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Digitalisation projects are gaining traction in the SME sector but digitalisation expenditure has remained low for years

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# Digitalisation projects are gaining traction in the SME sector but digitalisation expenditure has remained low for years

Small and medium-sized enterprises are increasingly embracing digitalisation. Between 2016 and 2018, 40% of SMEs completed digitalisation projects successfully, an increase of ten percentage points on the previous period. That means some 1.5 million SMEs have pushed ahead with their digitalisation – 380,000 more than in the period of 2015–2017. What is particularly pleasing is that this development continues to be sustained by enterprises of all sizes and industries.

The highest proportion of completed digitalisation projects can be found in the group of large SMEs (67%) and among knowledge-based service providers (48%), as well as research- and development-intensive manufacturers (45%).

Overall, however, SMEs invested a good EUR 19 billion in digitalisation in 2018, only a fraction of the funds they spent on traditional innovations (EUR 34 billion) or material assets (EUR 220 billion) in that year. A further negative is that average digitalisation expenditure has not risen in the past three years and remains at EUR 17,000. The vast majority of small and medium-sized enterprises are still taking small steps on the road to digital transformation.

By contrast, enterprises that are already among the technological leaders are putting more demanding digitalisation projects in place and they are doing it more often. They are spending more on digitalisation and investing more in digitalisation expertise.

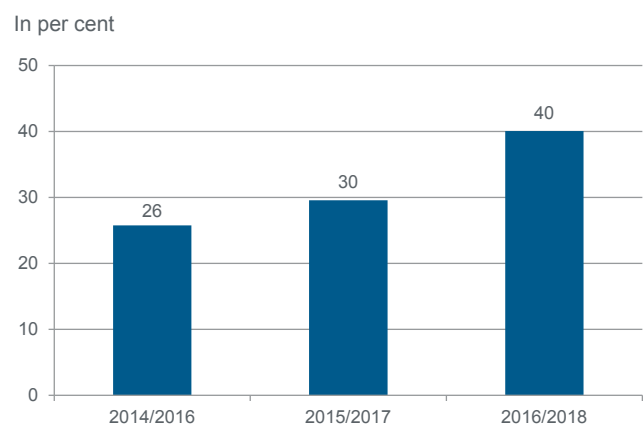
There is also concern that this could split the SME sector into highly digitalised – mainly large – SMEs that perform research and development and a large body of businesses that lag behind in the digital transformation. Another risk is that aggregate economic effects such as higher growth and productivity rates can then not be achieved because that would require digitalisation to generate broad and tangible benefits across the entire SME sector.

In order to mainstream the digital transformation more effectively throughout the SME sector, there is a need to address the key barriers to digitalisation. These include aspects relating to privacy and data protection, the IT skills shortage, problems in adapting IT systems and organisation and the quality of in-

ternet access. Lowering barriers to financing and raising awareness of opportunities and benefits of the digital transformation are important starting points for economic policy.

Digitalisation is regarded as an important source of innovation. As a ‘general-purpose technology’<sup>1</sup>, digitalisation is a beacon of hope for enhancing the competitiveness of broad sections of the economy, for stronger growth and a return to higher productivity rates. Numerous studies have determined that, like traditional innovation projects, digitalisation has benefits for the economy as a whole as well as for individual businesses.<sup>2</sup> They have also found that enterprises that have expanded their digitalisation in the past years also have a more stable employment pattern.<sup>3</sup> Finally, the coronavirus pandemic is currently highlighting the advantages of modern information and communication technologies as well as the existing deficits in Germany.

**Figure 1: SMEs with completed digitalisation projects**



Note: Figures extrapolated to the number of enterprises.

Source: KfW SME Panel, own calculations

We define digitalisation as the implementation of projects that involve introducing or improving the use of digital technologies in an enterprise’s processes, products and services and in its contacts with customers and suppliers. It also includes measures aimed at building corresponding skills within the enterprise and implementing new digital marketing and sales strategies. The broad overlap between traditional innovations and digitalisation projects is illustrated by the fact that, for example, 72% of innovative firms carry out digitalisation projects concurrently.

The penetration of information technologies into the economy and society is not a new trend. 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 leading to profound changes in the economy and society. This is also true because in an international comparison, Germany merely occupies a mid-range position in the current digital transformation. It ranks 11th within the EU 28 on the Digital Economy and Society Index of the European Union (DESI).<sup>4</sup> It ranks only fifth among the ten global locations covered by the monitoring report 'Wirtschaft DIGITAL' of the Federal Ministry of Economics and Technology.<sup>5</sup> According to the monitoring report, Germany does not possess any pronounced digitalisation-specific strengths. It has identified a distinct weakness in German exports of technologies relevant to digitalisation as a symptomatic consequence.

