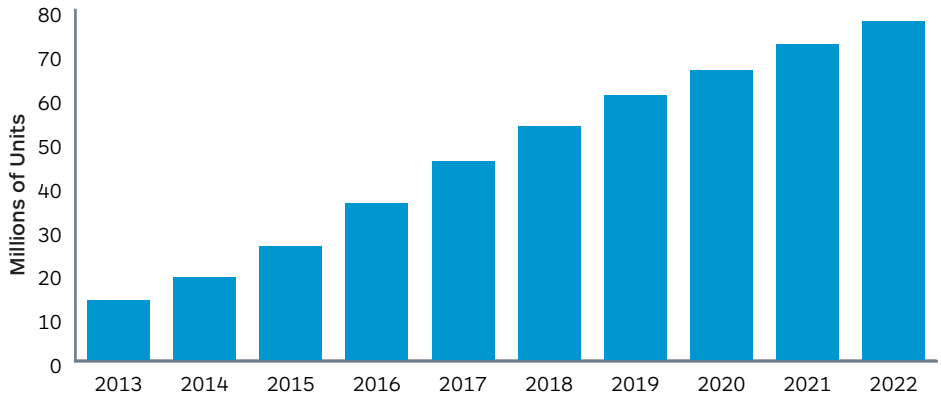
But a tension is building between the incumbent automotive players and a new wave of companies supplying the supporting software, components, and infrastructure, particularly as new solutions and business models emerge from outside the automotive industry.

In February, Mark Fields, president and CEO of Ford Motor Co., raised concerns that carmakers face the risk of becoming subordinate to the business models of other industries as new types of firms enter the auto trade.

"Guess what, they are looking at our industry, not taking anything for granted, they are questioning tradition and they are knocking down walls. I want to make sure Ford doesn't end up like the handset business," Fields was quoted as saying by Reuters.

Technology firms like Intel, Cisco and Nokia's HERE have announced multimillion-dollar investment funds for connected car technologies. Furthermore, Google with its Android Auto and Apple with its CarPlay are

Global Connected Car Sales Forecast



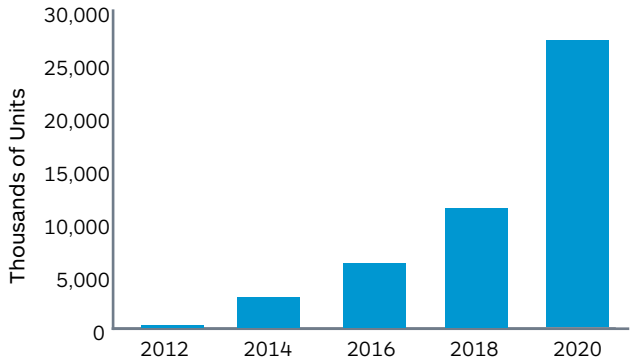
Source: IHS

both making plays for the automotive market with driverless cars. It is clear that companies outside the traditional automotive market want to capture some market share in the emerging connected car market.

But is the automotive industry correct to be threatened by the emergence of new actors? Not necessarily. While there is a strong push from companies outside the automotive market to gain a foothold in the connected car market, it should be remembered that the automotive sector is a trillion-dollar industry with some of the largest companies globally and one of the most complex, globally integrated supply networks. Making cars in volume and delivering them to the customer is not a trivial matter. Carmakers have proved time and time again that they are adept at successfully delivering new vehicles and new technologies.

The automotive industry is also making its own investments in connected cars. SAIC Motor Corp. Ltd and Alibaba recently announced a $160 million joint venture with the stated goal of releasing an

Global OTA-Enabled Vehicle Sales Forecast



Source: IHS

internet-connected vehicle by 2016. And Harman, a supplier of infotainment systems, recently spent nearly $1 billion on acquiring Symphony Teleca and Red Bend Software Inc., two companies that will enable it to have a strong presence in connected services.

Make sure you're connected

For strategic planners at automotive OEMs, the current imperative is to develop a strategy to offer connected services or explore ways to enhance and protect their existing connected car solution.

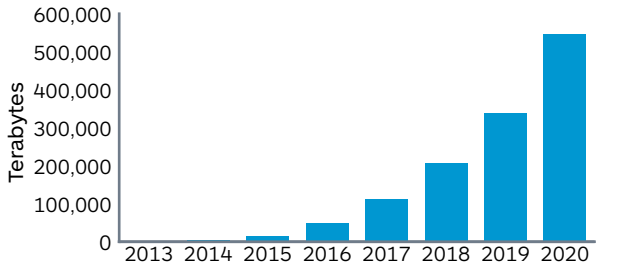
OEMs and suppliers that already offer a connected solution/technology should be prepared to make "riskier" investments in emerging, leading-edge technology companies. This type of behavior is more common in the technology market, where companies have sizable cash reserves from high-profit margin products or massive IPO valuations, and can afford to make higher-risk investments in immature companies and products when balanced against a sizable payoff. If automotive companies are also prepared to invest more opportunistically, they may be able to gain access to IP and solutions that offer them protection against emerging competitive threats.

