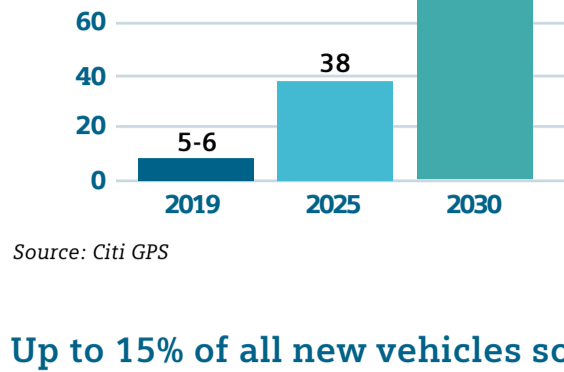


# Create the trust your customers need Autonomous Vehicle Development

## Autonomous vehicles on the rise

Autonomous vehicles' sales penetration is expected to rise sharply after 2030

### Driver Assistance System market development



Source: Citi GPS

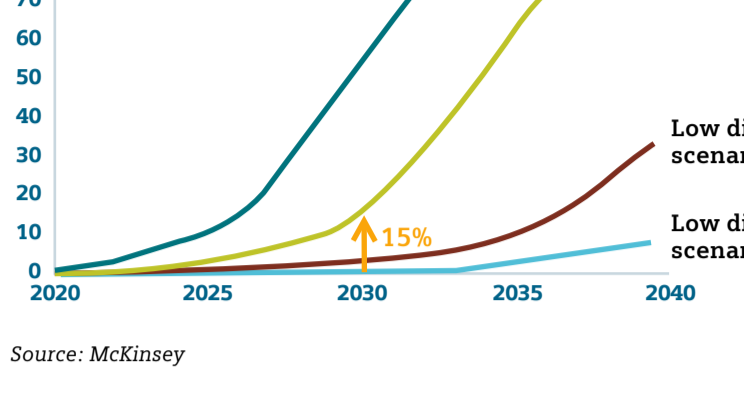
### Driverless cars



Source: Fortune

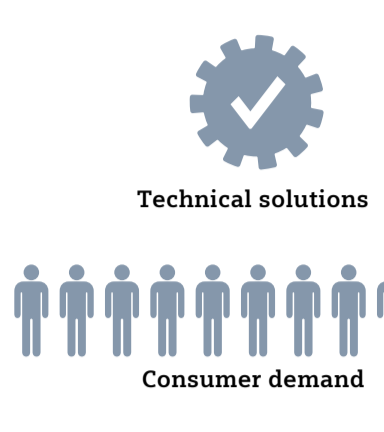
Up to 15% of all new vehicles sold in 2030 could be fully autonomous

