HOW AUTO OEMS CAN DRIVE OPERATIONAL EXCELLENCE WITH GENAI

In the fast-evolving landscape of automotive manufacturing, a powerful new force is emerging, poised to redefine operational excellence: Generative AI (GenAI). This isn't just another technological upgrade; it's a profound shift, with leading indicators showing that 93% of automotive stakeholders already perceive GenAI as a game-changing technology. As automakers grapple with the complexities of electrification, the dizzying pace of autonomous driving innovation, and fierce global competition, GenAI offers an unprecedented ability to fundamentally recast design, engineering, supply chain, manufacturing, sales, and service. This whitepaper delves into how Auto OEMs can strategically harness GenAI's transformative power to not only overcome current challenges but to truly drive the next era of innovation and efficiency, charting a course for unprecedented possibilities.

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The PYMNTS Intelligence Generative AI Tracker® Series Report 2024, focused on GenAI in the automotive industry, offers an illuminating, inside-out view of GenAI's current status and potential applications:

93%
of stakeholders across North America, Europe, and Asia perceive GenAI as a game-changing technology

69%
of R&D executives have planned GenAI adoption strategies

63%
of automotive enterprises are challenged by a skills gap in implementation

Corroborating this powerful trend, a parallel research study by the Infosys Knowledge Institute (IKI), spanning 3,000 enterprises across 12 diverse industries, further reinforces GenAI's undeniable impact. The IKI Generative AI Radar – Manufacturing report highlights key aspects of GenAI's influence in the manufacturing sector:

Widespread adoption:

92% of manufacturing companies have embraced GenAI

Business value:

22% of manufacturers have realized tangible business value from use cases that have been implemented

Optimistic outlook:

spend on GenAI is expected to grow significantly

GenAI leverages machine learning, neural networks, and computer vision to generate content, empowering automotive OEMs to recast design, engineering, manufacturing, and IT systems to boost productivity and efficiency. It is maturing into a reliable system for generating text, images and, 3D maps based on patterns; processing sequential data and natural as well as machine language; and performing a range of tasks without human intervention. Leading automotive manufacturers, including Toyota Motor Corporation, BMW, and General Motors, have integrated GenAI systems to realign core operations.
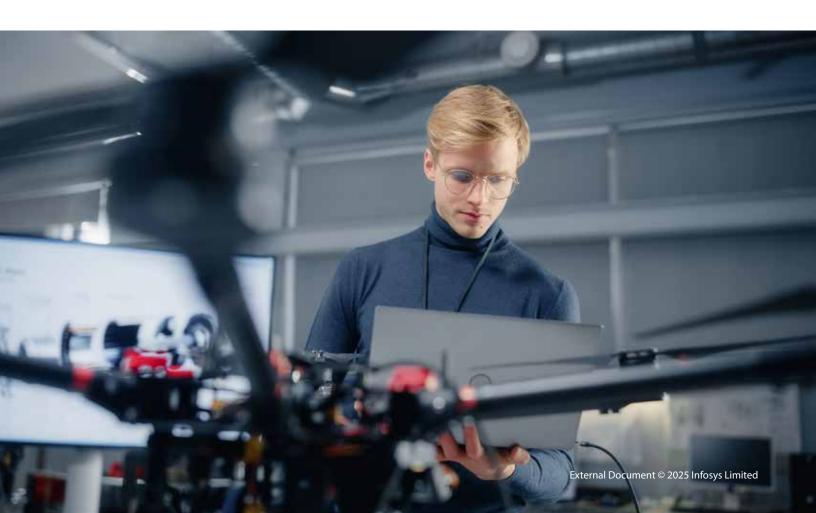
Revitalize product development

To truly pivot towards the future of electrification and autonomous driving, automotive OEMs urgently need advanced software and novel materials. GenAI serves as a powerful catalyst, enabling automotive research and development professionals to boldly conceptualize vehicles with unprecedented levels of autonomy. It allows them to swiftly explore design options using alternative raw materials and composites to achieve critical engineering goals such as enhanced durability, optimal mileage, superior heat resistance, and, critically, a footprint that is carbon-light. Notably, GenAI empowers researchers to identify viable alternatives by precisely analyzing material properties based on extensive external research and vast scientific literature. The generative design approach helped **General Motors** reduce the weight of various vehicle parts and components.

Generative AI's prowess extends to creating highly realistic digital prototypes of automotive systems, subsystems, and components. Furthermore, it can simulate complex real-world scenarios, including airflow around vehicles, diverse on-road conditions, stress factors, various weather conditions, human interaction, and other criteria that critically affect vehicle performance, wear-and-tear, reliability, and ultimately, the driver and passenger experience. This invaluable capability enables R&D teams to proactively identify design flaws during the formative development stage and robustly validate innovative design concepts against critical parameters like cost and strength. By simulating real-world scenarios and enabling virtual test drives, designers and product engineers can rapidly iterate, ensuring new models are road-worthy while strictly complying with engineering and aesthetic guidelines. Moreover, GenAI helps predict and swiftly resolve performance issues.

