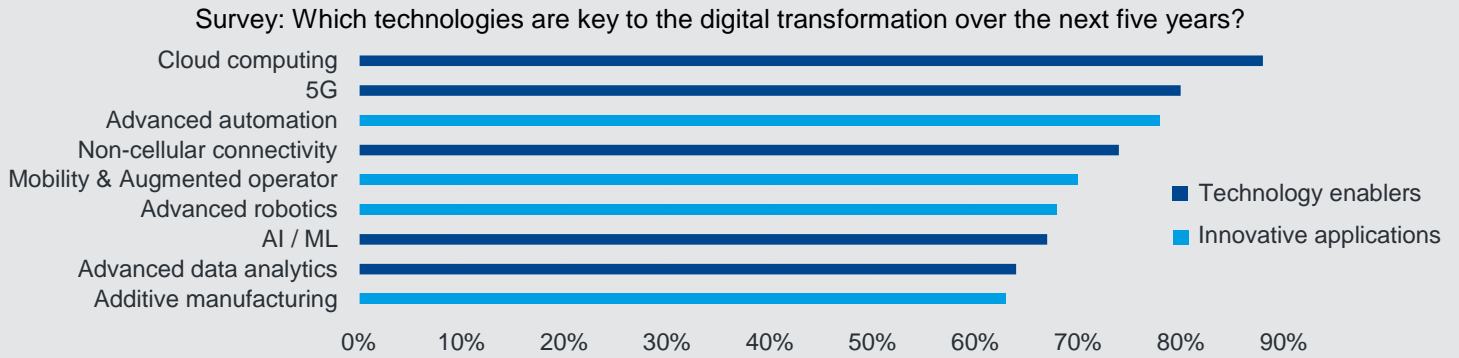


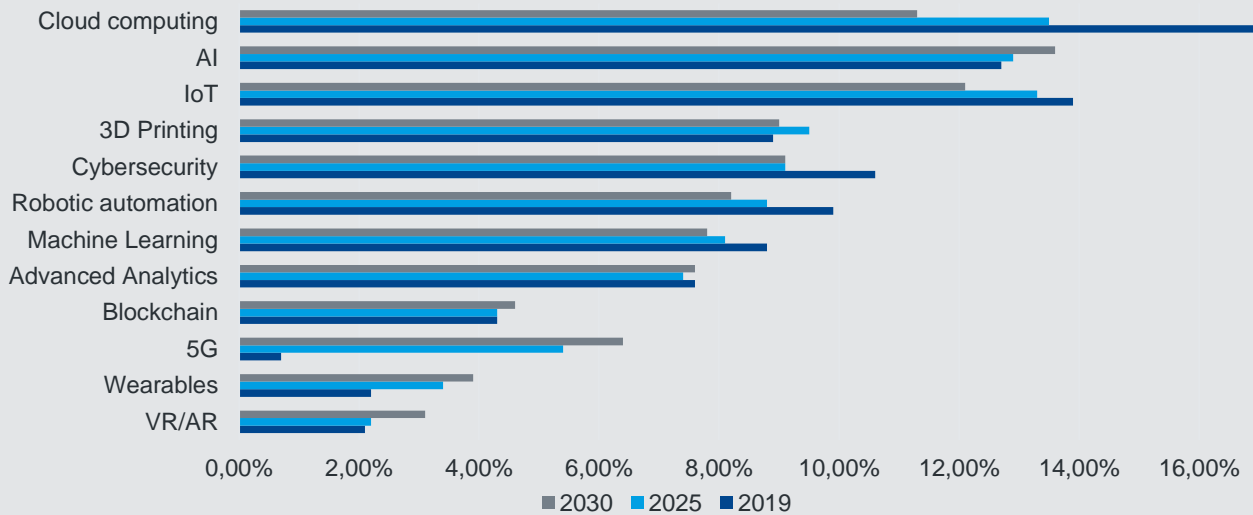


Managing Global Digitalization Challenges in Production

Decoding the path towards a digital factory - Getting inspired by key technologies for the manufacturing industry and learn to adapt as a company



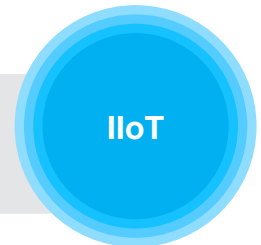
Survey: What percentage of investments are planned for the following digital initiatives in the respective years?



