SBD Explores: Automotive AI Use Cases

There are many forms of AI. Which one is right for your needs?

10-minute Insight

Generative AI has taken the world by storm this past year. Many industries both inside and outside automotive are looking to leverage its power to increase profits.

However, while generative AI can be applied to many use cases, other forms of AI may be better suited in some instances.

In this insight, SBD explores different automotive use cases and the type of AI which can best support it.

Target audience

Product planning Strategy Engineering Investing

Focus market(s)

Global

What is happening?

Consumer Experience

Car Features

Next-Gen Virtual Assistant

ADAS / AV **(Most OEMs)**

Examples of recent implementations

Car Services

Predictive maintenance

Advanced Vehicle diagnostics

OEM Business Process

Finance & Administration

Intelligent security center

Research & Development

SW developer co-pilot

Vehicle testing

Product design

Synthetic data for ADAS

Supply Chain Management

Material science

Supply Chain Risk Assessment

Production & Manufacturing

Smart factory/digital twin factory

Sales & Marketing

Sales planning advisor

Key takeaway

The latest advancements in Generative AI (Gen AI) have demonstrated significant potential across various business processes, prompting OEMs to reevaluate their AI strategies and applications.

- AI can support a wide range of business activities. But it can be categorized into two main objectives, consumer experience enhancement and OEM business process optimization.
- Most OEMs today prioritize integrating AI into modern car features like Virtual Assistant and ADAS. Yet, we see many opportunities for in-car services and OEM business processes, especially in R&D.
