



# Digitalisation of the economy in Germany

## Digitalisation Index 2024

### **Summary of the Digitalisation Index results in the project “Development and Measurement of the Digitalisation of the Economy in Germany”**

#### **Executive Summary**

The Digitalisation Index 2024 shows that the German economy has become around 14 percent more digital in the last five years. However, despite this progress, key challenges remain: The East has not been able to escape its role as the digitalisation bottom performer in the past five years. Rural areas are still lagging behind the cities. There are still clear differences in digitalisation within the industry groups, which cannot be attributed solely to differences in the digitalisation capability of products and business models, for example. The digitalisation challenges in Germany have not been resolved in the past five years – although five years is a small eternity compared to the speed of current technological progress. Nevertheless, it is remarkable that companies have become significantly more digital, especially from 2023 to 2024 – even though the German economy has had to endure severe crises.

#### Digitalisation in Germany

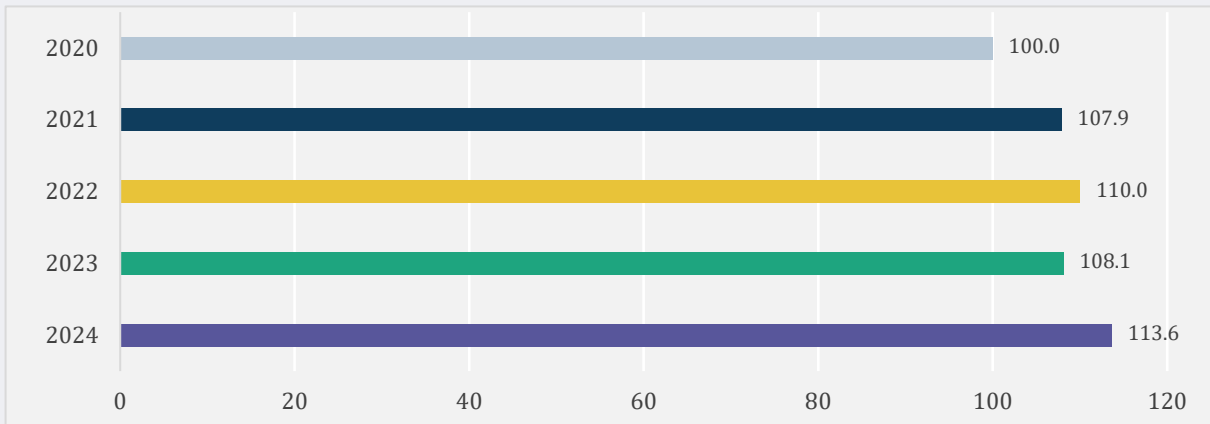
The digitalisation of the economy in Germany increases in 2024. The Germany-wide index value rises to 113.6 points compared to 108.1 points in 2023 (Figure 1).<sup>1</sup> Previously, the index value rose sharply in 2021 and then stagnated in 2022 and 2023.

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<sup>1</sup> Information on the methodology can be found on the last page of this report. The index values for 2021, 2022 and 2023 have been adjusted subsequently from 108.1 to 107.9 points (2021), from 110.5 to 110.0 points (2022) and from 108.6 to 108.1 points (2023) due to data updates for individual indicators. This is discussed in the long report on the 2024 Digitalisation Index.

