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Automotive & Assembly Practice

Outlook on the automotive software and electronics market through 2030

The automotive software and electronics market is poised for strong growth in the next decade. Our latest market projections offer a glimpse into the industry's future.

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Executive summary

By 2030, the global automotive software and electronics market is expected to reach $462 billion, representing a 5.5 percent CAGR from 2019 to 2030.

The forces disrupting the automotive industry—known collectively as ACES (autonomous driving [AD], connected vehicles, the electrification of the powertrain, and shared mobility)—have gained significant momentum. The COVID-19 pandemic and its aftermath have accelerated the future of mobility, with profound effects on customer preferences, technology adoption, and regulation. New participants continue to enter the electric-vehicle (EV) market, and many have higher valuations than incumbent OEMs. Automotive companies and their suppliers are investing heavily in software and electrification.

These disruptions are enabled by and contribute to the rapid growth of automotive software and electronics. By 2030, the global automotive software and electronics market is expected to reach $462 billion, representing a 5.5 percent CAGR from 2019 to 2030. In contrast, the overall automotive market for passenger cars and light commercial vehicles (LCVs) is projected to grow at a compound annual rate of 1 percent in the same period—from 89 million units in 2019 to just 102 million units in 2030. This reality reflects a significant shift in the future of mobility, propelled by the expansion of urban-access restrictions (such as bans on internal combustion engine [ICE] vehicles), higher adoption of nonownership models (including car sharing and micromobility), and disruptive technologies (such as urban AD). In this environment, automotive companies are looking to software and electronics as the next frontier to transform the industry.

Building on our previous report,[1] our latest research provides an updated perspective on the trajectory of the automotive software and electrical and electronic components (E/E) market through 2030 (see sidebar, "How we derived our insights").

[1] Ondrej Burkacky, Johannes Deichmann, and Jan Paul Stein, "Mapping the automotive software-and-electronics landscape through 2030," McKinsey, July 9, 2019.

How we derived our insights

Closely linked qualitative and quantitative research generated the insights in this report. The qualitative insights include interviews with executives in the automotive sector, as well as the knowledge of experts from McKinsey's Automotive & Assembly Practice. The result is a holistic viewpoint on how mobility trends and additional forces will influence the market for automotive software and for electrical and electronic (E/E) components.

For our quantitative market insights, we built bottom-up market models for each of the core components in the automotive software and E/E market:

- software development, integration, verification, and validation
- electronic control units (ECUs) and domain control units (DCUs)
- sensors
- power electronics
- other components (harnesses, controls, switches, and displays)

At the highest level, these models (excluding software) calculate the size of markets by following the same logic. Market size is the product of the number (per vehicle) of a given component, its average selling price, and the number of vehicles produced in a year. To achieve the proper granularity for each model, we distinguish the key automotive domains (for example, advanced driver assistance systems, body, and infotainment), as well as characteristics such as vehicle segment, OEM type, or SAE (Society of Automotive Engineers) autonomous-vehicle level. The number of vehicles produced each year comes from a separate model, in which we incorporate data from the latest McKinsey insights. The calculation of the size of the automotive-software market is based on the amount of the workforce across the supply chain involved in software topics, as well as on the number of vehicle platforms and variants across OEMs and suppliers and their change over time.