### Significantly more enterprises are implementing digitalisation projects

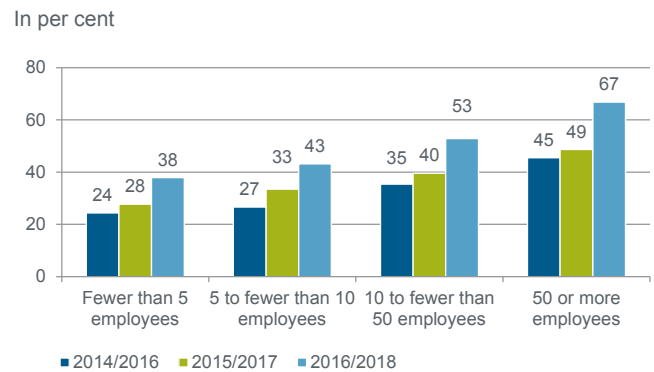
The digital transformation is making inroads into the SME sector. Between 2016 and 2018, 40% of SMEs completed at least one digitalisation project.<sup>6</sup> That share increased by 10 percentage points on the previous period of 2015–2017 (Figure 1). The number of SMEs with completed digitalisation projects rose by 380,000 to a good 1.5 million businesses. This finding confirms a clear digitalisation trend also found in other surveys.<sup>7</sup>

### Large SMEs are more digitally active

The share of SMEs undertaking digitalisation projects has grown in all size classes (Figure 2). Compared with the previous survey period, the difference in the relative increase between businesses of varying sizes is minimal. This illustrates that digitalisation has arrived in a broad range of enterprises regardless of size. In absolute terms, the increase is highest among large enterprises with 50 or more employees, at 18 percentage points.

However, significant differences exist between size classes in the percentage of enterprises that have completed digitalisation projects. Whereas it is 38% among small businesses with fewer than five employees, the percentage is 67% in large SMEs with 50 or more employees – around three quarters higher.<sup>8</sup>

**Figure 2: SMEs with completed digitalisation projects by enterprise size**



Note: Figures extrapolated to the number of enterprises.

Source: KfW SME Panel, own calculations

The percentage of businesses with digitalisation projects rises with enterprise size for a variety of reasons. For example, larger enterprises tend to be more motivated to go digital, for example because their broader activities mean they possess more extensive IT infrastructure and are more closely integrated into supra-regional value chains. Larger enterprises also tend to have a higher degree of automation. Besides, minimum project sizes and a higher proportion of fixed costs mean a relatively higher strain on small businesses. Finally, smaller enterprises have greater difficulty in accessing external finance for digitalisation projects.<sup>9</sup>

### Knowledge-based service providers and R&D-intensive manufacturers continue to lead the field

A sector comparison shows that enterprises providing 'knowledge-based services' remain in the lead, as they did in the previous period (Figure 3). These include, for example, media, IT and information services, law firms, tax consultancies and management consulting firms. The share of enterprises with digitalisation projects in these industries is 48%. R&D-intensive manufacturing is just behind, with 45% of enterprises having completed digitalisation projects. This includes mechanical engineering, electrical engineering and chemistry, for example. The trend here is similar to that of innovation activity, as enterprises in these sectors also have the highest share of product and process innovators.

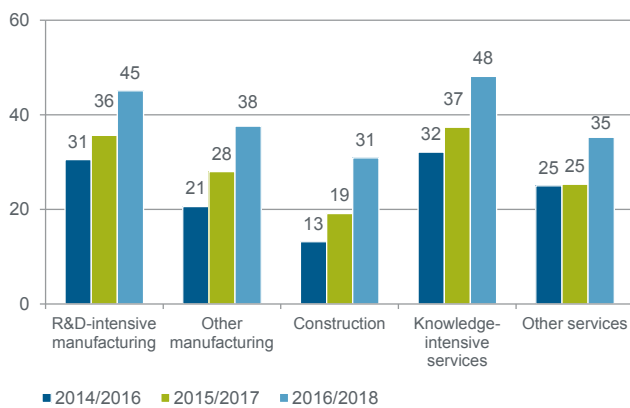
The construction sector, in which 31% of companies have completed digitalisation projects, typically exhibits a lower digitalisation potential than other sectors. The direct provision of services provides limited opportunities for digitalisation. The use of building information modelling (BIM), however, is often referred to as a key step towards digitalisation in the construction sector.



With shares of 35 and 38%, respectively, the shares of SMEs with digitalisation projects in the sectors of 'other services' (e.g. hospitality, transport and storage) and 'other manufacturing' (e.g. metal production and processing, garment production or animal feed production) are in midfield. As was the case in the previous periods, the percentages of enterprises with digitalisation projects increased in all sectors.

**Figure 3: SMEs with completed digitalisation projects by sector**

In per cent



Note: Figures extrapolated to the number of enterprises.

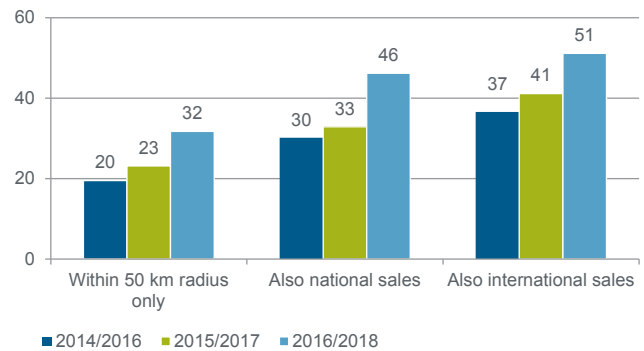
Source: KfW SME Panel, own calculations

### Intense competition in supra-regional markets is forcing businesses to go digital

The regional dimension of a company's sales market plays an important role in digitalisation. The share of enterprises with digitalisation projects grows with the size of their sales market (Figure 4). It is known that this correlation also applies to SMEs' innovation activity.<sup>10</sup> The reason for this is that the relevant enterprises are in closer competition and therefore under particular pressure to keep their products up-to-date and their business processes efficient. Moreover, having a presence in supra-regional and international markets is a source of new knowledge and ideas<sup>11</sup> that can lead to both traditional innovation and to greater digitalisation.

