IHS Markit®

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Contents

[OEM Highlights] BMW reveals eighth-generation iDrive

IHS Markit perspective

Implications	BMW has revealed an all-new iDrive system, which will be launched on the upcoming iX and i4 EV, including new graphics and a new environment.
Outlook	The new system appears to answer every challenge laid by the latest version of Mercedes-Benz Hyper MBUX and others, with increased level of predictive settings helping to reduce the traditional need for physical buttons and controls. Automakers have been looking to reduce the number of physical controls over the past decade or so, while at the same time vehicles have increased the level of features and functions to control. Based on initial data and images, the iDrive 8 user experience looks set to take the in-car environment forward by several steps.

BMW iDrive 8, Photo courtesy of BMW Group

BMW has revealed an all-new iDrive system, which will be launched on the upcoming iX and i4 electric vehicles (EVs). The latest iDrive has a significant enhancement to its natural language and touch operation and retains the driver controller. It also features a new generation of displays, controls, and software, and has powerful connectivity and data processing. Remote software upgrade for over-the-air updates continues, adding the ability to schedule an upgrade and to perform complex and large software updates including driving assistance and partial automation. The all-new BMW Curved Display in the iX groups together a 12.3-inch information display and 14.9-inch control display; both are slim, non-reflective glass high-resolution 200 ppi units. BMW Personal Assistant is the primary way for an owner to interact with the BMW. BMW Personal Assistant has been elevated with improvements to gesture control as well as the ability to respond with context and use light and sound to amplify communication. It is designed to adjust to the driver's routines and what is happening around the vehicle, BMW says. iDrive 8 will process self-generated data, but also will use BMW Group vehicle fleet information. Third-party apps will be seamlessly imported into the vehicle operating system, with availability for the most important apps in each individual market prioritised; the apps are integrated and display as original sources in the main menu. iDrive 8 vehicles will be permanently connected to the BMW Cloud and benefit from "combined computing power, long-term and real-time data, machine learning, and swarm intelligence generated by the 14 million connected BMW vehicles out on the roads." Within the car, iDrive 8 uses gigabit ethernet to support data processing flows of up to 30GB per second. BMW has improved the smartphone-as-key system, moving to a version with ultra-wideband (UWB) technology integrated into the vehicle for precise location identification and maximum security. There is an on-board network capable of full 5G performance and four exterior antennae. The increased data speed "will additionally enable a far greater degree of cloudification," BMW says.

BMW iDrive 8, Photo courtesy of BMW AG

The new system has a new design as well, including a reduction in the number of buttons. Instead, BMW sees intelligent automation of climate control, with adjustments made to the settings via voice control and stored in the user profile will end the need for physical controls. The system will control air conditioning, temperature, seat heating and ventilation and steering wheel heat, and adjust based on voice commands like “My feet are cold.” BMW says it has found an ideal pre-set configuration based on more than 440 million customer trips across all model classes and regions of the world. Climate is adjusted for the number of people in the car as well as for each seating location. Navigation builds on the cloud-based BMW Maps in iDrive 7 for creating predictive routes and information on current traffic situation. Three map views provide varying levels of information. My Modes replaces the prior Driver Experience Control, with 10 parameters assigned to specific modes, including efficient, sport ,and personal; more will be added over time. BMW is increasing the personalised settings BMW ID can hold, as well as ensuring securing the data from other users. A new graphical interface enables extensive individualisation for the instrument display, controlled through steering wheel buttons with two-axis control. There are three basic layouts (Drive, Focus and Gallery), with options within on information displayed. Navigation also takes three modes (adaptive, reduced and expanded). BMW says the new system was developed with Act, Locate, Inform principles guiding which information is shown where, aimed at ensuring only information relevant to driving is presented to the driver.

Outlook and implications

The new system appears to answer every challenge laid by the latest version of Mercedes-Benz Hyper MBUX and others, with increased predictive settings helping to reduce the traditional need for physical buttons and controls. Automakers have been looking to reduce the number of physical controls over the past decade or so, while at the same time vehicles have increased the level of features and functions to control. Based on initial data and images, the iDrive 8 user experience looks set to take the in-car environment forward by several steps.

BMW iDrive 8 controller, Photo courtesy of BMW Group

Although Cadillac was the first to offer a curved display and has stepped up to 5G with an all-new user experience, Cadillac has not advanced as far as BMW or Mercedes-Benz with voice assistance and natural language control.

Mercedes-Benz has also not adapted gesture control as BMW has, and BMW continues to refine gesture control with this generation of iDrive. BMW's iDrive 8 is intended to continue to evolve and eventually maintain a natural dialogue with the user. According to BMW, "This interaction will involve the user simply making iDrive aware of their wishes and requests, while the system learns how its user behaves, comes up with suggestions in real time (based on an extensive pool of detailed knowledge) and actively proposes them to the driver – who then only needs to confirm." Automakers have talked about the concept of the vehicle as a smartphone on wheels, but this iDrive 8 system, as well as systems being developed by other automakers, aims to elevate the vehicle to something capable of anticipating driver and passenger needs.

[OEM Highlights] SAIC begins to roll out battery-swappable EVs in China

SAIC Motor has begun to roll out its first battery-swappable electric vehicles (EVs) across China. Under a partnership with Aulton, a Shanghai-based EV transport solution provider, the Roewe Ei5 EV featuring battery-swapping technologies is to join the city of Shanghai's public transportation service network. The Roewe Ei5 is equipped with a 52.5-kWh battery pack, which is chargeable to 80% of capacity in 30 minutes using fast-charging mode. SAIC claims the driver can replace a vehicle's battery pack at Aulton's battery-swapping stations in less than half a minute. The first batch of 100 of Roewe Ei5 vehicles with battery-swapping technologies has been handed over to Dazhong Transportation and Shanghai Jiangnan Tourism Service Company for taxi and ride-hailing services.

