

# The digital factor - How Germany benefits from smart technologies

## Potential of artificial intelligence in manufacturing

**EUR 56 billion** – that’s the estimated amount by which the gross value added in manufacturing in Germany could increase through the use of generative AI.<sup>1</sup> This is equivalent to a 7.8 percent increase in gross value added. The estimate assumes productive use of generative AI by at least half of all manufacturing companies within ten years. **The manufacturing sector accounts for a significant share of the total potential of generative AI, totalling EUR 330 billion.**<sup>2</sup> Generative AI tools could unlock peak productivity growth of an estimated 1.3 percent per year in manufacturing.<sup>3</sup> This might break the trend of declining productivity growth in recent years. Generative AI offers the opportunity to maintain and increase the German manufacturing sector’s productivity lead over its international competitors.

An estimated **110,000 companies** in Germany’s manufacturing sector (51 percent) are already using AI. 17 percent of companies across the entire economy use AI.

An estimated **59% of jobs** in the manufacturing will be affected by the use of generative AI in the future.

### Most common areas where AI is used in manufacturing companies

Share of companies using AI, as at summer 2023



### Companies and workers are already seeing productivity effects through AI



The results presented here were compiled by IW Consult, commissioned by Google, and are primarily based on model calculations by the Implement Consulting Group and on population and business surveys conducted by Public First. Information on the methodology and further results can be found at:



[der-digitale-faktor.de](https://www.der-digitale-faktor.de)

1) Based upon Goldman Sachs' identification of the types of tasks exposed to automation by generative AI (Briggs/Kodani, 2023), Implement Consulting Group produced new estimates of the potential improvement in labour productivity. Gross value added (GVA) is calculated using 2022 prices. Further information on assumptions and prerequisites that must be fulfilled in order to leverage the potential can be found at [der-digitale-faktor.de](https://www.der-digitale-faktor.de) (2023).

2) The calculations of the total potential are also based on the findings of Briggs/Kodani (2023) and were carried out by Public First in 2023.

3) The estimate relates to the isolated potential of generative AI in around ten years' time, when the impact is likely to have peaked in most digitalised European countries. The effect is not fully additive to the current economic forecasts, as these already assume a certain contribution from technological progress.

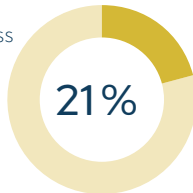
## The manufacturing sector: the central anchor of prosperity in Germany<sup>4</sup>

€781.4 bn

gross value added

(Year: 2023)

Share of total gross value added:

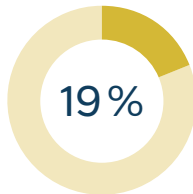


7.9 m

employed persons

(Year: 2023)

Share of total employment:

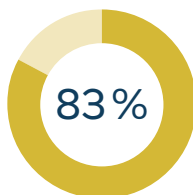


€62.6 bn

research and development expenditure by companies

(Year: 2021)

Share of total expenditure:

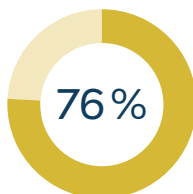


€1,042 bn

export

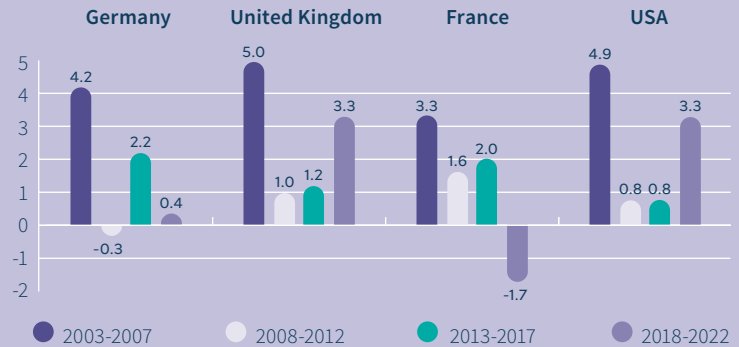
(Year: 2022)

Share of total export:



## Trend of declining productivity growth in the manufacturing sector

Annual average change in real labour productivity per employee in the manufacturing sector, in percent



## Core industrial activities have fewer points of contact with generative AI

Generative AI is rarely used in operational production processes:

### Jobs and the extent to which they are impacted by generative AI<sup>5</sup>

in the manufacturing sector, figures estimated

41%

or 3.3 m  
no or only minor impact  
For instance... manual tasks

52%

or 4.1 m  
complementing impact  
For instance... programming or creative task

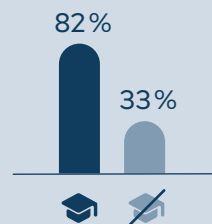
7%

or 0.6 m  
partial or full automation  
For instance... administrative or office task



## People with academic qualifications benefit most from generative AI

Generative AI supports 82 percent of jobs for graduates, compared to 33 percent for non-graduates.<sup>5</sup>



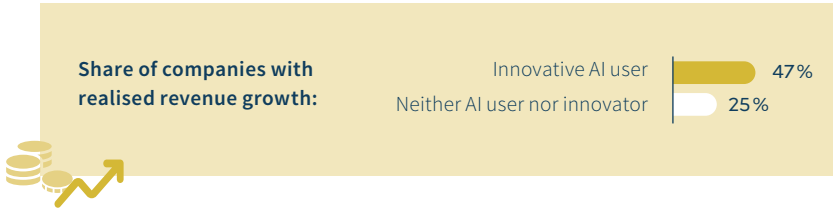
4) Calculations based on figures from Eurostat.