Automotive companies should also look to enhance the capabilities of their workforces and the skills of their dealerships to maximize the success of connected cars. Bringing on board experts in cloud and connected services, big data, and digital content will help them establish a coherent connected product strategy. Training their dealer networks to sell connected cars and services will also be fundamental in building market demand, as connected car services will be sold in a different way from the more traditional automotive sales process.

Over the air

One near-term connected car opportunity that automotive OEMs are seizing is the combined area of software over-the-air (SOTA) and firmware over-the-air (FOTA) updates. Total OTA-enabled vehicle sales per year will likely rise to 26.7 million in 2020, up from

Global Forecast of Data Generated by Connected Cars



Source: IHS

2.6 million in 2014, according to IHS Automotive. FOTA/SOTA updates are already widely used in other technology sectors including mobile phones, game consoles, PCs, and tablets. Connected cars increase the dependence on electronic components and introduce a higher prevalence of software bugs that could require OEMs to service many vehicles under warranty or recall an entire vehicle lineup.

IHS Automotive estimates the cost of updating software at a dealer to be $400 to $500 per car to properly account for the software itself and the labor cost. This means that remote software updates bring large cost savings to OEMs, in comparison to the existing manual approaches.

Beyond FOTA/SOTA, there is a revenue opportunity in monetizing the transfer of content to and from the vehicle. Services and apps for connected vehicles will offer copious opportunities for future business growth. These uses include communications applications, information retrieval, transaction and shopping, and entertainment content. Automakers have successfully charged car buyers and owners for such services by using a variety of payment models.

However, the success of the connected car business will not rely completely on consumers paying the bill. When consumers connect, they are also generating personal data that is valuable to many different third-party companies including wireless carriers, insurance and traffic providers, and advertisers.

Payment from opt-in data is a compelling new business model for automotive. These third-party companies would be willing to subsidize the connectivity and contents for consumers in exchange for the valuable data generation. Because of this, automotive OEMs can generate revenue through collaboration with such third parties, rather than selling services directly to consumers.

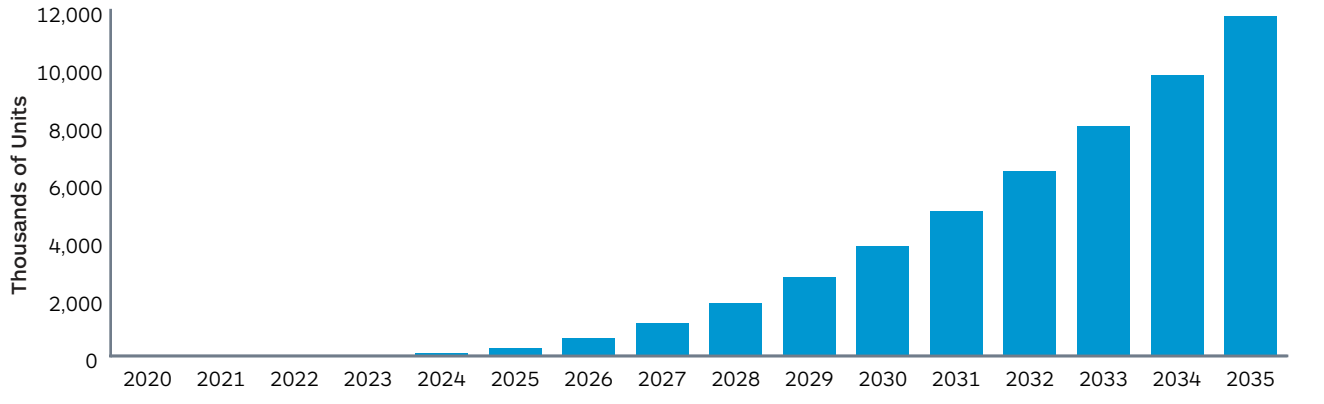
Big money and big challenges in big data

There are many opportunities for using big data generated by connected cars. By 2020, there will likely be a market generating approximately $14.5 billion in revenue from the data assets created by the automotive value chain. Value-added services or cost savings could be worth anywhere from $16-$80 billion depending on scale and scope.

The challenge for the automotive market will be to not drown in the massive quantities of unstructured data generated by the connected car. According to IHS Automotive, global data collection from connected cars could rise to 545 petabytes per year in 2020, up from 345 terabytes in 2013, representing a 186% CAGR. This is an example of the classic "data rich, insight poor" scenario.

