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KfW SME Digitalisation Report 2025

Digitalisation efforts losing significant momentum

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Executive summary

SMEs' digitalisation activities fell across a broad front in the current 2022–2024 reporting period. The proportion of businesses with completed digitalisation projects dropped by 5 percentage points to 30%. Digitalisation expenditure decreased by around EUR 8 billion on the previous year to just under EUR 24 billion. Digitalisation activities were found to be on the decline in all groups of businesses surveyed. The decrease was particularly steep among research and development (R&D)-intensive manufacturing enterprises and internationally active companies, at -12 and -6 percentage points. Among those operating only in regional markets and businesses with own R&D, the decline was just 3 percentage points each. The likely main reason for the downturn was the ongoing difficult economic situation – especially in imports – in combination with the end of special effects from the COVID-19 pandemic.

From a historical perspective, SMEs' digitalisation activities have increased nonetheless. The share of businesses with completed projects as well as aggregate and average digitalisation expenditure (by businesses actively engaged in digitalisation) are higher today than just under a decade ago. That applies to businesses of almost all sizes and groups of economic sectors.

Still, digitalisation activity remains strongly concentrated in large and pioneering enterprises. Large SMEs and medium-sized ones that conduct R&D are almost twice as likely to carry out digitalisation projects as small businesses and those without R&D activities. Large SMEs spend 19 times more than what small businesses spend. Furthermore, pioneers often carry out more complex digitalisation projects while many laggards are still preoccupied with basic digitalisation steps.

Addressing the key barriers to digitalisation may constitute economic policy approaches to additionally support digitalisation activities. They apply to both pioneers and laggards:

A key approach is to improve digital capacities. This involves both the availability of IT specialists and the digital skills existing in the broader workforce. More young people need to be motivated to study information technology and the dropout rate needs to be reduced. In addition, more IT specialists must be trained in the dual vocational training and education

system. Integrating IT knowledge in school, vocational and academic curricula is an important lever for improving basic digital education. With respect to continuing education and training, it is important to realise the guiding principle of 'lifelong learning'.

In order to mitigate financing problems, there is a need to set additional targeted financial incentives to implement digitalisation projects. Possible starting points consist in more closely dovetailing support measures for R&D and digitalisation, expanding equity finance (with a view to start-ups) and low-interest loans, or even a combination of loans and grants. For technologically high-end digitalisation projects, grants and R&D tax benefits constitute important financing instruments.

There is also a need for businesses to be more mindful of the strategic importance of digitalisation. With a view to digital laggards, that means raising awareness of the importance and strengthening their general strategic capacity. Useful approaches would be campaigns and greater integration of strategic considerations in vocational training. More advanced enterprises need to incorporate strategic concerns more closely into the planning of digitalisation measures and take steps to prepare and implement a digitalisation strategy.

Finally, with regard to the enabling environment for digital infrastructure, there is a need to address data security and data protection. The enabling conditions for SMEs can be improved by, for example, promoting academic research and developing digital standards. Realising a European internal market would make it easier to market digital offerings.

1. Introduction

High hopes have been pinned on digitalisation as a general-purpose technology¹ for kick-starting productivity growth and developing new value creation potential in broad sections of the economy. Digitalisation is regarded as a key driver of competitiveness and growth. This applies not only to the development of new technological fields. Digital technologies are also becoming increasingly pervasive in Germany's traditional areas of technological strength.² In the future it will therefore hardly be possible for Germany to develop new value creation potential or assert its traditional strengths without developing adequate capacity in the area of digital technologies.

The many different ways in which digitalisation and innovation activity are interconnected also play a role in this. Thus, digitalisation is often the technological basis that makes innovation possible.³ Conversely, it is particularly innovative enterprises that are driving digitalisation forward in great strides.⁴ From a business perspective, digitalisation activities are important investments for enterprises to position themselves in the market.

It is therefore unsurprising that numerous studies have found digitalisation to benefit not just individual businesses but the whole economy.⁵ What impact digitalisation has on the labour market, however, has not yet been conclusively investigated.⁶ A study for Germany, for example, found that the use of industrial robots increases the productivity of the business that uses them without jeopardising the existing workforce because that business modifies its demand for labour by hiring fewer new workers but not by laying off existing ones. Thus, employment relationships are steadier in enterprises that focus heavily on the use of robots than in those that do not make use of such technologies.⁷

With respect to the growing use of AI, a further study forecasts that the number of jobs in Germany will not change significantly in the next 15 years because potential job cuts will be offset by the emergence of new fields of work.⁸

The diffusion of information technologies in the economy and society is not a new trend. It is just that the term 'digitalisation' was coined only more recently. Examples of earlier digitalisation waves were the New Economy Boom of the second half of the 1990s, the rise of the PC since the 1980s and industrial robots since the 1970s. Nevertheless, the current digitalisation wave is a far-reaching process that is generating profound changes in business and society.

What is causing concern is that the development of digital technologies is not among the strengths of Germany's innovation system and that the country is not among the pioneers in the application of digital technologies either.⁹ Germany therefore achieves mean scores at best for a number of indicators measured by the EU compared with other European countries.¹⁰ These include, for example, the use of data analytics, electronic invoicing, social media, cloud computing and e-commerce.

These findings are likely a direct consequence of Germany's relatively low investment in information technologies.¹¹ The focal areas of Germany's innovation ecosystem and economy have gravitated to other technological fields over a long period of time.¹² One expression of this is, not least, Germany's pronounced weakness in external trade in digital technologies.¹³

¹ Cf. Bresnahan and Trajtenberg (1995), Brynjolfsson et al. (2017) or Nolan (2020).

² Cf. Zimmermann (2021a) and Schmoch et al. (2021).

³ Cf. Hassan et al. (2024), OECD (2020), OECD (2019) or Keuper et al. (2013).

⁴ Cf. Zimmermann (2021b) and Rammer et al. (2021).

⁵ Cf. Acemoglu et al. (2023), Czarnitzki et al. (2023), Rammer et al. (2022), Truant et al. (2021), Behrens and Trunschke (2020), Niebel et al. (2019), Gal et al. (2019), Bertschek et al. (2013), Cardona et al. (2013) or Kretschmer (2012).

⁶ Cf. Autor (2025) or Acemoglu and Restrepo (2019).

⁷ Cf. Dauth et al. (2017).

⁸ Cf. Zika et al. (2025).

⁹ Cf. Zimmermann (2025a), Zimmermann (2024a), Zimmermann (2021a) and Schmoch et al. (2021).

¹⁰ Cf. <https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts>, last retrieved on 24 February 2026.

¹¹ Cf. Zimmermann (2025a), Zimmermann (2024a) and Zimmermann (2021c).

¹² Cf. Zimmermann (2026a), Zimmermann (2025b) and Zimmermann (2022a).

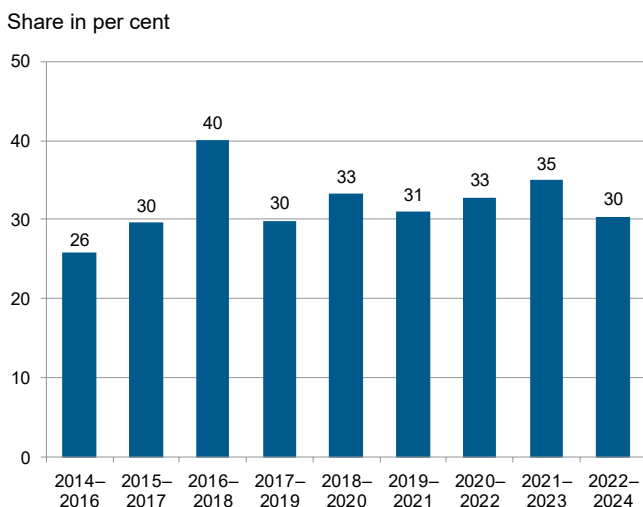
¹³ Cf. Kroll et al. (2022).

2. SMEs with completed digitalisation projects

Digitalisation activities have decreased

The percentage of enterprises with completed digitalisation activities has dropped again for the first time after rising in the past years. In the current survey of the KfW SME Panel, which covers the 2022–2024 period, the share of small and medium-sized enterprises with completed digitalisation projects stood at 30% (Figure 1). That was a noticeable drop of five percentage points on the previous year's survey (Box: Measuring digitalisation under the KfW SME Panel). Since the previous year's survey, the number of small and medium-sized enterprises with completed digitalisation projects dropped by around 200,000 to just under 1.2 million.

Figure 1: SMEs with completed digitalisation projects



Note: Figures extrapolated on the basis of the number of enterprises.

Source: KfW SME Panel, own calculations

This shows that the surge in digitalisation activities since the outbreak of the COVID-19 pandemic is not continuing. One likely major reason for this is the economic downturn that set in already in the course of the year 2022 and persisted in 2024 as well.¹⁴ The extent to which businesses carry out digitalisation activities typically depends on the prevailing economic situation.¹⁵ This is because businesses have different financial capacity in different stages of the business cycle. Besides, digitalisation measures that target the supply side – like product innovations – have greater benefits for businesses during favourable economic phases and are therefore timed accordingly.

¹⁴ Cf. Scheuermeyer (2025).

¹⁵ Cf. Zimmermann, V. (2018a).

¹⁶ Cf. Saam et al. (2016).

Measuring digitalisation under the KfW SME Panel

Unlike the definition agreed for innovation in the Oslo Manual of the OECD and Eurostat, a generally acknowledged definition of digitalisation does not yet exist.

The KfW SME Panel defines digitalisation activities as projects aimed at introducing or improving the use of digital technologies in an enterprise's internal processes and products (including services) and in its interaction with the business environment, as well as developing relevant capacities and skills.¹⁶ They include:

- projects implemented with the aim of renewing the IT structure or making use of new digital applications,
- digitalising interactions with customers and suppliers,
- introducing new, digital marketing and sales strategies,
- building digitalisation expertise and
- digitalising products and services.

In the same way as it does for innovations, the KfW SME Panel asks whether an enterprise has completed at least one digitalisation project in the past three-year period and how much it has spent on digitalisation in the past year.

After the COVID-19 pandemic triggered a surge in digitalisation in the past years, the special situation brought about by the pandemic with regard to digitalisation activities now appears to be over. Instead, it appears that digitalisation activities appear to have become more dependent on the business cycle again. The reason for that special situation was that many businesses saw a great need for digitalisation measures irrespective of the development of the business cycle. Thus, it was crucial for businesses to respond flexibly to falling demand and supply bottlenecks, to ensure distancing and remain visible for customers and cooperation partners.¹⁷ Digitalisation measures, in particular, were able to contribute significantly to these objectives under the pandemic conditions.¹⁸

This effect was intensified by the fact that many businesses expected permanent shifts in demand towards digital offerings and sales channels. In a

¹⁷ Cf. Köhler-Geib and Zimmermann (2022).

¹⁸ Cf. Bertschek (2020).