Figure 1: Results of the Digitalisation Index for Germany

In index points, survey years 2020, 2021, 2022, 2023 and 2024

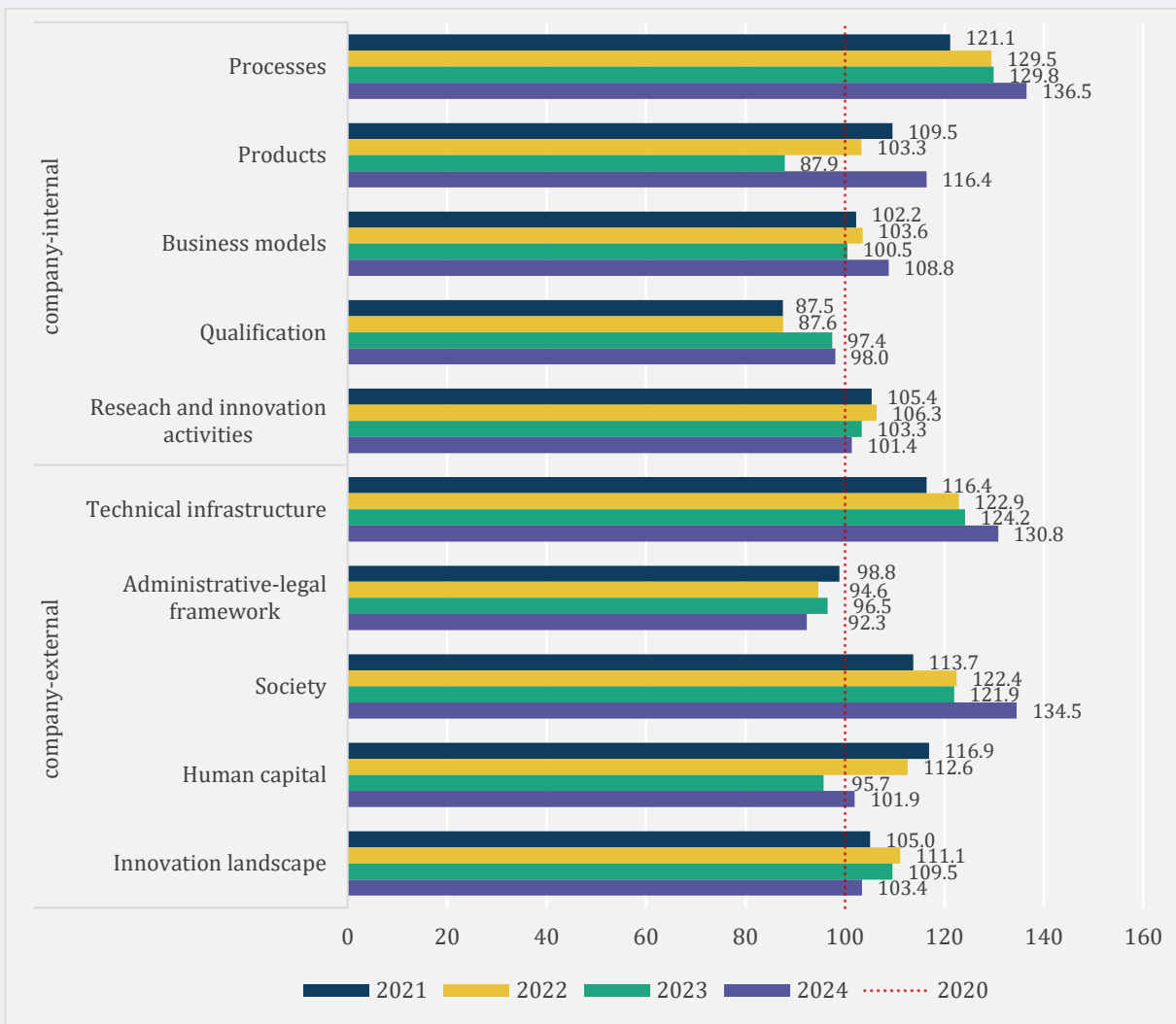


Source: German Economic Institute

The analysis of the individual index categories provides information on the drivers of this development (Figure 2).

Figure 2: Results of the Digitalisation Index for Germany by category

In index points, survey years 2020, 2021, 2022, 2023 and 2024



Source: German Economic Institute

In 2024, the company-internal categories gain on average of 7.9 points and the company-external categories 3.6 points. As a result, digitalisation progress in 2024 occurs primarily in the company-internal environment. Previously, in 2023, there were no increases on average in either the company-internal categories or the framework conditions. In 2021 and 2022, the framework conditions for digitalisation in particular improved, i.e. the indicators for the company-external categories. On average, they increased more than the indicators in the internal company categories. The former have driven digitalisation in this period.

### **Positive developments**

The strongest growth in absolute terms compared to 2023 is recorded in the internal category products. It reflects the extent to which companies offer purely digital products or products with digital components. The category value rises by 28.5 points to 116.4 points in 2024. This development is due to the fact that the revenue share generated by companies with purely digital and partially digitalised products is increasing sharply. The category value has fluctuated in recent years: in 2023, it was 87.9 points, well below the previous best value of 109.5 points (2021).

As in previous years, the category with the highest value is that of processes. In addition to the digital maturity of internal company processes, it also includes digital networking with other companies. This category increases by 6.7 points in 2024 and has therefore improved the most since 2020. This means that the processes of many companies are now significantly more digital and linked to the processes of other companies than in 2020.

The business models of companies in Germany become more digital in 2024. The category value increases by 8.3 points to a total of 108.8 points. This development is primarily due to the fact that companies use more digital procurement channels and developing more digital business model variants. The qualification category increases minimally by 0.6 points and achieves a result of 98.0 points, which is, as in previous years, below the initial value in 2020. This is due to slight improvements in employment in digitalisation occupations.

In the company-external categories, society increases by 12.6 points and the category of technical infrastructure by 6.6 points. They are thus continuing the positive trend from previous years. Data volumes in the mobile and wired sectors in particular are on the rise. Technical infrastructure is also keeping pace with the growing requirements: in particular, the broadband supply of households and business locations with gigabit speeds continues to increase.

In the company-external category of human capital, the negative trend of 2022 and 2023, which was primarily due to the widening skills gap in digitalisation occupations, is reversed. In 2024, the human capital category gains 6.3 points. This is due to the fact that more IT graduates and trainees in digitalisation occupations in particular are entering the labour market and the skills gap is narrowing slightly. Nevertheless, the human capital category reaches 101.9 points in 2024, which is only slightly above the initial level of 100 points in 2020.