### New vehicle market share of fully autonomous vehicles



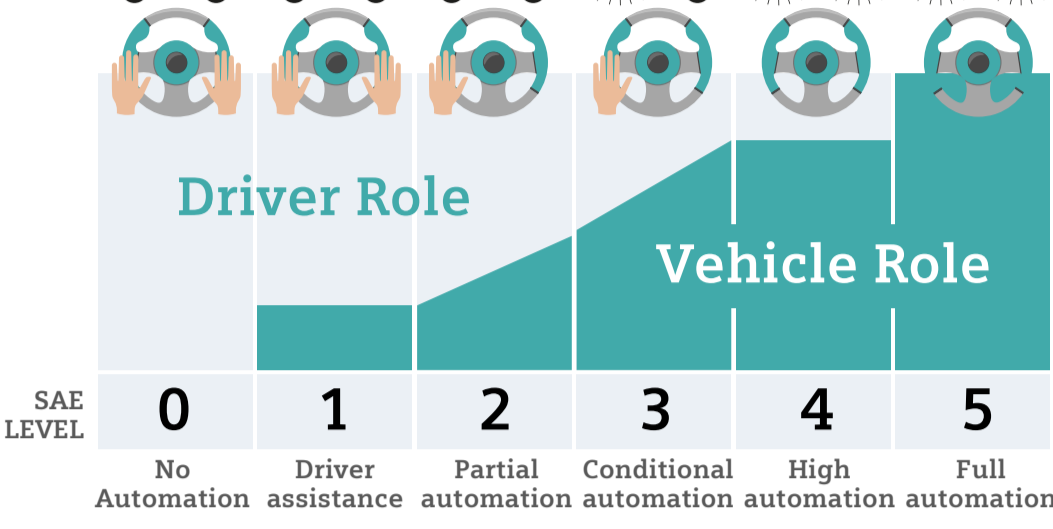
Source: McKinsey

### Depending on



## The 5 levels of driving automation

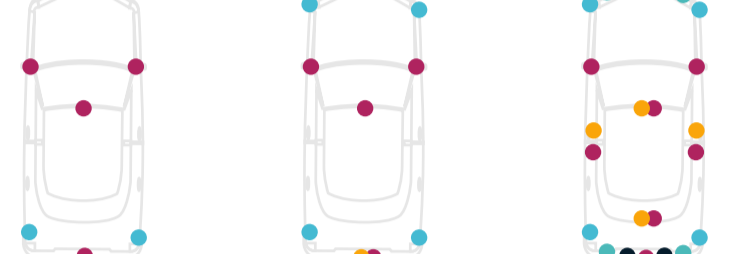
### Society of Automotive Engineers (SAE) automation levels



The first Level 3 highway systems will hit the market at some point from 2021 to 2024. Two to three years later, companies will probably upgrade their vehicle systems to Level 4 (McKinsey).

### Sketch of a vehicle and its sensor setup for AD

- Long-range radar ● Short-range LiDAR ● Camera
- Short-and medium-range radar ● Long-range LiDAR



Source: Expert interviews: Waymo Safety Report; Audi press announcements; GM investor presentation

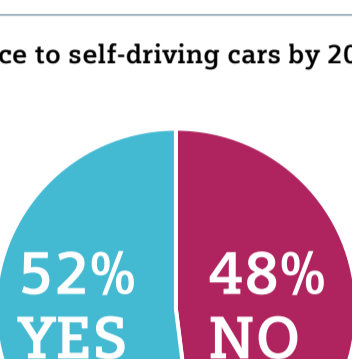
SAE AV Level 4 to 5 vehicles usually require a 360° view with different sensor technologies

To provide this 360° view, 5 to 10 cameras, 8 to 12 radar sensors, and 5 to 12 LiDAR sensors could be used.

The number of additional sensors for SAE AV Level 4 to 5 could easily reach 50 sensors or more.

## Changing consumer demand

### Consumer preference to self-driving cars by 2024

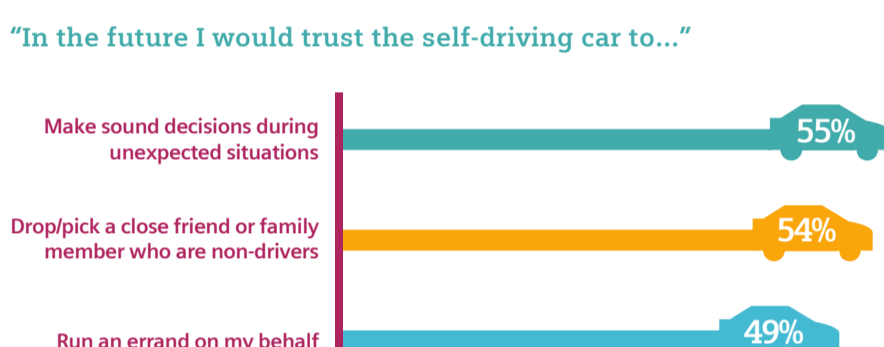


Source: Capgemini Research Institute

Acceptance is growing. Within five years 52% would prefer to be driven in a self-driving car than a normal one

### Consumer trust

"In the future I would trust the self-driving car to..."