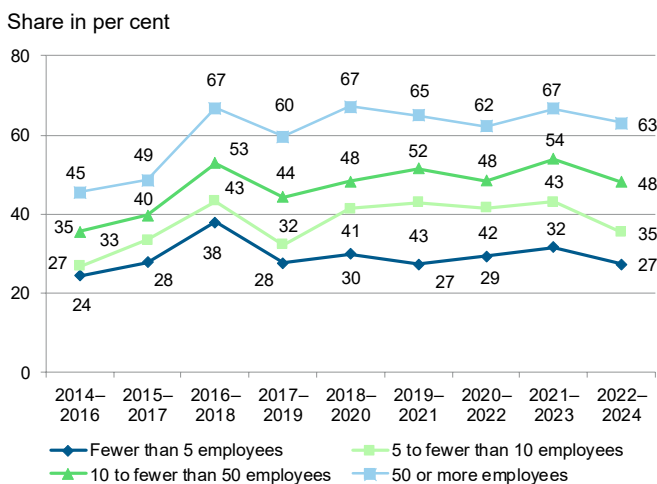
survey conducted in the autumn of 2021, nearly two thirds of SMEs already responded that they were at least partly expecting such permanent shifts in demand.¹⁹ These views likely prompted businesses to prepare for this transformation by initiating digitalisation measures of their own.

Another important factor likely driving the current development is that, after years of holding back on innovation, small and medium-sized enterprises are now reprioritising innovation again and stepping up such activities at the current margin.²⁰ Particularly during a difficult cyclical period, the funds employed for innovation have likely reduced the funds available for digitalisation projects. It is becoming evident – at least for the past years – that an increase in digitalisation activity goes hand-in-hand with a decline in innovation activity and vice versa. This indicates that despite the close correlation between innovation and digitalisation, SMEs in recent years have to some extent distributed available financial resources between innovation and digitalisation activities on an alternating basis.

Digitalisation activities have decreased across a broad front

The drop in the share of businesses with completed digitalisation projects is now evident in all enterprises size classes (Figure 2).²¹ With decreases between -4 and -8 percentage points, the downturn is similar in all enterprise size classes.

Figure 2: SMEs with completed digitalisation projects by enterprise size



Note: Figures extrapolated to the number of enterprises.

Source: KfW SME Panel, own calculations

¹⁹ Cf. Zimmermann (2022b).

²⁰ Cf. Zimmermann (2026b).

²¹ The number of employees is calculated including the active owners but excluding trainees and apprentices. Two part-time employees are counted as one full-time employee.

However, the share of businesses actively digitalising continues to be at least slightly higher in all enterprise size classes than it was at the beginning of the study period. This underscores the fact that small and medium-sized enterprises across the board have given increasing importance to digitalisation throughout the period of observation. However, the increase in the share of businesses with digitalisation activities was higher among larger SMEs than small ones throughout the entire survey period.

Large SMEs are more likely to go digital

Thus, digitalisation activities continue to differ significantly between enterprise size classes. The share of businesses with completed projects is more than twice as high among large SMEs as in the group of small businesses. This gap has even widened since this survey was first undertaken. Large SMEs are currently 2.3 times more likely to carry out digitalisation projects than small businesses. During the 2014–2016 period it was 1.9 times.

The percentage of businesses with digitalisation projects rises with enterprise size for a variety of reasons. Larger enterprises have more complex coordination problems to solve for which they require more information.²² Larger enterprises also tend to have a higher degree of automation and a broader range of activities. This means they have more IT equipment which, in turn, more often provides starting points for further digitalisation measures.

As they implement their projects, large enterprises benefit from the ability to allocate the (fixed) costs incurred to a larger sales volume.²³ That gives them more capacity to absorb the risks involved and makes internal and external financial resources more readily available.²⁴ For small businesses in particular, minimum project sizes and a higher proportion of fixed costs create a heavier burden, making them more likely to delay digitalisation projects. Finally, smaller businesses face greater challenges in accessing external finance for digitalisation projects.²⁵

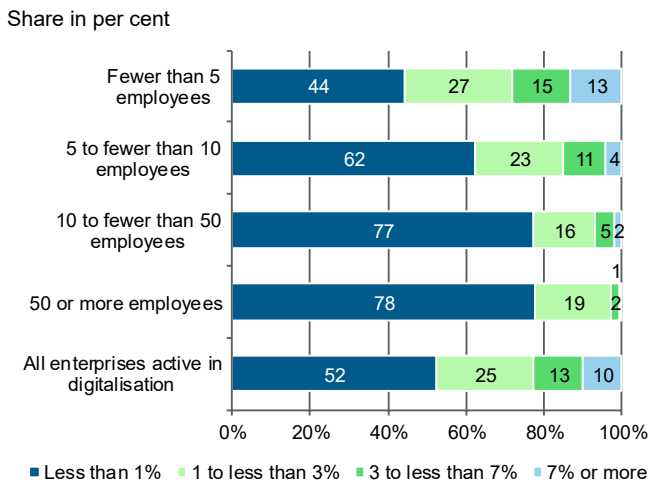
²² Cf. Dasgupta et al. (1999).

²³ Cf. Baptista (2000) and Crepon et al. (1998).

²⁴ Cf. Hwang et al. (2004); Premkumar and Roberts (1999) and Cohen and Levin (1989).

²⁵ Cf. Zimmermann (2020) and Zimmermann (2018b).

Figure 3: Digitalisation expenditure as a percentage of annual turnover by enterprise size



Note: Figures extrapolated on the basis of the number of enterprises, for all enterprises with digitalisation expenditure

Source: KfW SME Panel, own calculations

For example, 78% of large SMEs (with 50 and more employees) that are actively engaged in digitalisation spend less than 1% of their annual turnover on digitalisation projects (Figure 3). However, that percentage of turnover is spent by only 44% of businesses with fewer than five employees. At the same time, 13% of small businesses spend 7% and more of their turnover on digitalisation, while a further 15% spend 3 to 7% on such projects. Among large SMEs, these shares are a mere 1 and 2% respectively. The often higher relative burden on small SMEs means that they either have to shoulder a high (relative) financial burden or must forego digitalisation activities altogether. If they do carry out digitalisation measures, small businesses are usually able to carry out fewer projects at the same time. That means they have fewer options to spread their digitalisation risks across a broader project portfolio than large enterprises, which also hampers their digitalisation activity.

Share of businesses with digitalisation projects has decreased in all economic sectors

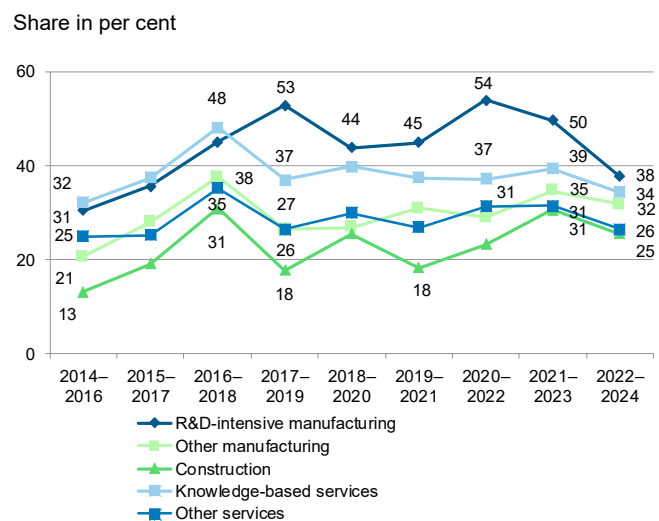
A sector comparison shows that the share of businesses with completed digitalisation projects has fallen in all economic sectors (Figure 4). Particularly in R&D-intensive manufacturing, the share of businesses with digitalisation projects is down sharply by -12 percentage points.²⁶ The previous year's trend has thus accelerated once again. The KfW SME Panel has established that economic expectations have fallen particularly sharply among R&D-intensive manufacturing enterprises. As businesses in these sectors often

²⁶ R&D-intensive manufacturing segments include, for example, mechanical engineering, electronics, chemicals; other manufacturing includes, for example, metal production and processing, garment production or animal feed production. Knowledge-based services include, for example, media services,

do business internationally or act as suppliers for internationally active enterprises, the feeble export performance is likely to put a dampener on activities particularly in these sectors. But the decline is also a result of the unusually high level of the 2020–2022 period. In a sector comparison, however, R&D-intensive manufacturing continues to top the list.

The share of businesses actively digitalising also continues to be at least slightly higher in all enterprise size classes than it was at the beginning of the survey period. What is also encouraging here is that sectors that were relatively little engaged in digitalisation at the beginning, in particular, such as construction and other manufacturing, were able to catch up somewhat. Thus, despite the current decline, the share of construction firms with digitalisation projects almost doubled compared with the beginning of the survey period.

Figure 4: SMEs with completed digitalisation projects by economic sector



Note: Figures extrapolated to the number of enterprises.

Source: KfW SME Panel, own calculations

R&D-intensive manufacturing and knowledge-based services are leaders in digitalisation

As in previous years, R&D-intensive manufacturing and knowledge-based services had the highest proportions of businesses with completed digitalisation projects. There are similarities to innovation activity here as well. Enterprises of these sectors also have the highest share of product and process innovators, which underscores the fact that innovation and digitalisation in businesses are closely linked. Compared with previous years, however, the gap to the other economic sectors has narrowed significantly. The share of businesses with digitalisation projects sits at 38% in R&D-intensive

IT and information services providers, law firms, tax consultancies and management consulting firms; other services include, for example, hospitality, transport and storage.

manufacturing, just 4 percentage points ahead of those in knowledge-based services.

The remaining sectors are closely behind with shares ranging from 25% to 32%. Construction firms, some of which used to be well behind the other groups of economic sectors under consideration here, almost caught up with the segments of other services.

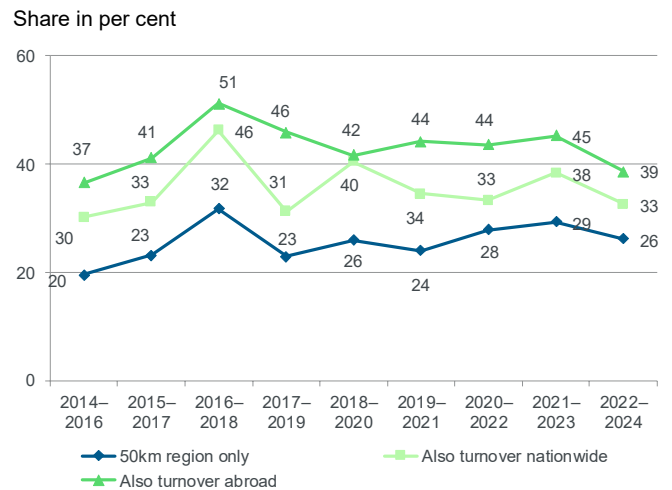
The strong variations in digitalisation activities in the various economic sectors come as no surprise. The sector to which an enterprise belongs may reflect varying requirements for data processing or differences in the business environment that cause businesses to act in different ways with respect to their digitalisation activities. Not least, sectors may also offer different technological options with respect to digitalisation.

Intense competition and access to new knowledge in supra-regional markets boost digitalisation

Broken down by sales market size, the share of firms with digitalisation projects fell in all groups from the previous year's survey (Figure 5). At -6 percentage points, the drop was steeper among internationally active businesses than among enterprises with other sales regions. The decline among regionally operating businesses was -3 percentage points. Weak export activity likely contributed to a sharper drop in digitalisation activities among internationally active businesses.

Furthermore, there is a clear stratification in the implementation of digitalisation projects depending on the regional expanse of a sales market. The larger the sales market, the more likely SMEs are to embark on digitalisation projects. The share of digital transformers is much higher among enterprises operating in an international sales market than among those with only regional activities (39 vs. 26%). It is known that the same pattern applies to SMEs' innovation activity.²⁷

Figure 5: SMEs with completed digitalisation projects by sales region



Note: Figures extrapolated on the basis of the number of enterprises.