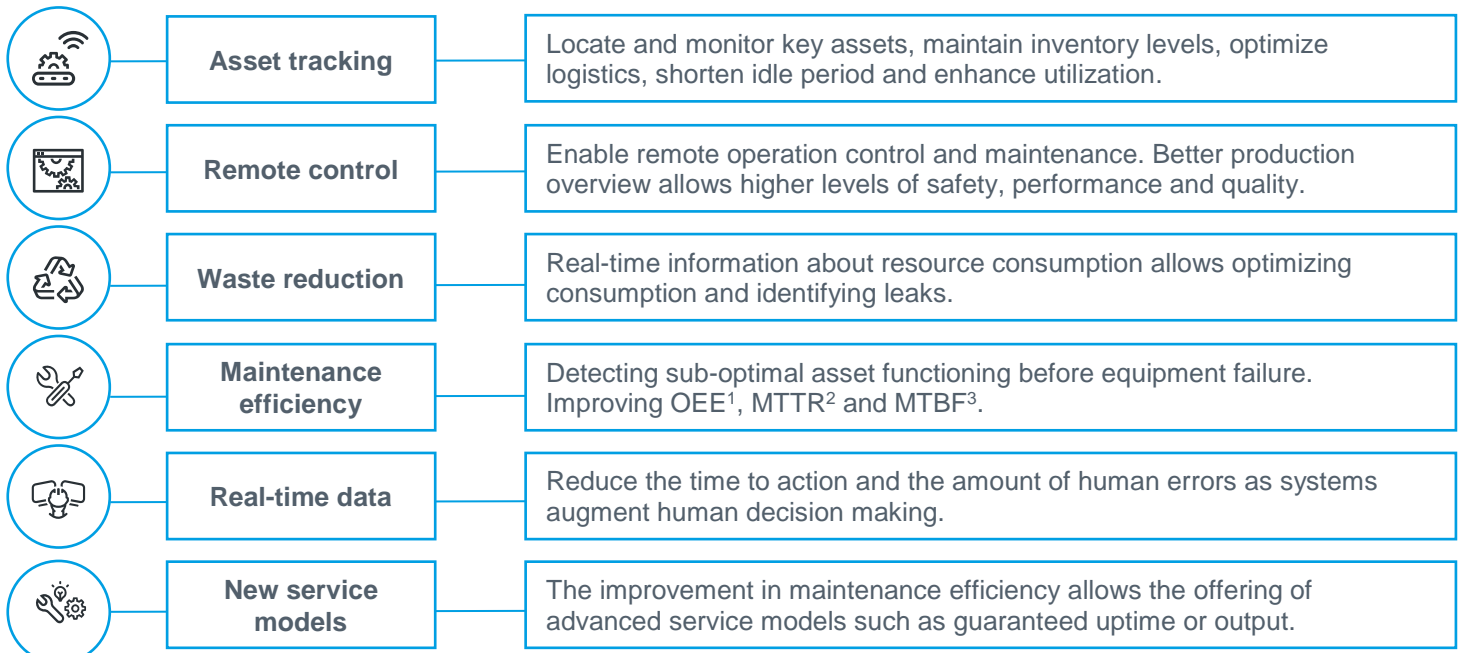
Source: Based on the analysis of existing surveys in the automotive and general industry (Capgemini, BCG, IBM, Bain, 2019 & 2020); Research Dürer Consulting

01 IIoT as the foundation of digital manufacturing

The market size for global IIoT platforms in manufacturing is projected to grow with a CAGR of 40% over the next 5 years. In combination with appropriate data analysis or AI based data insights, this technology provides various use cases for industrial manufacturers.