### **Negative developments**

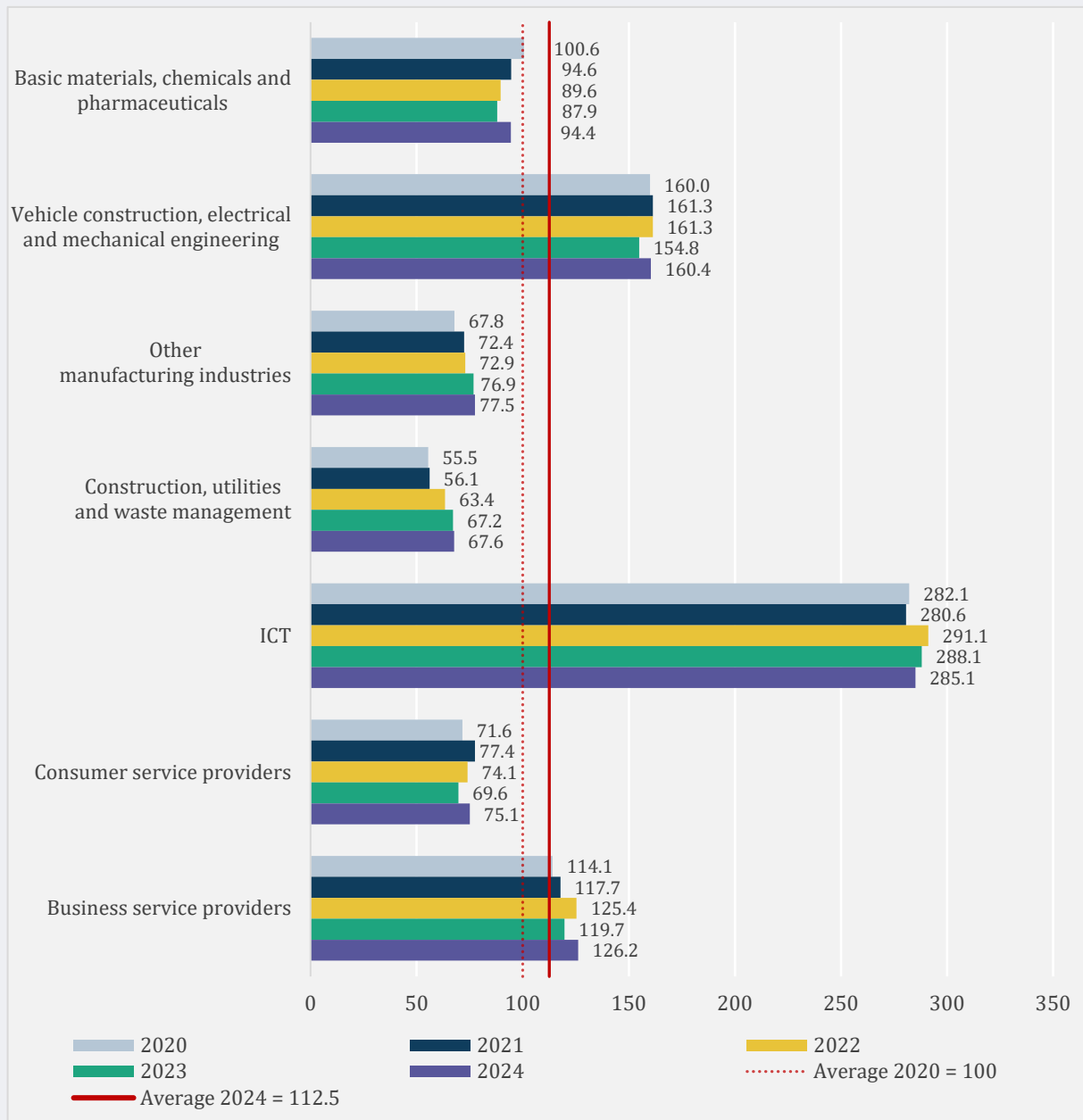
The company-external categories of innovation landscape (minus 6.1 points) and administrative-legal framework (minus 4.2 points) are deteriorating. This is primarily due to the fact that fewer scientific publications related to digitalisation are published and less companies enter research and development (R&D) as well as innovation collaborations. Public administration in Germany provides fewer pre-filled online forms and offers less online services for companies compared to other European countries. Among the company-internal categories, only the category of research and innovation activities decreases (minus 2.0 points), as companies register fewer digitalisation-related patents and slightly reduce their R&D expenditure.

## Digitalisation by industry group

An overall increase in digitalisation can also be seen at the level of the seven industry groups (Figure 3). The industry group average rises from 104.8 index points in 2023 to 112.5 points in 2024.<sup>2</sup> This corresponds to an improvement in digitalisation of around eight percentage points compared to the previous year. Overall, digitalisation is increasing in six out of seven industry groups. Only in the overall leading industry group, information and communication technology (ICT), the index value falls slightly. As in previous years, there are no major shifts between the sectors in 2024; the sector groups are increasingly converging.