Outlook and implications

EVs featuring battery-swapping technologies should fit in well with shared mobility service networks. The technology enables drivers to replace a depleted battery pack at a battery-swapping station, which, in most cases, takes less time compared to battery charging. According to an Autohome report, each Aulton battery-swapping station can store 60 battery packs. The used battery packs are to be recharged at the stations, boosting a station's service capacity to 1,200 vehicles per day. SAIC also plans to introduce battery-swappable technology in other Roewe models. For instance, the automaker plans to introduce a model variant of the ER6, a compact electric sedan, with swappable batteries. SAIC is currently constructing its first self-operated battery-swapping station in Shanghai, which will provide services for Roewe's battery-swappable EVs.

[Sales Highlights] IHS Markit forecasts Chinese passenger EV production to grow 81% in 2021

IHS Markit perspective	
Implications	China's push for passenger BEVs to account for a bigger share of the passenger vehicle market is to accelerate in the next decade. IHS Markit's current view on the market is still consistent with our earlier forecast released in December 2020. The Chinese NEV market as a whole is forecasted to continue to witness double-digit rate growth through 2025.
Outlook	IHS Markit forecasts the passenger BEV production volume in mainland China is to increase 81% to 1.76 million units in 2021, accounting for 8.4% of total passenger vehicle production.

IHS Markit forecasts the production volume of passenger battery electric vehicles (BEVs) in mainland China is to increase 81% to 1.76 million units in 2021, accounting for 8.4% of total passenger vehicle production. The surge is forecasted to be fuelled by automakers' efforts to expand their product offerings to capitalise on favourable government policies on new energy vehicles (NEVs). In addition, stricter regulations that require automakers to achieve certain fuel-consumption targets and NEV production quotas under the so-called 'dual-credit policy' are expected to force automakers to review their strategies and invest in new products.

Against this backdrop, BEV technologies have emerged as the main technology path for OEMs such as Volkswagen (VW) and General Motors (GM). IHS Markit's latest forecast on China's NEV market indicates passenger BEVs will continue to secure a dominate share of the passenger NEV market in 2021 and 2022. The total production volume of passenger BEVs is expected to increase from 1.76 million units in 2021 to 2.34 million units in 2022, accounting for 77% of total passenger NEV production. In terms of the top performers in the BEV market, Tesla is expected to lead the production expansion on the back of strong demand for its Model 3 sedan and Model Y. The launch of the lithium-iron-phosphate (LFP)-battery-powered versions of the Model 3 has enabled Tesla to reduce the price of the Model 3 in China, making the entry-level Tesla sedan even more accessible to mass-market electric vehicle (EV) buyers. The Model Y, production and sales of which began in January this year, allows Tesla to compete directly with premium automakers in the sport utility vehicle (SUV) market. In the budget EV segment, mini-sized EVs are playing a role in boosting EV acceptance among mass-market buyers. Models such as the Wuling Hongguang Mini EV introduced by SAIC-GM-Wuling and the Ora R1 introduced by Great Wall Motor are gaining traction in the market due to their practicality and low price point. EV startups such as NIO and Xpeng, in comparison, are targeting a different set of consumers who are less sensitive to brand image than premium EV buyers and are drawn to new technologies, especially advanced driver-assistance features. This group of EV buyers also has high requirements on cabin design and interior quality.

This year, VW is to enter the BEV market with the company's first MEB-based models, the ID.4 X and ID.4 CROZZ. The larger ID.6 is due to be unveiled in April at the Shanghai Motor Show 2021. However, faced with hurdles such as lack of dedicated charging infrastructure, VW's production ramp-up of MEB-based models is expected to only begin to accelerate in 2023.

Outlook and implications

China's push for passenger BEVs to account for a bigger share of the passenger vehicle market is to accelerate in the next decade. IHS Markit's current view on the market is still consistent with our earlier forecast released in December 2020. The Chinese NEV market as a whole is forecasted to continue to witness double-digit rate growth through 2025. Last November, China's State Council approved a development plan for the country's NEV industry for 2021–35. The plan includes a target of NEVs accounting for 20% of new vehicle sales by 2025. It also set out the top policy-making body's vision of BEVs becoming a main type of vehicle in the market by 2035. To quicken the adoption of BEVs, megacities such as Shanghai are fine-tuning their policies to favour BEVs. The city announced in February that plug-in hybrid electric vehicles (PHEVs) would no longer be granted dedicated NEV licence plates from 2023 onwards, while BEV buyers would still be able to apply for a free NEV licence plate. The new policy is expected to pull forward demand for PHEVs in 2021 and 2022, and sales of PHEVs are expected to slow down from 2023 onwards due to lack of incentives. We currently expect PHEV production in China to reach 600,000 units in 2022, compared with less than 390,000 units forecast for 2021. Production volumes of PHEVs are expected to grow further by 28% to around 769,000 units in 2023. SAIC Motor, a leading player in the PHEV market, is forecasted to be the automaker most affected by the new policy announced by the Shanghai city authorities. SAIC's production volumes of PHEVs are expected to increase to 45,000 units in 2022, compared with 20,849 units in 2020. The expansion is forecasted to be followed by a decline of 61% in the automaker's PHEV production volumes in 2023 when the new policy takes effect in Shanghai.

