Whitepaper

Beyond the hype: turning automotive disruption into opportunity

Bridging strategy and execution with four imperatives for success

Invented for life

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Preface

The mobility sector is undergoing a paradigm shift, with software becoming the defining factor. Coupled with artificial intelligence, this is leading to faster innovation cycles and an increased focus on the user experience. As a result, vehicles are becoming more and more connected and intelligent as they develop into integral parts of broader ecosystems.

While this transformation presents significant opportunities for the automotive industry, it also gives rise to fundamental changes that mobility players must respond to. Over-the-air updates and upgrades, for example, open up new business opportunities throughout the vehicle lifecycle, extending beyond traditional vehicle and component sales while also disrupting conventional value chains. Competition in these emerging fields of business is fierce, and the market is changing rapidly.

In the midst of this transformation, we in the industry must also collectively embrace a cultural shift toward co creation, adaptability, and a profound understanding of user needs. Strategic partnerships will prove crucial here, especially as rising geopolitical tensions and diverging regulatory requirements call for a deep knowledge of local markets. These new cultural approaches will be a major factor in capitalizing on the opportunities and overcoming the challenges of this emerging landscape.

In this whitepaper, we offer insights into how Bosch is navigating this seismic market shift: adapting to local market needs for global success, driving change for the software-defined vehicle (SDV), harnessing the power of artificial intelligence (AI), and fostering key partnerships.

Case studies provide examples of how we can successfully collaborate, generate mutual growth, and ultimately thrive in this fast-changing market environment.

We invite you to join us in shaping the future of mobility.

Andreas Dempf
Head of sales and customers
of Bosch Mobility

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Introduction

The automotive industry continues to navigate a period of transformative change marked by increasing complexity and uncertainty. In the time since the publication of our CES 2025 whitepaper, “Accelerating automotive transformation through partnerships,” where we discussed key strategies for shaping the future of mobility, the challenges have intensified. Escalating tariffs and accelerating rivalries in industrial policy will redraw supply chains and rewrite cost curves. Geopolitical tensions, diverging regulatory landscapes, and increasingly diverse demands from regional markets require a fundamental and ongoing shift in strategic thinking.

This whitepaper expands our previous analysis, providing a more granular perspective on the four key priorities we initially presented. We go deeper into how these priorities are playing out in real-world scenarios, and we showcase practical examples of how Bosch addresses these challenges.

The automotive industry can no longer act in isolation; it’s now inextricably linked to a software-driven digital world, part of a complex ecosystem of interconnected systems. This interconnectedness presents opportunities for growth through new business models, partnerships, and value chain disruption, as well as significant challenges in managing complexity and interdependencies.

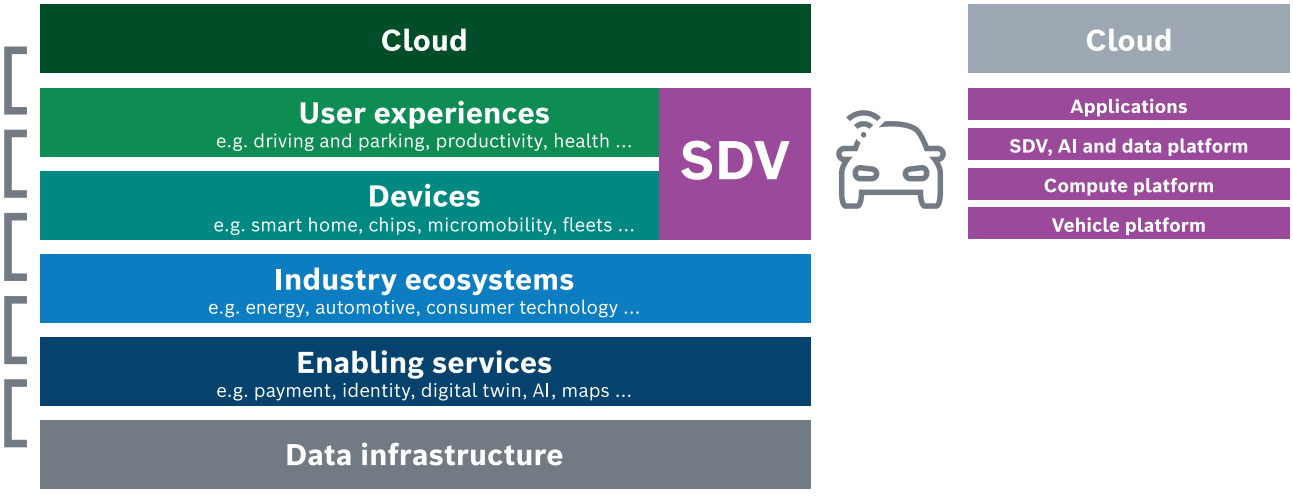

Figure 1: Illustrating the interconnected automotive ecosystem

In this evolving landscape, a central question emerges: how can the automotive industry not just survive, but thrive? The answer lies in understanding and meeting the diverse needs of end users, developing the necessary capabilities in digital enabling services as well as data infrastructure, and making smart investment decisions within a highly competitive landscape.