- While Gen AI has attracted lots of attention recently, it might not be the best fit for all use cases.
- We anticipate there will be numerous AI initiatives within OEMs spearheaded by diverse teams. This will need high level prioritization and coordination to ensure maximum efficiency and best Return on Investment is achieved.
- Mercedes-Benz is becoming a leader in automotive AI by investing more in AI than others, including an employee AI training program.

Why does it matter?

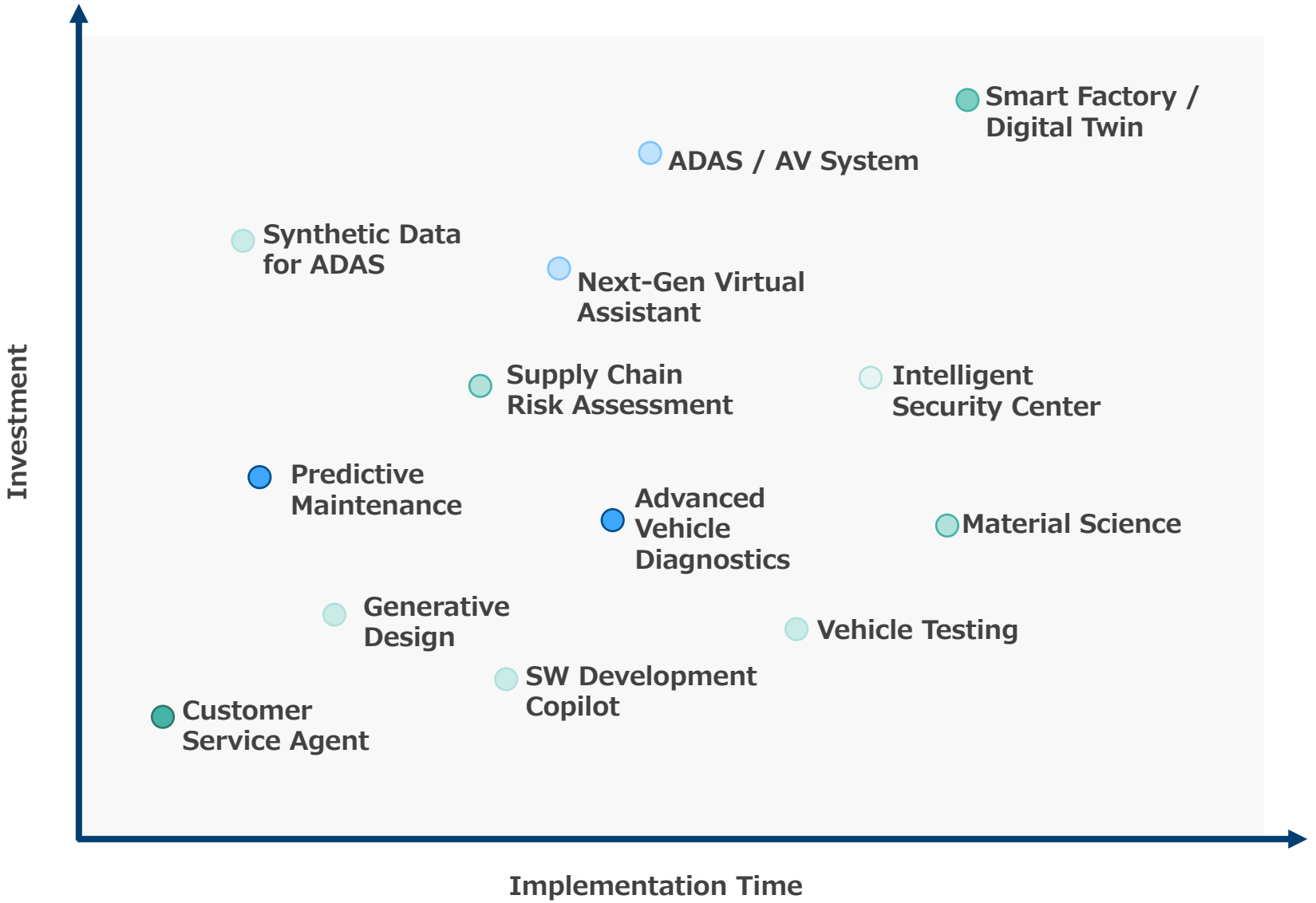
Use Cases	AI Category	Relative Maturity	Complexity	Data Type
Next-Gen Virtual Assistant	Gen AI (LSTM, Seq2Seq)	Medium	Medium	Voice, Text
ADAS / AV System	Deep Learning (CNN, Reinforcement Learning)	Medium	High	Image, Video, Radar / Lidar Data
Predictive maintenance	Machine Learning (Time Series Analysis, Regression)	Low	Medium	Time series, Sensor data
Advanced vehicle diagnostics	Machine Learning (Decision Tree, SVM)	Low	Medium	Sensor data, Device logs
Intelligent Security Center	Gen AI Deep Learning (CNN)	Low	High	Network logs, System logs.
SW development Copilot	Gen AI	Medium	Medium	Source code, Text
Vehicle Testing	Gen AI (Decision Tree)	Medium	Medium	Simulated data, Text, Code
Generative Design	Gen AI (GANs)	Medium	Medium	3D Models, Design parameters
Synthetic data for ADAS	Gen AI (GANs)	Medium	High	Image, Video
Material science	Deep Learning (Regression)	Low	High	Lab experiment data, Physical properties
Smart factory/digital twin	Deep Learning Gen AI	Low	High	Sensor data, Factory system logs
Customer service agent	Gen AI	High	Low	Text, Image, Customer interaction records