[Sales Highlights] Chinese new vehicle sales grow 365% y/y in February

IHS Markit perspective	
Implications	CAAM's data indicate a strong rebound in new vehicle demand for a second consecutive month in February, which, to a large extent, may be attributable to a low base of comparison. Chinese new vehicle sales contracted significantly by 79% in February 2020 because of the COVID-19 virus outbreak.
Outlook	According to IHS Markit's January light-vehicle market forecasts, light-vehicle production in mainland China is expected to increase 6% to 24.8 million units in 2021, after a decline of 4.3% in 2020. Light-vehicle sales in mainland China are expected to increase 6.2% to 25.1 million units in 2021.

The auto market of mainland China experienced another month of strong growth in new vehicle sales in February, propelled by robust demand for passenger vehicles (PVs) and for commercial vehicles (CVs). According to data released by the China Association of Automobile Manufacturers (CAAM), new vehicle sales on a wholesale basis increased 364.8% year on year (y/y) to 1.45 million units in China last month, while production rose by 418.9% y/y to 1.50 million units. In the year to date (YTD) for February, China's new vehicle sales were up by 76.2% y/y to 3.958 million units, while production volumes grew 88.9% y/y to 3.89 million units.

Of the total new vehicle sales and production in China last month, PV sales increased 409.9% y/y to 1.156 million units, while PV production rose by 480.6% y/y to 1.16 million units. The CAAM definition of PVs includes sedans, sport utility vehicles (SUVs), multi-purpose vehicles (MPVs), and minivans. During February, China's sales of sedans were up by 452.4% y/y to 528,000 units, MPV sales increased 218.4% y/y to 46,000 units, SUV sales rose by 399.1% y/y to 566,000 units, and minivan sales grew 386.4% y/y to 16,000 units. In the YTD, Chinese sales of PVs were up 74.0% y/y to 3.20 million units, while production of PVs increased by 87% y/y to 3.07 million units.

China's CV sales, including medium and heavy vehicles, also remained strong in February. Last month, sales volumes of CVs rose by 246.2% y/y to 299,000 units, while CV production increased 280.8% y/y to 340,000 units. In the YTD, sales of CVs rose by 86.2% y/y to 757,000 units, while production of CVs increased 96.3% y/y to 818,000 million units.

China's sales of new energy vehicles (NEVs), which include battery electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs), and fuel-cell vehicles (FCVs), increased 584.7% y/y to 110,000 units in February. Sales of passenger BEVs grew 633.6% y/y to 89,000 units in February, while sales of commercial BEVs increased 144.5% y/y to around 3,000 units. Sales of passenger PHEVs stood at 17,000 units in February, up 596.5% y/y. In the YTD, NEV sales in China rose by 319.0% y/y to 289,000 units, while production of NEVs increased 386.6% y/y to 317,000 units.

China's new vehicle exports jumped by 134.4% y/y to 105,000 units in February. By vehicle type, PV export volumes increased 122.8% y/y to 77,000 units, while CV export volumes grew 174.6% y/y to 28,000 units.

Outlook and implications

CAAM's data indicate a strong rebound in new vehicle demand for a second consecutive month in February, which, to a large extent, may be attributable to a low base of comparison. Chinese new vehicle sales contracted significantly by 79% in February 2020 because of the coronavirus disease 2019 (COVID-19) virus outbreak. The COVID-19 virus outbreak, which escalated in China in the final week of January 2020, resulted in a free fall of the market in February last year.

China’s CV sales witnessed rising demand for commercial vans and trucks in the past few months, thanks to government-led infrastructure building projects. The government's efforts to boost domestic consumption will continue to drive up demand for commercial vehicles. Last month, the NEV market of mainland China also remained strong owing to a high uptake rate for models such as the Tesla Model 3, BYD Han EV, and Wuling Hongguang Mini EV. Compared to a year ago, private-sector demand is now playing a more important role in underpinning the expansion of the NEV sector.

Government incentives and preferential policies will continue to play a role in boosting new vehicle demand in China during 2021. On 9 February, the Ministry of Commerce once again urged local government authorities to support auto consumption in rural areas and raise quotas of licence plates to encourage consumers, especially car-less families, to purchase NEVs. The country is also increasing its focus on use of hydrogen-run cars. In September last year, China announced new policies to support hydrogen fuel-cell vehicle (FCV) sales and the development of the industry’s supply chain and technologies. The effort will help China to boost the number of FCVs on its roads to 100,000 units, a target set for 2025. Encouraged by government incentives, Chinese automakers, including SAIC Motor, Great Wall Motor, and Geely Auto, have already announced plans to introduce FCVs in the market. SAIC Motor, for instance, has plans for 10 new FCVs by 2025 in an effort to achieve a market share of 10% in the segment in China.

The semiconductor supply shortage continued to have an impact on mainland China’s auto production during February. However, we still expect the current shortages to be more of a seasonal issue, with the volume lost in the first quarter displaced to later in the year.

According to IHS Markit’s January light-vehicle market forecasts, light-vehicle production in mainland China is expected to increase 6% to 24.8 million units in 2021, after a decline of 4.3% in 2020. Light-vehicle sales in mainland China are expected to increase 6.2% to 25.1 million units in 2021.