The fusion of software-defined vehicles (SDVs) and artificial intelligence (AI) is steering the automotive industry into a radically new era – one defined by adaptability, intelligence, and ongoing evolution. In this era, it will be possible to continuously adapt the vehicle to customer expectations, thus sustaining value added and positively impacting lifecycle management.

01 | Think local, win global: success in this transformation hinges on agility and adaptability. The key is to be present and empowered in local markets – understanding diverse user needs firsthand – while simultaneously building a globally scaled and resilient architecture to navigate geopolitical and regulatory complexity.

02 | The essential shift for SDVs – it's about more than just software: a similar degree of flexibility is required in the necessary cultural shift toward continuous improvement, freeing up resources to fund innovation and take advantage of the benefits of SDVs. The key is to unlock growth and master complexity through optimizing costs – which, in turn, is done by simplifying hardware with software, using virtualization across the entire product lifecycle, improving development processes, and standardizing platforms and data across OEMs.

03 | No AI, no future: meeting the needs of end users requires intelligent solutions, pushing us to turn the AI hype into high-value execution. This requires a strategic approach to AI implementation, focusing talent and capital on scalable use cases. AI will be the defining factor when it comes to cost efficiency, speed, and the crucial competitive edge.

04 | Partnerships are key: finally, no single company can master this transformation alone. Fostering a collaborative culture by building strong partnerships is essential for driving progress. Strategic partnerships help accelerate innovation, extend reach into emerging service areas, and share the costs and risks of developing localized solutions for a fragmented global market. Open-source collaboration can further amplify these efforts by enabling shared development, reducing duplication, and building on collective expertise. Transformation is a journey, and collaboration within a growing ecosystem is the key to reaching new horizons.

At Bosch, we believe the future of mobility is not just software defined – it is co-created. Our capabilities at the intersection of hardware excellence, software innovation, and AI leadership place us in a unique position to contribute to this transformation. With a global footprint, deep local expertise, and a full-stack portfolio, we are not only navigating disruption, we are shaping it. This whitepaper outlines how Bosch turns complexity into opportunity, delivering scalable, safe, and intelligent solutions that meet the evolving needs of our partners and end users worldwide.

Our call to action for the automotive industry: prioritize pragmatic forward-thinking solutions to turn disruption into opportunity – and emerge more resilient than ever.

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01
Think local, win global: meeting customer and regulatory needs for market-specific solutions.

The diverse expectations end users have regarding price, features, safety, and novelty are splitting the automotive world into fragmented local markets. Stakeholders in the automotive industry need to rethink their strategies and tailor their solutions to local demands while identifying opportunities for global synergies and scaling.

Striking this balance is a key challenge in these times of rapid technological advancement and intense competition. Geopolitics presents an additional challenge by disrupting the status quo. For decades, globalization allowed vehicle manufacturers and their partners to scale standardized solutions across regions, but today, this model is no longer viable. Geopolitical tensions are stifling technological exchange and leading to tariffs and export restrictions, reinforcing the fragmentation of what was once a global market.

more than
20
car manufacturers across Europe, China, and Japan

More than **20 car manufacturers** across Europe, China, and Japan are already utilizing our Vehicle Motion software packages.

approximately
300
customer projects worldwide

Bosch is currently spearheading approximately **300 customer projects** worldwide aimed at developing hardware and software solutions for eventual mass-market adoption.

Key messages:

- Anticipating the expectations of local end users and customers is crucial.
- A global architecture must be built for scaling innovations fast for local markets.
- Navigating global safety standards and regulations is a non-negotiable prerequisite.
- True resilience is the ability to adapt to geopolitical and supply chain uncertainty.

The essence of success: anticipating local needs with speed

At the heart of this transformation is a deep understanding of end-user needs. These preferences differ drastically by region, particularly when it comes to product features, business models, and spending habits. For example:

- **In China,** cutting-edge technology and features often serve as a status symbol.
- **In the U.S.,** users prioritize convenience and seamless digital experiences.
- **In Europe,** a complex balance of sustainability, regulation, and premium expectations prevails.
- **In Japan,** safety and convenience are paramount.
- **In Brazil,** security features are a top priority.

Anticipating these local needs and implementing solutions with speed is key. This requires strong regional organizations with the power and expertise to develop and adapt and produce solutions quickly. Through its local entities, Bosch benefits from the interchange between regions, enabling us to address specific customer needs while driving joint development for global scaling. The combination of local engineering and local production provides a critical advantage in both speed and relevance.

The global-local dilemma: scaling innovations for local markets

Catering to unique local needs without sacrificing the efficiencies of a global operation is the central challenge. A purely localized approach is too costly, while a purely global one fails to meet end-user expectations and local regulations. The key lies in an architecture designed from the outset for adaptation.

One example of this principle is Bosch's Vehicle Motion Management. This solution enables a personalized driving experience through multi-actuator control of braking, steering, powertrain, and suspension. Its robust architecture is easy to adapt to local preferences through calibration and parameterization, all via software. In addition, drivers can switch between various modes or accept recommendations from the AI-based system to adjust the vehicle handling to their individual preferences or road conditions – for enhanced safety, comfort, or agility. This concept empowers our UX-driven local teams to integrate locally developed features that are based on in-depth knowledge of regional end-user needs and then roll out those features to other regions.

