



Software-defined vehicles: From predictive personalization to individualized interaction

As OEMs shift their business model from product-focused to software services, business is no longer “as usual.” Software-defined vehicles not only require new production approaches and ways of working, but also a paradigm shift in how drivers and passengers experience vehicles and what they can do above and beyond transportation.

What’s going on

The automotive industry has pivoted from hardware creation to software optimization. Not so long ago, the car was a feat of mechanical engineering. Today, it’s a connected machine that has a lot in common with a consumer electronics device.¹

Car buyers no longer base their purchasing decisions on horsepower and unique seat innovations. Instead, in-car technologies have become a primary consideration for consumers when buying a car, an Accenture survey on connected vehicle solutions shows.²



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Digital services are what matter. Some 59% of buyers consider a car's connectivity in their purchasing decisions—a huge opportunity for the connected car industry.³

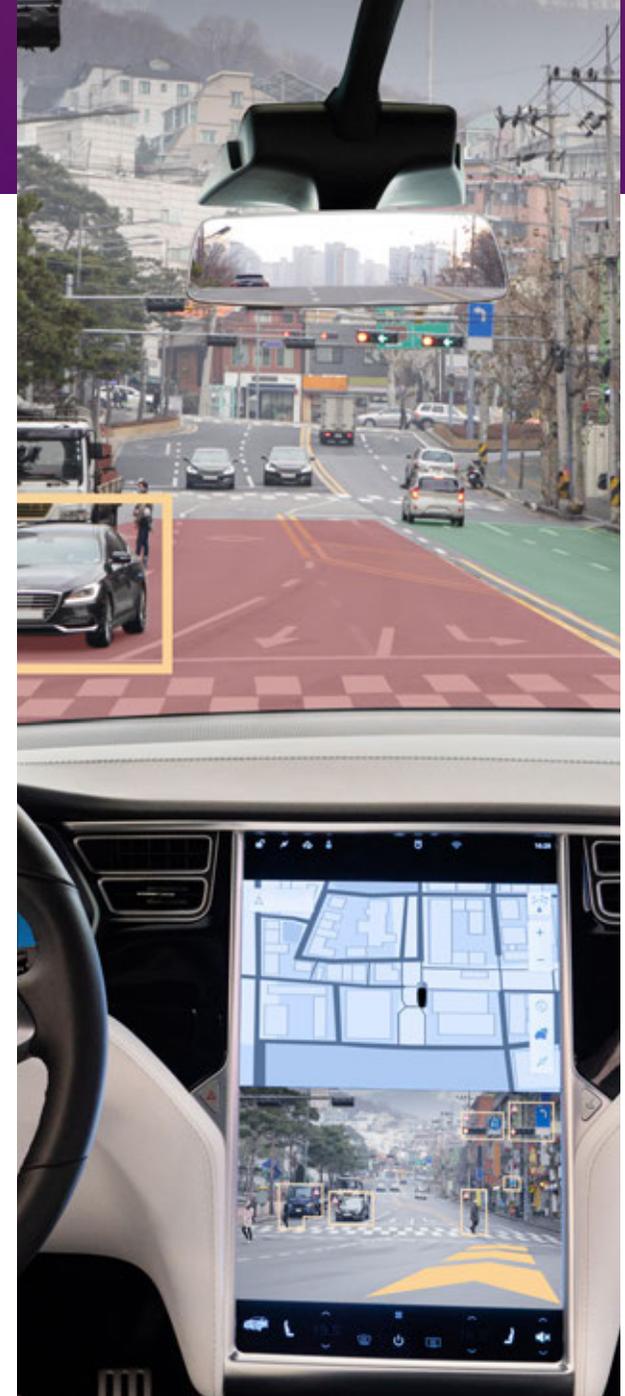
Empathetic car interiors are already a reality. Such interiors respond to an individual's in-car experience and preferences using an array of sensors to pick up nonverbal as well as verbal cues. But they don't just enable an enhanced in-car experience today; they also pave the way for far greater personalization in the near future.

New technologies have driven OEMs to rethink the way they design, manufacture and distribute cars from the ground up, across both the supply chain and the customer journey. They have increased the availability and value of data, fueling the evolution of a new generation of more tailored and responsive propositions and services.