[Technology Highlights] Evergrande's EV firm to form JV with Tencent to develop smart vehicle OS

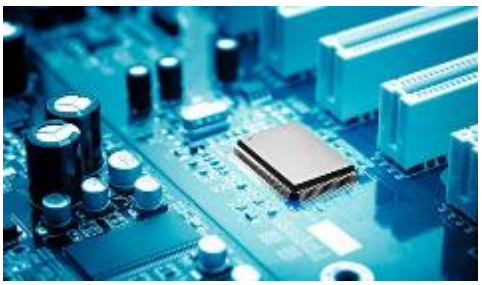
Evergrande New Energy Vehicle, the electric vehicle (EV) arm of China Evergrande Group, has announced plans to form a joint venture (JV) with a unit of Tencent Holdings to develop a smart vehicle operating system (OS), reports Reuters. The EV firm will contribute 60% of capital to the venture while Tencent unit Beijing Tinnove Technology will make up the remainder. Evergrande New Energy Vehicle said, "Both parties are expected to give a full play of their respective capabilities in new energy vehicle research and development, manufacturing, artificial intelligence, big data, cloud computation, commuting and other fields".

Outlook and implications

China Evergrande Group has closed several acquisition deals in the automotive industry in the past two years to make inroads into the country's booming EV sector. The group's subsidiary, auto company National Electric Vehicle Sweden (NEVS), entered into an agreement with Koenigsegg Automotive AB (KAAB) in 2019 to establish a JV company called Konev AB. Last year, Evergrande Group unveiled six new electric models to be introduced by its Hengchi brand, during a brand event held in China. The group announced plans to invest CNY20 billion to advance its EV business in 2020 and 2021. Meanwhile, Tencent is accelerating its deployment of technology-driven automotive services. Last year, Tencent launched TAD Sim 2.0, a new simulation platform to accelerate testing efficiency of autonomous vehicles.

[Technology Highlights] Samsung to develop chips for Waymo's autonomous vehicles

Samsung Electronics has reportedly won a project to develop chips for Waymo's autonomous vehicles (AVs). The chips can compute the data collected from the various sensors embedded in AVs or exchange information with Google data centres in real time to centrally control functions. The project is expected to be conducted by Samsung's logic chip development division, reports *Automotive News*.



Outlook and implications

Waymo is at the forefront of automated transportation development. The company has conducted 20 million miles of AV testing on public roads in 25 cities and more than 10 billion miles of simulation. Recently, it has published a white paper in which it offers a glimpse into how its autonomous system, Waymo Driver, could have mitigated fatal crashes in a virtually recreated environment. Samsung Electronics is also scaling up its efforts in the automobility sector and acquired US-based infotainment business Harman International in 2016. Harman recently acquired US-based startup Savari, which develops vehicle-to-everything (V2X) communication technology necessary for AV operations. In 2018, Samsung Group announced plans to invest KRW25 trillion over the next three years in the new growth areas of artificial intelligence (AI), 5G, automotive electronics components, and biopharmaceuticals.

[GSP] Europe Sales and Production Commentary -2021.02

Europe sales

January 2021: -20.5%; 1.152 million units vs. 1.450 million units

- The global spread of the COVID-19 virus and efforts to contain it are shaping the near-term economic outlook. The IHS Markit baseline forecast assumes that an effective vaccine will not be widely available until late 2021 or early 2022 and government restrictions on activities will be progressively eased through the remainder of the first quarter of 2021. The COVID-19 pandemic has emerged as the single-biggest risk factor facing the automotive industry for many years. The COVID-19 crisis piles intense additional pressure on an already stressed automotive industry, and the latest forecast includes downgrades across virtually all regions.

- Although the declines are steep, they are not as heavy as those recorded in early 2020. This is expected owing to the level of dealer readiness for new sales and handover processes that were not in place at the time of earlier lockdowns, which will support ongoing vehicle registrations. However, although automakers have begun offering online vehicle orders and some dealers can take orders over the phone, customers either seem to be less confident about this method or preoccupied by the wider implications of the lockdowns. This will likely lead to a depleted orderbook and therefore, will have a knock-on effect during earlier months of 2021. At the same time, those in the most heavily affected sectors, such as nonessential retail and hospitality, which will be more reliant on government support measures, are also less likely to enter the market when dealers reopen.

- The European passenger car market dropped almost one-fourth in 2020 as key markets implemented restrictions to tackle the spread of the COVID-19 virus during the year. The European market fell 20.4% year on year (y/y), to 16.41 million registrations, in 2020. As COVID-19-related restrictions remain in place in some markets in January 2021, combined with other factors, registrations in January slipped 20.5% y/y, to 1,152,864 units.

- With the introduction of new car market stimulus programs in countries, such as France, Spain, and Germany during July 2020, the region moved into the positive territory again. The decline suffered by the European car market in August was again disappointing after a positive sign in July. However, the decline was not as disastrous compared with earlier months, when the COVID-19-related restrictions were at their height. After a slight gain in September, losses followed in the final quarter of 2020. According to the latest IHS Markit forecast, registrations dipped 20.5% y/y during January to 1,152,864 units.