Figure 3: Results of the Digitalisation Index by industry group

In index points, survey years 2020, 2021, 2022, 2023 and 2024



Source: German Economic Institute

<sup>2</sup> The averages of the individual differentiation levels may deviate from the Germany index, since not all indicators and categories are available or relevant on all differentiation levels of the index.

- The ICT sector remains the **leader in digitalisation** in 2024. After its index value stagnated in 2021 and increased the most among all industry groups in 2022, it falls by 3 points to 285.1 index points in 2024. Vehicle construction, electrical and mechanical engineering remain in second place with 160.4 points in 2024 (plus 5.6 points). Business service providers<sup>3</sup> remain in third place with 126.2 points in 2024 (plus 6.5 points). This brings the index values of the three leading industry groups closer together.
- The **strongest growth in digitalisation compared to 2023** is recorded by business service providers (up 6.5 points) and basic materials, chemicals and pharmaceuticals (plus 6.4 points).
- In 2024, as in previous years, the industry groups construction, utilities and waste management and other manufacturing industries perform significantly **below average** at 67.6 points and 77.5 points respectively. Both industry groups also record the lowest growth in digitalisation – while construction, utilities and waste management increases by 0.4 points, the index value for other manufacturing industries rises by 0.6 points.

### **Top and bottom performers**

The best and worst-placed industry groups in the individual categories of the index have hardly changed over the five years of the survey. As in previous years, the ICT sector remains the front-runner in all categories with the exception of research and innovation activities. In this category, vehicle construction, electrical and mechanical engineering continue to lead by a wide margin. Consumer service providers are last in the category of qualification in 2024. In the category of innovation landscape, construction, utilities and waste management continues to bring up the rear. As in previous years, basic materials, chemicals and pharmaceuticals perform worst in terms of products and business models. While this industry group also came last in the category of processes last year, it is construction, utilities and waste management in 2024 – as it did in 2020 to 2022.

### **Biggest changes compared to the previous year**

The ICT sector primarily gains points in the category of products (plus 11 points), but also loses points, especially in the category of innovation landscape (minus 35 points). This is primarily due to the fact that, as in the previous year, fewer digital start-ups were founded. Vehicle construction, electrical and mechanical engineering gain points, particularly in the category of processes (plus 28 points). The other manufacturing industries make the biggest gains in the category of business models (plus 11 points), but loses ground in research and innovation activities (minus 6 points), as in the previous year. In the industry group of construction, utilities and waste management, products in particular are becoming more digital (plus 22 points), but the greatest losses are recorded in the category of processes (minus 17 points). The products of consumer service providers are also becoming more digital (plus 12 points). Consumer service providers are also the only industry group in which the innovation landscape is developing positively (plus 10 points). Business service providers are gain primarily in the categories of products (plus 15 points) and processes (plus 14 points). The industry group basic materials, chemicals and pharmaceuticals shows significant growth in the category of processes (plus 16 points) and loses ground in the category of innovation landscape (minus 16 points).

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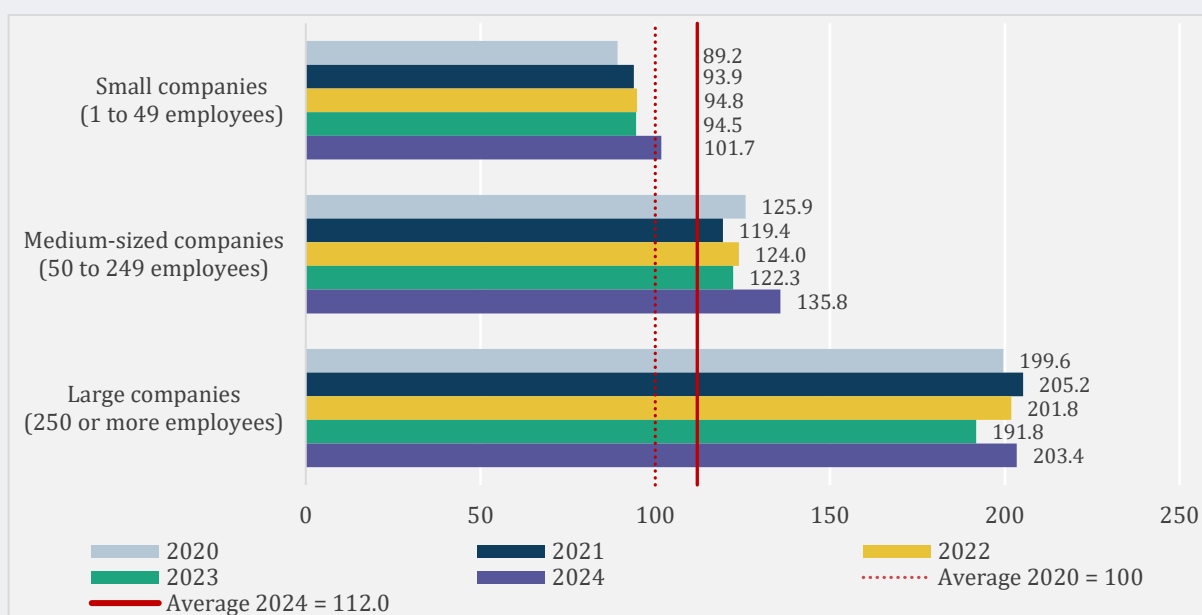
<sup>3</sup> Business service providers include, for example, firms in architecture and engineering, auditing and consulting.