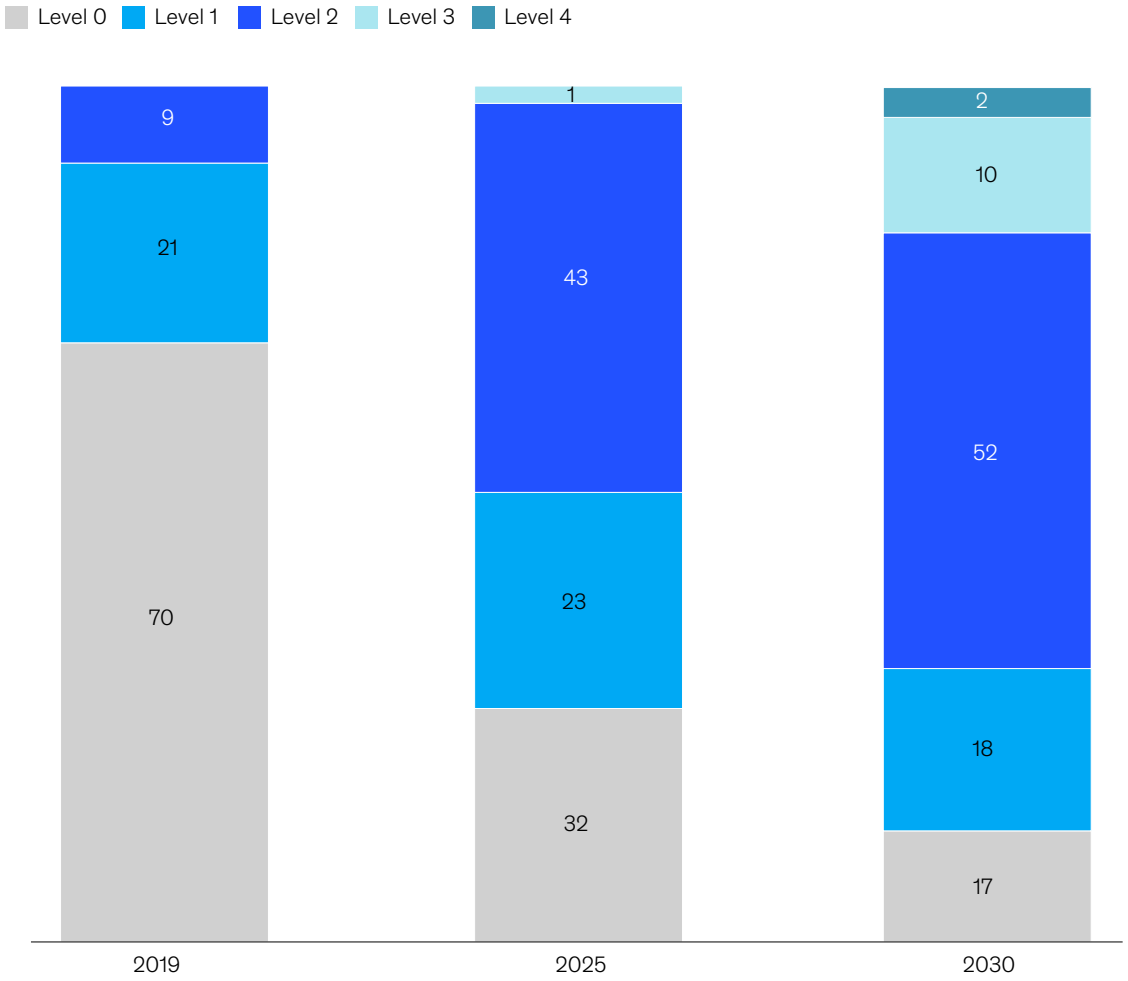
To compare our future outlook with more stable vehicle production, we have chosen 2019 as our market baseline, which was also the publication year of our last article. In the past three years, the automotive industry has faced major disruptions due to the closure of manufacturing plants at OEMs and their suppliers in the aftermath of the COVID-19 pandemic. The resulting shortage of semiconductors has led to a lower vehicle production forecast in 2030 compared with our last article. On the other hand, we have seen a clear acceleration in electrification since 2019. Many OEMs have announced a pure electric-vehicle portfolio after 2030, while governments are taking a more aggressive stance on climate regulation. We revised our forecast of the future shares of Levels 3 and 4 autonomous-driving capabilities to be less due to delays in the technical developments of the relevant software and sensors.

The adoption of driver assistance systems and AD will be fueled by changing customer preferences; regulations that prioritize safety and allow higher levels of autonomous driving; and technology breakthroughs, such as the availability of high-performance computers, advanced software, or light detection and ranging (LiDAR) sensors (Exhibit 1). For example, we expect strong annual growth of up to 30 percent for Level 2 advanced driver assistance systems (ADAS) through 2025, largely driven by regulations that require new vehicles to have these sensors. By 2030, we estimate that 12 percent of vehicles will be equipped with Levels 3 and 4 AD capabilities, compared with only 1 percent in 2025.