- In January, the Western European markets performed quite equally. High, double-digit losses were seen in countries, such as Austria (down 34.8%), Belgium (down 24.2%), Netherlands (down 18.2%), and Switzerland (down 17.2%). Out of the Big Five markets, France showed the best performance, with a 3.3% loss, followed by Italy, with a 13.1% loss. The other three markets showed stronger declines, with Germany down 30.1%, the United Kingdom down 33.9%, and Spain down 48.7%. On the other side, two markets were able to grow in January: Norway (up 2.8%) and Sweden (up 26.4%). Moreover, the implemented car stimulus programs have a direct effect on the recovery of the different markets. Looking back to 2020, the Western European market was down 23.7% y/y. The market started solid into the first quarter of 2020, but with the COVID-19 outbreak, the trend significantly changed and pushed the market into a deep recession, with sales volumes massively falling in the second quarter of 2020. With lower infection numbers and government support, sales volumes improved in the third quarter, until the second wave of COVID-19 infections arrived and again dragged down sales volumes. On the positive side, governments around the world are working toward sustainable ways to manage the COVID-19 pandemic. Recovery cycles will be largely determined by the path of the pandemic, including progress on vaccine programs. All parts of Western Europe face a winter of high COVID-19 infection rates and ongoing restrictions, which could further dent automotive demand prospects. The crisis intensifies operational and economic pressures on an already stressed global automotive industry, especially as OEMs and suppliers finetune strategies toward coping with “new normal” vehicle demand levels.

- The eurozone economy is heading for a double dip. The initial robust rebound following the easing of COVID-19 containment measures was already losing momentum prior to the recent reimplementation of restrictions. In line with the evolution of the IHS Markit containment indices for the eurozone and its member states, survey data markedly deteriorated in November, consistent with a quarter-on-quarter (q/q) contraction in GDP in fourth quarter 2020.

- The eurozone’s GDP is still well below the prepandemic level despite the record third-quarter rise. The 12%-plus q/q growth in GDP in the third quarter of 2020 far surpassed expectations, with expenditure components across the board benefitting from the prior easing of COVID-19 restrictions. However, despite the surge, eurozone GDP remained more than 4% below its level in the fourth quarter of 2019.

- The resurgence of the COVID-19 virus and related containment measures signaled another GDP contraction in the fourth quarter. Leading indicators, including IHS Markit Purchasing Managers’ Index® (PMI®) data, have shown a sharp deterioration in services activity during the fourth quarter. Activity in the manufacturing sector has been more resilient.

- The latest COVID-19 developments suggest the first quarter of 2021 will be weaker, with eurozone real GDP contracting quarter on quarter for a second consecutive quarter. With the downturn extended, the eurozone economy should bounce back more vigorously in the second quarter, followed by well above-potential growth in the second half of 2021 as vaccinations allow for fewer restrictions on activity. The third quarter and the holiday season will be pivotal to some of the economies hardest hit by the pandemic.

- Conditions will continue to vary across eurozone member states. Given variations in the containment of the COVID-19 virus, related restrictions, the economic structure, and the available policy space, the economic performance will continue to diverge at a country level. The economies that are more manufacturing driven, such as Germany, will outperform in the near term, while the highly indebted, services-orientated economies of southern Europe will take longer to return to their pre-COVID-19 GDP levels.

- Coordinated policy stimulus cannot prevent COVID-19-driven recessions, but it can mitigate some related risks. The European Central Bank's (ECB's) ongoing expansion of net asset purchases and long-term loan provision to banks has contributed to a compression of sovereign yield spreads and other risk premia, along with the EU-wide agreement on the Recovery & Resilience Facility (RRF). Still, high public-sector debt burdens, legal constraints on the ECB, banking sector vulnerabilities, and potential deflationary risks remain key sources of concern.

- Compared with the development in Western Europe, demand in Central Europe was on the same level and recorded a 23.2% loss in January 2021 with 93,295 units. After 11 months of steep falls, the Central European market posted another 23.2% decline during the first month of the year, which is similar to the performance of the Western European region. Strong declines and volume losses in January were seen in markets, such as Bulgaria (down 28.6%), Slovenia (down 26.5%), Romania (down 48.1%), Czechia (down 21.7%), Slovakia (down 21.8%), Estonia (down 12.0%), Croatia (down 25.6%), Hungary (down 10.7%), and Poland (down 16.0%). In addition, Eastern Europe was able to show a much better result than the other two markets in European region again. Demand in Eastern Europe during the month posted a slight growth of 2.0% compared with the same period last year. The main reason for this solid volume was again the strong result in the Turkish market (up 60.3%), which is related to the low base level in the Turkish car market during 2019/20.

- For full-year 2020, the European light vehicle market posted a significant loss of 20.4%, with sales of 16,417,367 units, mainly related to the outbreak of the COVID-19 pandemic in spring 2020. The results were affected by losses in Western Europe (down 23.7%) and similar losses in Central Europe (down 23.8%). The Eastern European region was dragging up the sales level of the whole European region with a gain of 2.1% for full-year 2020. Despite the good news that effective vaccines will be widely available by mid-2021, expectations for the beginning of 2021 leaned toward the cautious side. The global spread of the COVID-19 virus will still have a fundamentally impact on the near-term economic outlook.

- Other than the COVID-19 virus outbreak, which will have a massive effect for a longer period, there are further downside risks. Protectionism is a prominent source of concern. The threat of an all-out trade war could be enough to defer some expenditure, especially investment. Emerging-market turbulence is an additional headwind to growth and a source of uncertainty. Political developments in Italy, the potential effect on sovereign yields and spreads, and contagion to other member states also merit attention.