## Digitalisation by company size class

At the level of the company sizes, digitalisation is increasing in all three size classes (Figure 4). In 2024, the average for the company size classes increases from 104.7 points in 2023 to 112 points. This is an improvement in digitalisation of almost seven percentage points. Overall, however, the levels of digitalisation in the individual size classes continue to vary greatly.

Figure 4: Results of the Digitalisation Index by company size class

In index points, survey years 2020, 2021, 2022, 2023 and 2024



Source: German Economic Institute

- The index value for **small companies** with 1 to 49 employees rises from 94.5 points in 2023 to 101.7 points in 2024. This means that the index value is still below the average for the three company size classes in 2024. Small companies remain the least digitalised company size class.
- **Medium-sized companies** with 50 to 249 employees record the strongest growth (plus 13.5 points) of all three company size classes after a slight decline in the previous year. Their index value of 135.8 points in 2024 is therefore above the initial value of 125.9 points in 2020 for the first time.
- **Large companies** with 250 or more employees are reversing the negative trend that began in 2021 and return to the 2021 level. Their index value rises from 191.8 points in 2023 to 203.4 points in 2024. They remain by far the most digitalised company size class. Their index value is still around twice as high as that of small companies.

### Top and bottom performers

As in previous years, large companies are the frontrunners in digitalisation in 2024 in the categories of processes, business models, qualification, research and innovation activities and innovation landscape. Again, small companies are best in the category of products, followed by large and medium-sized companies. This may be due to the ICT-heavy industry structure among small companies, which produce a particularly large number of digital products. Furthermore, with the exception of the category of products and research and innovation activities, medium-sized companies are between the large and small companies. Medium-sized companies come last in these categories.

### Biggest changes compared to the previous year

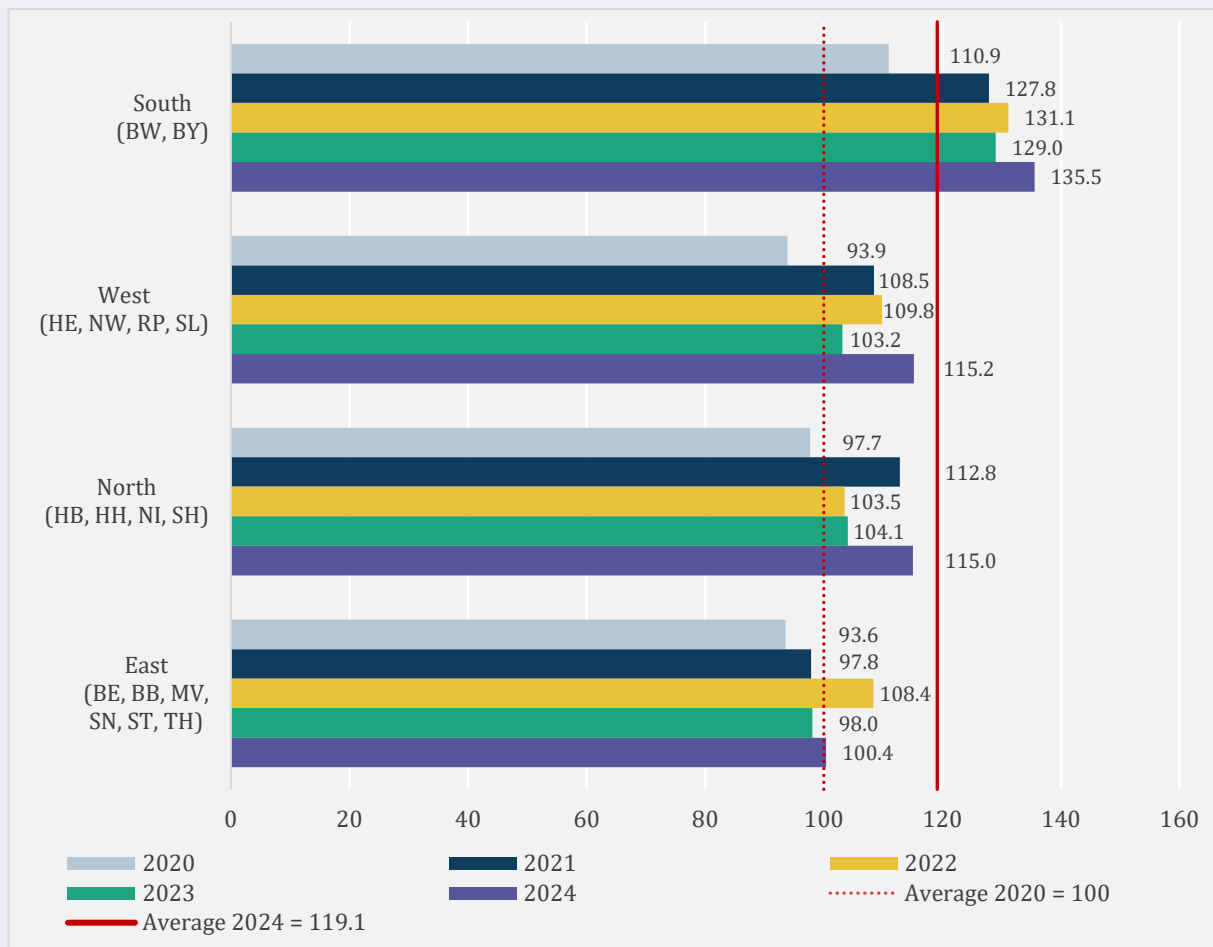
The increase in digitalisation among large companies is primarily the result of significant growth in the categories of products (plus 41 points) and processes (plus 27 points), with simultaneous sharp losses in the category of innovation landscape (minus 37 points). While small companies primarily gain in the category of products (plus 28 points) and most strongly of all company size classes in the category of business models (plus 9 points), medium-sized companies primarily become more digital in the categories of products (plus 33 points) and processes (plus 30 points). Small companies are also losing ground in the category of innovation landscape (minus 13 points), while medium-sized companies are the only size class to make gains in this category (plus 22 points) due to increasing R&D and innovation collaborations.