Source: KfW SME Panel, own calculations

Multiple factors may explain why digitalisation activities increase with the size of the sales region. The size of a company's sales market is deemed an indicator of the intensity of competition in a market. International markets are deemed to be particularly competitive.²⁸ Enterprises that operate in such markets are under particular pressure to keep their products up-to-date and their business processes efficient. Early adoption of new technologies and offering products and services of high technological quality provide them with competitive advantages over rivals.²⁹

The use of digital technologies also provides advantages in communicating across long distances. This applies to a company's visibility in foreign markets, for example, and its communication with customers and other business partners.³⁰ Thus, a certain degree of digitalisation is also likely to be an important prerequisite for gaining a foothold in international markets in the first place.

²⁷ Cf. (2025c) and Zimmermann (2018a).

²⁸ Cf. Fryges and Wagner (2010), Wagner (2007) and Greenaway and Kneller (2007).

²⁹ Cf. Gattignon and Robertson (1989).

³⁰ Cf. Premkumar and Roberts (1999).

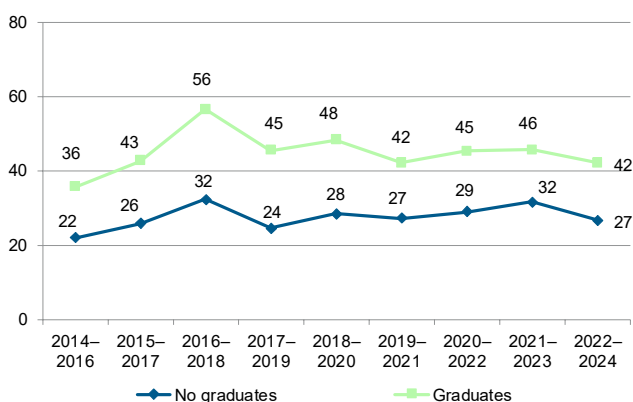
Not least, having a presence in supra-regional and foreign markets provides access to ideas and new, external knowledge from which enterprises operating in it can learn.³¹ External sources are an important input for creative activities of small and medium-sized enterprises in particular, given their limited internal resources.³²

Enterprises that employ graduates digitalise more

A breakdown according to whether or not an SME employs tertiary graduates revealed relatively minor variations in the share of businesses with digitalisation activities over time. The share of businesses involved in such activities decreased in both groups in the period under review (Figure 6). In both groups, the share was also higher than before the beginning of the period of observation, reaching 42% in the group of enterprises with graduates and 27% in the group without graduates.

Figure 6: SMEs with completed digitalisation projects with and without graduate employees

Share in per cent



Note: Figures extrapolated on the basis of the number of enterprises.

Source: KfW SME Panel, own calculations

One likely reason that enterprises with tertiary graduates digitalise more is that a high level of human capital is generally an important source from which new things are developed – for example, innovations – but also for implementing digitalisation projects.³³ Moreover, knowledge and skills acquired with higher formal educational qualifications also make it easier to use information technologies, an observation that also applies to the use of other advanced technologies.³⁴ This may in part be attributed to the fact that the relevant enterprises are better organised to prepare for the use of information technologies and that tertiary degree courses are more strongly geared to imparting the skills needed for their use than other education courses, for example by focusing more strongly on the development of problem-solving abilities. As both aspects can increase the benefits from the use of such technologies, this in turn incentivises greater use of such technologies.³⁵

Enterprises engaged in R&D are more likely to carry out digitalisation projects

R&D is defined as ‘creative and systematic work undertaken in order to increase the stock of knowledge [...] and to devise new applications of available knowledge’³⁶. It can be a source of inspiration for designing and implementing digitalisation projects. For example, companies can develop new digital products and production processes as well as further business applications in the context of R&D projects. What is also conceivable is that digitalisation ideas in enterprises conducting R&D do not emerge directly from their own research activity. Rather, engaging in own R&D may also indicate that the business is operating in an innovative environment and that this also translates into higher digitalisation activities – without meaning that it conducts R&D specifically targeted at digitalisation. As earlier studies have shown, innovation and digitalisation activities mutually reinforce each other.³⁷

³¹ Cf. Anderson and Löff (2009) Vendrell-Herrero et al. (2025).

³² Cf. Ugur et al. (2020), Jirjahn and Kraft (2011), Czarnitzki and Kraft (2012) and Cappelli et al. (2014).

³³ Cf. Hottenrott and Peters (2012); Zimmermann (2018a).

³⁴ Cf. Nelson and Phelps (1966), Griliches (1969), Welch (1970), Schultz (1975), Tinbergen (1975), Wozniak (1987), Blechinger and Pfeiffer (1999),

Rubart (2007), Gebhardt et al. (2015) or Biagi and Falk (2017).

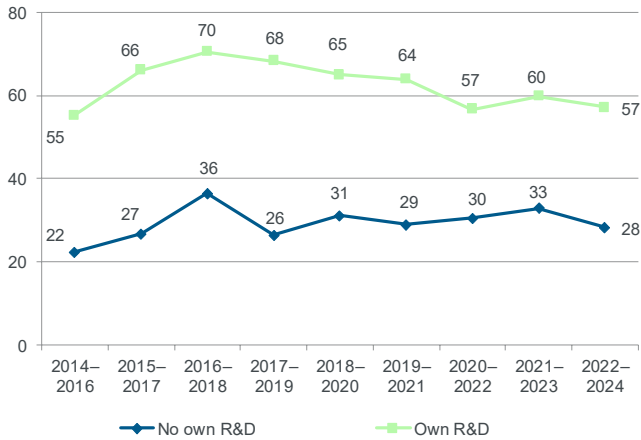
³⁵ Cf. Doms et al. (1997), Arvanitis (2005) and Falk (2005).

³⁶ Cf. OECD (2015).

³⁷ Cf. Zimmermann (2021d) and Zimmermann (2018a).

Figure 7: SMEs with completed digitalisation projects with and without own R&D activities

Share in per cent



Note: Figures extrapolated on the basis of the number of enterprises.

Source: KfW SME Panel, own calculations

These considerations also hold true for the SME sector. Over the entire period of the analysis, businesses that undertook own R&D carried out digitalisation projects significantly more often than those that did not (Figure 7). The corresponding shares currently sit at 57 and 28%, respectively. The share of businesses with digitalisation projects is around twice as high among SMEs with R&D activities than those without R&D. Businesses with own R&D activities are therefore among the pioneers of digitalisation. Besides large SMEs, they have the highest share of digitalisation activities of the groups of businesses under consideration here.

The share of businesses that have completed digitalisation projects decreased from the previous year's survey in both groups. While the decline was -3 percentage points among businesses with R&D, it was -5 percentage points among those without R&D.

3. Types of digitalisation projects completed

Ranking of different types of digitalisation projects remains very steady

Across the entire period under review, the ranking of different types of digitalisation projects has remained very steady. The positions of the individual types of projects in the ranking changed only little. At a more detailed level, however, this masks various fluctuations over time.³⁸

Digitalisation of interactions with customers and suppliers remains most common project type

During almost the entire observation period, digitalising interactions with customers and suppliers remained the most common type of project implemented. The share of enterprises active in digitalisation that carried out these types of projects decreased from its high of 63 to 54%. Thus, this share remains above the level typically observed throughout the period under review (Figure 8). With the exception of the previous year's survey, SMEs increasingly focused on digitalising their interactions within the value chain and with their final customers in the first year of the pandemic as well (58%). This type of project likely often involves re-designing websites and adopting internet applications such as online ordering and payment systems, using social media or setting up customer feedback mechanisms. It also includes data exchange within the value chain.

IT infrastructure upgrades follow closely behind, with 50% of mentions. IT modernisation is therefore the second most common project type. This includes installing new hardware, implementing new IT systems and adopting individual new applications. The renewal of IT structures also peaked at the beginning of the COVID-19 pandemic. Throughout the observation period, however, the significance of this type of project has generally decreased slightly in favour of other projects.

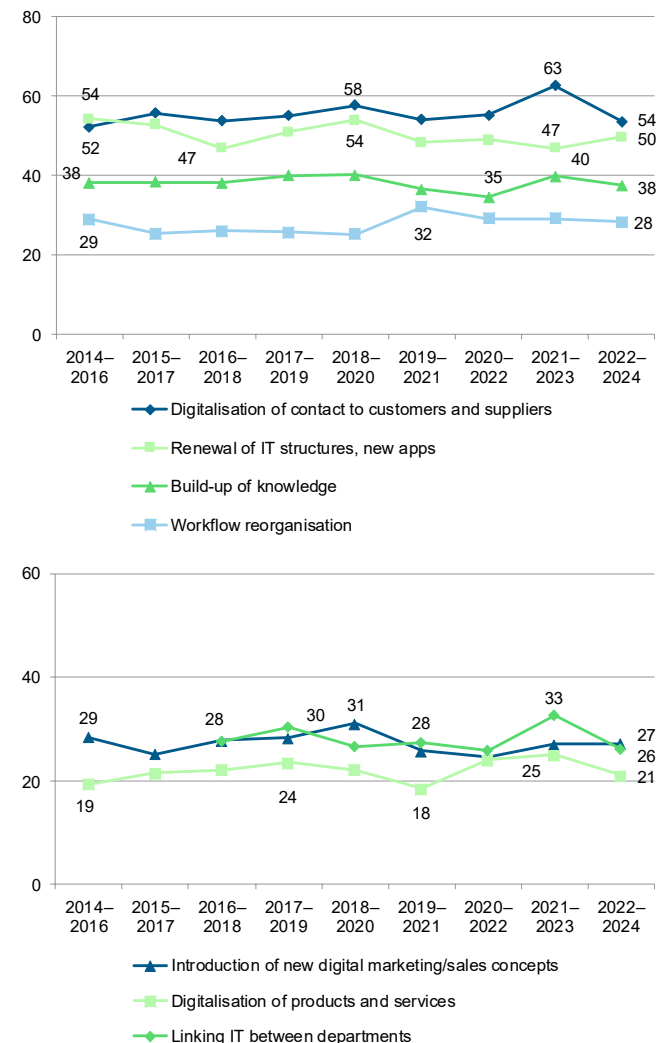
Building expertise is third most important type of project

Over the entire analysis period, projects aimed at boosting digitalisation expertise followed well behind as the third most common type. After the decrease in such measures during the pandemic, enterprises are now focusing more strongly on such projects again. At 38%, the share of enterprises with projects aimed at building expertise has now returned to the level measured at

the beginning of the analysis period.

Figure 8: Types of digitalisation projects

Share in per cent



Note: Figures extrapolated on the basis of the number of enterprises, for all enterprises with completed digitalisation projects.

Source: KfW SME Panel, own calculations

Projects aimed at building digitalisation expertise include the contracting of advisory services and training employees. Implementing these types of projects constitutes an important building block of digitalisation because a lack of in-house skills is one of the main barriers to digitalisation for businesses. Thus, digital skills deficits within the workforce as well as shortages of IT specialists – especially with tertiary degrees – equally constitute a bottleneck for businesses.³⁹ This applies all the more as it is difficult for companies to recruit for such skills.⁴⁰ Sought-after digital skills range

³⁸ Cf. Zimmermann (2025d).

³⁹ Cf. Zimmermann (2022c), Zimmermann (2019) and Zimmermann (2017).

⁴⁰ Cf. Zimmermann (2023a).

from the basic ability to use computers and standard software through the ability to operate specialist software or digital production machines to programming and complex statistical analysis skills.⁴¹

The fact that developing expertise ranks third in the list of digital project types shows that quite a considerable portion of SMEs are actively tackling this skills deficit and developing their digital capabilities. Advanced applications in particular often require businesses to have a minimum of expertise. Improving digital skills therefore plays a particularly important role in digitalisation.