Meanwhile, the ability to update your car over the air (OTA) is driving software-centric OEMs such as Tesla—an early adopter of the capacity to push OTA software updates to its vehicles, which it first did in 2012—to the top.⁴

In China, now the world's largest car market, Shanghai Automotive Industry Corporate and Alibaba have a strategic alliance to jointly manufacture cars with an internet connection. Both Dongfeng and Changan automobile manufacturers, meanwhile, have technological agreements with Huawei Technological Co. Ltd.⁵

In short, the industry has undergone a fundamental shift, creating a desire for new business models and new driving experiences based not on buying and selling a car, but on mobility services. Never has it been more critical for OEMs to optimize their digital capabilities and plan for new connected automotive experiences and the smart mobility services that lie ahead.



What's next

The automotive software market is set for significant further growth.

Globally, the connected car market is expected to reach just under 353 million units by 2023—a threefold increase in just five years—with China already the fastest-growing market, and Europe expected to be the largest.⁶

By 2025, in-car integrated marketplace apps will account for \$17.3 billion of vehicle-related purchases and personal consumer spending by 2025, one estimate suggests.⁷

In the U.S. alone, where 135 million workers pre-pandemic spent 51 minutes on average in their cars for their daily commutes, commuter commerce (transactions conducted in-car while on the go) is calculated as a \$230 billion opportunity.⁸

By 2025, the global automotive software market will be worth \$56 billion—up from \$19 billion in 2019, at a CAGR of 19.7%, according to one estimate.⁹

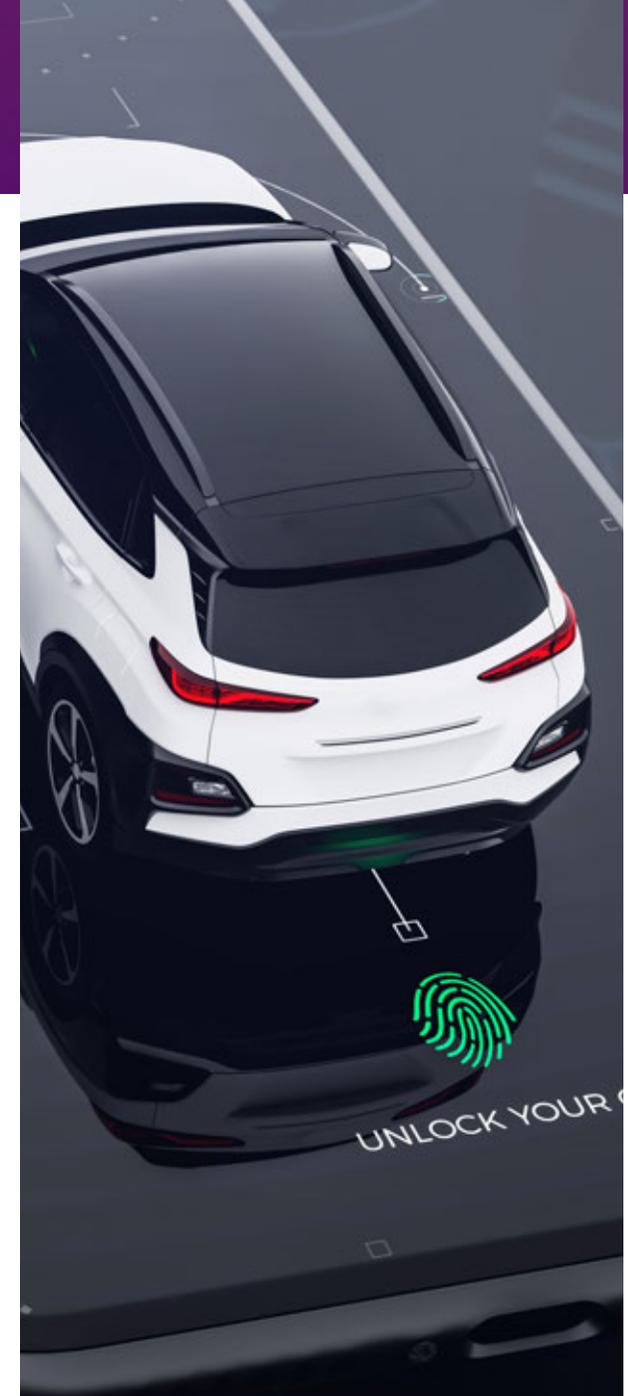
In the new race to OEM digitization, the stakes are high, however.