**Figure 4: SMEs with completed digitalisation projects by sales region**

In per cent



Note: Figures extrapolated to the number of enterprises.

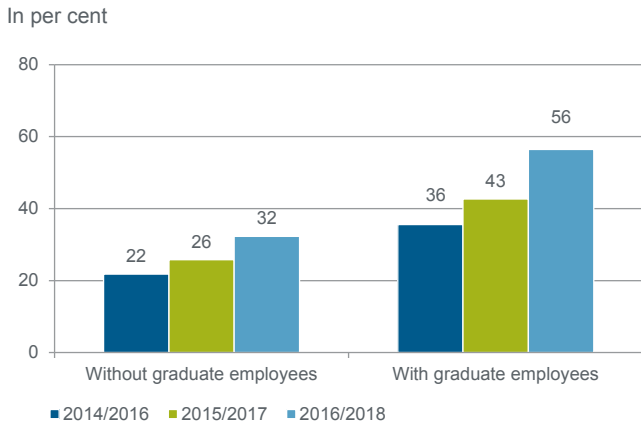
Source: KfW SME Panel, own calculations

Another finding is that, with a view to the region of the sales market, the share of digital transformers is growing across a broad front and not limited to individual segments. With a 13 percentage-point increase on the previous period, enterprises whose sales market covers all of Germany were most active in carrying out digitalisation projects.

### Having university graduates in the workforce is an asset for digitalisation

At present, 56% of enterprises that employ graduates are expanding their digitalisation. That share is around three quarters higher than in businesses that do not employ graduates (Figure 5). The likely reason for this is that human capital is an important source for generating innovations<sup>12</sup> and this also holds true for digitalisation. With an increase of nearly one third on the previous period, the proportion of enterprises with completed digitalisation projects is also on the rise, especially in enterprises with university graduates. An academic education thus provides a major boost to digitalisation. A completed university degree obviously enables workers above all to design and implement such projects.

**Figure 5: SMEs with completed digitalisation projects with and without graduate employees**



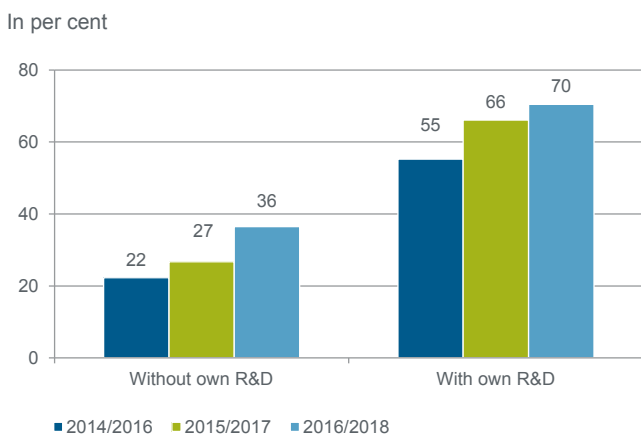
Note: Figures extrapolated to the number of enterprises.

Source: KfW SME Panel, own calculations

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

Own research and development (R&D) activities can constitute another source for the design and implementation of digitalisation projects. R&D is defined as ‘systematic creative work aimed at expanding existing knowledge [...] and using it with the objective of finding new potential applications’<sup>13</sup>. It enables a company to 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 indicate that the business is operating in an innovative environment and is therefore also more active in advancing digital transformation than other enterprises – without conducting R&D specifically targeted at digitalisation.

**Figure 6: SMEs with completed digitalisation projects with and without own R&D activities**



Note: Figures extrapolated to the number of enterprises.

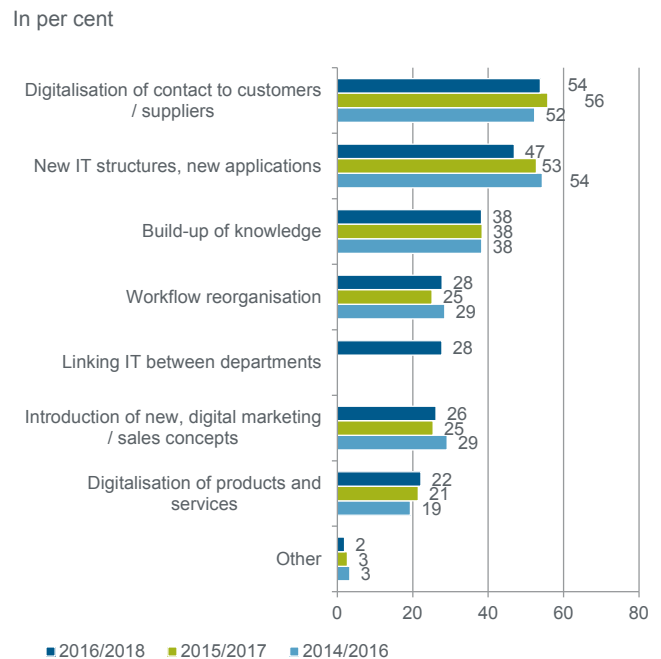
Source: KfW SME Panel, own calculations

Indeed, enterprises that perform own R&D do implement digitalisation projects more often than enterprises without R&D. At 70%, this share is nearly twice as high among SMEs conducting R&D as among those who do not (Figure 6). But enterprises without R&D activities have caught up slightly in the past years. Compared with the period of 2014–2016, the relevant share in both groups rose by 14 percentage points, an increase of nearly one third for enterprises without R&D but ‘only’ a good one quarter for enterprises with R&D activities.