### Digitalisation by federal state group

Significant increases in digitalisation are also emerging at the level of the federal state groups (Figure 5). The index value of all federal state groups increases and the federal state group average rises from 111.2 points in 2023 to 119.1 points in 2024. This corresponds to an increase of around eight percentage points.

Figure 5: Results of the Digitalisation Index by federal state group

In index points, survey years 2020, 2021, 2022, 2023 and 2024



Source: German Economic Institute



- The index value of the **federal state group South (Baden-Württemberg and Bavaria)** increases by 6.5 points in 2024. At 135.5 points, it is still far ahead of the other federal state groups and well above the national average of 119.1 points.
- The **federal state group West (Hesse, North Rhine-Westphalia, Rhineland-Palatinate and Saarland)** improves the most (plus 12 points) to 115.2 points in 2024, overtaking the federal state group North and taking second place among the federal state groups by a small margin after third place in the previous year.
- The **federal state group North (Bremen, Hamburg, Lower Saxony and Schleswig-Holstein)** also improves significantly (plus 11 points) and records the second-highest increase of all federal state groups. Its index value rises from 104.1 points in 2023 to 115 points in 2024, putting it in third place in the current survey year.
- The **federal state group East (Berlin, Brandenburg, Mecklenburg-Western Pomerania, Saxony, Saxony-Anhalt and Thuringia)** continues to be the least digitalised federal state group in 2024. Its gap to the other three federal state groups continues to widen, as growth is lowest in the East (plus 2.3 points). The index value of 100.4 points in 2024 is only just above the federal state group average in 2020.

### **Top and bottom performers**

As in the years 2020 to 2023, the federal state group South is by far the best in the category of research and innovation activities. It also maintained its top position in the categories of processes, products, qualification and human capital. For the first time since 2021, the South also achieved the top position in the category of business models, replacing the federal state group North, which had been the leader in the two previous years. As in previous years, technical infrastructure is by far the best in the federal state group North. In the category of innovation landscape, the federal state group East is in first place for the first time, while the federal state group West is ahead in the category of society. The federal state group East continues to bring up the rear in the categories of qualification, research and innovation activities, technical infrastructure, society and human capital. In contrast to the previous year, it is also in last place in the categories of products and processes in 2024. In the remaining categories of business models and innovation landscape, the federal state group North performs worst.

### **Biggest changes compared to the previous year**

The strongest increases in digitalisation are recorded by the federal state groups West and North, as the categories of products (West: plus 50 points; North: plus 27 points), technical infrastructure (West: plus 25 points; North: plus 22 points) and processes (West: plus 15 points; North: plus 21 points) improve in particular. The positive development in the federal state group West is only held back by losses in the category of innovation landscape (minus 12 points). The federal state group South records gains in the categories of products (plus 20 points) and technical infrastructure (plus 15 points), but loses ground in the category of innovation landscape (minus 11 points). The federal state group East also increases in the category of products (plus 13 points) and most strongly of all federal state groups in the category of technical infrastructure (plus 28 points), with simultaneous losses in the category of processes (minus 16 points).