To be successful in the connected car space, automotive planners will need to integrate big data analytics into their long-term strategic planning. By being able to integrate and respond quickly to vast data sets, OEMs will, for example, be better able to respond to vehicle faults or drive more nuanced consumer behavior analysis, increasing loyalty and driving profitability in the long term.

Global Self-Driving Car Sales Forecast (Includes Level 4, With Steering Wheel, and Level 5, Without Steering Wheel)



Source: IHS

Autonomy

Each development in connected cars—telematics, FOTA/SOTA, data services—can be monetized, thus justifying the investment in hardware and support. And while all these individual developments will have major impacts on automotive technology and business models, collectively they will lead to the biggest transformation yet to come: the rise of vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communications, and the advent of semi- and fully autonomous driving.

The advent of V2X and autonomous driving could lead to the greatest relocation of value in the automotive industry. IHS Automotive forecasts total worldwide sales of self-driving cars to rise from 253,000 in 2025, to nearly 11.8 million in 2035.

At your service

In the era of connected cars, automobile manufacturers begin to shift their focus away from simply being "builders of cars," and look at ways to offer connected services and, eventually, mobility as a service.

Where value is currently generated through the sale of hardware (the car), fuel, servicing, and insurance, in the future value may be generated through a mobility service. If a car is autonomous and can be available on demand, why does a consumer need to own, fuel, and service it? Value flows to those companies that provide the service, and away from those who build the hardware.

In the short to midterm, there is scope for auto manufacturers to collaborate successfully with new players: after all, auto companies on their own don't have all the expertise necessary to create connected services.

In the longer term, and as the value from connected cars increases as well as begins to flow toward a mobility service, the risk of disruption to the traditional automotive market increases.

By Alastair Hayfield, senior manager, Automotive Technology, IHS Automotive

Challenge 3

Increased Competition: How Can Automakers Find Growth?

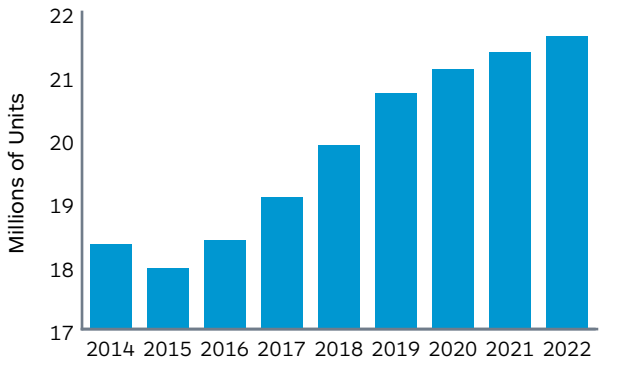
Of the myriad challenges facing automotive OEMs as they seek out global growth opportunities is the prospect that their overall marketplace might be moving ever closer to peak demand and increasingly tough competition.

Auto sales seemingly are already flattening in many mature markets such as Japan and Europe, while North America faces the prospect of slowing demand conditions toward the end of this decade. As growth opportunities dwindle in the high-volume, high-margin mature markets, automakers face the prospect of ever-intensifying competition for every piece of the market-share pie.

The slowdown in autos sales growth is a worldwide phenomenon, with global light vehicle sales estimated to increase at a compound annual growth rate of only 3.1% from 2014 to 2019. This is down from 4.7% from 2008 to 2013, which were the heady days of growth in the emerging markets.

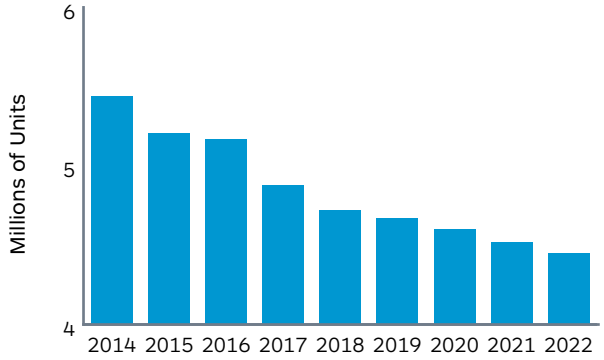
Europe and Japan are largely responsible for the deceleration in worldwide unit sales growth projected for the next few years. IHS believes that Japan's aging population and negative population growth will mean

European Light Vehicle Sales



Source: IHS

Japanese Light Vehicle Sales



Source: IHS

that the 2029 Japanese auto market will be around 25% lower than it is today. Likewise, in Western Europe shifting demographics, increasing urbanization, ongoing austerity economics, environmental concerns, and new technological advances are key drivers pointing to a lower growth rate for the auto industry.