Reorganising workflows is now slightly more important than before the pandemic

Digitalisation measures aimed at reorganising workflows currently rank fourth, with a reported share of 28%. Enterprises likely reorganise workflows when the digital transformation profoundly alters their existing processes and business organisation. This suggests that affected enterprises are more likely to undertake complex digitalisation measures that are designed for the longer term. In a similar way as the integration of digital links between functional areas (rank 6), such projects are more likely to be carried out by enterprises that pursue strategic goals with their digitalisation projects.

In particular, projects of this kind were carried out more often with some delay in the course of the COVID-19 pandemic, which also suggests that they did not constitute a fast response aimed at managing the COVID-19 crisis but required a certain period of preparation. Activities of this type continued on a higher level in the phase following the pandemic.

Introducing new digital marketing and sales strategies was closely behind in sixth position, with currently 27% of mentions. After adjustments were often made to marketing and sales channels, particularly in the first year of the pandemic, the share of businesses that carried out such projects had decreased in the meantime and increased again moderately only in the current survey.

The introduction of new digital marketing and sales strategies may be associated with the digitalisation of the customer interface. The frequent mention of this aspect in the first pandemic year was likely due to the

fact that many digital laggards have also carried out such projects in their efforts to manage the crisis. The introduction of meal pickup and delivery services by hospitality businesses was a typical example. However, this type of digitalisation project was also mentioned particularly often by enterprises that conduct R&D, as well as by those that focus on expansionary strategies based on innovative products and services.⁴² This suggests that at least some of these projects are also more complex in nature. One example of this are statistical analyses of customer behaviour and marketing strategies based on these.

Businesses are likely to predominantly adopt a long-term perspective in the digital integration of different functional areas. Its aim is to connect all digital applications at a whole-of-company level. It can therefore be seen as a long-term project with which the degree of digitalisation of an enterprise reaches a new level. Businesses that carry out digitalisation activities in pursuit of strategic goals, such as implementing a pioneer strategy, standardising and improving their range of offerings or increasing their flexibility, are more likely to undertake such projects.⁴³ This means a business needs to have a certain size because distinct functional areas that can be linked exist only in larger SMEs. That and the integration of these types of projects with strategic digitalisation objectives are likely among the reasons that implementing such projects today merely ranks second to last, with 26% of mentions.

Digitalisation of products and services remains rather uncommon

Just as in the previous periods, digitalising products and services ranked last in the survey. After the slump in this type of project in the course of the pandemic, however, the share of enterprises that completed such projects initially almost caught up with the types of projects ranked next highest. This is probably due mainly to the fact that a certain need for catching up existed here after two years of the pandemic, even though the economic environment for the introduction of new products and services was not exactly optimal.⁴⁴ The current decline can likely be attributed to this. At 21%, the respective share is currently near the average for the overall period of observation. A clear trend towards digital product and service offerings and, thus, away from the frequently voiced criticism of excessive focus on efficiency gains⁴⁵ cannot be observed across the overall period of observation.

⁴¹ Cf. Leifels (2021).

⁴² Cf. Zimmermann, V. (2024b) and Zimmermann, V. (2022d).

⁴³ Cf. Zimmermann, V. (2022d).

⁴⁴ Cf. Poschen and Zimmermann (2014) and Zimmermann (2010).

⁴⁵ Cf. Zimmermann (2018b).

Ambitious digitalisation projects are implemented mainly by SMEs that are large and conduct R&D

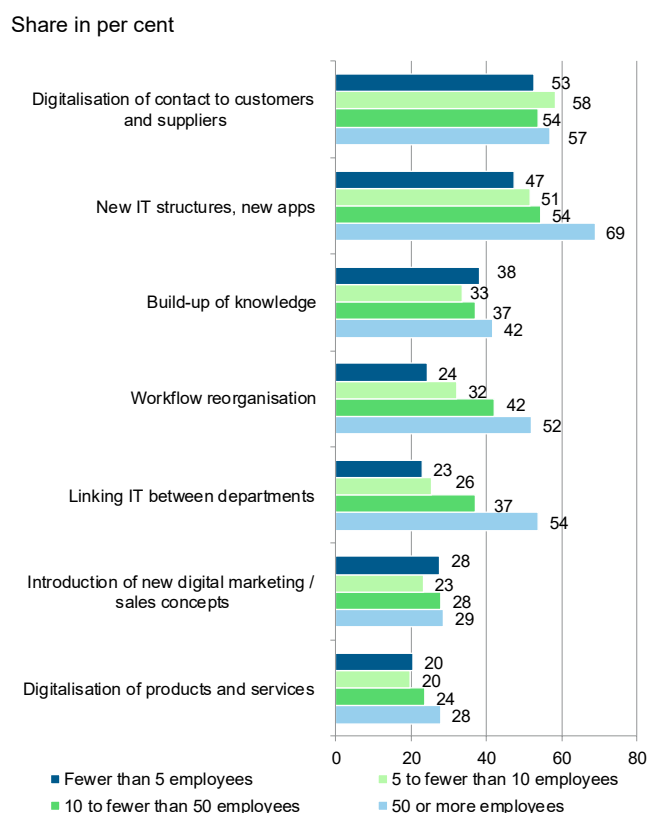
The patterns of behaviour of individual types of enterprises in implementing the various types of digitalisation projects have also remained comparatively steady over time. The digitalisation of customer and supplier linkages continues to be the most frequent type of digitalisation project implemented by small businesses with fewer than five employees, at 53% of enterprises with digitalisation projects (Figure 9). This suggests that these often constitute first steps taken by laggards in this direction. After all, large and already more digitally advanced SMEs in particular are likely to have completed such steps already. To be sure, more ambitious projects also fall into this category, such as automated data exchange, and accordingly this type of digitalisation project also plays an important role among large enterprises and those conducting R&D (Figure 12). But at the same time, these enterprises also focus increasingly on other types of projects so that their digitalisation activities focus less on digitalising their interactions with the business environment than is the case in small businesses.

With respect to the size of the sales market, it has been found that the larger it is, the more likely a business is to carry out such projects (Figure 11). The share of businesses engaged in these projects rises from 48% among those that operate regionally to 59% among internationally active enterprises. The likely reason for this is that digitalised interfaces are less relevant for businesses that operate regionally because of the shorter distances involved than for enterprises that have a presence in international markets.

The focus of large SMEs with 50 and more employees, on the other hand, lies on the modernisation of their digital infrastructures and the introduction of new applications, with 69% of mentions. Furthermore, large SMEs are particularly active in carrying out projects that involve the digital integration of functional areas (54%), workflow reorganisation (52%) and the development of expertise (42%).

It is likely that the more frequent renewal of digital infrastructures, introduction of new applications and digital integration of functional areas is partly a size effect. After all, large enterprises have a greater need to digitalise such activities. Measures aimed at digitalising workflow reorganisation in particular are probably also driven by the fact that these are usually enterprises that are generally more innovative and already more digitalised than others. Such enterprises also carry out complex digitalisation projects more often than others.

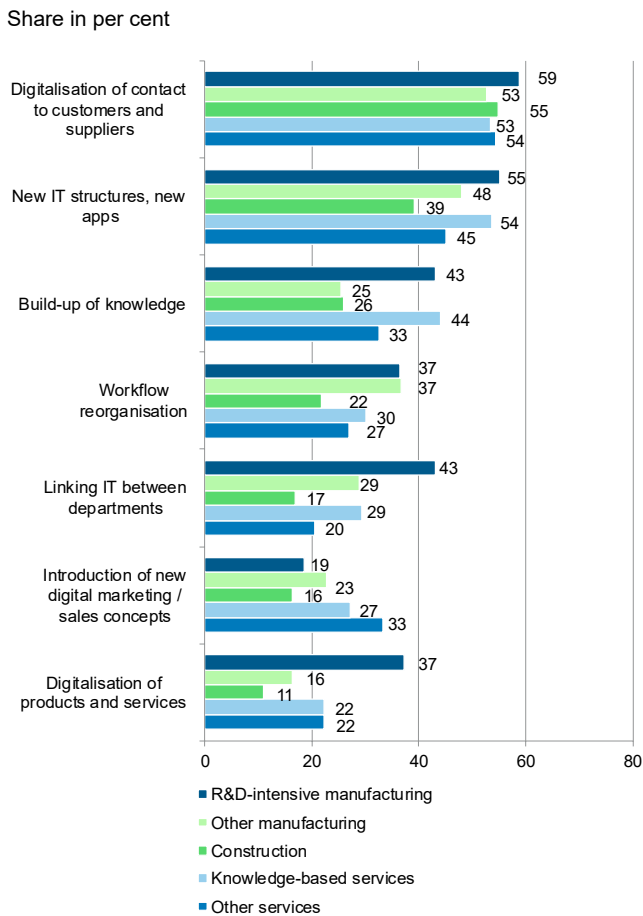
Figure 9: Types of digitalisation projects by size of enterprise in 2022–2024



Note: Figures extrapolated on the basis of the number of enterprises, for all enterprises with completed digitalisation projects.

Source: KfW SME Panel, own calculations

Figure 10: Types of digitalisation projects by economic sector in 2022–2024



Note: Figures extrapolated on the basis of the number of enterprises, for all enterprises with completed digitalisation projects.

Source: KfW SME Panel, own calculations

Digital pioneers are upgrading their digitalisation expertise ...

Businesses with own R&D, in particular, pursue projects aimed at building expertise more frequently, at 50% (Figure 10). R&D-intensive manufacturers and knowledge-intensive service providers are particularly active in this area, with shares of 43 and 44%, respectively, of enterprises implementing digitalisation projects (Figure 9). Importantly, large SMEs are also more likely to undertake such projects more often (42%). The relevant enterprises thus possess characteristics typically associated with pioneering companies. This finding is consistent with study results according to which enterprises intensively engaged in digitalisation activities are particularly likely to perceive a lack of digital skills as a barrier to digitalisation.⁴⁶

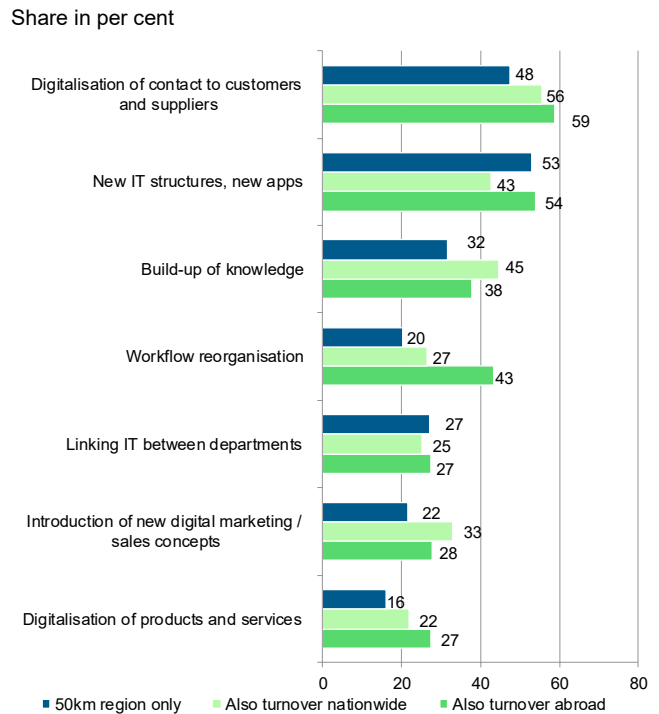
... and reorganising their workflows as part of digitalisation projects

With the exception of large SMEs, workflow reorganisation as part of digitalisation projects is also most

⁴⁶ Cf. Zimmermann (2022c).

common in businesses with supra-regional operations (43%) and in those that conduct R&D (42%). This confirms the consideration that these are more far-reaching projects that are typically more likely to be rolled out by pioneering enterprises.