**Digitalising interactions with the business environment remains at the top of the list**

A closer look at the specific types of projects reveals that the type of digitalisation projects carried out has hardly changed in the past years. SMEs are mainly digitalising their interactions within the value chain and with their final customers. This often involves redesigning websites and adopting internet applications such as online ordering and payment systems, as well as the use of social media and customer feedback mechanisms. It likely includes automating and, thus, digitalising the exchange of data within the value chain as well. Over time, the share of SMEs that have completed projects of this type varies slightly between 52 and 56%, with the current rate of 54% sitting in mid-range (Figure 7).

**Figure 7: Types of digitalisation projects**



Note: Figures extrapolated to the number of enterprises.

Source: KfW SME Panel, own calculations

The upgrading of IT structures follows closely behind at 47%. This includes the installation of new hardware, the implementation of new systems or the adoption of individual, new applications. IT modernisation is therefore the second most common project type. The share of enterprises that carry out this type of digitalisation project dropped slightly across the three observation periods.

As in the previous period, and with the same percentage (38%), projects aimed at boosting digitalisation expertise were the third most common type. They include contracting IT consultancy and training employees. Lack of in-house expertise is among the most important obstacles to digitalisation.<sup>14</sup> The fact that developing expertise ranks third in the list of digital project types shows that a significant portion of SMEs are actively tackling this obstacle and developing their digital capabilities. Advanced applications, in particular, often cannot be utilised unless an enterprise has the requisite competencies. Improving digital capabilities therefore plays an important role.

Workflow reorganisation in the context of digitalisation measures ranked fourth, with mentions between 25 and 29%. Enterprises need to reorganise workflows when digital transformation profoundly alters existing processes and business organisation. The affected enterprises are then more likely to undertake complex digitalisation measures.

For the first time, the current survey shed light on how businesses are computerising links between functional areas as a digitalisation project. With a share of 28%, projects of this type rank on a par with workflow organisation.

Introducing new digital marketing and sales strategies ranks sixth with 26% of mentions, potentially in the course of digitalising customer interactions, as previously described. This would rather be an indication that digital latecomers, too, are implementing these projects. Like the upgrading of IT infrastructure, the frequency of mentions of this type of digitalisation project also dropped from 2014/2016.

Just as in the previous periods, digitalising products and services ranks last in the survey. What is pleasing is that increasingly more enterprises are dealing with the issue – at least to a small extent. Still, with a share of 22% the range of products and services on offer still plays a relatively minor role in digital transformation efforts. This is consistent with the frequently voiced complaints that digitalisation in Germany focuses too much on efficiency gains<sup>15</sup> and rarely includes the search for

new areas of sales and activity or the further development of business models.

### **Sophisticated digitalisation projects are implemented mainly by large SMEs that conduct R&D**

As in the previous period, small businesses, construction firms and providers of other services as well as enterprises with Germany-wide sales were most active in digitalising their interactions with customers and suppliers (Figures 8, 9, 10, 11). This suggests that these enterprises are mostly latecomers. Large SMEs that are already more digitally advanced and operating internationally are likely to have completed this step already. The fact that businesses with Germany-wide operations are in the lead with respect to sales market region does not contradict this. It is likely due to the fact that companies operating regionally are still even less likely to regard digitalised interaction as relevant to their business because of the shorter distances.

By contrast, upgrading IT infrastructure and introducing new applications is the main focus of larger SMEs. Furthermore, SMEs with 50 and more employees implement projects that involve workflow reorganisation particularly often.

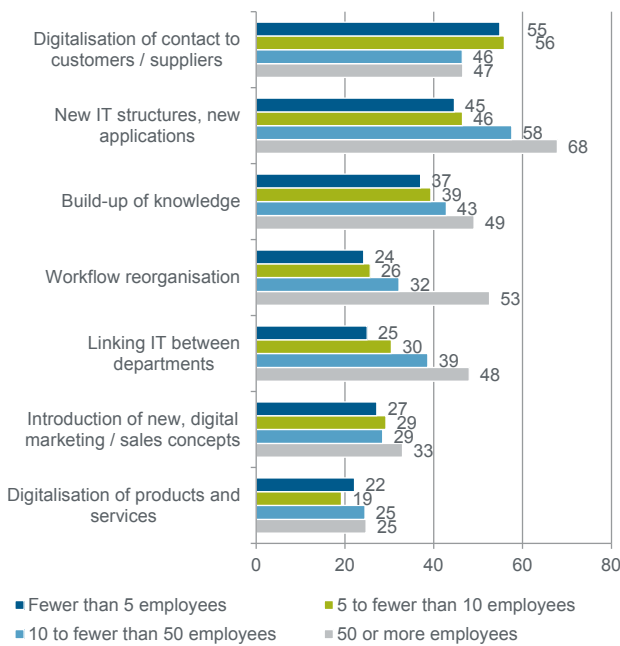
The more widespread upgrading of IT infrastructure and adoption of new applications is likely to be partly a size effect because large enterprises also have more of a need to digitalise activities. Measures aimed at digitalising workflow reorganisation in particular are probably also due to the fact that these enterprises generally tend to be more innovative than others. Such enterprises are also quicker to introduce digital innovations than others.