- For the western part of the continent, IHS Markit predicts a recovery within this region with a 11.0% increase, up to 13.85 million units—about 1.4 million units more than in 2020. Western and Central Europe combined, recovery is expected to reach only 15.3 million units in 2021—about 10.9% above the 2020 level. In the east, turmoil is far from over in Russia and its neighboring countries, with expectations being held at bay. The recovery of the Turkish economy, especially with the stabilisation of the Turkish lira and changes in local taxation, has resulted in a jump of vehicle sales in the country. The latest data show a better performance than in the Western and Central European markets, with a slight growth of 2.0% in Eastern European sales in January 2021. For full-year 2020, Turkish light vehicle sales advanced 61.3% y/y thanks to the low base of comparison. The ongoing economic recovery and interest rate cuts have boosted deferred vehicle demand. However, the recent geopolitical tensions may affect growth performance. Aimed at boosting domestic demand in the face of the COVID-19 virus crisis, lower interest rates significantly raise downside risks to the stability of the lira. Some OEMs announced suspended production at Turkish plants for several weeks amid the COVID-19 virus outbreak. Currently, the net effect of the COVID-19 virus to Turkey's economic activity remains uncertain. Generally, for the short term, a gradual recovery in the new vehicle market will be seen on the back of an economic growth rebound starting in 2020.

- For the Eastern European region, the outcome for 2021 is uncertain because of the COVID-19 global pandemic. Because of various restrictive measures imposed by national governments and the expected overall economic downturn, IHS Markit has considerably decreased the assumptions in 2020–21 for Russia, Belarus, Kazakhstan, and Ukraine. In 2021, sales in Eastern Europe are expected to stagnate. A marginal improvement in Russia is likely to be offset by a downward development in Turkey, where the market might suffer a payback effect after the advanced buying in 2020. Demand in Ukraine, Kazakhstan, and Uzbekistan is expected to slightly increase, while the Belarusian market might further contract. Sales will exceed 4.0 million units in the next decade, as Russia approaches the 2.0-million-unit mark and Turkey becomes a 1.0-million-unit market in 2026–27. Nevertheless, Eastern Europe is not expected to return to its 2012 mark (23%) of European sales before 2034. Europe is now gripped by a full-scale COVID-19 crisis, with demand conditions worsening by the day. The region faces months of rolling disruption, as the conjoined health and economic crises play out across economies. Combined Western and Central European auto demand for 2021 is set at 15.3 million units, up 10.9% over 2020, but still significantly below pre-virus settings.

- In the longer term, Western Europe is not expected to return to the 2007 sales peak level. Some markets may even enter a demotorization phase in the early stages of the next decade. Surprisingly, the recovery path is expected to be on the positive side. Pent-up demand is larger and, above all, releasing far sooner and faster than anticipated. This result was helped by a general environment that has been supportive, which includes extremely low energy prices, fast gains in purchasing power in many countries, and the ECB’s monetary policy. However, for the longer term, many of the core issues—including public debt,

unemployment, and pension systems—will still be in place. Moreover, Europe will have to cope with structural constraints—such as dull demographics (with some exceptions); increasingly constraining transport legislation; and disruptive social evolutions (e.g., shifts in transport habits and relationship with cars)—in the same time frame, which could hamper vehicle sales potential. The continent must also cope with the Brexit effect. Moreover, the transfer to electrification will lead to a phase of uncertainty because it is not clear which concept (plug-in hybrid electric, battery electric, compressed natural gas, fuel cell, gasoline, or diesel) will come out on top. Especially in the private-car buyer sector, the uncertainty will continue because nobody wants to be stuck with an "outdated" car or concept. In addition, OEMs' fleet carbon dioxide (CO2) emissions targets starting from 2020/21 will be a huge challenge for all participants and will affect the market structure, powertrain mix, and car prices. On the positive side, growth in Central European countries should become more sustainable, since the market is far from being saturated, and new demand (i.e., newcomers to the new car market) should keep building, along with wealth and income gains. Eastern Europe should also rebound in the medium-to-longer term. Prospects in Turkey are bright, thanks to strong demographic and economic potentials. Russia presents a more complex case. Undoubtedly, this market can easily yield 2.5 million units on a regular basis, but some structural evolutions (e.g., creating a more diversified economy) are necessary to turn the fragile giant into a top player.

Europe Production

January 2021: -17.9%; 1.35 million units vs. 1.65 million units

- European production should rebound 14% in 2021 to 18.95 million units, based on a 10% improvement of demand and significant inventory rebuild, after the decorrelation of supply to demand that occurred in 2020. On top of the extension of lockdowns affecting retail in important parts of Europe and the weather conditions disrupting part of the activities, the current situation with the shortage of semiconductors is putting pressure on the supply side. This issue will likely have a noteworthy seasonal effect, but at this point, there is no impact on overall volumes for the full year. In this forecast round, 267,000 units have been removed from the first half of the year, and the same volume is balanced back to the second half. Around 172,000 units have been removed from the first quarter, and while OEMs seek to shift volumes from the first quarter to the second, the forecast incorporates the possibility that issues with microchip supplies will drag into the second quarter, leaving limited room for catch-up and possibly harming existing work plans. Therefore, IHS Markit analysts have removed 90,000 units from the forecast for the second quarter.

[Supplier Trends and Highlights] Foretellix, Humanetics demonstrate toolchain for ADAS, autonomous driving system

Toolchain will help OEMs and tier-1 suppliers to reduce development and validation costs

Source: Getty Images

Foretellix has teamed up with Humanetics, a US-based company specializing in active safety testing equipment and services, to demonstrate a joint tool chain that bridges the gap and allows for correlation between virtual and physical testing, the Israel-based company said in a press release on 16 March. The joint tool chain combines physical and virtual testing of advanced driver assistance systems (ADAS) and automated driving systems (ADS). It will help original equipment manufacturers (OEMs) and tier-1 suppliers to reduce development and validation costs while accelerating testing to ensure safety and compliance.