Figure 11: Types of digitalisation projects by sales region in 2022–2024



Note: Figures extrapolated on the basis of the number of enterprises, for all enterprises with completed digitalisation projects.

Source: KfW SME Panel, own calculations

Projects that involve the digital integration of functional areas are also implemented particularly often by large enterprises that conduct R&D and by R&D-intensive manufacturing enterprises. To some extent, this likely reflects the size effect previously mentioned because only companies larger than a certain size have clearly delineated functional areas that can be integrated. But the type of product or service the business provides and how much innovative capacity it has is likely to play a role as well.

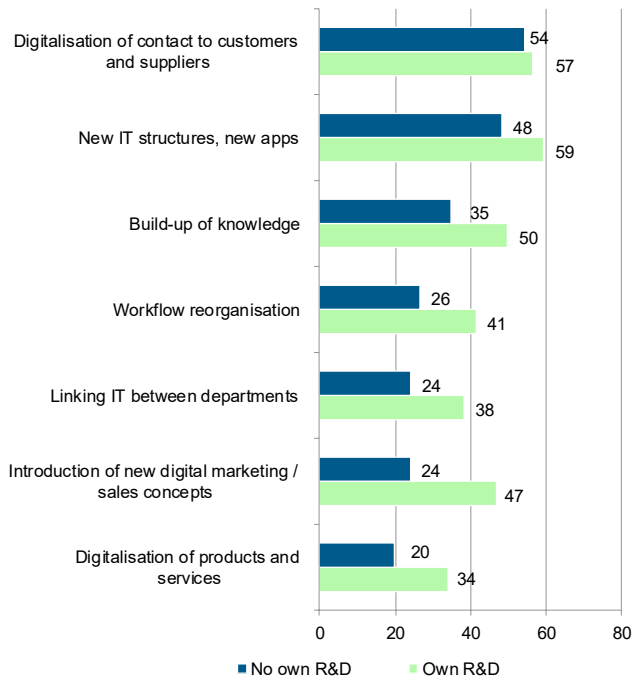
Introduction of new, digital marketing and sales strategies by SMEs with supra-regional operations and those that conduct R&D

There are only minor business size-related differences in how actively SMEs introduce new digital marketing and sales projects (23 to 29%). A wider variation is evident in regard to R&D (47% among R&D active vs. 24% for non-R&D active businesses) and in regard to sales markets (28 and 33% for companies with

international operations and supra-regional operations, respectively, 22% for regionally active businesses). This confirms the discussed broad range of projects summed up under this category, which are carried out not just by companies that are typically more often among the laggards (such as small businesses, for example) but also by pioneering enterprises.

Figure 12: Types of digitalisation projects of enterprises with and without own R&D activities in 2022–2024

Share in per cent



Note: Figures extrapolated on the basis of the number of enterprises, for all enterprises with completed digitalisation projects.

Source: KfW SME Panel, own calculations

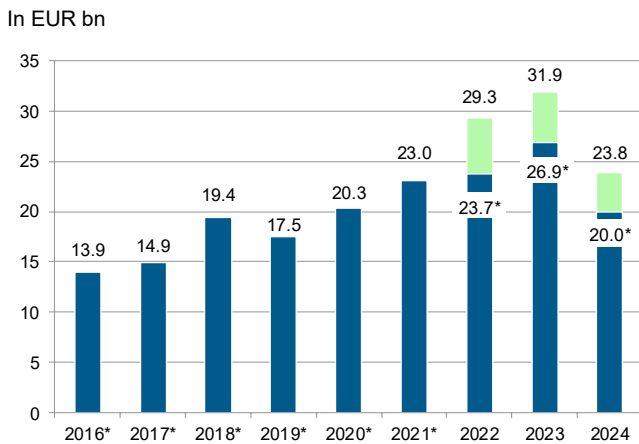
Finally, digital products and services are brought to market particularly by R&D active businesses (34%) and R&D-intensive manufacturing enterprises (37%). Large and internationally active businesses also stand out from the rest. With respect to these characteristics, the digitalisation of products and services thus remains heavily concentrated in pioneering enterprises with high innovative potential.

4. Development of digitalisation expenditure

Digitalisation expenditure has dropped at the current margin

In 2024, small and medium-sized enterprises spent EUR 23.8 billion on digitalisation projects (Figure 13). That was an EUR 8.1 billion decrease on the previous year in current prices. On a price-adjusted basis, the drop was even greater (EUR -8.6 billion).⁴⁷ The weak economic performance throughout the year 2024 is thus likely to have had an adverse impact on SMEs' digitalisation expenditure and caused the surge triggered by the COVID-19 pandemic to fizzle out again.

Figure 13: Aggregate digitalisation expenditure in the SME sector



Note: * Only enterprises with completed digitalisation projects, nominal, values extrapolated on the basis of the number of employees.

Source: KfW SME Panel, own calculations

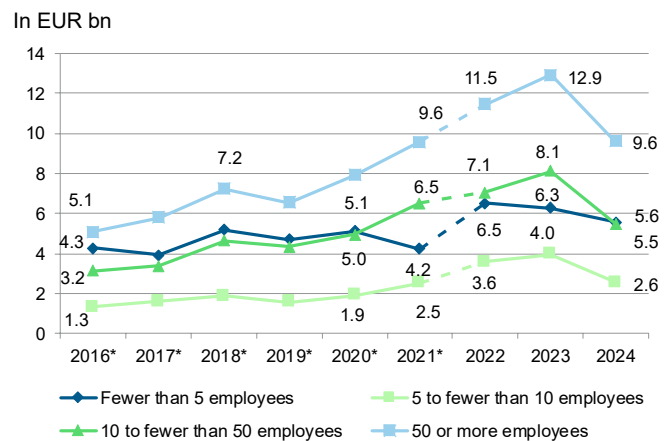
As was the case in the surveys of the two previous years, the current one also asked those businesses about their digitalisation expenditure whose digitalisation projects were not yet completed in the year under review. Adding the digitalisation expenditure incurred by these enterprises revealed an increase in digitalisation expenditure of EUR 3.8 billion. Not counting these companies' digitalisation expenditure, that is, following the approach taken in the surveys up to and including 2021, total digitalisation expenditure in the SME sector currently amounts to EUR 20.0 billion. From this angle, it is evident that digitalisation expenditure – despite the significant drop – is roughly on the level it was in the year of the outbreak of the pandemic and around 44%

⁴⁷The deflation of innovation expenditure is not trivial as figures on the exact calculation for Germany are not available. Here it is done with a composite deflator made up 37% of the variation in the prices for fixed capital formation in machinery and equipment and 63% of the variation in the prices of other machinery and equipment as reported by the Federal Statistical Office (2024) (ed.) Fachserie 18 Reihe 1.4, Blatt 2.3.11. This deflator can be considered an approximation to the inflation rate of digitalisation expenditure because digitalisation expenditure is composed 37% of physical investments, and other

higher than at the beginning of the period of observation (in current prices).

A comparison with investments in physical assets (machinery, plant, equipment and similar items) shows that SMEs continue to spend much less on digitalisation. SMEs invested EUR 256 billion in assets (new and used goods) in 2024.⁴⁸ That means SMEs spent almost 11 times as much on investments in traditional assets as they did on digitalisation.

Figure 14: Aggregate expenditure on digitalisation by size of business



Note: * Only enterprises with completed digitalisation projects, nominal, values extrapolated on the basis of the number of employees.

Source: KfW SME Panel, own calculations

Digitalisation expenditure is heavily concentrated in large SMEs

Businesses with fewer than five employees accounted for EUR 5.5 billion or just under one quarter of digitalisation expenditure in the SME sector (Figure 14). The share of small businesses in digitalisation expenditure is thus higher than that of enterprises with five to fewer than ten employees. At first glance, this may come as a surprise because the share of companies with digitalisation projects is relatively low in the group of small businesses. This finding is due to the fact that at 81% of companies, enterprises with fewer than five employees make up the bulk of small and medium-sized enterprises.

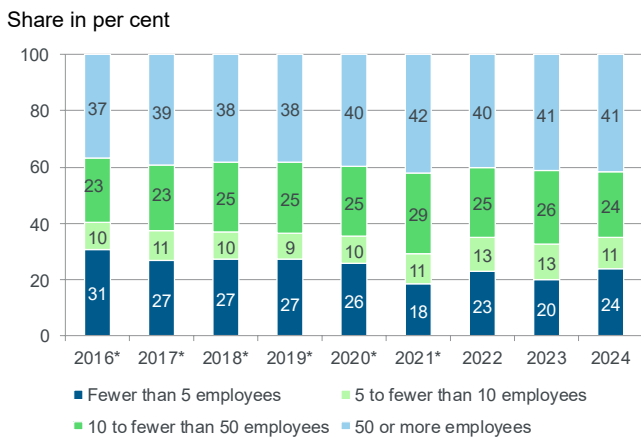
machinery and equipment comprises, among other things, expenditure on intellectual property such as research and development, which is similar to the activities for the implementation of digitalisation projects. For more on the share of material investments in digitalisation projects see Zimmermann, V. (2023b).

⁴⁸ Cf. Schwartz and Gerstenberger (2025).

The current downturn among small businesses is minor compared with other business size classes, so that their share in SMEs' overall digitalisation expenditure in 2024 was higher.

Large SMEs with 50 and more employees account for the greatest share of digitalisation expenditure – EUR 9.2 billion, or 41% – even though they represent a small share of 2% of small and medium-sized enterprises (Figure 15). The share of digitalisation expenditure by large SMEs has grown over time, reaching 42% in 2021. In the year 2016 that share was just 37%. At the same time, the share represented by micro-businesses dropped by 13 percentage points up until the year 2021. Since the survey was modified in 2022, the shares have moved without a clear trend. Overall, the concentration of digitalisation expenditure in large SMEs has increased significantly since the first survey despite the increase in digitalisation expenditure in all enterprise size classes.

Figure 15: Distribution of digitalisation expenditure by enterprise size



Note: * Only enterprises with completed digitalisation projects, nominal values, not counting enterprises of the remaining economic sectors, extrapolated on the basis of the number of employees.

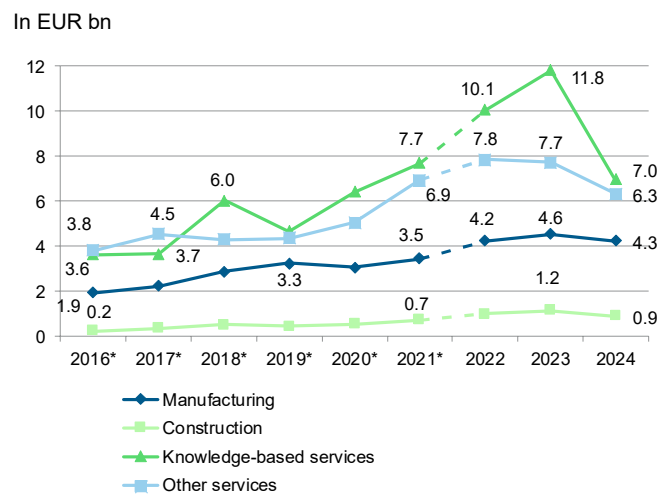
Source: KfW SME Panel, own calculations

The rise in the share of smaller SMEs with fewer than ten employees in digitalisation expenditure from 2021 to 2022 is likely the result of the change of the survey design. The capture of the expenditure of smaller enterprises whose projects have not yet been completed has probably resulted in a more precise counting of and, hence, an increase in the recorded digitalisation expenditure of small businesses in particular, which often carry out only sporadic and smaller projects at irregular intervals.