Despite—or perhaps because of—the longer-term slowdown projected for mature markets, competition is growing increasingly intense, with more OEMs and many more vehicle models being offered than ever before. In 2000, IHS Automotive tracked 89 OEMs offering a total of 1,544 models worldwide. In 2015, the number of OEMs is set to rise to 97, with the number of models soaring to 2,306, representing nearly a 50% increase in models and a 22% rise in the number of OEMs during a 15-year period. While the relative complexity of bringing all-new models to market has been reduced by the adoption of global modular platforms, the law of unintended consequences appears to have landed OEMs with a new set of business and operational complexities in managing this ever-wider portfolio.

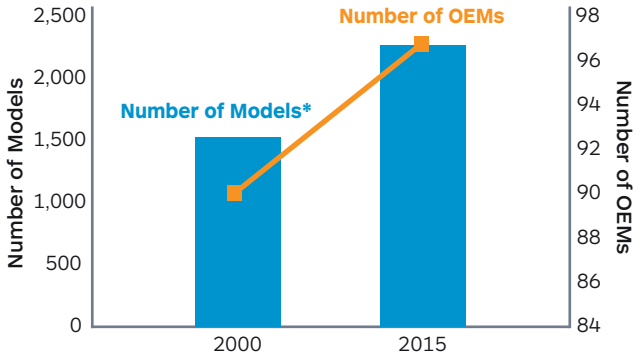
For regions like Europe and the United States, the overabundance of players and products has created a hyper-competitive market. Even in emerging markets,

competition is equally rife. For example, in China a heady combination of Western brands, joint ventures, and local domestic players means that China has fast emerged as the most competitive auto market on the planet. In many ways, the stakes in this part of the world are even higher, as missing out on Chinese market growth means automakers have to pedal harder elsewhere in the world just to keep up with their rivals.

Loyalty is such a lonely word

In this environment of slower growth and intense competition, customer loyalty is a rare commodity. According to IHS, only half of all new car buyers in the United States remain loyal and become repeat buyers of the brand they already own. That means that a carmaker would have to attain the industry average

Number of Automotive OEMs and Car Models Worldwide in 2000 and 2015



*Includes models sold under different names in different countries

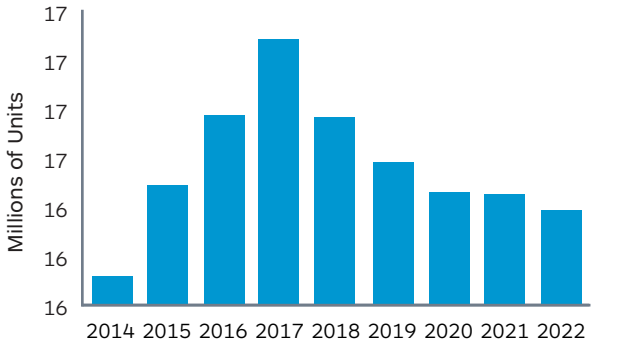
Source: IHS

for customer loyalty plus attract buyers away from other carmakers—known as "conquest" sales—as well as first-time buyers for the other 50% to maintain its existing market share.

In the past, US automakers relied on new young "entry" buyers to drive sales growth. However, there are signs that car ownership is going out of style among millennials—those born between the 1980s and the early 2000s. Buying patterns show that millennials simply don't drive as much as young people from previous generations.

Three factors are driving this trend. First, millennials are gravitating toward urban environments where mass transit is readily available. Second, the prevalence

US Light Vehicle Sales Forecast



Source: IHS

of social media and wireless communications has decreased the desire for face-to-face social interaction, reducing the need to own a car. And third, many millennials lack the financial resources to buy cars, partly as a consequence of the Great Recession.

To surmount the challenges of low growth, intense competition, and shifting demographics, automakers must focus on loyalty and retention strategies to keep the customers they have and engage in conquest campaigns to replace owners they may have lost.

The logic of loyalty

It goes without saying that for automakers to keep customers loyal to their brand—and at the same time attract new customers—they must have products that appeal to the wants and needs of the consumer at each stage of life. The challenge today is that those wants and needs are changing rapidly as a result of demographic shifts and the pace of technological innovation.

A key challenge for mainstream OEMs has been the growth of premium offerings that tempt mainstream buyers. This trend will intensify in the coming years.

OEMs need to be able to read the staging posts in the marketplace; quickly widen product portfolios to back "winner segments," cull and cleanse "loser" brands and models, nimbly exploit emerging market geographies, and harness appropriate customization and build-to-order, bringing potential customers as close as possible to real-time access to fast-moving technologies.

Meanwhile, aging populations in Japan, Europe, the US, and China over the next 20 to 30 years will

require a pivot in strategy. Appealing to the millennial generation—and those that will come next—demands a fundamental rethink of the value proposition of the automobile.

The distorting expectations for car-sharing concepts and business models, especially when coupled with the advent of the autonomous, networked vehicle, introduces a layer of complexity more profound than any previous technology advancement. As automotive OEMs integrate these factors into their product designs and customer messaging, the definition of loyalty and the tactics of conquest are starting to change. It is increasingly likely they will be unrecognizable within a decade.