OEMs face a variety of challenges. These include the stringent regulatory and policy requirements they must meet while applying cutting-edge technologies and competition from emerging enterprises. Further, they must confront the fact that digitization is about more than reinvention.

As their ability to keep pace with change will be critical for their survival, OEMs must adapt accordingly—upgrading current architectures to support the artificial intelligence software that will be needed for autonomous vehicles, for example, which will make traveling by car safer and more efficient.¹⁰

Standardized platforms for smart mobility services will be defined, paving the way for a reimagination of automotive experiences. Internet of Things (IoT) capabilities will advance, which will enable data to be transmitted securely across more complex ecosystems of interconnected devices.

The future of mobility promises a driving experience that is automated, seamless, personalized and on-demand.



Opportunities for reimagination

1. Growing demands for personalized experience

In a world of liquid expectations, the success of today's brands—irrespective of their industry—is dictated by the adaptive personalized experiences they provide. And OEMs are no exception.

When reimaging the automotive experience, two particular areas worth exploring stand out.

The first is OTAs and where they might take you.

Today's standard cars have approximately 100 million lines of code—up to 1 billion for autonomous vehicles.¹¹ Yet, when it comes to OEMs using software for updating and enhancing the customer experience, development is embryonic.

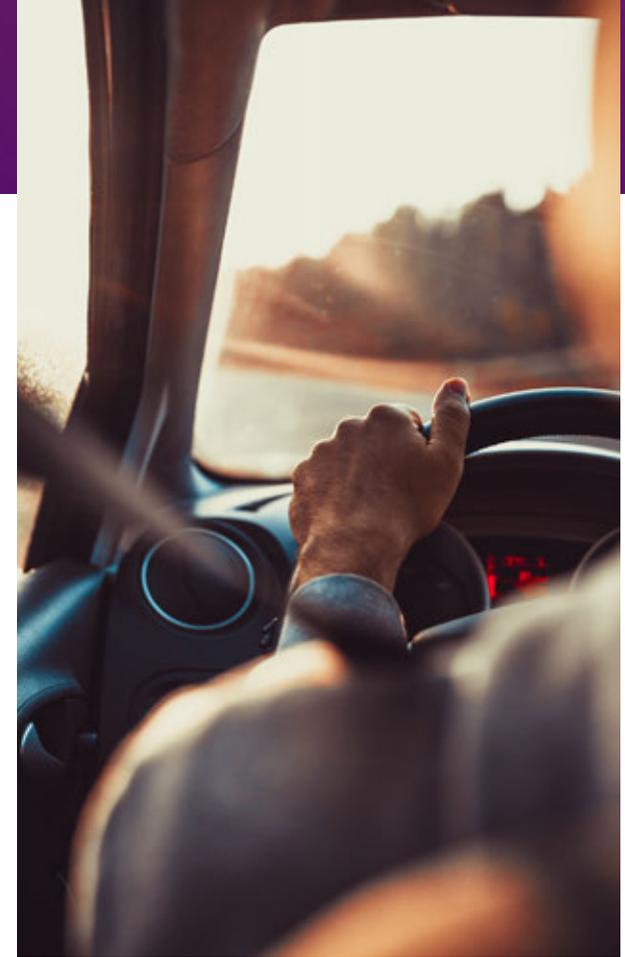
Tesla aside, too many OEMs are content with OTAs that are, at best, superficial—mainly only experienced by the customer as an onscreen update. But what if an OEM leveraged some of its cars' built-in features more wisely?

Consider heated seats. Beyond making them adjustable to an individual's temperature preference, what if an OEM better leveraged that customer's data to remind them of the feature if left unused, tailor it according to needs or location, and even package it as part of a premium in-car personalized environment proposition?

Transferable personalization is a second area worthy of closer consideration.

With vehicles increasingly defined by their software and operating systems becoming common in cars, there's an opportunity to reimagine how software can be used to create a consistent set of personalized experiences. These could be centered around the driver or passenger, with each individual able to migrate their profile from vehicle to vehicle.