Leveraging IIoT for the manufacturing business



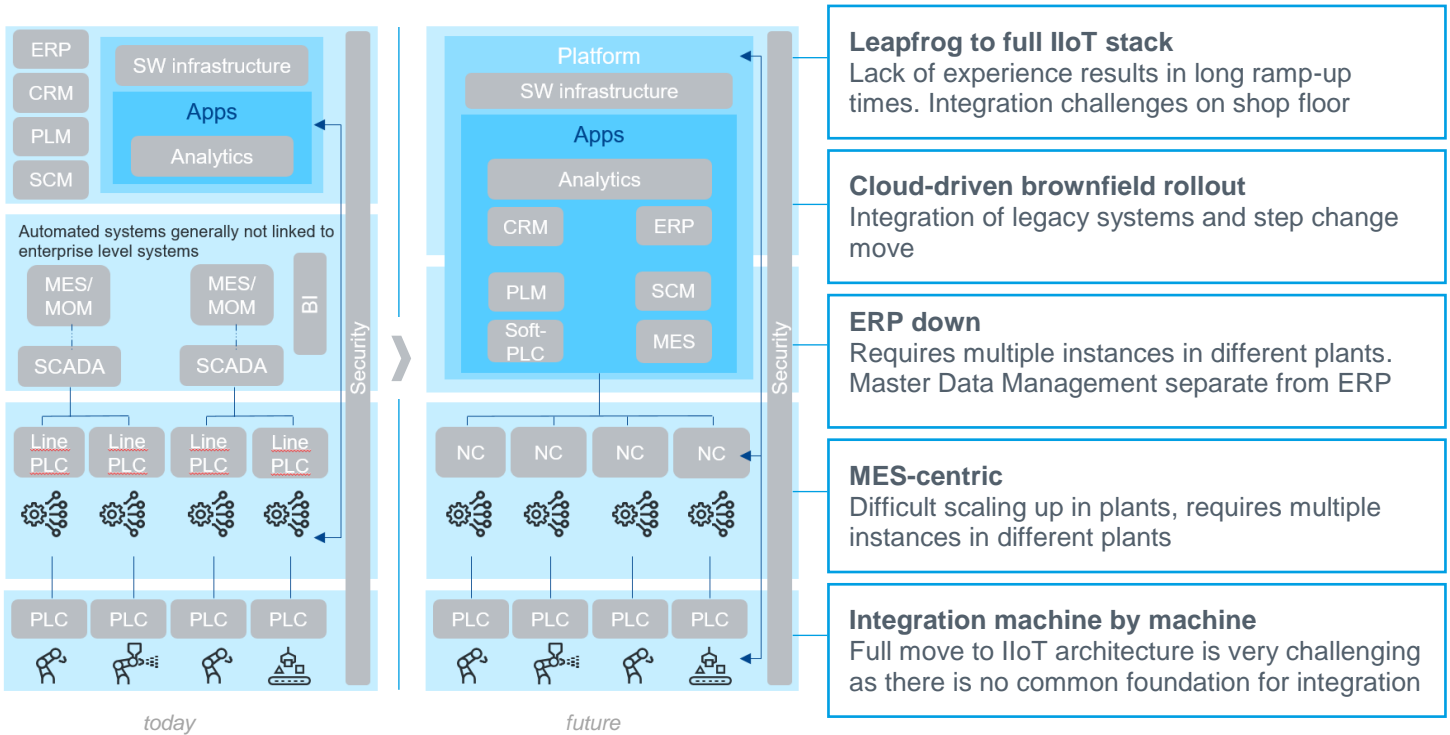
¹ Overall Equipment Effectiveness ² Mean-Time-To-Repair ³ Mean-Time-Between-Failures



02 Vertical system integration in the industrial IT infrastructure

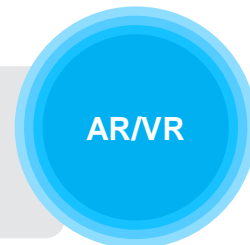
The next generation of system integration will implement and leverage the advantages of the OPC UA IoT framework from the control level upwards and allows a greater use of data from different sources to be included in the analytics. Furthermore, the network will enable companies to optimize operations on a cross-plant level with a holistic view on the supply chain.