By Colin Couchman, director, IHS Automotive

Challenge 4

New Powertrains and New Regulations: Balancing the Demands of Technology and Government

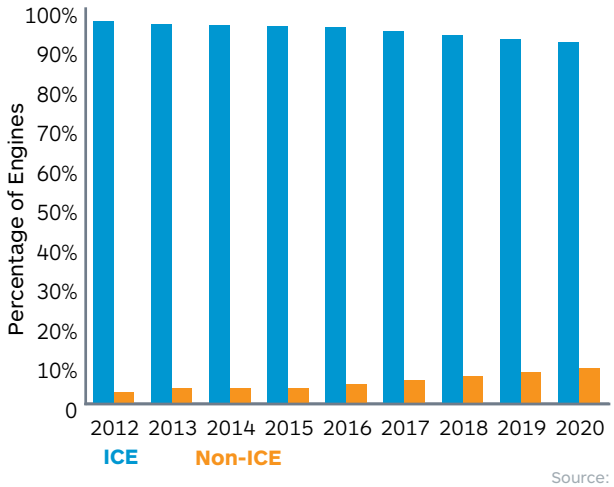
For OEMs, trying to balance the myriad demands placed on global powertrain development has never been harder. All major global automotive markets have in place increasingly stringent legislation focused on controlling carbon dioxide (CO_2) emissions and exhaust gas emissions—such as particulates and nitric oxide (NOx)—and improving fuel economy. A key challenge for the industry is to make the right powertrain and technology choices in the context of rapidly changing societal preferences and within a changing regulatory environment.

As auto manufacturers navigate an increasingly complex landscape, they need to contend with three main drivers. First, changes in the development of ICE (internal combustion engine) technology are occurring at breakneck speed. Second, societal adjustments in response to demographic and urbanization shifts are shaping the demand of mobility. Third, governments are providing a regulatory framework that will change and determine the required technology offerings and choices.

No single technology roadmap

From a technological standpoint, announcements of the death of the ICE are premature. OEMs have been finding varied and creative solutions to reduce CO_2 output and meet emissions legislation around the world. The technology mix adopted varies by region and is typically a function of the test cycle specific to that region, but there are common trends worldwide in electrical and mechanical systems. The deployment of these ICE technologies is having a big impact on meeting regulations. One challenge for the industry will be passing on the additional compliance costs to a price-sensitive public, especially since the technologies deployed typically get more expensive as the industry works its way down the emissions curve.

Propulsion Design Trends for U.S. Automakers (Percentage of Cars Sold with ICE and Non-ICE Engines)