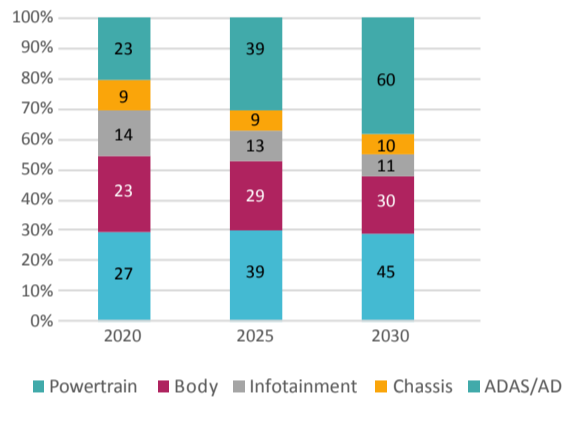


Source: Capgemini Research Institute

54% Share of consumers would trust the self-driving car to drop off or pickup non-driving friends and family members

## Cars become computers on wheels

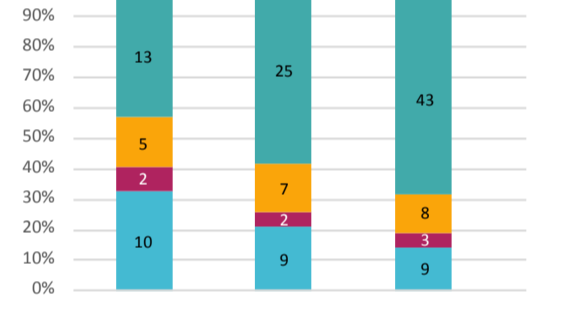
### ADAS/AD represents the largest ECU/DCU market size in 2030



Source: McKinsey

Domain	2020	2025	2030
ADAS/AD	20.7%	30.2%	38.4%
Powertrain	29.3%	30.2%	28.8%
Body	25.0%	22.5%	19.2%
Infotainment	15.2%	10.0%	7.1%
Chassis	9.8%	7.0%	6.4%

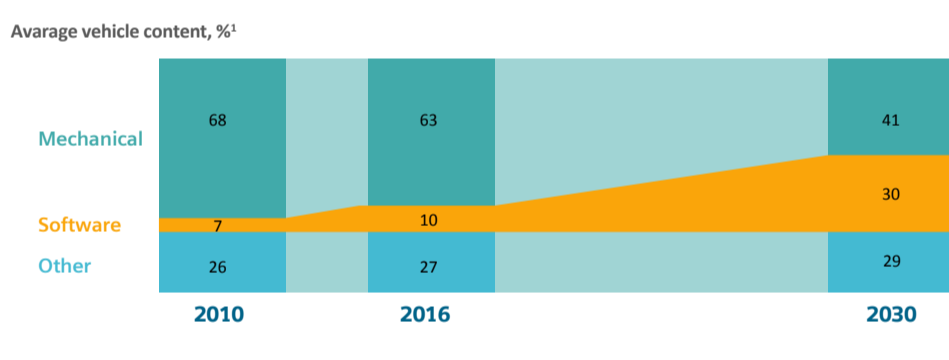
### ADAS/AD is the strongest growing domain in the automotive sensor market



Source: McKinsey

Domain	2020	2025	2030
ADAS/AD	43.3%	58.1%	67.2%
Powertrain	33.3%	20.9%	14.1%
Body	7.7%	4.7%	4.7%
Chassis	16.7%	16.3%	12.5%