The sector comparison shows that digitalisation expenditure has fallen in all groups of economic sectors (Figure 16). The decline is particularly pronounced among knowledge-based service providers, at EUR 4.8

billion. It can be attributed to the decreased share of businesses with digitalisation projects and the decline in average digitalisation expenditure in businesses with digitalisation activities (see below). Services businesses, however, continued to spend the most on digitalisation overall, with knowledge-based service providers spending EUR 7.0 billion and other service providers EUR 6.3 billion. Both groups also represented the highest shares of small and medium-sized enterprises. The much smaller group of manufacturing enterprises accounted for EUR 4.3 billion in digitalisation expenditure. Construction firms spent the least on digitalisation: EUR 0.9 billion. The volume of expenditure thus also confirms the relatively low level of digitalisation activities of the businesses mentioned last.

Figure 16: SMEs' aggregate expenditure on digitalisation by economic sector



Note: * Only enterprises with completed digitalisation projects, nominal values, not counting businesses with fewer than 5 employees, extrapolated on the basis of the number of employees.

Source: KfW SME Panel, own calculations

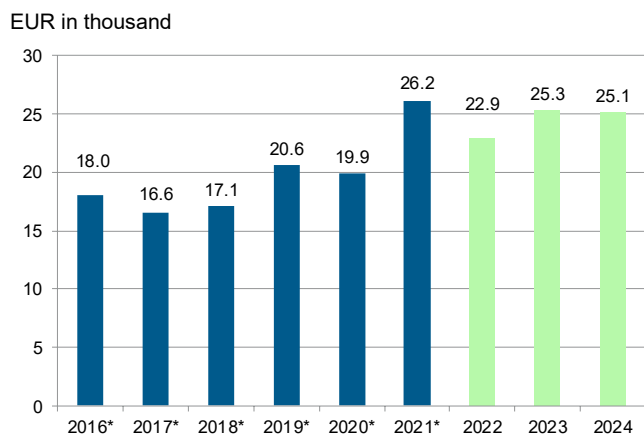
Average digitalisation expenditure has remained steady

In order to illustrate the concentration of expenditure in different types of enterprises in greater detail, the following figures show SMEs' average digitalisation expenditure. SMEs that were conducting digitalisation activities spent around EUR 25,000 on average on digitalisation in 2024 (Figure 17). That was a minor and negligible decrease in nominal terms on the previous year. Despite the dampening effect of counting the digitalisation expenditure of businesses whose projects have not yet been completed, average digitalisation expenditure was 22% higher than before the outbreak of the pandemic.

Average digitalisation expenditure was also generally on a higher level over the past years than at the beginning of the survey period. The surge in digitalisation

seen in recent years is therefore evident from this perspective as well.

Figure 17: Average expenditure on digitalisation in the SME sector



Note: * Only enterprises with completed digitalisation projects, nominal, values extrapolated on the basis of the number of employees, only businesses that invested in digitalisation.

Source: KfW SME Panel, own calculations

Wide gap in average digitalisation expenditure between small businesses and large SMEs

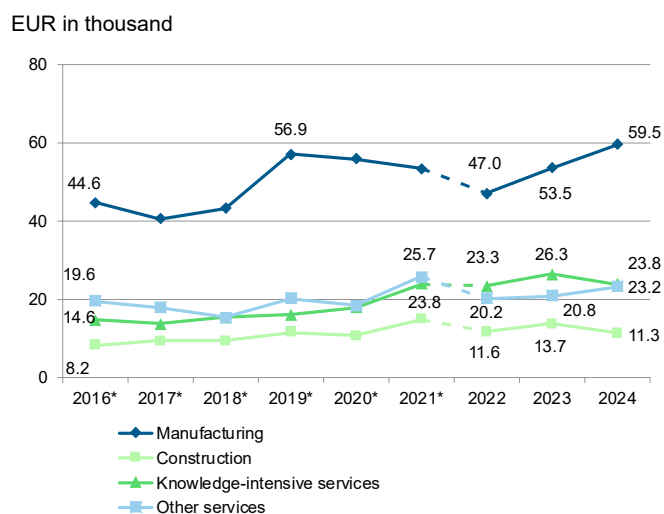
The level of average expenditure depends heavily on enterprise size. Businesses with fewer than five employees spent only just under EUR 10,000 on average on digitalisation in 2024. This proportion rose almost exponentially to just under EUR 189,000 in enterprises with 50 and more employees (Figure 18). What is noteworthy is that since the outbreak of the pandemic, average digitalisation expenditure rose most sharply among large SMEs. That means large SMEs on average spent almost 19 times more on digitalisation than small businesses in 2024. This span was 'just' 17-fold before the outbreak of the pandemic, for example in the years 2019 and 2016.

When we compare expenditure by enterprise size, however, we must always take into account that because of their size, small businesses also need to invest only smaller amounts in absolute terms in their digital transformation. Among other reasons, this is because they have less hardware and software and have a greater proportion of work processes in which automation does not pay off. In relation to annual turnover, small businesses in particular invest above-average amounts in digitalisation relative to their size, so that digitalisation costs place a heavier cost burden on them than on large enterprises (Figure 3).

Manufacturing enterprises spend the most on digitalisation

In a sector comparison, manufacturing enterprises spent the most – just under EUR 60,000 (Figure 19). Businesses in these sectors are currently the only ones to have significantly increased their average digitalisation expenditure (based on companies with digitalisation activities) on the previous year, which has contributed to dampening the decline in aggregate digitalisation expenditure in this group of economic sectors. They were followed at a significant distance by companies providing knowledge-based services and other services, which were almost on a par at EUR 24,000 and EUR 23,000. The construction sector is in fourth position with just under EUR 11,000.

Figure 18: Average expenditure on digitalisation by SME size



Note: * Only enterprises with completed digitalisation projects, nominal values, not counting enterprises of the remaining economic sectors, extrapolated on the basis of the number of employees, only enterprises with digitalisation expenditure.

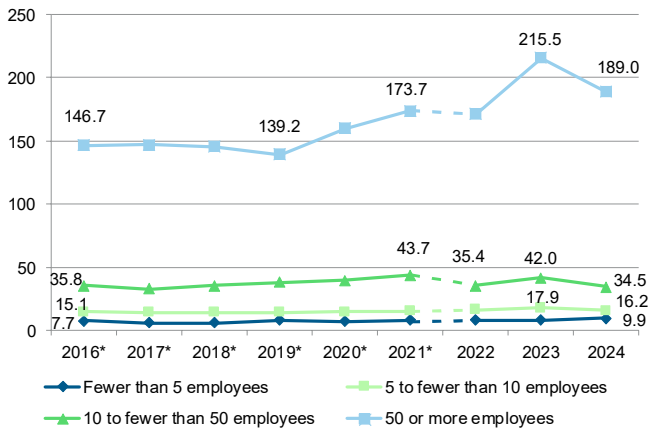
Source: KfW SME Panel, own calculations

The likely main reason manufacturers spend so much on digitalisation is that digitalising manufacturing processes is very costly as it often involves replacing or retrofitting machines and equipment. Enterprises whose material investments represented a high share of their digitalisation costs spent particularly high amounts on digitalisation.⁴⁹ In services businesses, on the other hand, the processes of service delivery are typically less capital-intensive. It is easier for them to implement changes. In the construction sector, too, digitalisation activities often focus on administrative processes and less on the direct provision of services. For this reason, they are also likely to be less capital-intensive.

⁴⁹ Cf. Zimmermann (2023b).

Figure 19: SMEs' average expenditure on digitalisation by economic sector

EUR in thousand



Note: * Only enterprises with completed digitalisation projects, nominal, values extrapolated on the basis of the number of employees, only businesses that invested in digitalisation.

Source: KfW SME Panel, own calculations

5. Conclusion

Key findings on the development of digitalisation in the SME sector

SMEs' digitalisation activities fell on a broad front in the current reporting period, which covers the years 2022–2024. Since the previous survey, the proportion of businesses with completed digitalisation projects dropped by 5 percentage points to 30%. Digitalisation expenditure decreased by around EUR 8 billion to just under EUR 24 billion. The surge in digitalisation triggered by the pandemic has thus fizzled out. As the average amount spent on digitalisation by businesses that are digitalising their operations has remained steady since the previous year's survey, that means the current decline in digitalisation expenditure is attributable to a falling number of businesses that have completed digitalisation measures.

Irrespective of the current trend, however, SMEs' digitalisation activities have nonetheless increased over the long term. Thus, the share of businesses with completed projects as well as aggregate and average digitalisation expenditure (by businesses with digitalisation activities) are higher today than when this data was first surveyed by KfW Research in 2017. That applies to businesses of almost all sizes and groups of economic sectors. The only exception are businesses with 10 to under 50 employees, where average digitalisation expenditure has dropped slightly.

Overall, however, the share of enterprises actively engaged in digitalisation has grown more strongly among large SMEs than small SMEs. The concentration of digitalisation expenditure in large SMEs has also been on the rise since the survey was first conducted. Furthermore, differences between pioneers and laggards became evident in regard to the types of digitalisation projects carried out. Pioneers often carry out more complex digitalisation projects while many laggards are still preoccupied with basic digitalisation steps. Thus, the long-term trend is that the gap has widened, particularly in the distinction between large and small SMEs.

Possible starting points for economic policy measures

Germany has an elaborate system of measures to promote digitalisation that addresses all actors. However, the scope of promotion varies in the individual segments, so that there are different potentials for

further developing the promotional schemes on offer. Promotional schemes currently focus mainly on supporting cutting-edge enterprises. Activities aimed at promoting the transfer of new digital solutions to broad areas of application and supporting the application of digital technologies, on the other hand, exist to a limited extent only.⁵⁰ But it is important that promotional measures adequately address the digitalisation activities of both pioneers and digital laggards. Only in this way will it be possible to simultaneously tap into growth areas of the future, achieve economically measurable digitalisation results,⁵¹ and prevent a split into digital and non-digital SMEs.

Improve research into digital technologies

Researching digital technologies and developing products and services based on them is not among the strengths of the German innovation ecosystem. This is evidenced by Germany's positions in these technologies with regard to academic publications, patents and external trade. Its gap to leading countries has widened since the turn of the millennium, particularly in patent applications.⁵²

Strengthening Germany's position in research into digital technologies will require expanding relevant research in universities and non-university research institutes. This would include creating further relevant professorships and making available more funds to carry out research projects. It also appears to be necessary to strengthen business research in the field of digital technologies. To this end, the R&D activities of businesses need to be supported.⁵³

Closing the gap to the leading countries in research of digital technologies and establishing Germany as a provider of high-quality digital problem solutions requires patience and perseverance. In the past decades, the leading countries have built up a significant lead that Germany will hardly be able to catch up to in the short or medium term. Instead, the catching-up process will likely have to be planned for the long term, particularly with regard to research into digital technologies.

Put digital technologies to use

In the short term, it would make sense for economic policy to promote the use of digital technologies more broadly throughout the economy and integrate

⁵⁰ Cf. Kulicke et al. (2023).