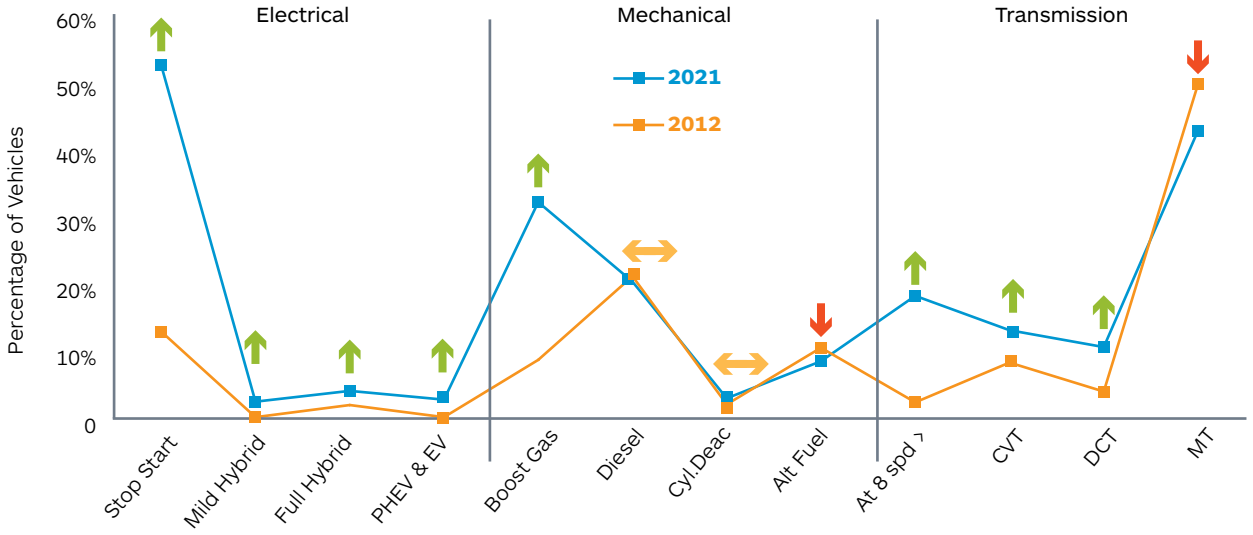


Source: IHS

Within electrical systems, all forms of hybrid technologies will be adopted in larger numbers. Mild, full, and plug-in hybrids will show significant growth in percentage terms, but overall volumes will remain comparatively low out to 2021. The current low oil-price environment has a dampening effect on the take-up rate of these technologies particularly in the US, as the economics of adoption are undermined. For example, the payoff period between a standard ICE and a full hybrid on the same midsize car in the US rises from 6 years with gasoline prices at $4 per gallon to over 12 years with prices at $2 per gallon. Start-stop technologies, in contrast, have a rapid payback period and will be widely deployed by 2021, thanks in part to test cycles that include significant idle time.

On the mechanical side—and in a reversal to a strong trend in the last decade—there is now a significant political shift away from diesel-powered vehicles as governments focus increasingly on reducing pollution from particulates as well as on CO_2. This helps explain why global diesel penetration is forecast

Outlook for Powertrain Technology 2012-2021 (Percent of Light Vehicles Produced Globally)



Notes:
Cyl Deac: Cylinder Deactivation
AT 8 spd: Automatic Torque Converter Transmission with 8 speeds or greater
CVT: Continuously Variable Transmission
DCT: Dual Clutch Transmission
MT: Manual Transmission

Source: IHS

to remain static in years to come, while the trend of turbo-boosted gasoline engines shows sharp growth. Finally, the widespread adoption of higher-speed, fuel-efficient automatics and a new clutch technologies is also playing a role in helping the ICE meet emissions challenges. In tandem, the light-weighting of vehicles is being increasingly deployed to help increase fuel efficiency.

Demographics, competition, and urbanization

Another challenge for OEMs is how to respond to the rapidly changing demographic and consumer trends rippling through the global economy. In developed markets the population is getting older and younger buyers are becoming harder to attract. In developing markets larger numbers of young, first-time buyers are appearing. These younger groups are voicing their environmental preferences more loudly and are acting as a catalyst to improve the overall efficiency of conventional ICE technology.

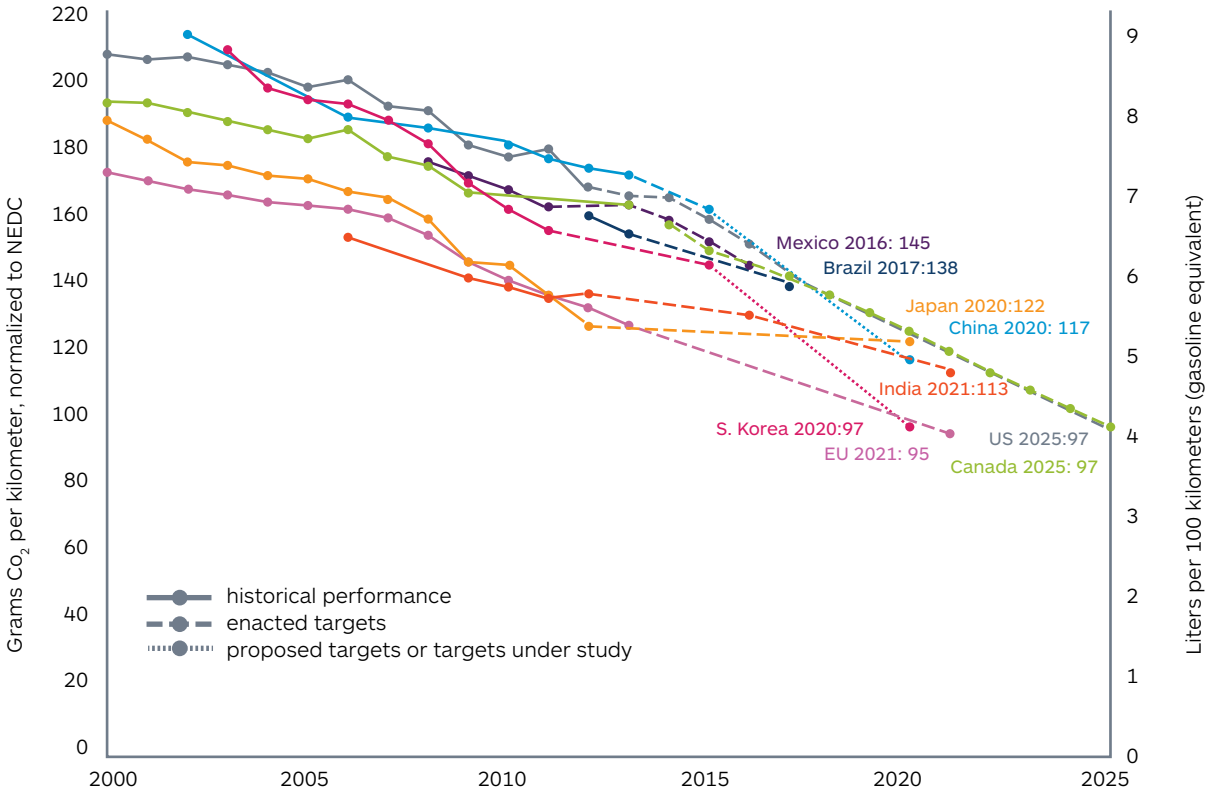
Meanwhile, increasing urbanization across the globe means there is growing demand for small and efficient passenger cars, a trend that has the potential to have a significant impact on powertrain developments. In many cities particulate pollution is increasingly a public issue, resulting in the adoption of zero- and low-emission zones. New personal transport concepts, such as the Renault Twizy electric quadricycle, are being introduced to offer zero-emission individual urban mobility solutions. However, not all countries and cities are deploying policies in the same way or rate. Finding the right mix of technologies that meets both consumer demand and legislative requirements will be a significant challenge for the industry.