### We expect software to account for nearly 30% of total vehicle content by 2030

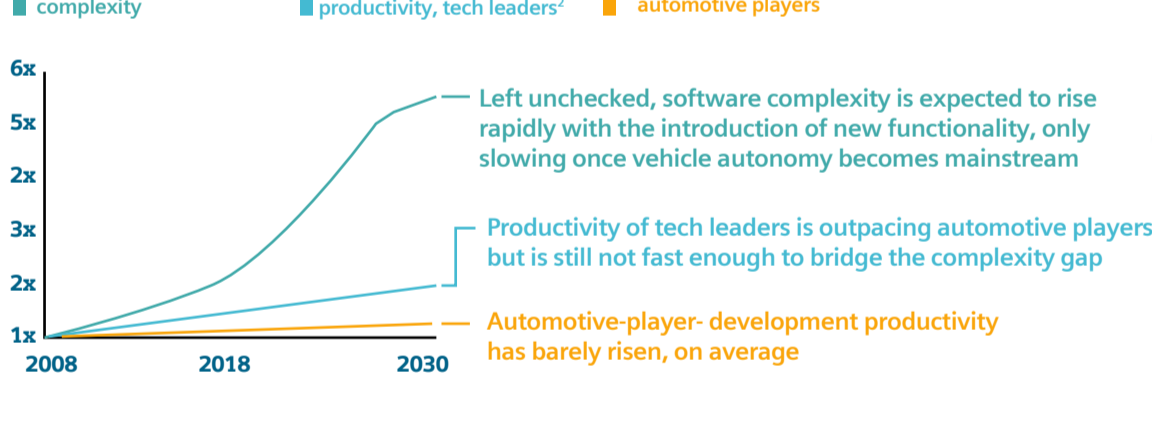


1 Figures may not sum to 100%, because of rounding. Source: McKinsey

## Turn complexity into a competitive advantage

### The automotive industry is confronting a widening and unsustainable gap between software complexity and productivity levels

Relative growth over time, for automotive features, 1 indexed, 1 = 2008



1 Analysis of >2000 software-development projects from OEMs and from tier-1 and tier-2 suppliers. 2 Top-performing quartile of technology companies. Source: Numetrics by McKinsey

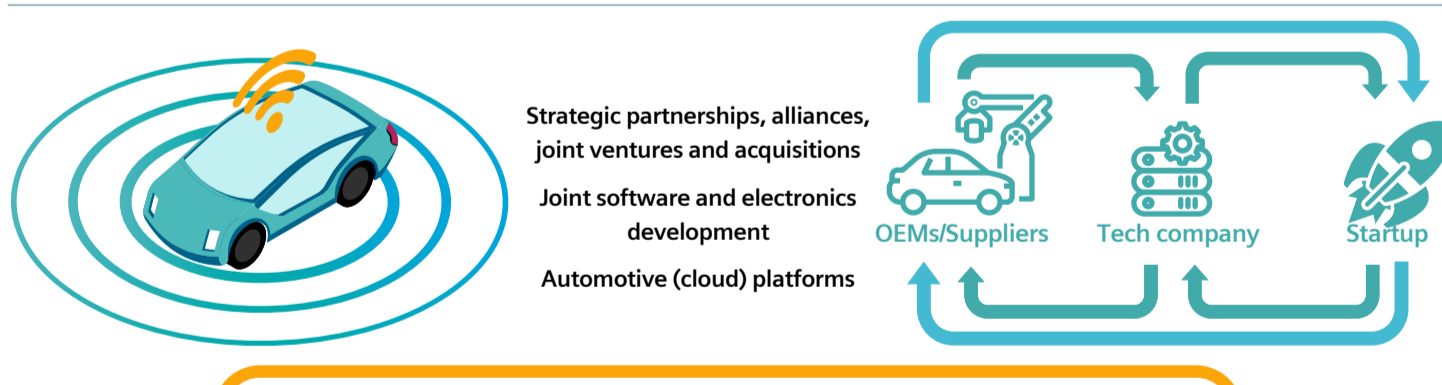
Higher levels of complexity while development productivity is stagnating  
Source: McKinsey