Figure 3 Trends in the industrial IT infrastructure

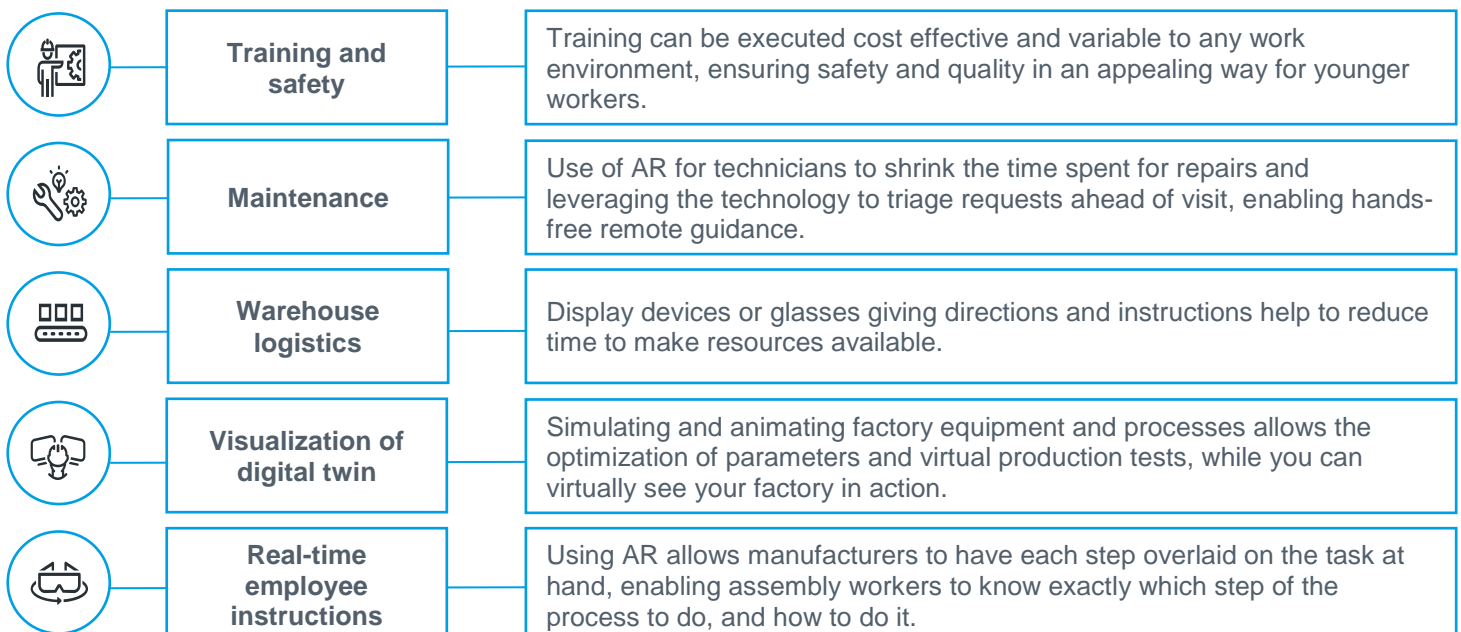


03 Virtual and Augmented Reality in the factory of the future

Augmented or virtual reality is often mentioned in the context of the next generation video games, but also offers a wide range of use cases in the manufacturing business. Industrial companies from all sectors make substantial investments into this technology, as the application becomes increasingly affordable.



How to use AR to generate value in a factory








04 Bringing the digital twin to life

The use of digital twins is expected to triple by 2022, compared to 2019 level. Most industrial companies already identified the advantages of simulations and are investing into digital twins on product-, process- and R&D level.

Digital Twin

Using a digital twin to save costs and increase transparency

	Production efficiency	Reduction in operations and process variability and commission times. Troubleshoot potential issues on a production line before putting it into place and manage performance in real-time.
	Service level	Improve the customer support through remote access (remote expert support on real-time digital model). Additionally, improvement of predictive maintenance and performance-based business models.
	Quality management	Use the digital twin to detect quality issues proactively and trace them back to the source.
	Logistics planning	The digital twin helps to optimize the supply chain and allows to gain a clear view of material usage to enable an automated replenishment process and establish a leaner production
	Product-/ Process re-design	The digital twin can simulate different scenarios to identify possible improvements in the production system.