Toward a harmonized global approach?

The third challenge will be to navigate the different and changing regulatory frameworks currently in effect across the globe. The good news is that fleet targets across the globe are set to converge by the early to mid-2020s. Significant progress has been made in Europe, for example, where legislated CO_2 levels have fallen to 130g/km in 2015, with impetus to bring the level down to 95g/km by 2021. Similar targets are being set elsewhere. This trend should, in theory, make it easier for OEMs to provide global powertrain technologies that meet emissions levels in a more cost-effective way.

The next logical step in this process is to bring global vehicle regulatory standards and specifications into a fully harmonized worldwide light vehicle test procedure (WLTP). This cycle will yield certified fuel economy and exhaust emissions performance far closer to real-world experience, and it will be adopted by several nations. Nonetheless, differences for vehicle types will likely be allowed, giving rise to a looser definition of a “harmonized” cycle.

Passenger Car CO_2 Emissions and Fuel Consumption, Normalized to NEDC



NEDC: New European Driving Cycle
Updated November 2014
Details at www.theicct.org/info-tools/global-passenger-vehicle-standards

Source: ICCT

Thus, while it is true that the WLTP will help provide a regulatory framework more closely linked than before, there will still be significant differences in technology deployment around the world. In this context, the industry will still need to meet the challenge of finding the right blend of performance, utility, efficiency, emissions, and cost.

By Andrew Fulbrook, director, Global Powertrain Forecasting, IHS Automotive

Challenge 5

Globalization and Consolidation of Platforms: Welcome to the Age of the Megaplatform

The leading global automakers are rethinking their platform strategies in response to the pressures generated by intensifying competition, new global consumers, and state regulators. The trend toward a strategic consolidation around modular architectures or "megaplatforms" is replacing the earlier, often successful, rationalization within a segment that sought to make best use of a common platform and provide variation in vehicles by adopting "top hats."

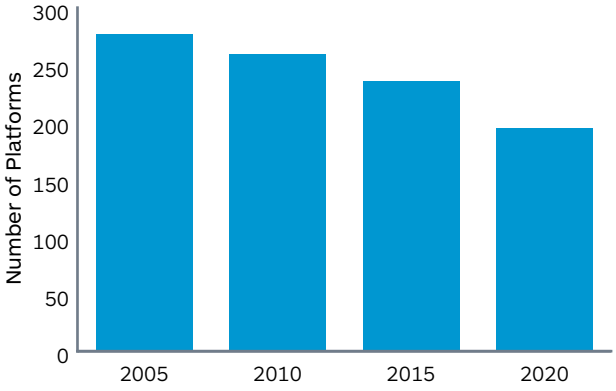
The new megaplatforms take a more holistic approach toward the aim of consolidation, stretching beyond segment coverage to encompass the layout or the basic architecture of a vehicle type. This is leading to differentiation based around how a vehicle is purposed—for example, a hatchback, sedan, or crossover—rather than just the segment it is in; architectures are emerging that accommodate the basic requirements of transverse front-wheel-drive, longitudinal rear-wheel-drive, or all-wheel-drive layouts.

Stepping down from the platform

As the cost balance in vehicle engineering continues to shift from steel to silicon—and as the emphasis on electronics surpasses the need to focus on structural hard points, such as the floor pan—this modular approach is increasingly the key denominator, overriding more traditional physical or dimensional constraints. The flexibility inherent in these new modular architectures is an enabler in accommodating newer, complex infotainment and emerging connected-car technologies, safety systems, and new powertrain combinations.