### **Digital pioneers are upgrading their digitalisation expertise ...**

Developing digital expertise was another measure mentioned more often by large SMEs (49%) than small businesses (37%). Knowledge-intensive service providers and R&D-intensive manufacturers are particularly active in this area, with 45 and 42% of enterprises, respectively, implementing digitalisation projects. This is consistent with the fact that enterprises with own R&D also invest more often in expertise than other enterprises. Thus, the relevant enterprises possess characteristics that are typically associated with pioneer companies.

**Figure 8: Types of digitalisation projects by size of enterprise**

In per cent

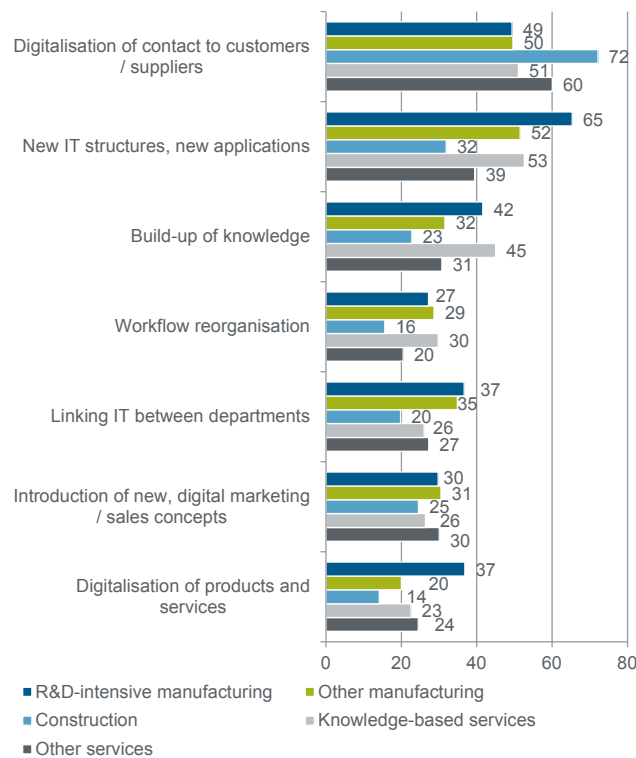


Note: Figures extrapolated to the number of enterprises.

Source: KfW SME Panel, own calculations

**Figure 9: Types of digitalisation projects by economic sector**

In per cent



Note: Figures extrapolated to the number of enterprises.

Source: KfW SME Panel, own calculations

**... and reorganising their workflows in the context of digitalisation projects**

Workflow reorganisation as part of digitalisation projects is more widespread in knowledge-based service providers and manufacturing firms as well as in enterprises with supra-regional operations. As described above, this also applies to large SMEs and enterprises with own R&D. The greatest differences in the frequency of mentions for this type of project can be seen between enterprises with and without own R&D in particular. Only in the area of digitalisation of products and services are these differences greater. This confirms the above consideration that these are more far-reaching projects that are typically more likely to be rolled out by pioneer enterprises.

Projects that involve digitally integrating functional areas are being more intensely pursued by manufacturing enterprises, larger enterprises and, in particular, those that conduct R&D activities. This is likely to be largely a pure size effect because only larger SMEs have clearly demarcated functional areas that can be integrated. However, it is also apparent that the way in which a company makes its product and how much innovative capacity it has both play a role for digitalisation in companies that belong to the manufacturing sector and conduct R&D activities.

**Few differences in the introduction of new, digital marketing and sales strategies**

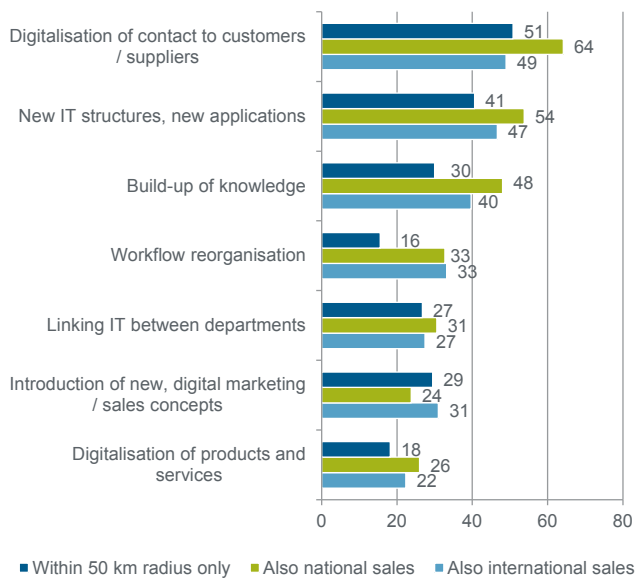
By contrast, in the introduction of new digital marketing and sales projects the differences between the business characteristics examined here are, for the most part, only minor. A wider variation appears only in regard to whether an enterprise conducts R&D. Thus, for this type of project there are at least initial indications that they are more likely implemented by enterprise types that are typically among the technological pioneer enterprises.