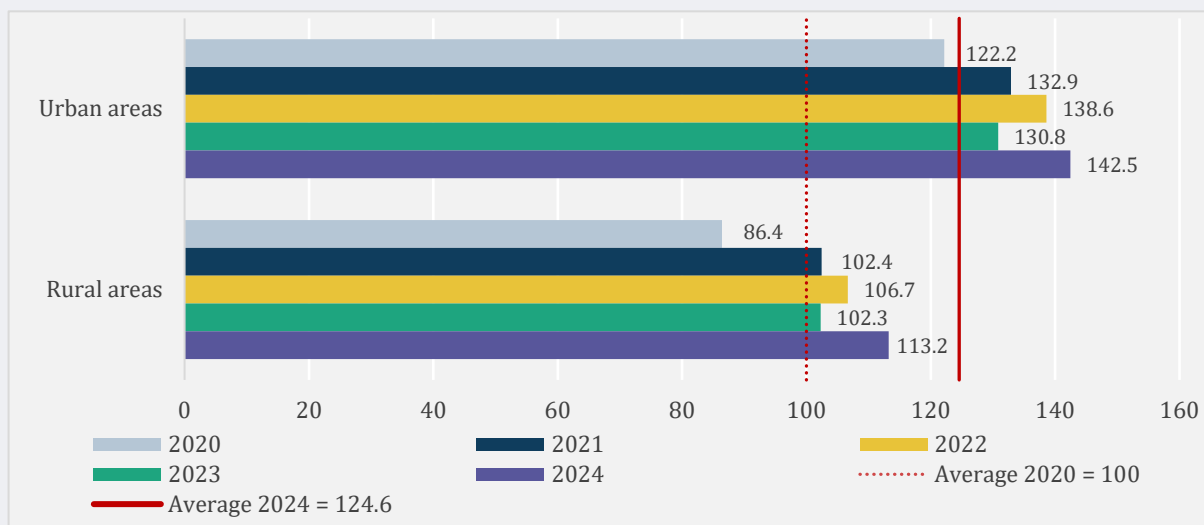


## Digitalisation by type of region

The types of regions<sup>4</sup> also become more digital in 2024 (Figure 6). Urban areas continue to be more digitalised than rural areas. The absolute gap between the two index values rises slightly. Overall, the average for region types increases from 112.8 index points in 2023 to 124.6 index points in 2024. This means that the digitalisation of the economy in the types of regions grows by around 12 percentage points.

Figure 6: Results of the Digitalisation Index by type of region

In index points, survey years 2020, 2021, 2022, 2023 and 2024



Source: German Economic Institute

- The index value for **urban areas** rises significantly by 11.6 points to 142.5 points in 2024, after falling in 2023 (minus 7.8 points). This means that urban areas continue to perform above average: their index value is 29.2 points above the index value for rural areas.
- The index value for **rural areas** also rises from 102.3 points in 2023 to 113.2 points in 2024, increasing by 10.9 points after falling by 4.4 points in the previous year.

As in previous years, urban areas outperform rural areas in all categories in 2024 – including the category of processes for the first time since 2020. In the categories of technical infrastructure, research and innovation activities and innovation landscape, the gap between urban and rural areas is particularly large. However, rural areas are still slowly catching up in these categories: For example, the score of urban areas falls slightly in the categories of business models and innovation landscape, while it increases in rural areas. Compared to the previous year, rural areas gain, particularly in technical infrastructure (plus 24 points) and products (plus 20 points). In urban areas, products (plus 25 points) and processes (plus 23 points) are also becoming significantly more digital.

<sup>4</sup> The urban areas include all district-free cities in Germany, while rural areas include all districts.

## Conclusion and outlook

Following a stagnation in digitalisation in 2022 and 2023, **the German economy becomes significantly more digital again in 2024**. There are significant increases in the company-internal categories in particular, but the external framework conditions are also developing positively on average. There are no major shifts over time at the various index levels. Large companies, the ICT sector, the federal state group South and urban areas continue to be pioneers of digitalisation.

The positive development in the company-internal categories sends a signal of robustness: despite the ongoing crisis situation resulting from geopolitical conflicts, high energy prices, disrupted supply chains, inflation and general uncertainty, companies in Germany are driving their digitalisation forward. In the previous year's survey, one reason given for the stagnating development at the time was that many companies may have (temporarily) postponed investments in their digitalisation due to increasing cost pressure, for example. This could have related to investments in the digitalisation of products, for example. Such restraint can no longer be observed in 2024. Instead, companies are increasing their digitalisation activities. Products as well as processes and business models become more digital. It is conceivable that companies are motivated to invest by the prospect of medium to long-term productivity and competitive advantages due to increasing digitalisation. Particularly in view of the current tense economic situation in Germany, such competitive advantages could prove to be necessary from an individual company perspective and, in extreme cases, even vital for the company's existence.