Outlook and implications

Israel-based Foretellix offers verification and validation platforms for automated driving systems. The company has developed Foretify, a coverage driven verification and validation platform for ADS. Foretellix has also developed a Measurable Scenario Description Language (M-SDL) to describe both scenarios and coverage goals at very high level to enable a measurable safety ecosystem. In November 2020, DENSO selected Foretellix's Foretify platform for verification of its ADAS and ADS.

Foretellix and Humanetics released a video showing a complete verification and validation cycle of a scenario for testing ADAS. The scenario is first defined on Foretellix's verification platform using M-SDL. The abstract scenario is then utilized by Foretify to automatically create thousands of meaningful tests that can be sent to different test platform. In the demonstration, a set of concrete tests are sent to the Humanetics' UFO Base software. Humanetics test robots then accurately execute these tests on the proving ground by converting the data with UFO Base script. Once conducted the test data is then sent back to Foretify productivity dashboard for KPI and Coverage Driven Analysis, correlation with the virtual testing and further iteration on the different simulators. After the virtual demonstration, Foretellix and Humanetics plan to conduct a joint event at GoMomentum Station in Concord, California, US, in May 2021.

[Supplier Trends and Highlights] Socionext next-gen smart display controller to use Inova Semiconductors' APIX3 Technology

The first batch of the controllers will be available by the second quarter of 2022

Source: Getty Images/Antiv3D

Socionext has announced a licensing agreement with Inova Semiconductors to use Inova's APIX3 technology from for its next generation of smart display controllers, according to a company press release on 16 March.

The first batch of the controllers will be available by the second quarter of 2022. The fourth generation include features such as a repeater function where several graphic controllers can be cascaded, allowing new architectures such as panoramic displays in the dashboard. New functionalities such as Local Dimming and Warping-on-the-fly can also be implemented.

"Socionext has successfully integrated APIX technology into its smart display controllers and other products over several generations, so that it is now fair to speak of a de facto standard. Thanks to the high flexibility and the scalable bandwidths, a wide variety of applications can be served in the car - from inexpensive, simple information displays through to sophisticated infotainment systems to safety-relevant instrument clusters," said Koichi Yamashita, Corporate Senior Vice President, Head of Automotive Business Unit of Socionext.

Outlook and implications

Socionext's partnership with Inova Semiconductors began in 2007 with the former being the first manufacturer to license the APIX interface for its smart display controller and also the first licensee of APIX2 and APIX3 technologies.

APIX, short for Automotive Pixel Link, is a 12 Gbps SerDes (Serializer/Deserializer) technology developed by Inova for high resolution automotive video applications used in are infotainment and entertainment systems in vehicles. According to the press release, there are around 150 million chips with APIX interfaces currently in use in the vehicles of numerous manufacturers worldwide, with over 50 million of from Socionext alone. The new smart display controllers will be used in vehicles from 2025/2026.

[VIP ASSET] The case for OEM-made operating systems in the age of software-driven vehicles

Seamless integration between hardware and software will make the vehicle the ultimate mobile device, more than a phone or a computer. To tap into its full potential, OEMs such as Daimler and Volkswagen have made a clear decision to architect and develop their own operating system in-house. The software-driven architecture will become the starting point of all new vehicle projects in the medium-to-long term.

By combining vehicle domains with the cloud and internet of things (IoT), future software architecture will have a common hardware layer at the vehicle level, a common middleware layer in the software level, and an operating system that will add different features in a scalable way. To sustain future profitability, OEMs are looking to provide on-demand and subscription-based features at the point of sale as well as an enhancement for driving.

Introduction

The evolution of autonomous, connected, and electric mobility (ACE) is intensifying, pushing OEMs and their suppliers toward embracing unconventional thinking and new business strategies. The key to dominating the market lies in taking control of system and software integration.

The seamless link between hardware and software will offer tremendous opportunities in the future. Other than electrification, OEMs are prioritizing their efforts toward the software and digital sphere given their significant impact across domains from infotainment and driver assistance to IoT capabilities.

To tap into that potential, many OEMs have made a clear decision to become the architect of their own operating systems. For example, according to recent press statements from Volkswagen and Daimler, both confirmed their strategic intent to develop their own software operating systems. While, ZF and TTTech Auto, providers of software and hardware platforms for automated driving as well vehicle steering systems, are also developing operating systems together with a software ecosystem.

The result of these strategic decisions illustrates a profound shift in the automotive supply chain. The industry is likely to evolve from a supplier-driven complete solution toward a multifaceted ‘software technology stack’ that in many ways resembles the PC industry.

In today’s vehicle, the accompanying value relates to the supplier developed hardware—the chassis, the powertrain, interiors, and exteriors—but the new aforementioned paradigm means differentiation and profitability will migrate toward the technology and the associated software of the stack. In this context and based on IHS Markit Automotive Supply Chain and Technology market research and analyses, we offer a perspective on two key questions:

- What are the key drivers behind the growth dynamics of OEM in-house software development?
- How are these drivers going to influence the future growth of supply chain value mapping?