The ability to scale local innovations globally is a crucial competitive advantage. An accelerated time to market for new vehicle models and software features is no longer a priority just for China; it's becoming a global imperative. A flexible, software-centric global platform makes it possible to take a feature developed for one market and efficiently adapt and deploy it worldwide, thus satisfying diverse user expectations without costly, redundant engineering efforts.

Ensuring global safety and regulatory compliance

However, speed and scalability are meaningless without an unswerving commitment to safety and compliance. Releasing features across different markets requires navigating a complex maze of safety laws and regulations. For safety-critical systems like Vehicle Motion Management, ensuring compliance at the highest level, such as ASIL-D, is nonnegotiable for any global rollout. This requires a worldwide network of safety experts with in-depth local expertise, capable of monitoring and adapting to ever-changing governance requirements. At Bosch, a network of local competence centers staffed with safety experts ensures that our solutions are compliant and safe around the world.

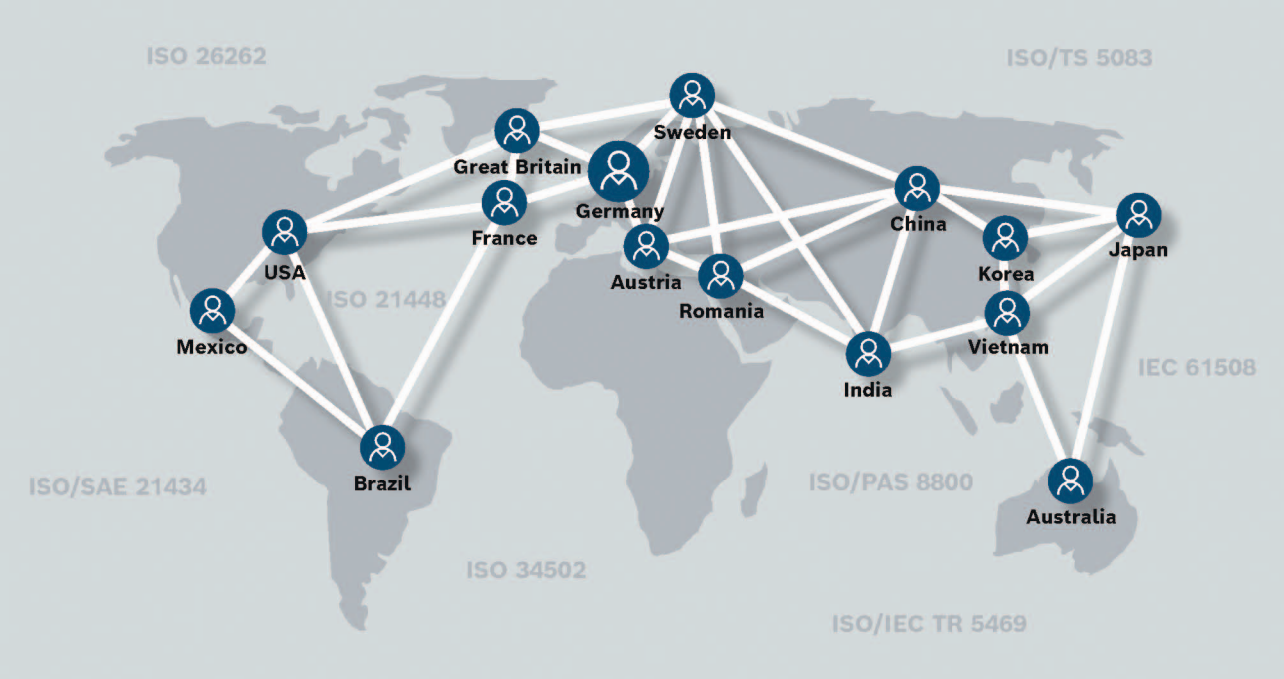

Figure 2: Bosch global product and functional safety network

True resilience means finding practical ways to neutralize uncertainty

This foundation of compliance is essential for building true resilience in an era of hybrid globalization. Resilience is more than a buzzword; it is the practical ability to adapt to the uncertainty created by rising geopolitical tensions and trade restrictions. One way to do this while maintaining compliance involves taking advantage of a global footprint; for instance, by exchanging components to meet export restrictions.

This is particularly relevant for software: while code can be developed across borders, doing so raises questions of intellectual property ownership and foreign influence.


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02
The essential shift for SDVs – it's about more than just software: we must embrace fundamental operational and cultural shifts to meet the demands of SDV development.

While the initial hype around the software-defined vehicle has met the hard realities of implementation, its strategic importance remains undiminished. The automotive world continues its shift toward a new generation of digital-native consumers who expect advanced connectivity, personalization, and a constantly evolving driving experience. At the same time, OEMs want to decouple hardware and software, increase the reuse and portability of software, and efficiently manage the increasing software complexity. The SDV promises all these things.