In turn, this trend is leading to a further consolidation in the number of platforms being engineered by the major OEMs. Major auto OEMs were using an estimated 277 individual platforms in 2005. IHS Automotive forecasts that number could fall to 195 by 2020. At the same time, the average number of vehicle programs being developed on each discrete platform is rising; among the leading global OEMs it is expected to grow by nearly 50% in the same time line.

Number of Platforms Assigned to Leading Global Automotive OEMs



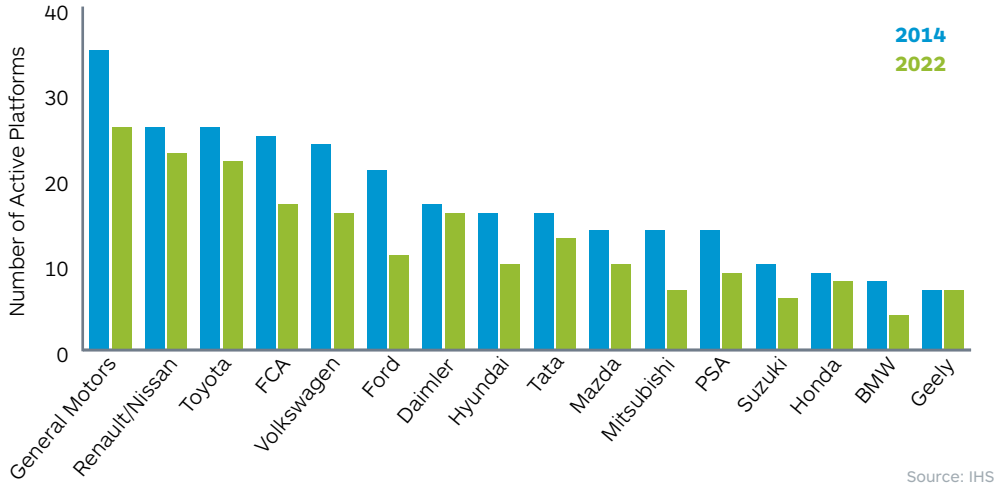
Source: IHS

The proportion of light vehicle production engineered on major platforms by the leading global OEMs was 35% in 2005, but is forecast to rise to 83% by 2020 as platform counts are rationalized and deployed globally. This concentration of platforms implies both risk and opportunity for suppliers and OEMs.

Thoroughly modern modules

Although Volkswagen is credited with being the first OEM to adopt a megaplatform strategy—with the launch of the ubiquitous MQB architecture in mid-2012—it had, in fact, already embarked on a modular approach with the longitudinal engine MLB architecture in late 2006. Volkswagen may have the first-mover advantage, but Renault/Nissan, PSA, and Daimler have all launched similar modular architectures. Toyota, BMW, and General Motors have all described upcoming efforts that will deliver the same attributes.

Automakers are Reducing the Number of Platforms on Which Vehicles are Assembled



Source: IHS

There are clearly identified advantages to the modular approach cited by almost every OEM: greater economies of scale, reduced development costs, shorter development times, and greater manufacturing flexibility. Renault/Nissan quotes a potential 30-40% reduction in the entry cost per vehicle model and a 20-30% percent reduction in component costs across the alliance through the implementation of its Common Module Family (CMF).

Meanwhile, PSA expects to be able to build up to six vehicle types on a single production line with the introduction of its Efficient Modular Platform (EMP). At this stage, the deployment of these architectures is too immature to be able to confirm these claims.

While the trend has been established, many risks remain. For OEMs there is the challenge of executing on these strategies, while suppliers will be measured on how well they respond to the new demands for greater volume, regional presence, and technology innovation.

The modular approach may require greater upfront investment costs, but the payoff is significant from the lower number of unique engineering bases required, which reduces production complexity and overall lifetime costs. The payoff in flexibility is that modular manufacturing should allow for any combination of "accepted" modules to be built in any plant correctly configured.

As modular platforms are increasingly stretched across layouts—that is, covering all transverse front-wheel-drives as opposed to just one or two segments—there will be significant increases in scale as volumes are multiplied across key component sets or modules. Successful execution will become the cost of entry for the major OEMs in order to be competitive, providing scale, efficiency, and flexibility.

However, there are risks that need to be recognized. The first surrounds the exposure to fault or recall, where the impact of a single failure at a component level will be amplified due to the associated increase in volumes that the megaplatforms will bring. Second, when a product redesign is required, costs rise and execution becomes more difficult and more resource consuming. And third, the need for suppliers to support contracts covering increased volume and geographic requirements could lead to an accelerated narrowing of the supply base, as suppliers are challenged to scale their operations.

Whatever the reservations, they are outweighed by the rewards of success as OEMs build scale and as suppliers compete for fewer but larger contracts. The process is underway, and both OEMs and suppliers need to position themselves to adapt to the new competitive pressures.

By Mark Fulthorpe, director, Light Vehicle Production, IHS Automotive

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