Finally, digitalised products and services were brought to market primarily by R&D-intensive manufacturers and enterprises that conduct R&D. So they, too, are groups of enterprises that are also among the pioneers of traditional innovations.



**Figure 10: Types of digitalisation projects by sales region**

In per cent

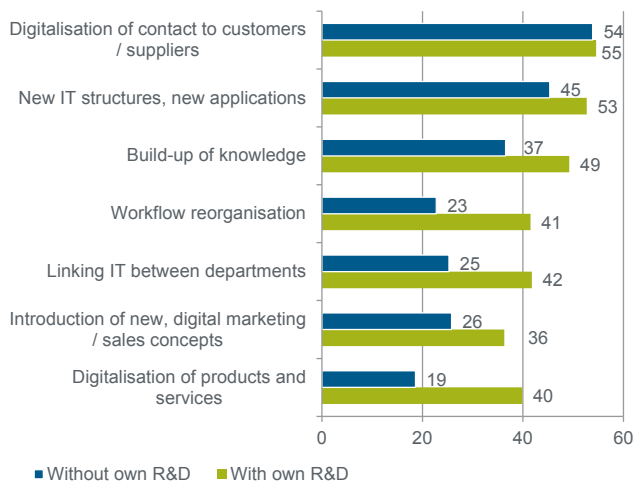


Note: Figures extrapolated to the number of enterprises.

Source: KfW SME Panel, own calculations

**Figure 11: Types of digitalisation projects of enterprises with and without own R&D activities**

In per cent



Note: Figures extrapolated to the number of enterprises.

Source: KfW SME Panel, own calculations

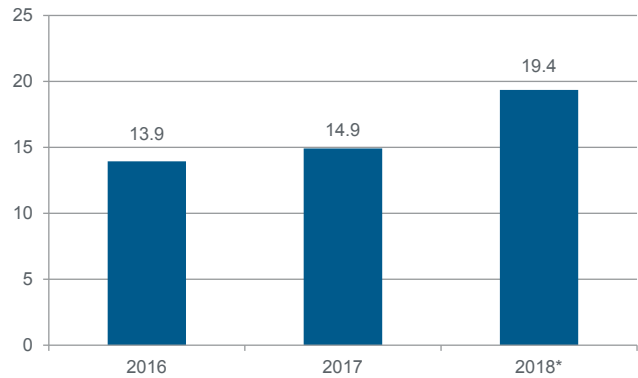
**Digitalisation expenditure was EUR 19 billion**

In 2018, small and medium-sized enterprises spent EUR 19.4 billion on digitalisation projects (Figure 12). For the first time, digitalisation expenditure surveyed in 2018 included enterprises with ongoing and aborted digitalisation expenditures instead of covering only those enterprises that had completed digitalisation projects. The change in aggregate expenditure from the previous year is thus not very informative. A comparison with investment or innovation expenditure sur-

veyed along with digitalisation expenditure demonstrates, however, that digitalisation expenditure is clearly lower than the former types of expenditure. Thus, SMEs invested EUR 220 billion in assets such as machinery, equipment and other items and a good EUR 34 billion in traditional innovations in 2018.<sup>16</sup>

**Figure 12: Aggregate expenditure on digitalisation in the SME sector**

in EUR bn



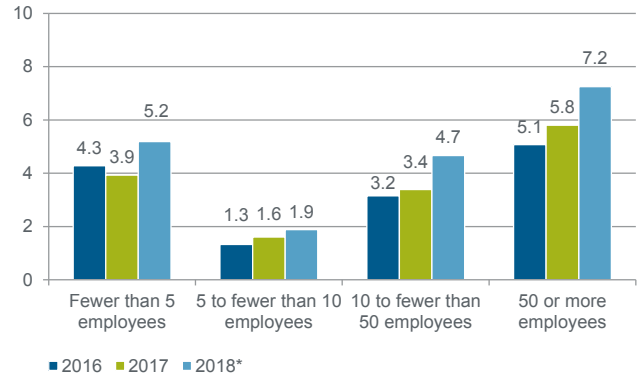
Note: 2018 including enterprises with ongoing or aborted digitalisation projects, values extrapolated from the number of employees.

Source: KfW SME Panel, own calculations

Businesses with fewer than five employees took a high share of around EUR 5 billion or approx. 27% (Figure 13). At first glance, this may come as a surprise because the share of enterprises with digitalisation projects in this group is relatively low. This finding can be attributed to the fact that enterprises with fewer than five employees make up the bulk of small and medium-sized enterprises – 81%.