With advances in machine learning, this profile could learn and adapt to users' needs. By saving core preferences (e.g., temperature, seat posture, button size),



it could learn which are most used, then prioritize the display for easy access through an adaptive menu. The ability to transfer on-demand preferences and functions from one vehicle to another creates opportunity for a host of new customer propositions—for example, a subscription for fast Wi-Fi in all your Uber rides for a month.

In this way, OEMs can redefine their core value propositions to align with where other consumer industries have already migrated.





2. The OTA mindset

For decades, car features were updated with each model. Now, vehicles receive OTA updates, with features added bimonthly. This keeps customers satisfied and the competition on its toes. Therefore, a speedy and agile response are essential if OEMs want to keep up—and lead—in tomorrow's automotive marketplace.

OEMs will need to embrace and foster agile working environments, data-driven decision-making and the rapid speed at which business will increasingly be done. To make these updates and iterations possible, companies need to prioritize digital reinvention and operate more like start-ups, with agility and innovation at the heart of their operations.

Volkswagen has established CARIAD, which employs about 5,000 people and develops the VW.OS automotive operating system, to develop common software for all brands and markets to prepare for the future.¹²

VW plans to invest €7 billion in this organization by 2025—money that will be spent on activities such as its VW.OS automotive operating system, connecting with VW's automotive cloud, consolidating

technological platform solutions for data-driven business models and group innovation. It expects to increase its in-house software development up to 60% by 2025; the proportion today is less than 10%.¹³

Daimler has committed more than €70 billion (est. \$85 billion) to digitization and electrification.¹⁴ It plans to cut out traditional parts makers in order to fund a software development push that will involve hiring thousands of coders to build an operating system that rivals that of Tesla. It has also brought key strategic partners such as Nvidia onboard to expand its software ecosystem over the last couple of years.¹⁵

An OTA mindset is about approaching agile as a way of life, which is essential if an OEM is to achieve the organizational—and cultural—transformation it will need for future success.



What automotive leaders can do next

1. Identify which strengths to play to

By 2030, 30% of an OEM's revenues will come from services, so identifying the right services to develop and appropriately resourcing their development is key.¹⁶

Consider which areas or domains of your vehicle's operating system you want to control or monetize. Speech control, for example, or account log-ins, customer data, etc. Choose which to prioritize and which to relinquish.

Then, tool up.

Speed up the transformation to digitization and electrification. Become an ambidextrous organization that's more agile and reactive to changing customer expectations.¹⁷ Focus your talent strategy to attract the best data/computer scientists to meet these new priorities. Invest in new skills. Restructure for more collaboration.¹⁸

Select the right partners, too.

Rather than compete internally for limited budget against internal bureaucracies, it

can be faster and more effective to adopt new technology from dedicated, focused and agile external teams. OEMs can rapidly access new technologies—often at a lower cost than if they'd developed the technology in-house or commissioned it from their traditional supply chain partners.

2. Optimize for partnership

OEMs will not be able to succeed in the future alone. They'll need partners.

This may mean striking partnerships with organizations they see as competitors, such as other OEMs or big tech. But they need to push themselves to do so even if it feels uncomfortable. And they have to tackle the thorny issue of revenue sharing with partners head on, and how best to do it.

Choose your platform partner(s) wisely. Automakers will rarely be able to become software-driven alone. AWS, Google, Microsoft, Tencent and Baidu are just some of the main platform providers looking to occupy this space. When selecting a software platform, it's important to determine which one offers the most versatility and security in the region in which you plan to operate.

At the same time, work toward becoming the owner of all your customer touchpoints,

rather than ceding control to big tech. Gain access to previously inaccessible customer insights and transactional data.¹⁹

To turn that data into valuable market insights for economic growth, create new functions and an operating model that enables data analysis and a data-driven decision-making process—around pricing, for example, or production volumes and stock configuration planning.²⁰

3. Rethink vehicle and vehicle function development cycles

With the development of EVs, which have very few moving parts, the physical engineering of cars is becoming simpler—at a time when automobiles' software is growing ever more important and complex.²¹

With software and electronics becoming more crucial differentiators than hardware, decouple vehicle and vehicle function development cycles.

To eliminate the "dilemma of smart things"—the need for constant upgrades caused by the constant innovation required to keep pace with constant technological advances—work to enable software and hardware updatability and upgradability.²²



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