Cloud

05 Using the cloud for next level data availability and connectivity

The Global Cloud Manufacturing Market is expected to grow at a 19.8% CAGR during the forecast period 2019–2024.

Companies that move development to IaaS and PaaS clouds from Amazon Web Services (AWS) reduced downtime by 72% and improved application availability by 3.9 hours per user per year.

How the cloud improves shop floor operations

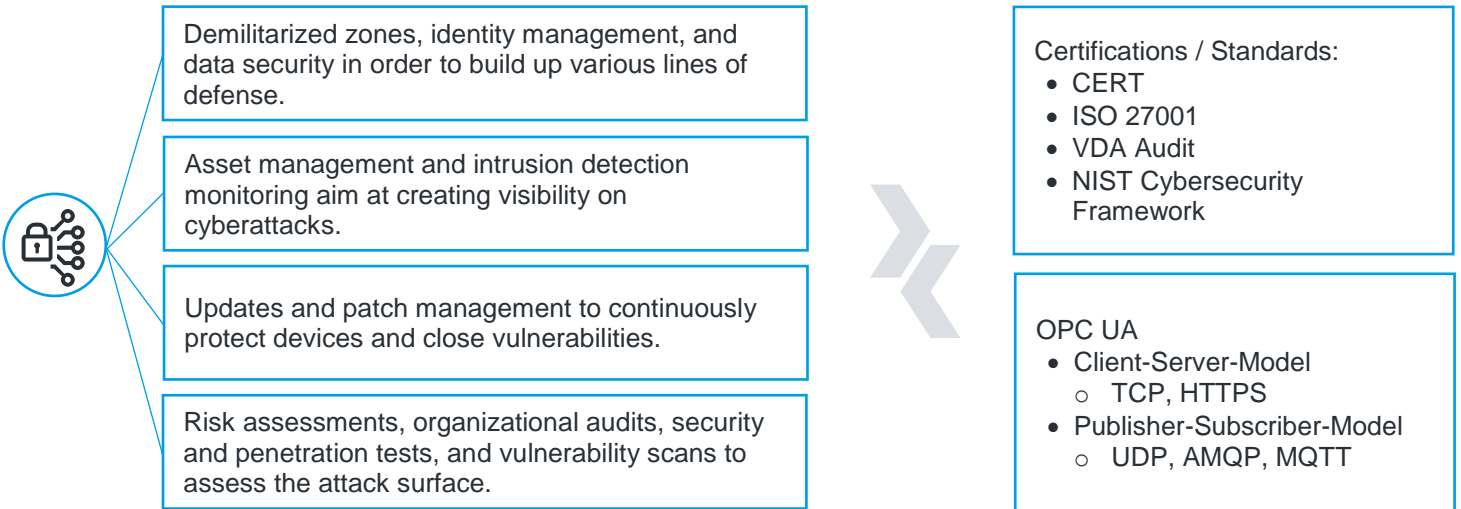
	Scalable computational resources	Helping producers overcome such challenges as data latency, limited bandwidth, and intermittent connectivity on the shop floor.
	Unify global operations	With a common cloud platform across all global operations, each branch can perform their jobs in a collaborative, synergistic way, enabling inter-site operation optimization.
	Facilitate integration	Intelligently integrating data streams from several partners (e.g. Integrating the supply chain), platforms, and devices is much easier with a cloud based platform.
	Change in consumption of products	Cloud computing will play a critical role as information technologies enable products to be remotely updated, maintained, or even sold as services, as part of an increasingly common business model called “servification”.
	Backup and disaster recovery	Businesses can store backup data in the cloud to keep those resources off-site, downloading backup data when needed. Reducing the risk of data loss and physical on-site destruction.

06 Safety first

In the eyes of customers, the suppliers and Industry 4.0 platforms are responsible for providing IT security. Over 60% of companies expect support in industrial security from their suppliers. Downtimes due to unpredictable cyber attacks are tremendously increasing.

Cyber-security

What safety issues are to consider during software development and implementation?