It is important that companies' research and innovation activities also increase again in the future and that more digitalisation skills are developed among employees. Both are crucial to the success of digitalisation projects in companies and their ability to exploit their full digitalisation potential. One example is the use of artificial intelligence (AI) in companies, which can simplify processes enormously and thus save financial and human resources. However, this requires companies to have qualified personnel who can handle AI applications. For example, a comprehensive use of AI in production requires a high level of data availability. This can be guaranteed by a digitalised representation of company processes and products. The AI example illustrates how closely the company-internal categories are linked. Together, they enable successful digitalisation projects. Companies should therefore perform well in several categories.

The development of the external business environment is ambivalent. On the one hand, the technical infrastructure continues to improve and positive demand impulses from society are also increasing. This is important to ensure that digitalisation projects can be technically implemented and that the (partially) digital products and services offered resonate with demand. On the other hand, there is still a considerable shortage of skilled workers in digitalisation professions, external innovation impulses are decreasing and the expansion of e-government is happening too slowly. A combination of these negative aspects could prove to be a bottleneck for digitalisation in Germany in the future and sabotage the company-internal digitalisation progress. **The results of the Digitalisation Index 2024 are an unambiguous signal to politicians to quickly improve the administrative and legal framework conditions for digitalisation.** These can also have indirect effects on other categories such as the external innovation landscape: If the state only provides online services and pre-filled forms to an insufficient extent, the founding activities of digital start-ups will be negatively affected. If the process of setting up a company is too bureaucratic and cannot largely be carried out digitally, it will reduce incentives for potential founders. If there are no significant improvements in the future, external framework conditions could slow down the economy's digitalisation efforts or further exacerbate existing delays. This must not be allowed to happen.

The development in the category of human capital gives hope that the negative trend of the past few years can be reversed. The skills gap is at least not widening any further and more IT graduates and trainees in digitalisation-related professions are entering the workforce. However, the stagnating skills gap may also be an expression of the current tense economic situation if companies are advertising fewer new jobs. It is unclear whether the influx of human capital will be able to cover the high demand for digitalisation skills in companies in the medium term – especially when the economic situation eases again. Overall, both the digitalisation efforts of companies and the external framework conditions for digitalisation should continue to enhance in the future.

This is crucial if the German economy aims to remain competitive. Only with the help of digitalisation is it possible to find and implement robust long-term solutions to challenging transformations, including but not limited to the areas of demographics, (de)globalisation and decarbonisation.

## On the methodology

The 2024 Digitalisation Index shows how the digitalisation of the economy in Germany has developed under the impression of the current tense economic situation due to increasing geopolitical conflicts, high energy prices, disrupted supply chains, inflation and general uncertainties. The comparison with the results from the initial publication of the Index 2020 and Indices 2021, 2022 and 2023<sup>5</sup> demonstrates the development of digitalisation throughout Germany as well as at the levels of industry groups, company size classes, federal state groups and types of regions.

The index measures company-internal and company-external indicators of digitalisation. The internal indicators are divided into five categories: processes, products, business models, qualification and research and innovation activities. The external indicators are divided into the following categories: technical infrastructure, administrative-legal framework, society, human capital and innovation landscape. Each category contains several meaningful indicators.<sup>6</sup> Due to different data availability and differentiability, not all indicators and categories are applicable at all differentiation levels of the index.<sup>7</sup>

This report presents the core results of the Digitalisation Index for the survey year 2024. An extensive results report with detailed analyses is published at the same time. The IndicatorTool on [de.digital](https://www.de.digital) illustrates the results.<sup>8</sup>

## Responsible authors:

**Jan Büchel, Dr. Marc Scheufen and Barbara Engels (German Economic Institute)**

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<sup>5</sup> The 2020, 2021, 2022, 2023 and 2024 summary versions (in German and English) as well as the 2020, 2021, 2022, 2023 and 2024 long versions can be found at <https://www.de.digital/DIGITAL/Navigation/DE/Lagebild/Digitalisierungsindex/digitalisierungsindex.html>. At the various levels of differentiation, the 2020, 2021, 2022 and 2023 index values have changed slightly in some cases due to indicator updates. This is discussed at length in the 2024 long version.

<sup>6</sup> A complete list of all indicators and their availability at the different differentiation levels can be found in the “Glossary of indicators” at <https://www.de.digital/DIGITAL/Redaktion/DE/Digitalisierungsindex/Publikationen/publikation-download-glossar-indikatoren.pdf?blob=publicationFile&v=1>.

<sup>7</sup> A detailed explanation of the methodology is provided in the paper “Methodology of the Digitalisation Index” at <https://www.de.digital/DIGITAL/Redaktion/DE/Digitalisierungsindex/Publikationen/publikation-download-methodik-des-digitalisierungsindex.pdf>.

<sup>8</sup> It can be retrieved at <https://www.de.digital/DIGITAL/Navigation/DE/Lagebild/Indikatorentool/indikatorentool.html>.