Exhibit 1

Consumer demand will propel the rapid growth of autonomous-driving and advanced driver assistance systems (AD/ADAS) vehicle sales.

Vehicle sales by SAE[1] level, % of vehicles

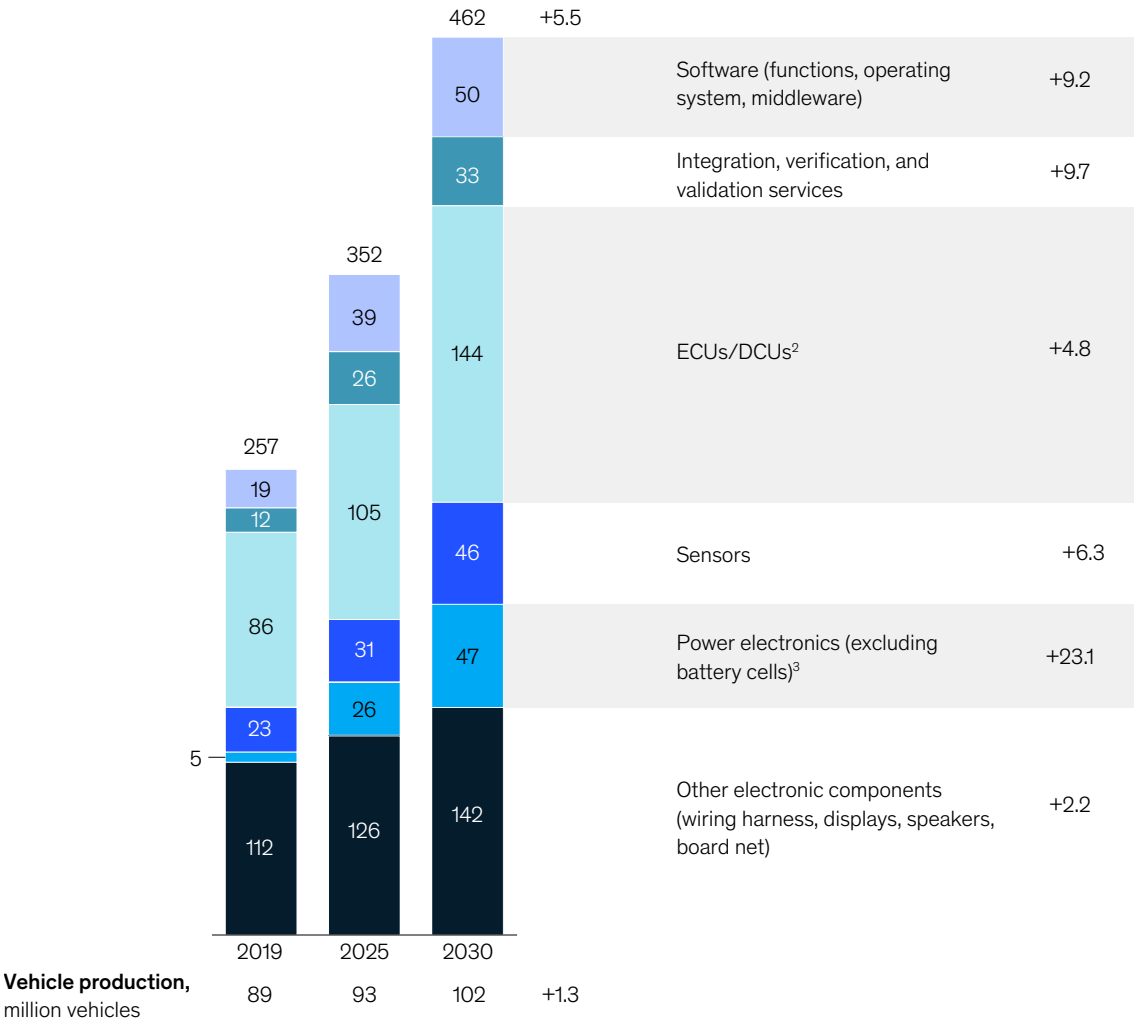


Note: Figures may not sum to 100%, because of rounding.
[1]Society of Automotive Engineers
Source: McKinsey Center for Future Mobility Current Trajectory Scenario