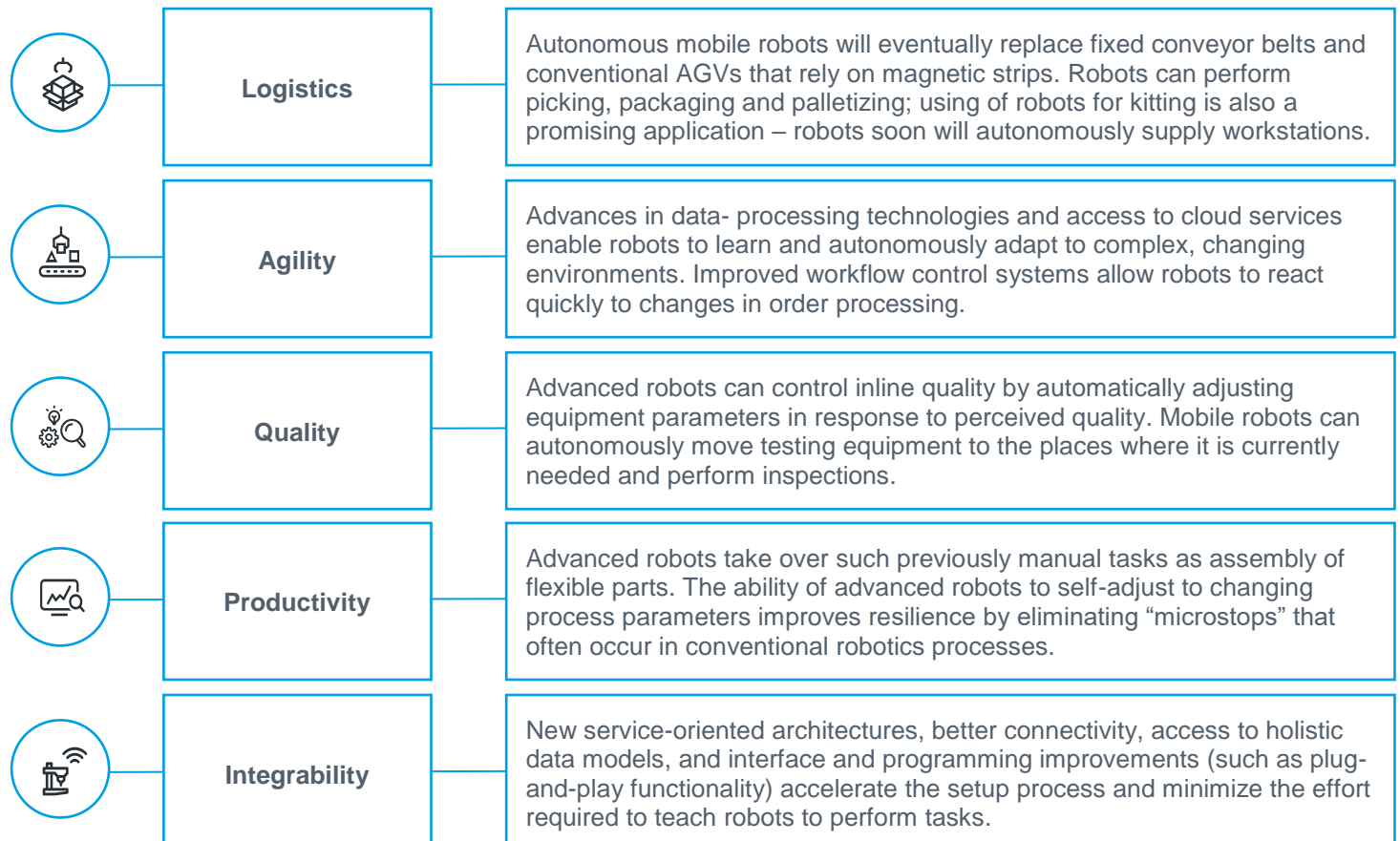


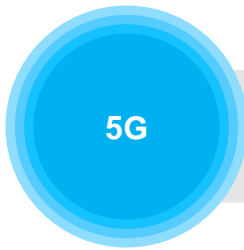
Advanced robotics

07 Putting a brain into factory robots

The global market value of advanced robotics in manufacturing is going to triple by 2021 – from 1.2 bn USD (2018) to 3.7 bn USD. A great development is also happening in the global market value of advanced robotics in logistics, with a rise from 0.5 bn USD to 0.9 bn USD in the same period.