⁵¹ Cf. Andrews et al. (2015), Andrews et al. (2016) and Gal et al. (2019).

⁵² Cf. Zimmermann (2025a), Zimmermann (2024a), Zimmermann (2021a) and

Schmoch et al. (2021).

⁵³ Cf. Kulicke et al. (2023).

applications of digital technologies into products and services.

One approach would be to improve the transfer of academic research findings into the business community. Setting up new businesses is one important channel for this. Start-ups are a particularly important actor in transferring research outcomes as they are often the first to pick up on new findings and translate them to marketable products and services. Promoting start-ups, for example by providing venture capital and quasi-equity forms of funding, therefore plays an important role. Other possible approaches to improving knowledge transfer could be to strengthen transfer facilities or more effectively support research institutions in putting their research findings into practice.

SMEs also face a range of obstacles and hurdles to the adoption of digital technologies which can be addressed by economic policy measures. The important thing to consider here is that the bulk of businesses do not conduct any R&D activities and therefore cannot be addressed with R&D support measures.

The obstacles can be summarised into four groups. The hurdles that originate in the business environment can be summed up under quality of Internet connectivity and data protection and data security requirements. Adjustment problems occur in the form of specific difficulties in migrating existing IT systems and difficulties in adapting the work and corporate organisation of businesses. Lack of IT expertise is reflected in a shortage of IT specialists, insufficient digital skills within the broader workforce and uncertainty about future technological developments. Last but not least, difficulties in obtaining finance also pose a major hurdle for enterprises.⁵⁴

It has also been found that many businesses are not yet paying enough attention to the strategic importance of digitalisation. The share of businesses with a company-wide digitalisation strategy remains on a moderate level.⁵⁵ Besides, only a small proportion of SMEs explicitly conduct digitalisation measures with the aim of achieving strategic objectives.⁵⁶ It has also been found that the competition strategy pursued by a business plays a less important role for digitalisation activities than for its innovation activities.⁵⁷ The bulk of

SMEs thus approach digitalisation less from a systematic perspective than on an ad hoc basis.

The following options can be derived from these considerations as possible starting points for economic policy:

Expand funding opportunities

In order to mitigate financing problems, there is a need to set additional targeted financial incentives to implement digitalisation projects. Digitalisation projects have a variety of features that make them more difficult to finance than physical investments. For example, it is difficult for potential external capital providers to predict their chances of success.⁵⁸ The share of material investments in project costs is low, at just 37%. That is why digitalisation projects hardly generate any assets that could be used as loan collateral.⁵⁹ These factors are particular barriers to the external financing of digitalisation projects, for example with the aid of bank loans.

Financial offerings must be geared to the maturity level of the digital technologies. With respect to the business sector, that means expanding the commitment of the public sector in the early phase by providing subsidies and tax benefits for R&D. Germany's support for corporate R&D is relatively moderate in an international comparison.⁶⁰ In order for research into individual promising technologies such as artificial intelligence or quantum computing to make progress, economic policy must provide technology-specific promotional approaches as well as direction and coordination in a similar way as is currently being pursued in the promotion of key technologies or mission-oriented components of innovation policy. Identifying key technologies and missions and designing specific measures places high demands on economic policymakers. In order to avoid making misguided decisions, it is necessary to have a good source of information and well-founded advice without becoming exposed to lobbyism. In this regard, an important demand is to establish academic foresight and monitoring processes in order to identify relevant trends and technologies in a timely manner.⁶¹

In supporting cutting-edge enterprises, an additional approach would be to more closely interlink promotion of R&D and digitalisation. To this end, investment in

⁵⁴ Cf. Zimmermann (2023c) and Zimmermann (2022c).

⁵⁵ Cf. Zimmermann (2022e).

⁵⁶ Cf. Zimmermann (2022d).

⁵⁷ Cf. Zimmermann (2024c).

⁵⁸ Cf. Zimmermann (2020).

⁵⁹ Cf. Zimmermann (2023b).

⁶⁰ Cf. Rammer (2025), Zimmermann (2022a) and Rammer and Trunschke (2022).

⁶¹ Cf. Expert Commission on Research and Innovation (2026), Chapter A1.

digitalisation, for example in software and databases, could also be classified as activities eligible for support by making corresponding adjustments to funding guidelines. Separating R&D projects from digitalisation projects is particularly difficult in the services sector because introducing new and further developing existing service offerings and processes almost always requires new digitalisation approaches and digital solutions.⁶² As set out above, improving the offer of equity finance and quasi-equity financing instruments for start-ups would help new digital technologies and business models come to market quickly.

Low-interest loans would support the implementation of digitalisation measures across the business community as a whole and, thus, the diffusion of digital technologies. Financial support for these enterprises therefore should not focus on R&D expenditure but must ease the costs of implementing new digital applications and technologies and designing products and services.

Another option is to combine loans and grants, which can generate additional leverage effects. A sizeable proportion of the grant component would widen the financial scope for businesses and help reduce the financial risks of such projects. The credit component would help businesses manage large project volumes, particularly in the adoption of new technologies. Existing promotional instruments could also be integrated more closely or combined to achieve this.

Further options could include combining such financing solutions with an advisory offer or strengthening transfer support by enabling research facilities to benefit from the grant component in their cooperation projects and the participating businesses to use the loan funds for putting into practice the research findings.⁶³ It should also be examined to what extent the use of financing instruments that preserve equity such as leasing or mezzanine capital can also be developed further to finance digitalisation projects.

Enhance digital skills

A key barrier to digitalisation in the SME sector is the shortage of necessary skills. Hardly surprisingly, digital skills are exactly what businesses actively engaged in digitalisation are more likely than other enterprises to require and not have.⁶⁴

With regard to digital skills, one necessary approach is to ease the shortage of IT specialists. In order to do this, it will be important to increase the supply of labour overall and address the growing shortage of skilled workers resulting from the retirement of the baby boomer generation from the workforce. More people must therefore be encouraged to join the labour market. To achieve this, it is important to make better use of the domestic labour supply, for example by increasing labour force participation of women and older people and to view migration as a potential source of skilled labour.⁶⁵

Even if the use of artificial intelligence may potentially reduce demand for IT specialists in the future, more IT specialists must be trained today. More young people therefore need to be motivated to study information technology and dropout rates need to be reduced. One way to increase the number of students is to attract more female students, since the share of female students of information technology sits at only just under one quarter.⁶⁶ To remedy this situation, one approach is to improve careers advice at upper secondary school level.⁶⁷ With a view to the vocational training of IT experts, businesses should step up their training efforts, enhance their appeal as an employer and reach out to more potential trainees.

Digital skills across the broad workforce can be enhanced by enhancing the IT knowledge of school leavers and vocational and academic graduates. To this end, IT skills teaching should be integrated more strongly into school, vocational training and tertiary education curricula. Germany lags well behind other European countries in the teaching of digital skills in schools⁶⁸, with the result that digital literacy in the population as a whole is also lower than in other European countries.

Companies that are expanding their digitalisation are already more active in meeting their skills requirements than other enterprises and addressing the skilled labour shortage with a broad set of measures.⁶⁹ Businesses' training efforts can be supported by a range of economic policy measures. At the level of vocational training, existing hurdles must be lowered for small and medium-sized enterprises in particular and they must be made more attractive as businesses that provide training. With respect to continuing education, the

⁶² Cf. Zimmermann (2022f).

⁶³ Cf. Zimmermann (2023d) and Kulicke et al. (2023).

⁶⁴ Cf. Zimmermann (2023a).

⁶⁵ Cf. Kuhn et al. (2025), Müller (2025), Zimmermann (2023a) and Zimmermann (2024d).

⁶⁶ Cf. <https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bildung->

[Forschung-Kultur/Hochschulen/Tabellen/studierende-mint-faechern.html](#), last retrieved on 3 March 2026.

⁶⁷ Cf. Anger et al. (2023).

⁶⁸ Cf. Suessenbach et al. (2023).

⁶⁹ Cf. Zimmermann (2023e).

guiding principle of ‘lifelong learning’ must be realised. Increasing participation in continuing education will require not just effective training incentives in the form of financial support such as promotional loans, direct cost reimbursement or the granting of tax benefits for continuing education expenditure. Other important starting points include certification of qualifications along with navigation and quality assurance in the confusing market for continuing education.⁷⁰

Advisory offers also play an important role in building skills. The existing advisory services such as Digital Jetzt, go-digital and the Mittelstand-Digital centres are experiencing high demand. It can be assumed that demand is outstripping supply, so that expanding such services could reach further businesses.⁷¹

Expand digital infrastructure

The availability of fast internet increases the productivity and growth of not just businesses but the economy as a whole.⁷² Despite expansion work in recent years, Germany still occupies a lower mid-table position in Europe, particularly in its provision of fixed broadband Internet coverage.⁷³ Under the KfW SME Panel, even enterprises in conurbations often deplore inadequate internet connectivity as a barrier to digitalisation. That means this barrier is not limited to rural regions.⁷⁴ Therefore, even in areas that are currently better connected it must be continuously assessed whether the services provided still meet the requirements. While internet expansion usually pays for itself in more densely populated areas, rural regions require additional economic policy measures.

Simplifying support criteria can help speed up the expansion. This could encourage small providers to make use of promotional programmes and thus speed up the rollout of broadband networks even in areas that are not as commercially profitable. The limited willingness of households to pay for high bandwidths could be addressed with subsidies for fibre-optic connections. This would enable the regional usage rates required for expansion to be reached more often.⁷⁵

The growing use of cloud computing and the expected expansion of necessary computing capacity required by the use (and development) of artificial intelligence is

increasingly shifting the spotlight on the existing capacity of computer centres. Meeting the anticipated demand will require computing capacity to be increased substantially in order to prevent Germany’s dependence on foreign providers from worsening further. The establishment of new computer centres in Germany and the EU is currently hampered by shortcomings in the electricity grid, high electricity costs and administrative hurdles. For example, lengthy approval and planning procedures are impeding the expansion of computing centre infrastructure.⁷⁶ Economic policymakers therefore need to identify anticipated needs early and focus on the expansion of computer centres – and the related requirements.

Reduce the burden of data security and data protection requirements

Close to one third of small and medium-sized enterprises have become a victim of cybercrime in recent years.⁷⁷ Attacks are most likely to target larger businesses and pioneering enterprises. Increasingly, however, smaller businesses also make worthwhile targets for criminals as they digitalise more of their systems. SMEs in particular often fail to accurately assess the threat landscape. Businesses therefore need to be made aware of the threat from cybercrime. Attractive training courses can be helpful to achieve this. Outsourcing IT security to specialised IT service providers can also be a solution. To this end, it would be helpful to increase the relevant offering and transparency for small and medium-sized enterprises in particular. Establishing further specific IT security standards and certifications can also enhance IT security and raise the awareness of employees about secure handling of information technology.

Data protection requirements have changed significantly since the introduction of the GDPR in 2018. Many enterprises regard the data protection requirements as an impediment to their digitalisation and innovation activities.⁷⁸ In addition to restrictive and, in part, contradictory regulations⁷⁹, businesses also regard the existing scope for interpretation as a hindrance because it creates a high degree of uncertainty.⁸⁰ But it is difficult to quantify the extent to which bureaucratic obstacles specifically act as roadblocks, as they are also an expression of how intensive and ambitious digitalisation activities are. A recent study based on rigorous

⁷⁰ Cf. Leifels (2021).