5) Based upon Goldman Sachs' identification of the types of tasks exposed to automation by generative AI (Briggs/Kodani, 2023), Implement Consulting Group produced these estimates of AI exposure. For jobs with no/low impact from generative AI, less than 10% of activities are affected by generative AI. In the case of jobs for which generative AI has a complementary effect, 10%-49% of activities are affected by generative AI. Jobs whose activities are affected by generative AI by 50% or more are partially or completely replaced by generative AI. Differences in the total are due to rounding.

## Industrial sector driving innovation in Germany

Some 65 per cent of manufacturing companies are innovators,<sup>6</sup> and 83 percent of R&D spending by companies in Germany is in manufacturing. AI can help strengthen the innovation ecosystem in manufacturing in two ways:

- The **working time freed up** by the use of generative AI can be used for **innovation activities**.
- AI enables **new business models** and accelerates innovation processes.



## Google AI can help make the manufacturing sector more competitive

For over a decade, Google has been integrating products and services to support people and businesses. Google services can contribute to making the manufacturing sector in Germany go digital:

2 out of 3

manufacturing companies say Google services have helped them transition from a physical to a digitalised business.

70%

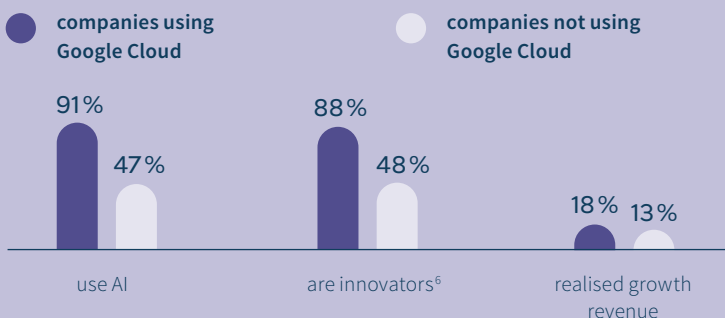
of manufacturing companies that implement IoT applications use Google services to do so.

60%

of manufacturing businesses using Google Cloud say that Google services are having a **positive impact** on their ability to develop entirely new products, services or business models.



## Google Cloud usage goes hand in hand with AI usage, innovation and success in manufacturing companies



## Google services open up new markets for companies in the manufacturing

A key part of the manufacturing sector's business model is the export of its products and services. Manufacturing accounts for around 76 percent of the value of goods exported from Germany. Google services can contribute to this business model:

54%

of manufacturing companies using Google say that Google services have helped them reach new markets.



For  
2 out of 3

manufacturing businesses using Google, using Google services makes it easier to sell to international customers.



1.2 times

more of their customers abroad than companies that do not use Google's advertising services.



<sup>6</sup> In this business survey, innovators are classed as those companies that have been able to demonstrate at least one product or service innovation since 2020. Innovation is defined as the introduction of a completely new or significantly improved product or service.

<sup>7</sup> Google advertising services include Google Ads, AdSense and YouTube Ads.



**Founding year:** 1871

**Sector:** Manufacturing/Automotive

**Annual sales:** approx. EUR 41.4 bn (2023)

**Number of employees:** approx. 200,000

**Other:** operating in 56 countries

‘Together with Google we are bringing artificial intelligence for drivers into the car. This is how our vision of the software-defined vehicle becomes a reality.’

**Philipp von Hirschheydt,**  
Member of the Continental Executive Board,  
Automotive Group Sector

## Case study

# Continental and Google Cloud bring generative artificial intelligence to cars

The trend towards digitalisation and connectivity in cars and the use of intelligent voice assistants in the cockpit continues to gain momentum. Google and German automotive supplier Continental have therefore entered into a partnership in 2023 to jointly offer innovative AI and cloud solutions for smart cockpits.

## Challenge

The requirements for digital assistance systems in cars are becoming increasingly complex. Drivers want to be able to access and operate information and assistance features as easily as possible while driving. At the same time, the driver's safety and alertness must not be compromised.

## Partnership between Continental and Google Cloud

Continental and Google are combining their expertise in the areas of automotive, software, AI and cloud computing. Together, they are developing a new generation of connectivity and assistance solutions that make the interaction between users and cars safer, more intuitive and more efficient - all with the help of generative AI.

## First milestone presented at the IAA 2023

Continental is one of the world's first automotive suppliers to integrate generative Google Conversational AI solutions, i.e. AI that can simulate human conversations, into its high-performance on-board computers. This combination of hardware and software features an AI-based user interface, a wide range of voice-controlled connectivity and assistance functions and very fast response times. This makes it a key component of smart cockpits.

- An AI-driven smart cockpit offers several benefits **to the user:** Voice control allows important vehicle functions to be operated safely while driving. In addition, virtual assistants can search for and read out content, such as the optimum tyre pressure for different loads or route-dependent information on places of interest or hotels.
- Of particular interest to **car manufacturers** is the ability to access pre-configured functions for AI-based intelligent cockpit systems. This allows them to significantly reduce their own development and time-to-market times, thereby lowering development costs.



**In the future, Continental and Google will expand their partnership** into other areas to further enhance in-car connectivity and user experience. For example, an expansion to include additional AI-based functions such as biometric user recognition and access systems is conceivable.