With access to new technological features, robots enhance manufacturing performance





08 The next generation of connectivity and speed

The 5G technology impresses with the enhanced mobile broadband speed, the ultra-reliability, low latency, massive machine type communication (number of connected devices per unit area) and allows more secure operations.

How does 5G perform compared to conventional connectivity?

	5G	4G	Wi-Fi
Enhanced mobile broadband speed	20 Gbps for downlink and 10Gbps for uplink	1 Gbps for downlink and 500 Mbps for uplink	Approximately 4.8 Gbps
Massive machine type communication (Number of connected devices per unit area)	1 million/km ²	100 thousand /km ²	Not defined. Depends on the bandwidth required per device
Ultra-reliability and low latency	Network latency is less than or equals to 1 millisecond with 99.999% assurance of delivery	Network latency is 10 milliseconds	Network latency is less than 10 milliseconds for 5Ghz band



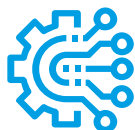
How can companies leverage the 5G technology for their business?

Remote control and monitoring



- 5G can support the time-critical operations in remote plants from a central command center.
- 5G can deliver the sensing or remote-control abilities of innovations like cobots, drones or self-driving cars with the right level of security
- 5G will support the development of cloud-based, high resolution AR/VR services, driving adoption and enabling remote operations / maintenance / training solutions through AR/VR
- 5G's faster wireless communication can provide high quality, real-time video feed for surveillance allowing remote control of distributed production lines.
- 5G's ability to connect more devices with improved security will enhance the effectiveness of remote monitoring of en-route shipment conditions (e.g., temperature and humidity)

Real-time services and analytics



- 5G's faster wireless communication, improved reliability and ability to connect 10–100x more devices can provide real-time information from a large set of devices, which can be converted into real-time insights leveraging edge computing
- 5G will enable flexible management of edge and cloud resources, such as on-demand deployment of applications or data transfer
- Low latency of 5G network will also enable the real-time emergency shutdown of remote systems
- 5G will increase the effectiveness of monitoring and alert systems, leveraging its ability to connect more devices over more reliable and secure network
- 5G's ability to connect 10–100 times more devices with better security protocols and 99.999% availability will make uses such as self-triggered order placement based on inventory levels possible.

09 How much future is in your factory?

What are the pain points on which most improvement is necessary? How digital is your factory compared to the competitors from your industry? Dürr Consulting will help you to assess the digital readiness of your factory and ensure to guide your manufacturing site to the next level of digitalization.