While passenger car and LCV sales will increase slightly from 89 million vehicles in 2019 to 102 million in 2030 (just higher than 1 percent CAGR), the automotive software and electronics market is projected to grow at nearly four times that rate during the same period (Exhibit 2). Making up the largest share of the market, electronic control unit (ECU) and domain control unit (DCU) sales are expected to reach $144 billion by 2030. The second-largest share of the market will be software development (including integration, verification, and validation), with a revenue potential of $83 billion by 2030. Power electronics is by far the fastest-growing component market, with EV adoption fueling an expected CAGR of 23 percent through 2030. Sensors are projected to grow at a compound annual rate of 6 percent, driven by AD/ADAS sensors.

Exhibit 2

The automotive software and electronics market is expected to grow at 5.6 percent per year through 2030.



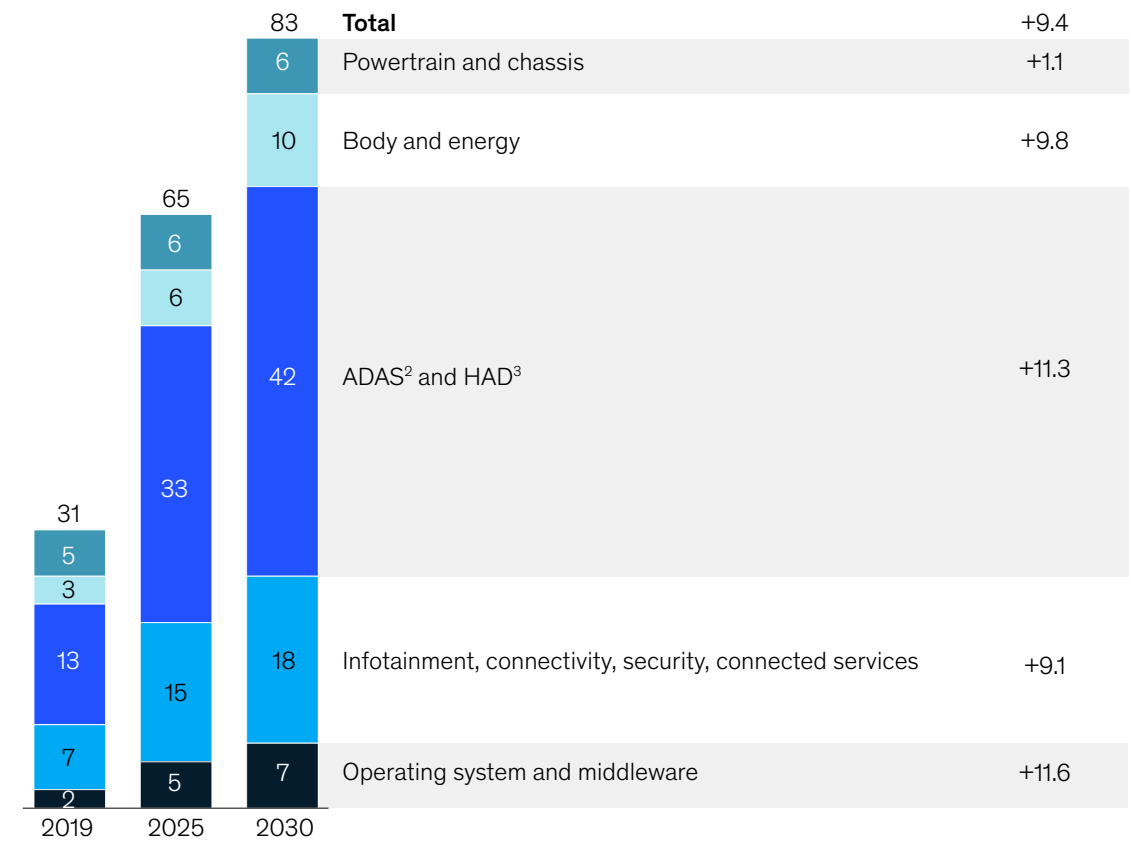
Note: This is a forecast for light vehicles, including passenger cars and light commercial vehicles. Figures may not sum to 100%, because of rounding.
[1]Electrical and electronic components.
[2]Electronic control units and domain control units. Hardware only.
[3]Includes onboard charger, DC/DC converter, and high-voltage inverter.
Source: McKinsey Center for Future Mobility Current Trajectory Scenario