However, the industry is rightly questioning the path forward. The SDV's promise now faces critical tests: the viability of recurring revenue models that use over-the-air (OTA) updates, the costs and benefits of fully centralized E/E architectures versus hybrid solutions (with more of the architecture being decoupled than envisioned in first-generation SDV concepts), and the real-world complexity of decoupling hardware and software. These challenges have led some to doubt the SDV's immediate value.

We believe this view is shortsighted. The SDV's promise is not about features alone; it is a direct answer to the industry's most pressing challenges: high development costs paired with long development cycles and the

up to
50%
reduction
in development
time

Up to **50% reduction** in development time through standardization and co-creation with customers and partners.

Key messages:

- The SDV is a primary driver of cost efficiency.
- The cost of hardware can be reduced by combining, simplifying, or even (partially) replacing it with software.
- Faster time to market is achieved through process and tool innovation.
- Cross-OEM standardization unlocks greater savings.
- Open-source collaboration is an effective path to industry-wide standards.

inefficiency of developing non-differentiating software multiple times. New SDV concepts can eliminate the wasteful practice of designing individual control units from scratch for every manufacturer and car line, delivering the cost and margin improvements the industry so urgently needs.

Therefore, the question is not if the industry should pursue the SDV, but how it should do so to finally realize its benefits. While there is no single blueprint for SDV implementation, we believe progress hinges on four tangible, high-impact areas for action:

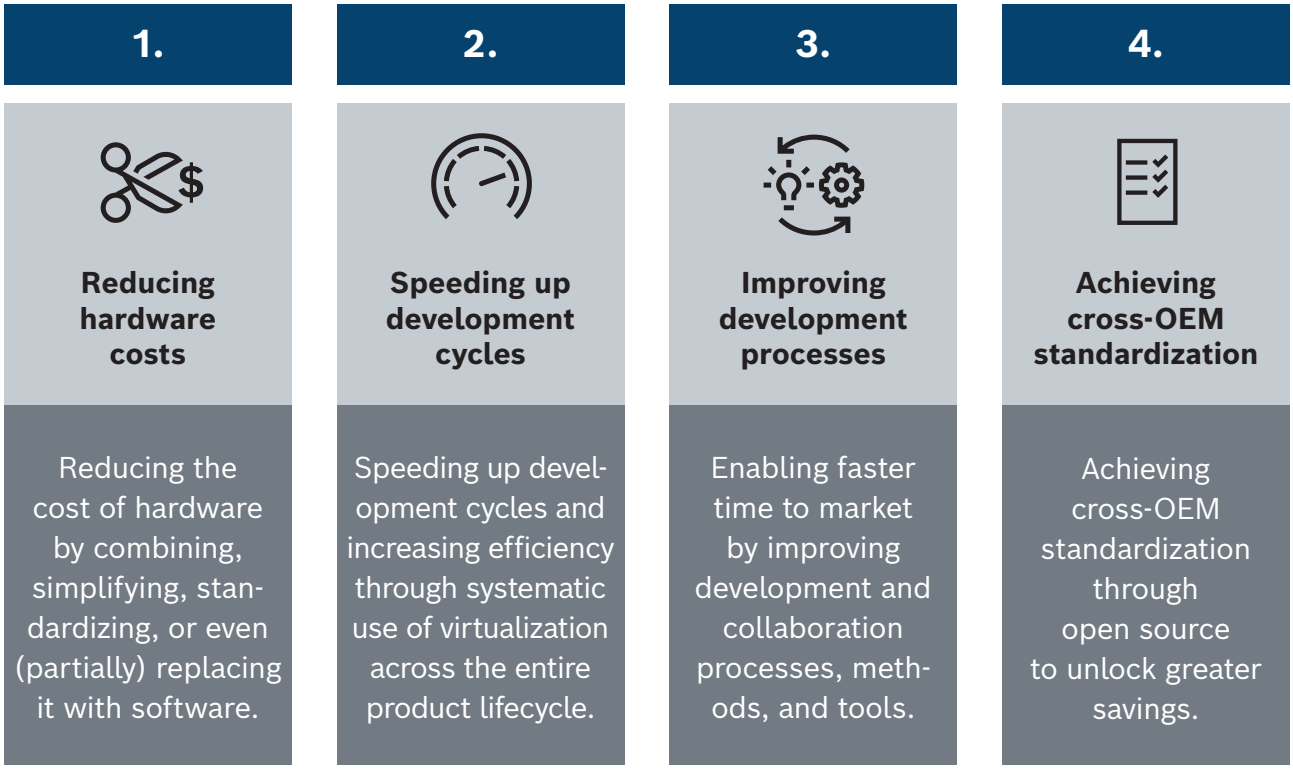

Figure 3: The four main levers for reducing costs in the software-defined vehicle

Reducing hardware costs in SDVs

An SDV may be software-driven, but it is still a very physical entity made tangible by combinations of hardware. While the computing power needed for central, zonal, or domain controllers might add costs, the SDV also has the potential to cut down on hardware costs, either by combining or standardizing hardware or by replacing it (wholly or in part) with software.

Cutting costs by combining hardware

One key SDV promise is that it can reduce costs by combining hardware functions. While replacing dozens of ECUs with a single central computer is still not the norm, today's powerful microcontrollers already allow for significant consolidation.