⁷¹ Cf. Kulicke et al. (2023).

⁷² Cf. Briglauer et al (2025), Duso et al. (2025) and Bertschek et al. (2013).

⁷³ Cf. <https://digital-decade-desi.digital-strategy.ec.europa.eu/datasets/desi/charts>, last retrieved on 4 May 2026.

⁷⁴ Cf. Zimmermann (2022c).

⁷⁵ Cf. Zimmermann (2022g).

⁷⁶ Cf. Expert Commission on Research and Innovation (2026), Chapter B3.

⁷⁷ Cf. Zimmermann, V. (2023f).

⁷⁸ Cf. Zimmermann (2025e), Zimmermann, V. (2024e) and Zimmermann (2022c).

⁷⁹ Cf. Appl et al. (2017).

⁸⁰ Cf. Bertschek et al (2024).

statistical methods arrived at the conclusion that the introduction of the new General Data Protection Regulation (GDPR) actually encouraged innovation activity overall.⁸¹ Another study indicates that a high regulatory density does not in itself have to negatively impact business performance but the way regulations are implemented and the quality of administration play a major role in this.⁸²

In order to prevent bureaucracy from placing a disproportionately heavy burden on digitalisation activities, there is a need to examine bureaucratic regulations as to whether the intended protections are proportionate to the adverse impact on digitalisation. This is a tedious process in which a vast number of regulations must be assessed in detail. It requires expert knowledge, patience and stamina. The reform package recently submitted by the EU Commission⁸³ on simplifying and harmonising EU digital laws may be a first step to improving the situation.⁸⁴ A reporting office for administrative obstacles to digitalisation might also constitute a low-threshold participation option for businesses to ease the administrative burden.

One possible approach to preventing the emergence of new administrative burdens is to carry out a systematic appraisal of new legal regulations and to design them in a way that allows for sufficient scope.⁸⁵ What is also important here is that new bureaucratic regulations must be consistent and formulated in a way that their interpretation is unambiguous. Another way to generally reduce the administrative burden on enterprises is to digitalise administrative processes and the interface to businesses. The main advantage of digitalisation is that it dispenses with the need to review and assess individual regulations in detail and that the administrative contact for businesses can generally be managed more efficiently.

Strengthen research and overcome European fragmentation

In the area of supporting top performers, a possible approach to supporting digitalisation efforts could be to expand support for research at universities and non-university research facilities.⁸⁶ Besides improving Germany's position in research into digital technologies, expanding R&D-capacities in academia mainly provides pioneer SMEs with the basis on which they

would be able to further intensify their own digitalisation efforts, for example because qualified graduates and partners for joint research activities are available in larger numbers. The example of how R&D activities have evolved in Germany vividly illustrates the mutually beneficial interactions between academia and research work undertaken by businesses.⁸⁷

The development of digital standards, as is being undertaken by the federal and state governments and the EU (e.g. GAIA-X), is a helpful measure being implemented outside the business sector. The problem of data protection is also an expression of the legal fragmentation of digital markets, for example, which makes it difficult for businesses to operate Europe-wide and thus reach a critical scale. Realising a single internal market would support the further development and marketing of digital technologies in this respect as well. After all, despite the freedom of the internal market there are still considerable barriers preventing many enterprises from making full use of the size of the EU market to their advantage. As a result, European SMEs suffer competitive disadvantages compared with large, integrated markets such as the USA or China.⁸⁸

Raise awareness of strategic importance

SMEs who approach digitalisation from a strategic perspective invest more and take a broader approach to digitalisation. They also implement more ambitious digitalisation projects.⁸⁹ At the same time, strategic alignment and strategic considerations play only a limited role in the digitalisation activities of small and medium-sized enterprises. Strengthening enterprises' strategic capacity is therefore likely to increase digitalisation activities.

After all, many small businesses with well-established but not very innovative business models do not devote much attention to the aspect of strategic business development. Limited resources and the prioritisation of day-to-day business often prevent them from seeing the need to focus on innovation and the further development of their business as a whole.⁹⁰ Particularly for these businesses, strengthening their general strategic capacity and highlighting the possible role of digitalisation for their business strategy is a lever they can apply to take greater account of strategic aspects in digitalisation as well.

⁸¹ Cf. Blind et al. (2024).

⁸² Cf. Kritikos et al. (2023).

⁸³ Cf. <https://digital-strategy.ec.europa.eu/de/library/digital-omnibus-regulation-proposal>, last retrieved on 3 March 2026.

⁸⁴ Cf. Expert Commission on Research and Innovation (2026), Chapter B3.

⁸⁵ Cf. Holz et al. (2025) and Expert Commission on Research and Innovation (2026), Chapter B3.

⁸⁶ Cf. Zimmermann (2025f), Zimmermann (2024a) and Zimmermann (2024f).

⁸⁷ Cf. Zimmermann (2022e).

⁸⁸ Cf. Expert Commission on Research and Innovation (2026), Chapter A4 and Dorn et al. (2024).

⁸⁹ Cf. Zimmermann (2024c), Zimmermann (2022d) and Zimmermann (2022h).

⁹⁰ Cf. Zimmermann (2024g) and Astor et al. (2016)

In order to more effectively develop the potentials of digitalisation, it therefore appears to be useful to more strongly emphasise the benefits of digitalisation for businesses, especially from a strategic perspective. Greater efforts must be undertaken to raise awareness of the strategic importance of digitalisation among businesses, for instance with regard to their positioning in markets, tapping into new customer groups and the further development of existing business models.

Approaches aimed at improving strategic capabilities include, among other things, awareness-raising campaigns that highlight specific role models and best-practice examples, providing more long-term offers of low-threshold information for small and medium-sized

enterprises on digitalisation and competition strategies and continuous monitoring and, where appropriate, further development of the quality of advisory services. Another measure is to raise awareness about the significance of strategic considerations by incorporating such aspects more systematically in technical and vocational education and training, for example in the training of specialists and master tradespeople. More advanced enterprises need to incorporate strategic concerns more closely into the planning of digitalisation measures and take steps to prepare and implement a digitalisation strategy. Not least, explicitly incorporating strategic aspects in the context of digitalisation promotion can be another helpful approach.

Annex

The structure of innovative SMEs

The SME sector, according to KfW's definition, covers all enterprises in Germany whose annual turnover does not exceed EUR 500 million. By this definition, around 3.87 million SMEs exist today. The SME sector thus accounts for 99.95% of all enterprises in Germany. Of these enterprises, nearly 1.2 million have successfully completed digitalisation projects.

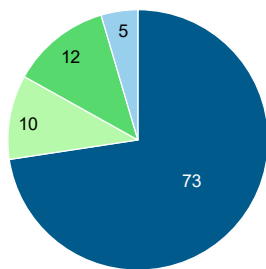
Most SMEs with completed digitalisation projects are small businesses. The majority of SMEs with digitalisation projects – just under 0.9 million enterprises, or 73% – have fewer than five employees. This high percentage is due to the overall structure of the small and medium-sized enterprise sector. Eighty-one per cent of SMEs have fewer than five employees. Seven per cent of enterprises with digitalisation projects are manufacturers and 84% are service providers.

Eighty-three per cent of SMEs with completed digitalisation projects do not conduct any R&D of their own. A mere 17% have conducted own R&D activities in the past three years.

Figure 20: SMEs with completed digitalisation projects by enterprise size

In per cent

Note: Figures extrapolated on the basis of the number of enterprises.

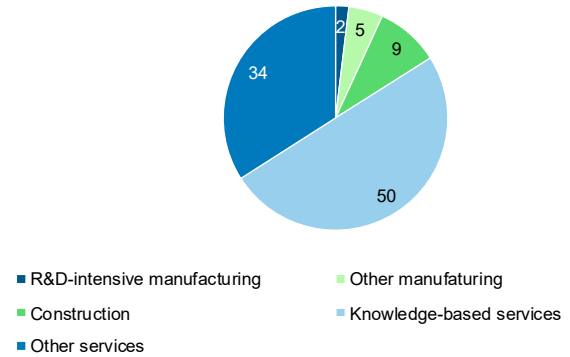


- Fewer than 5 employees
- 5 to fewer than 10 employees
- 10 to fewer than 50 employees
- 50 or more employees

Source: KfW SME Panel, own calculations

Figure 21: SMEs with completed digitalisation projects by sector

In per cent

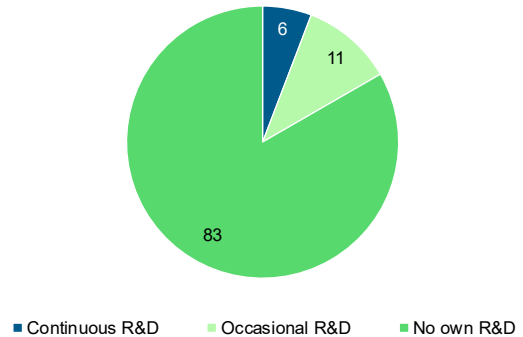


Note: Figures extrapolated on the basis of the number of enterprises.

Source: KfW SME Panel, own calculations

Figure 22: SMEs with completed digitalisation projects with and without own R&D activities

In per cent



Note: Figures extrapolated on the basis of the number of enterprises.

Source: KfW SME Panel, own calculations

KfW SME Panel

The KfW SME Panel (KfW-Mittelstandspanel) has been conducted since 2003 as a recurring postal survey of small and medium-sized enterprises in Germany with annual turnover of up to EUR 500 million. With data based on up to 15,000 companies a year, the KfW SME Panel is the only representative survey of the German SME sector, making it the most important source of data on issues relevant to the SME sector. As it is representative of all SMEs of all sizes and across all branches in Germany, the KfW SME Panel offers projections for even the smallest companies with fewer than five employees. A total of 13,079 SMEs took part in the current wave.

The KfW SME Panel is used as the basis for analyses of long-term structural developments in the SME sector. It gives a representative picture of the current situation and the needs and plans of SMEs in Germany. It focuses on annually recurring information on companies' performance, investment activity, innovation and digitalisation activities and financing structure. This tool provides a unique way of determining quantitative key figures for SMEs such as investment spending, loan demand and equity ratios.

The basic population used for the KfW SME Panel comprises all SMEs in Germany. These include private-sector companies from all sectors of the economy with annual turnover of not more than EUR 500 million. The population does not include the public sector, banks or non-profit organisations. Currently there are no official statistics providing adequate information on the number of SMEs or the number of people they employ. The survey used the German Company Register (Unternehmensregister) and the official employment statistics (Erwerbstätigenrechnung) to determine the current population of SMEs as a starting point. The KfW SME Panel sample is designed in such a way that it can generate representative, reliable data that are as precise as possible. The sample is split into four groups: type of promotion, branches, firm size as measured by the number of employees, and region. In order to draw conclusions on the basic population based on the sample, the results of the survey are weighted/extrapolated. The four main stratification criteria are used to determine the extrapolation factors. These factors look at the distribution in the net sample (in line with the four group characteristics) in relation to their distribution in the population as a whole. Overall, two extrapolation factors are determined: an unlinked factor for extrapolating qualitative parameters to the number of SMEs in Germany, and a linked factor for extrapolating quantitative parameters to the number of employees in SMEs in Germany.

The survey is conducted by GfK GmbH on behalf of KfW Group. The project received expert advice from the Leibnitz Centre for European Economic Research (ZEW) in Mannheim. The main survey of the 23rd wave of the KfW SME Panel was conducted in the period from 10 February to 20 June 2025.

Further information can be obtained at www.kfw-mittelstandspanel.de.

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