The automotive software market is projected to more than double in size from $31 billion in 2019 to roughly $80 billion in 2030—a CAGR of more than 9 percent (Exhibit 3). ADAS and AD software will account for much of this growth and make up almost half the software market by 2030. Timing also plays a role: the development of software for higher-level autonomous driving (for example, urban AD) will precede market introduction by several years.

Infotainment, connectivity, security, and connected services will also grow at pace with the overall software market, becoming the second-largest software market by 2030. This growth is driven by a high share of connected vehicles and demand for features such as in-car payments, location-based services, and music streaming. The market for body and energy software will exhibit a CAGR of 10 percent as a result of increasingly stringent energy management requirements for EVs and an increasing number of premium comfort features in lower vehicle segments.

Exhibit 3

The automotive software market is expected to grow at 9.4 percent per year through 2030.



Note: Figures may not sum, because of rounding.
[1]Software includes function development, integration, and verification or validation.
[2]Advanced driver assistance systems.
[3]Highly autonomous driving.
Source: McKinsey Center for Future Mobility Current Trajectory Scenario

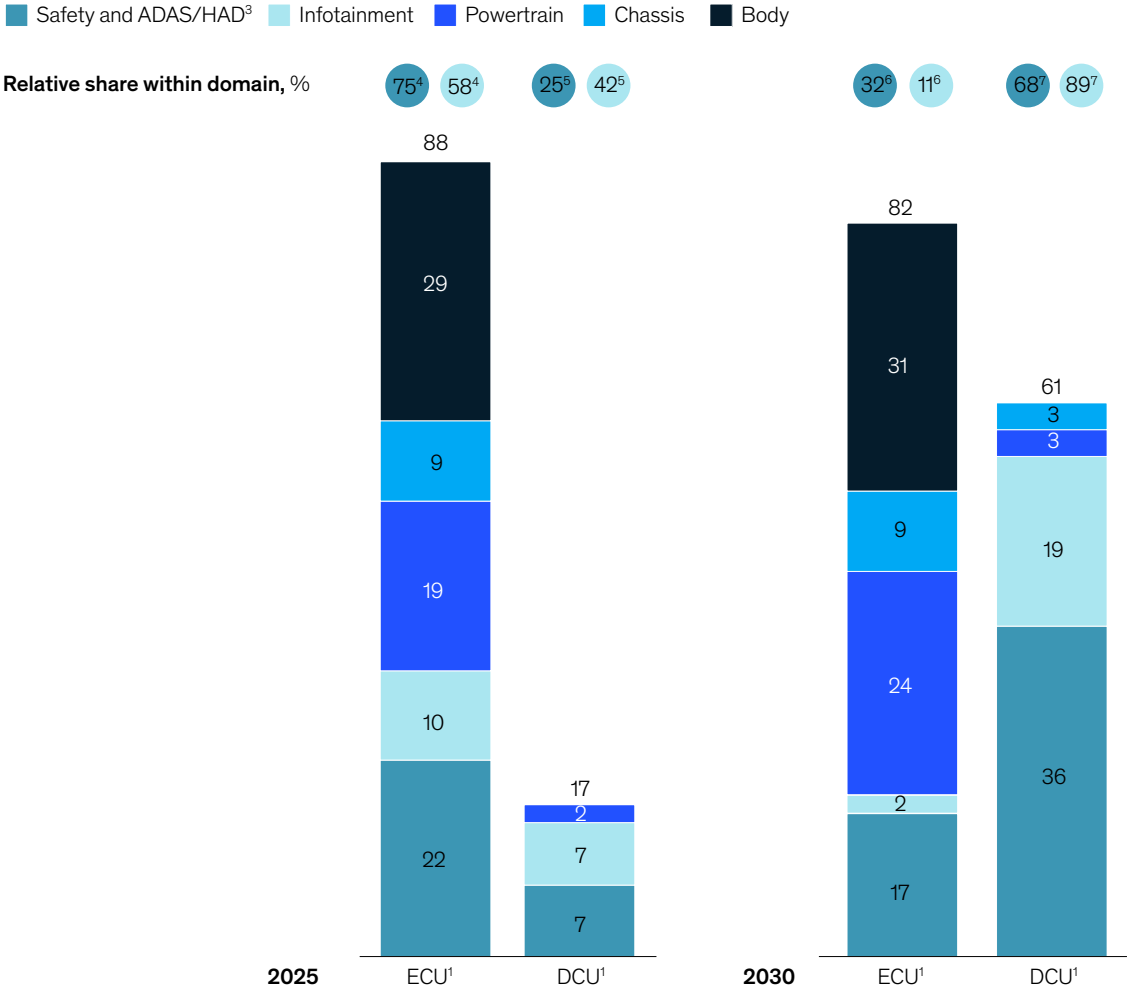
The ECU/DCU market is projected to grow to $144 billion by 2030 and is mostly driven by growth in DCUs. In 2019, DCUs made up less than 1 percent of the combined ECU/DCU market. We expect this share will increase to 16 percent by 2025 and to 43 percent by 2030. However, ECU/DCU market growth will be cut back by decreasing unit costs in some domain types and the consolidation of ECUs into DCUs.