More features with every introduction  
Source: McKinsey

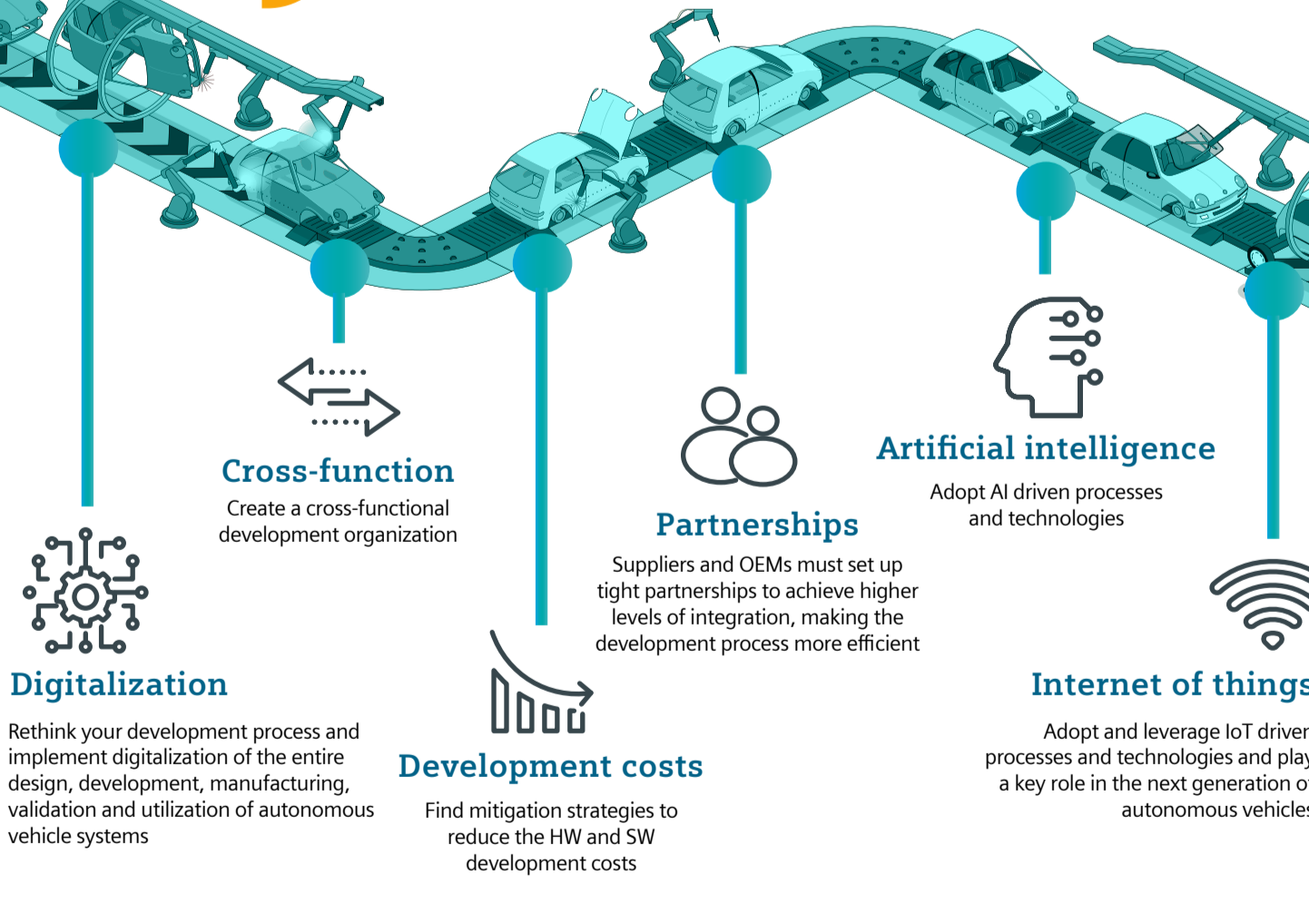
Autonomous car 4 TB data daily  
(Source: Strategy Analytics)

Design validation will be a major – if not the largest – cost component  
Source: Roland Berger "Autonomous Driving" 2014

### Competitors, tech companies and startups are starting to work together to share the high development costs and speed up development



In the evolution toward autonomous driving, virtualization of software functionality and abstraction from hardware, will become even more imperative  
McKinsey & company