Key takeaway

The relationship between AI models can be complicated. At a high level, these models can be viewed as subcategories of one another with each one providing additional functionality. Understanding which model to apply to each use case is critical for effective implementation.

- Machine Learning: A form of AI that can be trained to perform tasks which may be automated. It can also identify and classify data in a structured form (i.e., in tabular form). Automotive applications include predictive maintenance, remote diagnostics in cars. Machine learning needs less data and runs smoothly on modern vehicle MCUs/MPUs.
- Deep Learning: A subset of machine learning which uses a neural network to analyze data. It outperforms machine learning when unstructured data is used (image classification, natural language processing, video, etc.). Deep learning is generally more about recognizing patterns, making decisions, or extracting features from data.
- Generative AI (Gen AI): A subset of deep learning. Gen AI can read data, learn from it, and generate new synthetic instances. This form of AI works well for a situation which requires adaptive outputs.

Where Next?

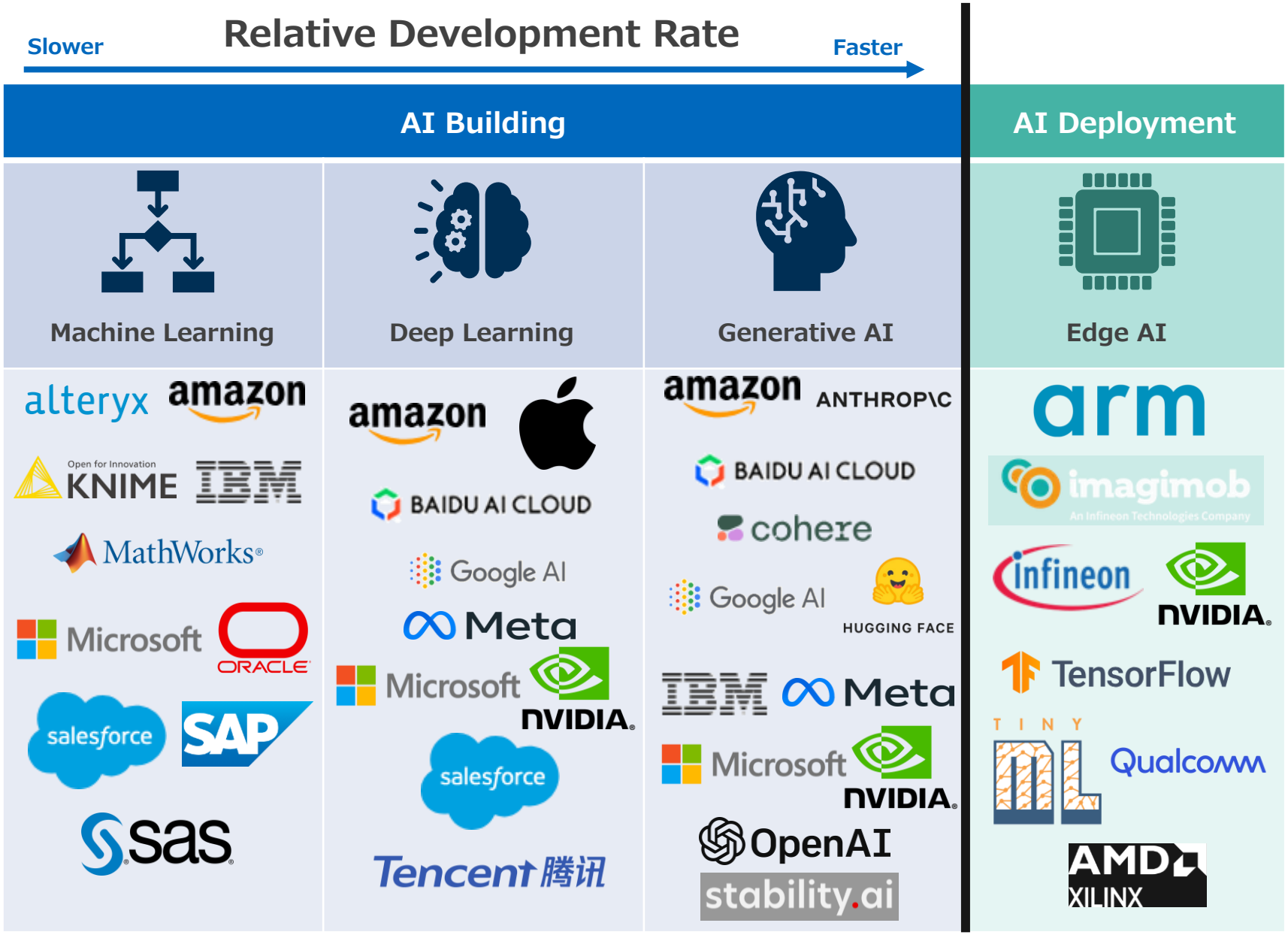


Key takeaway

SBD has evaluated some use cases related to the automotive industry and determined which ones should be of high priority based on implementation time and investment.

- The LLM-powered virtual assistant will transform in-car experiences with its deep grasp of human intentions, multi-objective capability, and swift responses. However, integrating LLM-powered virtual assistants into vehicles and making a seamless experience on the road requires more fine-turning effort.
- Predictive Maintenance and Advanced Vehicle Diagnostics can be facilitated using traditional ML algorithms, eliminating the need for Gen AI. However, gathering such data demands a robust information infrastructure for both the vehicle and its service network.
- Customer Service Agent on either an OEM website or app can be a quick win to leverage Gen AI with very little fine-tuning and can be implemented in weeks.
- Smart Factory takes a longer time and more investment to build and fine-tune with digital twin technology. However, this is an ideal moment to begin as most OEMs are preparing their new EV plants.

What to watch out for?



Key takeaway

While AI can be overhyped, it is still a very powerful tool when implemented correctly. However, the entry ticket can be expensive depending on the model used and there are uncertainties and concerns when applying it into enterprises. SBD has the following suggestions:

- AI will be embedded into different layers of technology stacks for future vehicles. It will be a combination of different small and large models running from chip to cloud. Monitoring industry trends will help OEMs to refine their AI strategy.
- The operational cost of LLM-Inferencing remains high and should be a primary consideration for large-scale implementations of Gen AI. However, it does save cost on data annotation during the model training.
- Watch edge AI players. Research is ongoing into model compression methods to optimize complex large models so they can run effectively on embedded systems.
- Some players in the chart offer both AI tool chains and training datasets. OEMs lacking in data might consider sourcing it from external parties.

How should you react?

1 Prepare

All intelligent AI models need to be trained with quality data. Look internally for where this data can come from or explore third party options to acquire data.

2 Prioritize

Identify weak points within your company where automation and efficiency can be improved. Consider different types of AI models to use depending on the use case.

3 Monitor

See how the AI model performs and adapt as needed. If AI was implemented in a consumer facing use case, respond to customer feedback to improve the model/system.

Authors

Andrew Wilczynski
Research Analyst

Michael Graf
Research Analyst

Andy Qiu
Domain Principal

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