The centralization of the E/E architecture will continue to drive demand for more complex and powerful DCUs at the expense of traditional ECUs. DCU adoption will be highest within the infotainment and AD domains—both of which are expected to exceed 70 percent adoption by 2030 (Exhibit 4).

Exhibit 4

Autonomous vehicles and infotainment will become the earliest adopters of domain control units.

ECU/DCU[1] market by domains,[2] $ billions



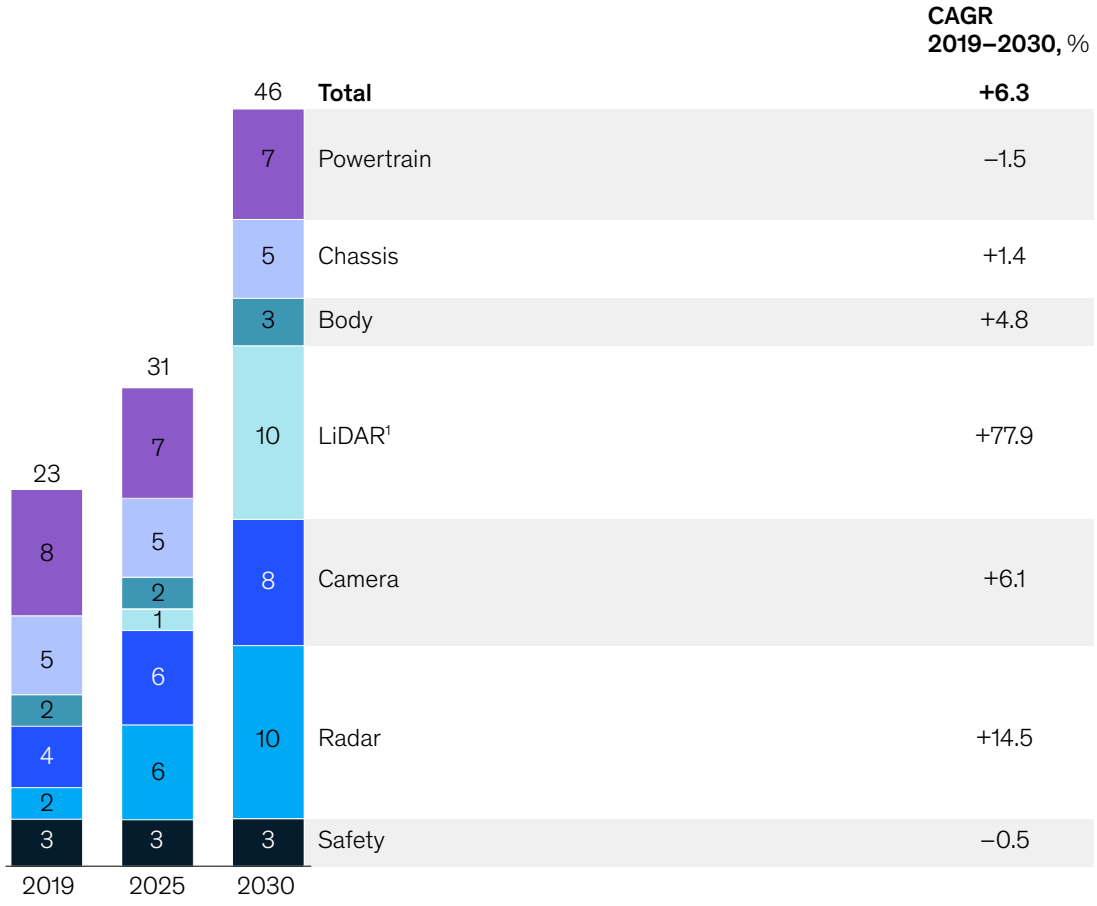
Note: Figures may not sum, because of rounding.
[1]Electronic control unit and domain control unit.
[2]Hardware only.
[3]Advanced driver assistance systems and highly autonomous driving.
[4]Other domains > 90%.
[5]Other domains < 10%.
[6]Other domains > 80%.
[7]Other domains < 20%.
Source: McKinsey Center for Future Mobility Current Trajectory Scenario