A clear example where this has been successfully implemented is the integration of controls in the powertrain domain. Addressing the need for simplified powertrain controls in various vehicle types with hybrid or pure internal combustion engines, Bosch has incorporated multiple control units (engine control unit, vehicle control unit, transmission control unit, etc.) into a single domain controller. The aim here was to reduce complexity and overall system costs by more than 20 percent. Integrating the controls in this way enables the orchestration and optimization of various powertrain elements, such as engine management, transmission control, and electrification components.

In general, we see huge potential in making SDV-like E/E-architectures cost efficient by consolidating previously separated controls into one device, made possible by the combination of increased computing power and reduced costs.

Cutting costs by simplifying hardware with software

The automotive industry has made significant progress in using vehicle data to implement software that executes tasks previously requiring hardware, particularly in the sensor area. The advantages are clear: reduced hardware costs, diminished maintenance challenges (e.g. for hard-to-reach sensors), and increased accuracy due to validating inputs from multiple sources.

One example of such “virtual sensors” (software solutions that replicate the functions of physical sensors) uses AI and is based on a detailed understanding of the physical system. The sensors form neural networks that mimic the physical system and can be transformed into AI code at the touch of a button. That code can run on any embedded control unit without the need for special hardware. Another example is tire health management: checking tire status, such as a loss in tire pressure, can be done using either special sensors or a software algorithm – part of the Vehicle Motion Management’s data-based feature portfolio.

A third example is the Bosch sensorless temperature model for electric motors, which measures the temperature of the motor’s stator. By utilizing physics-based methods together with machine learning, this approach provides a cost-effective alternative to conventional sensors.

Speeding up development through virtualization

Virtualization is the consistent application of models and simulation to increase performance across the entire product lifecycle, and is an essential part of state-of-the-art engineering at Bosch. By utilizing simulation models of the product (digital twins) and its environment in all development steps – including requirement elicitation, product design, prototype implementation, test planning, and release – Bosch can accelerate development processes and thus bring down their costs. Furthermore, virtualization eliminates the costs for hardware prototypes, broadens test coverage, speeds up testing, improves reuse, and enables consistent data- and AI-based

development paradigms. Virtualization also makes it easier to handle variants and supports fleet observations and product improvements during use.

Virtualization is a must for competitiveness

Customers today expect OEMs to act quickly when it comes to software updates, new features, and new vehicle models. Such speed, however, calls for a fundamental rethink of the vehicle development process. One example is advanced driver assistance systems, or ADAS; because they must be tested under a wide variety of environmental conditions and complex traffic situations, such tests are time-consuming and costly. In simulations, it's possible to vastly modify and test multiple scenarios in parallel, yielding greater coverage and much lower costs. Recently updated testing procedures, such as those of the NCAP, are providing the foundation for broad use of virtual tests and thus serve to push virtualization methods.

It's not possible to realize complex safety functions without virtualization, so gaining cutting-edge capabilities in this area today is paramount for staying competitive.

Virtualization drives the SDV value chain

Due to fundamental shifts in the development paradigm, virtualization will have an impact on most elements in the SDV value chain, affecting collaboration models as well as hardware, software, and (sub-)system development methodology across the entire lifecycle. For example, virtualizing hardware components in an SDV facilitates development not only of the components but also of software by providing a virtual vehicle model for testing the software. As a result, companies can develop new features in simulated environments.

Standardizing interfaces and simulation architectures also makes it possible to tap into high reuse potential. By combining standardization with state-of-the-art development processes (see next page), multiple companies can collaborate on virtual (sub-) systems, providing significant front-loading effects.

Trustworthiness of virtual development

Trustworthiness is key if critical business decisions are to be based on virtual approaches, and hence is required for broad acceptance of the method. Bosch follows an end-to-end approach, managing the risks throughout the virtualized development process, including in tooling, processes, infrastructure, simulation models, data acquisition, and parameterization. By providing high-fidelity solutions, this paves the way for acceptance by regulatory authorities (e.g. by ensuring conformity for automotive safety) and ultimately drives our vision toward virtual SDV development and release.

Improving development processes for faster time to market

The previous two points expand on a single truth: the most significant lever for success in the SDV era lies in radically changing how we develop vehicles. The industry-wide imperative is to increase speed, yet many organizations are hindered by legacy processes and structures. Surmounting these obstacles requires more than just process optimization; it demands a cultural shift. Faster time to market is achieved not through a single "big bang" organizational change, but through a series of targeted improvements to methods, tools, processes, and collaboration models. Below, we highlight key areas where such advancements are already making a significant impact.

Efficient toolchains for rapid iteration

To compete on a global scale, especially with the pace set by new players, development must become more efficient. This requires an end-to-end toolchain that supports a comprehensive, data-driven development loop for everything from deep learning to function development. For ADAS, this means an infrastructure that enables fast, daily software iterations and debugging. A crucial aspect is globalization: such a toolchain must support unified infrastructure management, federated training with no transfers of raw data to respect regional compliance, and robust data anonymization. This allows development teams worldwide to collaborate effectively, leveraging global data while adhering to local regulations.