**Figure 13: Aggregate expenditure on digitalisation by SME size**

in EUR bn



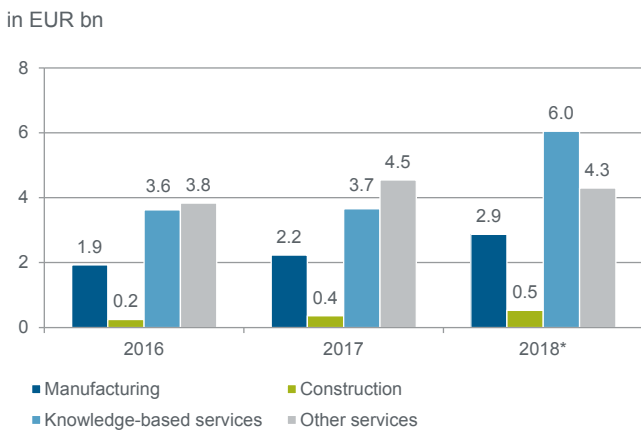
Note: 2018 including enterprises with ongoing or aborted digitalisation projects, not counting enterprises of other sectors, values extrapolated from the number of employees.

Source: KfW SME Panel, own calculations

Although they represent a small proportion of 2% of small and medium-sized enterprises, large SMEs with 50 or more employees account for the largest share of digitalisation expenditure: a good EUR 7 billion or 38%. The growth in digitalisation expenditure, which is at least partly a result of the expansion of the group of enterprises surveyed, as explained previously, is spread across enterprises of all size classes.

A breakdown by economic sector shows that service providers continue to spend the most on digitalisation overall, at EUR 6 billion for knowledge-based service providers and just under EUR 4.3 billion for other service providers (Figure 14). Both groups also represent the highest shares of small and medium-sized enterprises. Manufacturing accounts for EUR 2.9 billion in digitalisation expenditure. Construction firms spend the least on digitalisation – half a billion euros. The level of expenditure thus also confirms the relatively low level of digitalisation activities of these businesses.

**Figure 14: SMEs’ aggregate expenditure on digitalisation by economic sector**



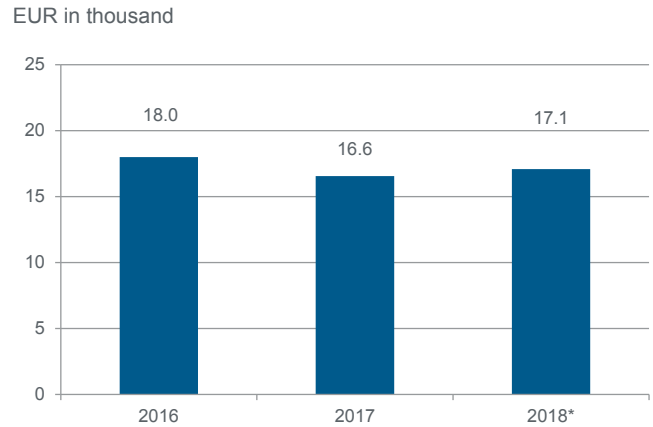
Note: 2018 including enterprises with ongoing or aborted digitalisation projects, not counting businesses with fewer than five employees, values extrapolated from the number of employees.

Source: KfW SME Panel, own calculations

**Average digitalisation expenditure is nearly unchanged**

In order to be better able to assess variations in expenditure compared with previous years, the following figures show small and medium-sized enterprises’ average digitalisation expenditure. In difference to aggregate digitalisation expenditure, it can be assumed for average digitalisation expenditure that expanding the group of enterprises surveyed has only a minor effect on the average digitalisation expenditure captured. SMEs spent an average EUR 17,000 on digitalising their business in 2018. That was not a significant variation on the previous years (Figure 15).

**Figure 15: Average expenditure on digitalisation in the SME sector**

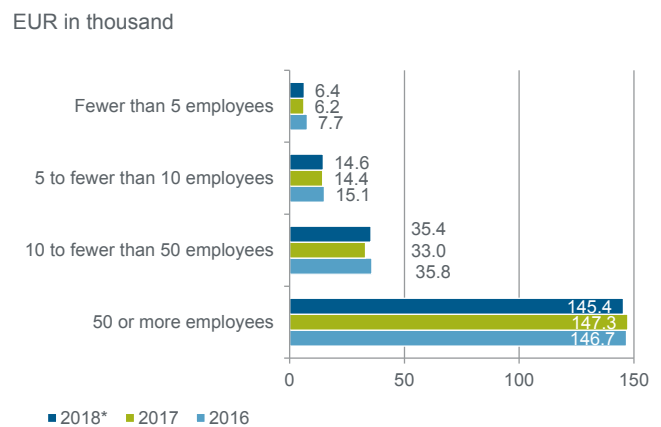


Note: 2018 including enterprises with ongoing or aborted digitalisation projects, values extrapolated from the number of employees.

Source: KfW SME Panel, own calculations

The level of expenditure depends heavily on enterprise size. Businesses with fewer than five employees spent a good EUR 6,000 on digitalisation on average in 2018. This sum rises almost exponentially to EUR 145,000 in enterprises with 50 or more employees (Figure 16). That is around 24 times more than what small businesses spend. A breakdown by enterprise size also reveals only minor changes in digitalisation expenditure in the past three years.