By seamlessly combining design documentation and field reports with rich simulation results, GenAI systems profoundly enhance vehicle design across vital aspects: aerodynamics, overall performance, safety, ergonomics, and fuel efficiency. Crucially, it accelerates the entire development cycle by automating design workflows and brilliantly reducing the need for costly, time-consuming physical prototyping. The Toyota Research Institute (TRI), for example, has developed **a pioneering GenAI technique** to reconcile engineering constraints, such as drag, chassis dimensions, and cabin size, with creative prototypes in the design phase. This innovative approach has demonstrably enhanced the aerodynamic performance of the Toyota BEV series.
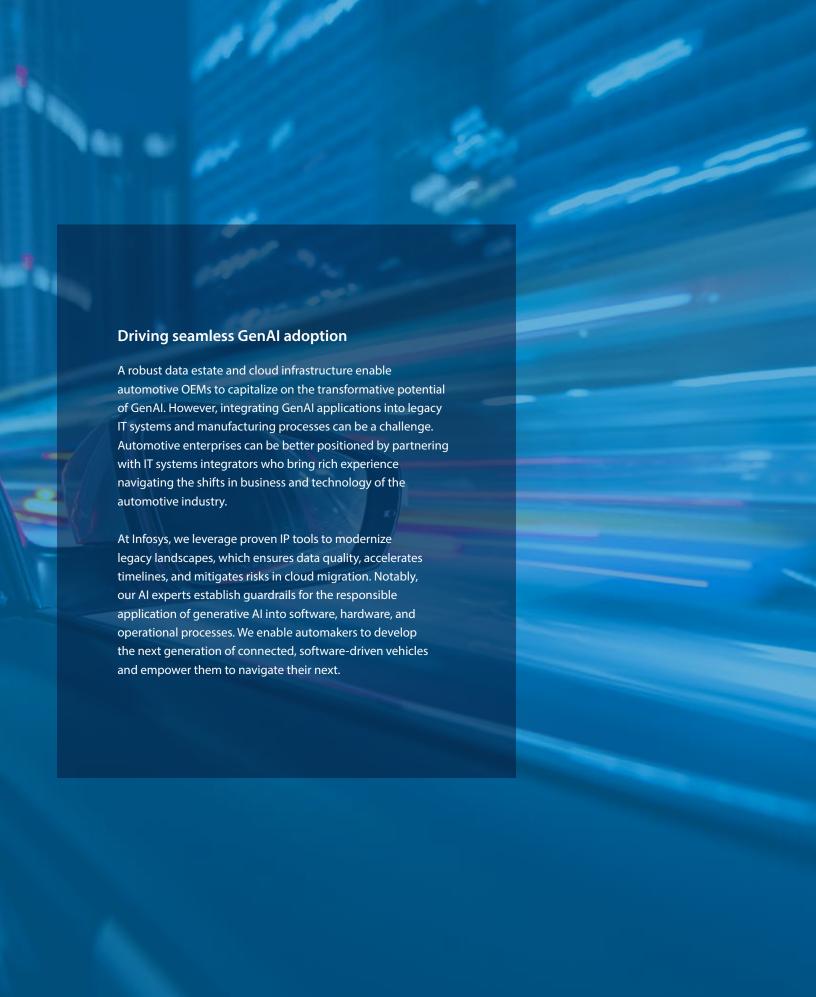
Energize the production assembly

In an automotive context, the conversational interface opens several possibilities for GenAI use cases. Chatbots can be trained to retrieve specific data, summarize voluminous technical documentation, and sense and respond to operational requirements. Mercedes-Benz, an early GenAI adopter, is **integrating ChatGPT into its global production network** to optimize processes and enhance quality management. This intelligent bot aggregates critical product quality data from development, manufacturing, and customer experience databases, facilitating daily production planning and enabling swift identification of defects.

Generative AI fundamentally transforms quality control in automotive manufacturing. It achieves this by continuously monitoring assembly processes in real time using capabilities such as computer vision and accurately analyzing data from production lines. Inherently, GenAI incorporates a powerful, continuous learning loop mechanism to continuously boost product reliability. Automated defect detection and analysis empower quality management teams to fine-tune preemptive measures, effectively eliminating inefficiencies and rework. This algorithmic approach drastically minimizes the time, effort, and cost typically associated with physical inspection, all while ensuring that vehicles strictly comply with stringent safety standards. Notably, a comprehensive digital ecosystem, powered by GenAI, seamlessly addresses complex regulatory requirements and automatically generates compliance reports, streamlining a previously laborious process.

Driving seamless GenAI adoption

A robust data estate and cloud infrastructure enable automotive OEMs to capitalize on the transformative potential of GenAI. However, integrating GenAI applications into legacy IT systems and manufacturing processes can be a challenge. Automotive enterprises can be better positioned by partnering with IT systems integrators who bring rich experience navigating the shifts in business and technology of the automotive industry.

At Infosys, we leverage proven IP tools to modernize legacy landscapes, which ensures data quality, accelerates timelines, and mitigates risks in cloud migration. Notably, our AI experts establish guardrails for the responsible application of generative AI into software, hardware, and operational processes. We enable automakers to develop the next generation of connected, software-driven vehicles and empower them to navigate their next.

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