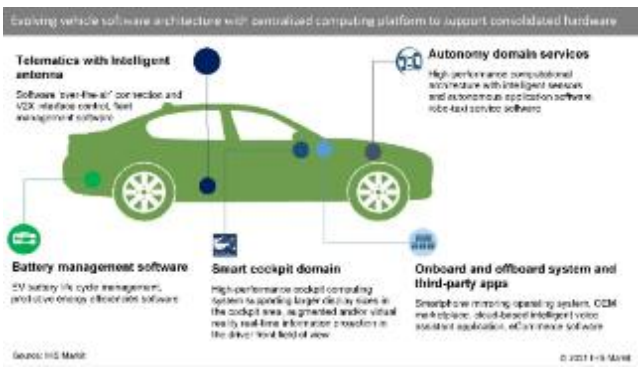
Software continuing its procession into the core of the vehicle and driving user experience

A series of societal forces together with advancements in ACE and shared mobility have started to reshape consumers’ mobility expectations and needs. In terms of autonomy, the implementation of intelligence sensors is

converging into a move toward a 'central computing system' with requirements for superior reliability, processing, and data storage.

As well as on-demand advanced driver assistance system (ADAS) functions, these systems also better support location-based services, which can require constant connectivity to be a part of inter-modal intelligent transport services for cloud interfaces and infrastructure communication.

The industry is also installing an increasing level of artificial intelligence (AI) and machine learning (ML) algorithms not only for ADAS functions, but also for electric vehicle (EV) battery management systems in order to predict energy savings and battery lifecycle management. As for shared mobility applications, requirements around shared ownership, digital keys, authentication, vehicle personalization features are all providing the double-digit growth of automotive software.



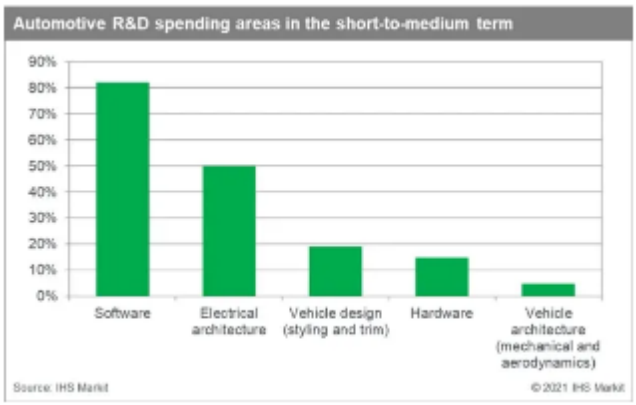
Significantly, OEMs are looking for new revenue streams as it is becoming clearer that vehicles as a product alone will not provide sufficient revenue between the bill of material and retail pricing. In this regard, in-vehicle software through digital services provides a new revenue stream in and for those OEMs that have vertically integrated its development, allowing further monetization or cost efficiencies to be made.

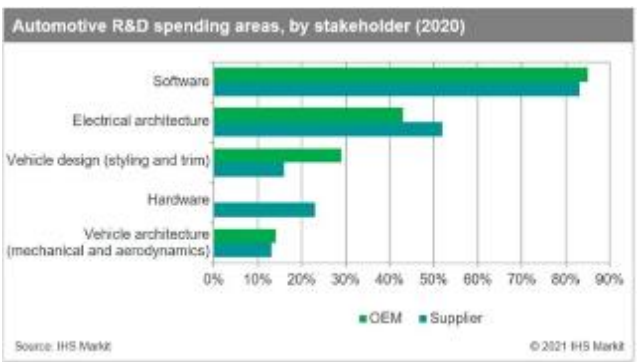
Furthermore, with in-house expertise, OEMs are more likely to bring new features and updates to customers faster than the traditional supply chain approach.

In fact, evidence suggests that OEMs and their suppliers will invest more of their research and development (R&D) budget toward software in the short-to-medium term from 2021. The data clearly illustrates a pattern: vehicle

manufacturers have little appetite for spending their budget on hardware or hardware-oriented features in the medium and long term unless there is a case for significant quality or cost improvements.

The implication of the survey data is very clear: for incumbents to stay relevant to the automotive industry, they must recognize these unfolding shifts, especially in the area of software and application-focused layers that provides higher revenue and margin and act accordingly to place themselves in the evolving software convergence landscape.





Changing business model – from point of sale to subscription-based feature option

The business model around the sale of automotive features is changing. Many of the upcoming features will be offered in a subscription-based model. This requires a deeper integration of hardware and software in a vehicle to support future add-ons or on-demand services.

Many experts opine that the whole logic of the vehicle is transforming from a fixed point update to a continuous update with the help of 'software-over-the-air' (SOTA); it is no longer reaching its peak capabilities at the point of sale but rather is getting better over time with the help of ML, AI, and data-based learning. A lesson traditional OEMs are adapting from Tesla; the OEM possesses OS ownership with strong in-house software capabilities. It also actively engages with third-party content providers, while traditional carmakers are highly dependent on supplier-developed OS and use this as a means to integrate content.

The new model of business will contribute towards an OEM's sustainability. If a high-quality vehicle stays up to date, it will be used and enjoyed longer. OEMs will still seek strong partnerships with the best in their field, especially

in the area of connectivity and autonomy, but they are more likely to define the standards and will retain control over the integration of systems and standards.

Addressing obvious industry challenges – how to pivot for the future

Faced with the long-term revenue declining scenario, OEMs, and suppliers are accelerating the growth prospect of the consolidated domain controller to improve reliability and reducing operating costs while maintaining quality, safety, and security as well as spearheading innovations.

The consequence of such a strategic move is that OEMs are now facing several challenges, which in turn becomes the driver for in-house software operating system development. In the following sections, we derive considerations and rationales for in-house software development.

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