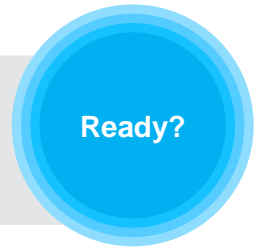
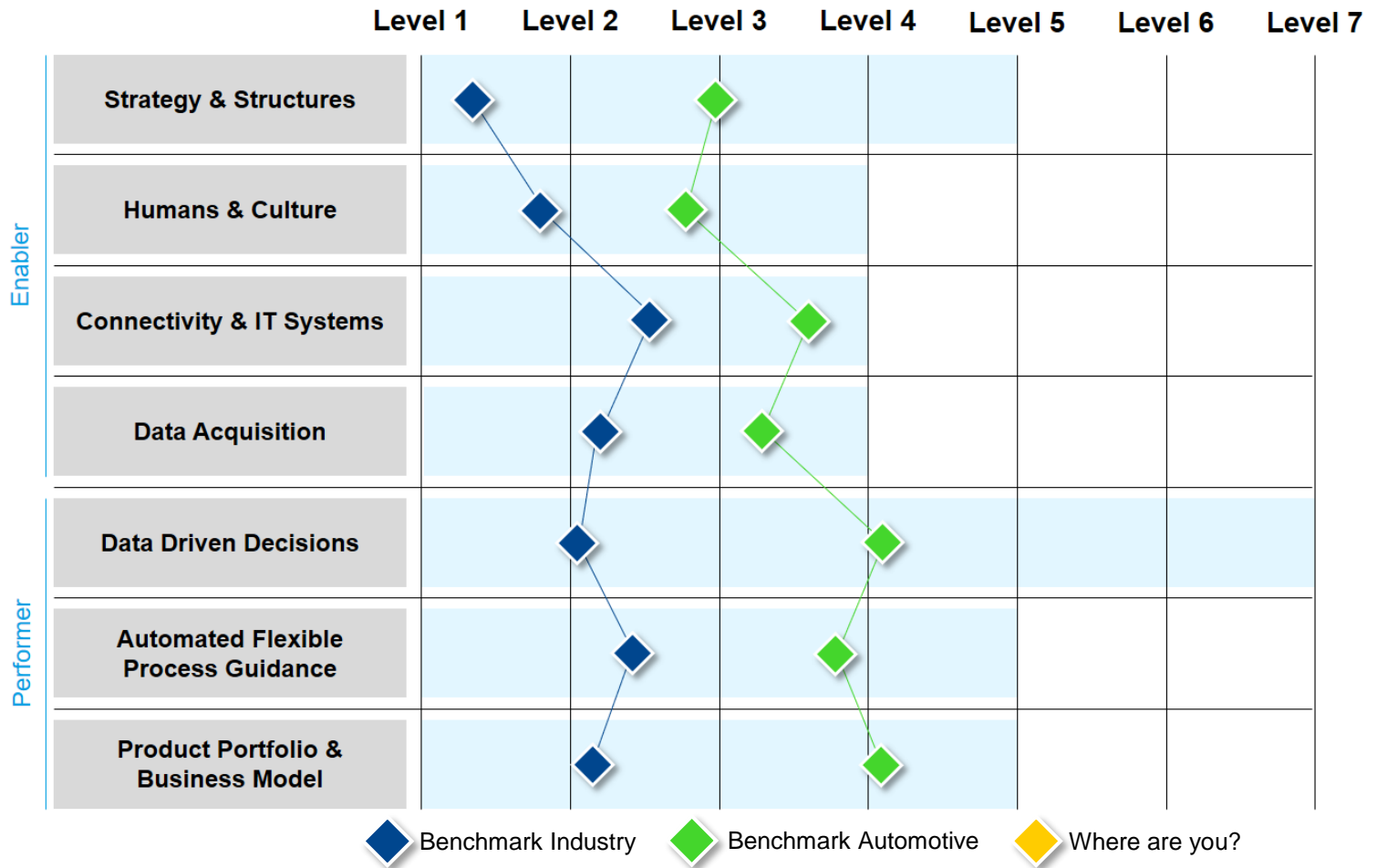


Figure 4 Benchmarking digitalization maturity in the manufacturing industry



How to bring your factory to the next level

Strategy & Structures	Humans & Culture	Connectivity & IT Systems	Data Acquisition	Data Driven Decisions	Automated Flexible Process Guidance	Product Portfolio & Business Model
Development of digitalization strategies to overcome uncertainties within existing organizations Establishment of transparency for benefits & risks	Implementation of new training models and establishment of new mindset for digitalization as an enabler	Linking existing physical systems with IT-infrastructures and establishment of technological maturity in the production landscape	Standardization for data acquisition methods and technologies as well as the implementation of standard platforms Build understanding for data governance	Build transparency in data analysis methods Build consistency from data collection to generate information of data and the usage of data	Implementation of measures to improve IT-resilience Use digitalization to stabilize and guide production processes	Evaluation of potentials for business creation through final product data backflow Generate & Implement business growth through usage of data of the final product



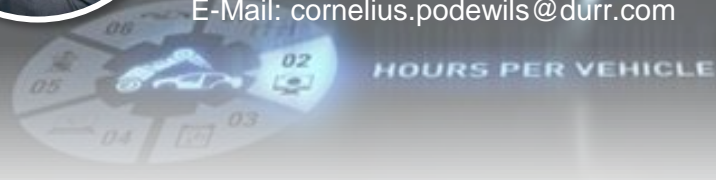
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Sitz der Gesellschaft: Stuttgart; eingetragen im Amtsgericht Stuttgart HRB 757705
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