Decoupling innovation from large-scale development

Gaining speed requires developing innovative new features in parallel without jeopardizing the stability and timelines of volume production. Modern E/E architectures make this challenging, as their features often span multiple control units, vehicle computers, and communication networks. The solution is to create a parallel innovation prototyping space. Such an environment allows for the rapid development and testing of new ideas – even leveraging generative AI (GenAI) to create applications from natural language or embedded AI functions, such as virtual sensors – completely decoupled from core large-scale development. Once a new feature has been successfully tested and is mature, it can be integrated into the main development branch, thus accelerating innovation without risking committed starts of production.

Trusted collaboration spaces for faster joint development

Real progress on complex systems requires effective collaboration between multiple partners. While the industry agrees that common development environments are more efficient, the primary barrier has been not technology, but trust. How can partners collaborate without risking their intellectual property? The answer lies in building trust through technology. For example, HERMETIK, a secure, multi-party collaboration platform, uses confidential computing to create neutral, trusted collaboration spaces. This allows all stakeholders – OEMs, Tier 1 suppliers,

and software partners – to integrate and test their latest software changes together in a shared environment where each party's IP remains cryptographically protected. The approach fundamentally changes the collaboration dynamic. It enables rapid feedback cycles, secure cross-partner debugging, and system-wide optimization without exposing proprietary source code. With solutions like KOSHIP, a continuous integration platform built on HERMETIK, development cycle times can be reduced from weeks to days or hours, unlocking frictionless, scalable, and confident cross-company collaboration.

Achieving cross-OEM standardization unlocks greater savings – open source is the way to establish standards

In the past, companies often viewed the operating system, including middleware, as a strategic control point. This led to heavy investment in proprietary, in-house solutions, creating a fragmented landscape of expensive, non-scalable platforms. This model has become a major bottleneck, consuming vast resources in redundant development while diverting focus from the application layer where true customer value is created.

At Bosch, we believe the solution to this is for the industry to collaborate on the non-differentiating parts of the SDV – that is, the foundational layers of the stack that end users don't see, but that consume significant development resources. By standardizing this common ground, we can unlock greater efficiency and refocus our development spending on creating the innovative, customer-facing features that truly matter.

Open source is the way forward

In our view, the ideal path to these standards is through open-source collaboration. This approach leverages a global ecosystem of contributors to accelerate innovation, reduce development costs, and crucially, avoid vendor lock-in for OEMs. Open source fosters the transparency, security, and interoperability that are the essential pillars of any scalable, future-proof automotive platform. At Bosch, we are dedicated to turning this vision into reality. We are fully committed to initiatives such as S-CORE in Europe, where Bosch and ETAS work together with founding members that include BMW, Mercedes, Porsche, Continental, and ZF. By providing a way for companies to collaborate on non-differentiating features for high-performance computing software stacks, this initiative reduces redundant development efforts and promotes consolidation and standardization in the automotive software industry. The result is accelerated creation of next-generation SDVs.

Strength in numbers

An ecosystem is only as strong as its members, however. Its success requires the participation of a critical mass of players. We therefore extend an open invitation to the industry: let us work together on the non-differentiating parts of the SDV. The most effective way to build our shared future is through a new, more collaborative model for automotive development: true open source.


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03
No AI, no future: from hype to maximizing scale and adoption.

In today's automotive market, AI is no longer optional; it's the definitive factor for cost efficiency, speed, and a sustainable competitive edge. While many in the industry struggle to move beyond the hype, market leaders are defined by their ability to implement AI strategically and at scale. This means focusing on use cases that deliver measurable value today while building the foundation for the innovations of tomorrow.

At Bosch, our approach is built on this principle. We demonstrate how strategic AI integration drives tangible results across the entire vehicle, from optimizing core components to enabling the most advanced driver assistance systems. Our expertise is showcased in three key areas:

1. **Optimizing battery performance with cloud-based AI:** Extending battery life by up to 20 percent and reducing warranty risks for OEMs through advanced data analysis.

2. **Building the foundation for AI with rich sensing data:** Providing a comprehensive sensor suite to power current and future AI-based ADAS features.

3. **Accelerating premium ADAS with an end-to-end AI stack:** Deploying advanced AI to create premium, comfortable, and safe mobility.

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by the end of
2027

Bosch will have invested more than **2.5 billion** euros in AI by the end of 2027.

Key messages:

- **From hype to value:** AI is no longer optional. Strategic implementation is key to turning potential into profit.
- **Holistic AI strategy:** We deliver measurable results across the entire vehicle – from optimizing battery life with cloud AI to enabling premium ADAS features with advanced sensor solutions.
- **Future-ready and scalable:** Our AI solutions are designed to be efficient on today's hardware and scalable for tomorrow's innovations, like generative AI.

AI in the cloud: optimizing battery performance and reducing risk

In the EV space, battery performance directly impacts market success. Our cloud-based hybrid solution demonstrates how combining proven physical models with AI can unlock significant gains. By analyzing battery data in the cloud, our models achieve up to 20-percent extension in battery life and enable early discovery of potential faults.