## Siemens Autonomous Vehicle Development

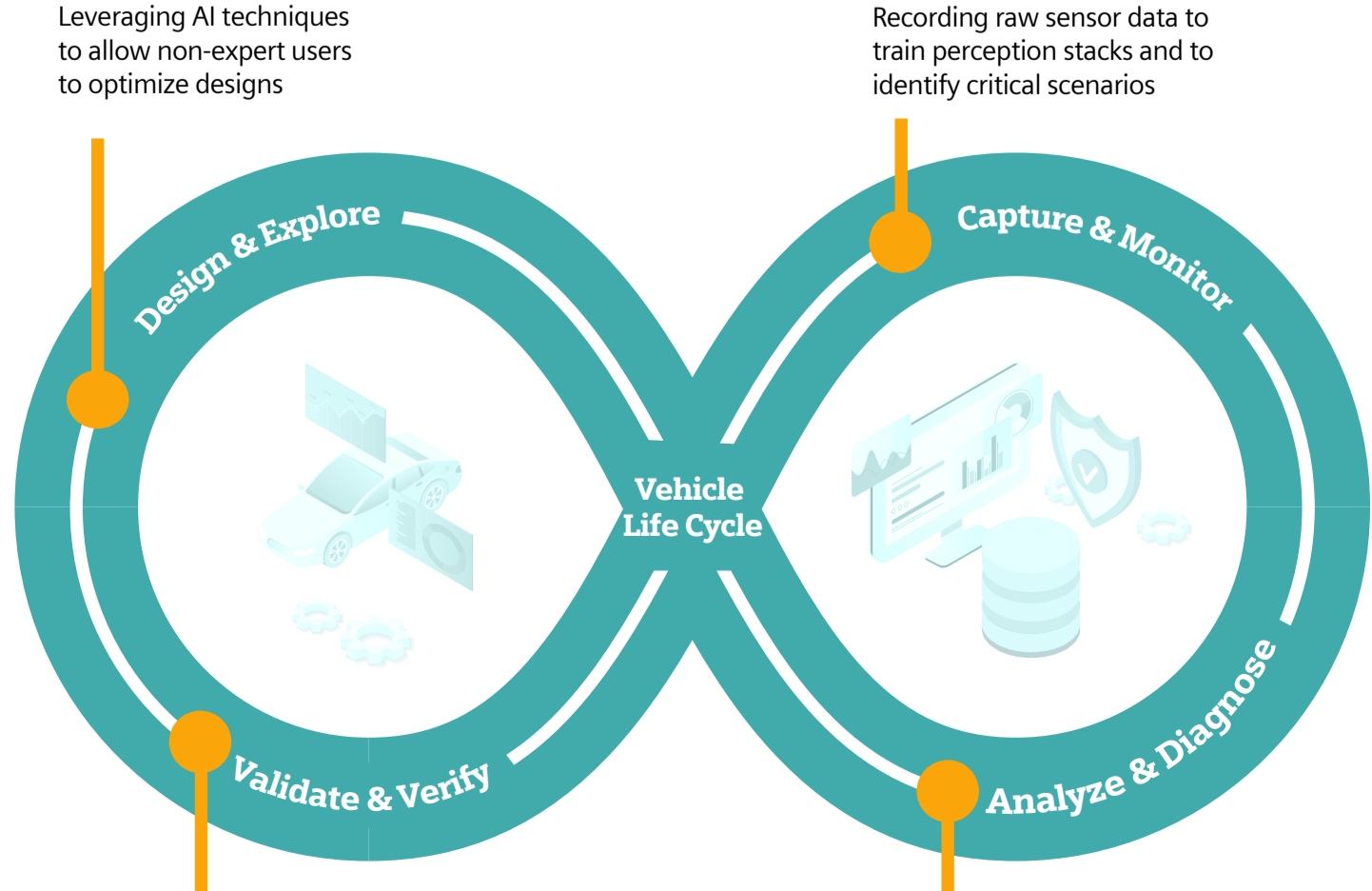
### From chip to city



A closed-loop development process and massive validation and verification programs for autonomous vehicle systems development on the level of the chip, electronics, vehicle and city infrastructure (from chip to city)

Leveraging AI techniques to allow non-expert users to optimize designs

Recording raw sensor data to train perception stacks and to identify critical scenarios



Create the trust your customers need with Siemens solutions for Autonomous Vehicle Development

For more information, visit:  
[www.siemens.com/AVD](http://www.siemens.com/AVD)