We expect the automotive sensor market to grow from $23 billion in 2019 to $46 billion in 2030, primarily driven by growing demand for ADAS and AD sensors—specifically for LiDAR, cameras, and radars (Exhibit 5). Traditional powertrain sensors will experience a slight decline during this period, in line with the ICE automotive market. Growth in new sensors for electric drives will not be able to offset the decreasing demand for sensors in ICE vehicles, which have higher sensor content per vehicle. Body sensors represent a growing market due to new comfort features and higher demand for existing comfort features—especially in smaller vehicle segments and at nonpremium OEMs.

Exhibit 5

Advanced driver assistance systems (ADAS) and autonomous-driving (AD) sensors will drive growth in the overall automotive sensor market.

Total automotive sensor market, $ billions



Note: Figures may not sum to 100%, because of rounding.
[1] Light detection and ranging.
Source: McKinsey Center for Future Mobility Current Trajectory Scenario

Conclusion

The future is here for automotive software and electronics. As the software-defined vehicle becomes reality, automotive companies across the value chain must act quickly and decisively to harness its potential. With a clearer outlook on market dynamics, automotive players can take a number of strategic and operational actions to adapt to the future landscape.[2]

Automotive OEMs must develop and refine their strategic perspective based on their resources, capabilities, and industry positions. In response to increasing per-vehicle hardware and software costs, OEMs can consider partnering with other OEMs to create economies of scale, making software reusable across platforms, and simplifying the E/E architecture. Automakers should also strengthen their software development capabilities by hiring and developing the right talent and building their competencies along the full technology stack (including middleware, the operating system, the hardware abstraction layer, and cloud computing). Breaking down silos and creating a cross-functional development organization can improve efficiency and speed up time to market.

Tier-one suppliers will need to redefine their software and E/E strategy to respond to the new capabilities and sourcing decisions of OEMs. By positioning themselves as thought partners to OEMs, they can work in tandem to define the future E/E architecture and shape the requirements. Suppliers can gain a significant advantage by investing in software development and integration areas to capture a larger share of the growth. And similar to OEMs, tier-one suppliers will need to break down domain silos and encourage cross-functional collaboration to stay competitive and respond to their customers' changing needs.

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[2] For more information on strategic considerations for OEMs, tier-one suppliers, tier-two or component suppliers, and semiconductor players, see our previous report *Automotive software and electronics 2030*, McKinsey, July 2019.

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