For OEMs, this translates directly into reduced warranty costs and improved residual values – key factors in EV market acceptance. This solution has already been validated with multiple OEMs across key markets (EU, India, China, and the U.S.), proving its global scalability and financial benefit.

Rich sensing data: the foundation for every AI-powered feature

Market pressure for software-defined vehicles demands robust, scalable sensing solutions that are both cost efficient and safe to ensure provision of high-fidelity data.

To train and run effective AI-based systems, redundant 360° sensor fusion is essential. This is not just about placing sensors around the vehicle; it's about creating a rich, multilayered perception of the environment that meets several critical performance requirements.

First, the system must provide comprehensive spatial awareness, from detecting objects at extremely close range – as near as five centimeters – to identifying vulnerable road users (VRUs) at long distances of up to 300 meters. This requires a diverse sensor suite, including ultrasonic, radar, and cameras, to provide a variety of information.

Second, the system needs high-resolution discrimination capabilities. This means reliably distinguishing pedestrians from vehicles even when they are close together, identifying small, hazardous objects on the road, and distinguishing two-wheelers near a guardrail. These are the challenging corner cases where advanced sensor performance is most critical.

Third, the sensor architecture must be flexible and intelligent. Sensors need to provide two simultaneous data streams: raw data to feed central, AI-based algorithms for enhanced performance and new features (like wet road detection); and edge-processed data to ensure functional safety across different E/E architectures and trim levels.

Finally, this performance must be durable and reliable over the vehicle's entire lifetime. This requires using manufacturing processes that guarantee sensor performance under all temperature conditions, ensuring that a critical function like automatic emergency braking (AEB) remains as effective several years later as it is on day one.

Bosch's scalable sensor set of ultrasonic, cameras, and radar ensures a safe transition to AI-based solutions through a sensor-embedded safety path while simultaneously providing a dense high-fidelity representation of the environment for high-performance central processing. It allows our customers to reduce development costs while enabling premium ADAS performance across all vehicle segments.

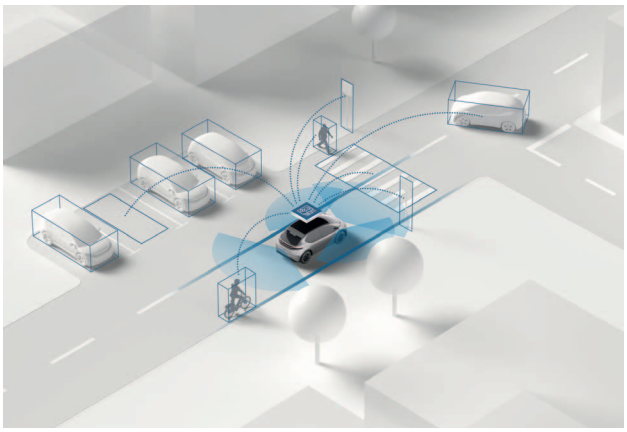

Figure 4: High-fidelity data is needed for AI-powered features

AI-powered ADAS: accelerating toward premium driving comfort

The rapid development pace in markets such as China is setting new standards in global competition. Our ADAS solution for the high-end segment, already in volume production, shows how a scalable and modular one-stage end-to-end AI stack can deliver comprehensive address-to-address driving capabilities across all road scenarios.

This solution's fast time to market demonstrates how AI can accelerate development cycles while maintaining the highest safety and reliability standards. By seamlessly integrating sensor data to create a comprehensive understanding of the driving environment, it adapts to future advancements in sensor technology, protecting our customers' investments.

Looking ahead: generative AI as the next evolution

These case studies showcase our comprehensive approach: vertically integrating hardware and software, combining AI with deep domain expertise, and ensuring scalability.

Building on this, our latest developments integrate generative AI to enhance driving functions with human-like perception and reasoning. Our vision-language-action models (VLAs) enable predictive, context-aware responses, such as anticipating a pedestrian's intent before they even step onto the road. Crucially, we have optimized these advanced models to run efficiently on small automotive systems on a chip (SoCs), thus making this technology viable for volume production.

At Bosch, AI is not just a future promise but also a present reality. When implemented strategically, AI delivers immediate market advantages and a sustainable competitive position.

04
Partnerships are key: transformation demands scale – and scale demands collaboration.

The automotive industry is undergoing a fundamental transformation in multiple respects. At Bosch, we believe this means that strategic partnerships are no longer optional, but essential for navigating this complexity and driving innovation. The SDV transformation requires a collaborative effort, as no company can provide all the necessary components on its own. These include centralized vehicle software building blocks, big data storage, computing power, and AI training environments, together requiring a total industry investment of nearly 4 billion euros. By building on a foundation of shared resources, expertise, and risk, we can accelerate development, expand our reach, and shape the future of mobility.

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nearly
4 billion
euros in
joint
investment

Partnerships are essential for accelerating SDV transformation and solving complex problems – a collaborative industry effort requiring nearly **4 billion** euros in joint investment.

Our partnership approaches

Figure 5: Taking a multilayered partnering approach to accelerate the SDV transformation

Key messages:

- To secure long-term competitiveness and reduce costs, standardization across software and data is paramount.
- Building local ecosystems is vital for providing tailored solutions and ensuring compliance with specific market needs.

Laying the foundation: the power of data standardization and open source software

The future of the global automotive supply chain fundamentally hinges on bold new approaches for collaboration and data exchange. Currently, non-standardized data poses a major impediment to efficiency, resilience, and sustainability. As a founding member of a collaborative data ecosystem called Catena-X, Bosch is actively driving the adoption of data standardization. Catena-X facilitates secure, cross-company data exchange through standardized data models and open-source frameworks, co-created with key industry partners. One case in point is Bosch's pioneering work in quality management: its shift from traditional part-driven inspections to rapid, data-driven insights is enabled by directly sharing data from OEMs via Catena-X. This clearly demonstrates how standardized data not only detects quality deviations earlier and accelerates root cause analysis, but also delivers significant efficiency gains and higher customer satisfaction for all involved. Such approaches are a critical step toward truly integrated and trustworthy data collaboration across the industry.

Accelerate development with local partners for local solutions

In the field of ADAS, global players aim to meet a diverse range of end-user needs, but face increasing cost pressure due to the rapid pace of technological change and evolving regulations. This necessitates more localized solutions. A "local for local and local for global" strategy enables tailored offerings that meet regional demands while ensuring that OEMs can attain a cohesive global presence. One aspect of this strategy involves entering into partnerships that deliver optimal performance-to-cost ratios for each target market. Bosch's partnerships with Horizon Robotics and WeRide in China exemplify this approach, resulting in high-quality, cost-effective ADAS solutions that have achieved significant market penetration. In addition, it's crucial for us to maintain relationships with leading technology providers so that we can adapt to local ecosystems. Achieving sustainable efficiency in all regions requires a cultural and, at times, structural shift. The reward is the ability to bring innovations to market faster.

Expand market reach with leading ecosystem players

Recognizing its relative newness in the connected fleet services market, Bosch has entered into strategic partnerships with global telematics leaders such as Geotab and Zubie in the U.S. This approach leverages the latter companies' established presence and extensive reseller networks, greatly lowering the barriers to market entry. As a result, Bosch gains broad market reach and becomes highly accessible to its core customer segments: logistics and mobility service providers. These collaborations accelerate the market launch of Bosch's fleet service offerings, driving innovative new features for the future of mobility.

Shape the future through collaboration

Because the mobility landscape is evolving rapidly, the key to business development is to establish ecosystems and strategic partnerships. Why wait for the industry to transform us when we can transform the industry? Or at least, we can be proactive in directing that transformation. As shown by the examples above, Bosch is committed to fostering a collaborative environment. The benefits of such collaboration are clear: shared risk, accelerated technological advancements, streamlined supply chains, and resilience against market disruptions.

Yet the benefits go beyond these short-term gains. By forming strategic alliances, sharing best practices, and co-investing in research and development, companies can drive innovation, set new industry standards, and even influence regulatory frameworks. One company on its own may find the task of tackling challenges or even seizing emerging opportunities to be insurmountable. But by joining forces with other industry players, we can become more than the sum of our parts. Together, we can play a pivotal role in shaping the future of our industry – and ensure that it develops along socially and environmentally responsible lines.

Conclusion

The automotive world is undergoing a fundamental transformation, and industry players who don't learn how to adapt to the new world will be left behind. We have identified four key areas where they can take action to ensure they stay competitive amid this upheaval. Our numerous examples show how Bosch has successfully taken steps in these areas, allowing us to continue to shape the world of mobility.

To thrive in the market both today and tomorrow, automotive companies must undertake a strategic shift toward localized solutions built on a worldwide foundation of synergies. Bosch's global footprint, powered by in-depth local expertise, allows us to adapt swiftly and meet the specific needs of any market.

The pivotal force for the industry is the software-defined vehicle, through which we can unlock substantial hardware savings, optimize development cycles, and reduce both complexity and time to market. Embracing open-source collaboration and establishing cross-OEM standards will be crucial for building the transparent, secure, and interoperable foundation our industry needs. This whitepaper has illustrated how Bosch delivers the full spectrum of capabilities to empower our partners across all these vital areas.

Another factor essential for maintaining competitiveness is AI. Strategic AI integration, from hybrid battery management to ADAS systems, will be decisive in shaping the future of software-driven mobility. Bosch is leveraging its profound cross-domain experience and comprehensive systems expertise to design, develop, and implement tailored solutions for any setup.

Ultimately, strategic partnerships are crucial for expanding market reach and pioneering new business models. Through our unique combination of deep domain expertise, global-local presence, and full-stack capabilities, Bosch is an excellent partner for players in a variety of contexts. We are dedicated to achieving sustainable efficiency and maximizing innovation through collaboration.

Bosch is confident that with practical yet visionary solutions, the automotive industry can turn disruption into opportunity. We believe the future is co-created, and we are committed to building the partnerships that will unlock it. Together, we can shape the future of mobility and ensure resilience in an ever-changing world.

Please do also read our technical whitepaper:

Driving innovation: collaborating to unlock the full technical potential of software-defined vehicles

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Get in touch with our expert team. We are looking forward to support you with our expertise to find out more about the future of mobility.

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