**Figure 16: Average expenditure on digitalisation by SME size**



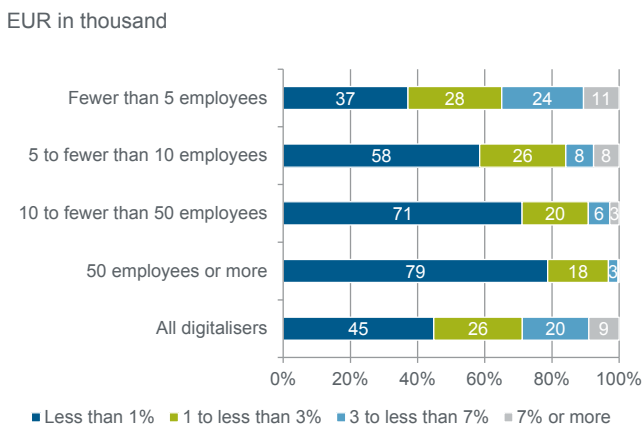
Note: 2018 including enterprises with ongoing or aborted digitalisation projects, values extrapolated from the number of employees.

Source: KfW SME Panel, own calculations

A comparison by enterprise size must generally take into account that, because of their size, small businesses also need to invest only small amounts in digital transformation in absolute terms. They have less hardware and software, for example.

However, in relation to annual turnover, small businesses invest above-average amounts in digitalisation relative to their size. The bulk of large SMEs with 50 or more employees (79%) invest less than 1% of their annual turnover in digitalisation measures. Only 3% of these enterprises spend more than 3% of their annual turnover on digitalisation (Figure 17). By contrast, only 58% of small businesses with fewer than five employees invest less than 1% of their annual turnover in digitalisation, while 35% of them spend more than 3%. This indicates that, just like innovation projects, digitalisation projects also involve minimum project sizes and high fixed costs.<sup>17</sup>

**Figure 17: Share of innovation expenditure in turnover by enterprise size in 2018**



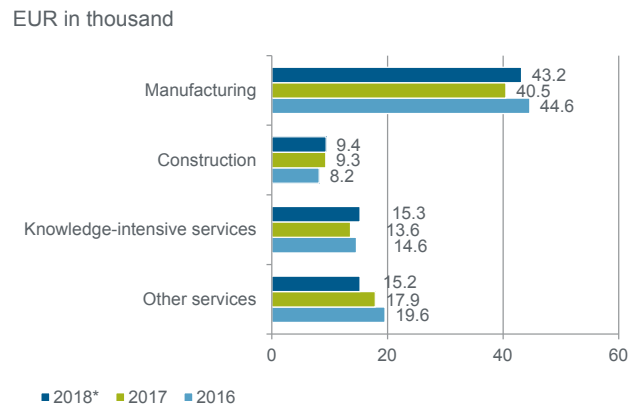
Note: Figures extrapolated to the number of enterprises.

Source: KfW SME Panel, own calculations

A look at average digitalisation expenditure by sector confirms the high amounts spent by manufacturers. With around EUR 43,000 per enterprise with digitalisation projects, these companies invest 2.8 times more than the average service provider (a good EUR 15,000). Construction firms spend the least on digitalisation, with EUR 9,400 on average (Figure 18).

The main reason for high digitalisation expenditure in the manufacturing sector is likely that the digital transformation of production in that sector is very costly because it often involves replacing or retrofitting machines and equipment. In service enterprises, on the other hand, the processes of service delivery are often not so capital-intensive, so changes can be made here at a lower cost. In the past three years, average expenditure on digitalisation changed little between individual sectors as well – with the exception of other services.

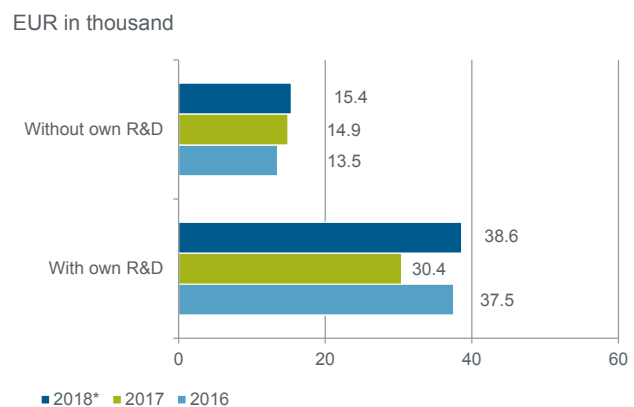
**Figure 18: SMEs' average expenditure on digitalisation by economic sector**



Note: 2018 including enterprises with ongoing or aborted digitalisation projects, values extrapolated from the number of employees.

Source: KfW SME Panel, own calculations

**Figure 19: Average digitalisation expenditure of SMEs with and without R&D activity**



Note: 2018 including enterprises with ongoing or aborted digitalisation projects, values extrapolated from the number of employees.

Source: KfW SME Panel, own calculations

Not only are SMEs with own R&D activities more likely to carry out more digitalisation projects and more ambitious ones; they also spend more on digitalisation on average. In 2018 that was just under EUR 39,000 on average, 2.5 times as much as enterprises without own R&D activities. This gives rise to concerns that a gap will open up in the medium term between heavily digitalised, usually large enterprises with R&D activities and enterprises without R&D that are also lagging behind in digitalisation.

**Conclusion**

Small and medium-sized enterprises are increasingly adopting measures to step up their digital transformation. The percentage of enterprises with completed digitalisation projects has increased significantly for the second time in a row. After the recently identified 10 percentage-point increase on the previous period, that share is now 40%, putting it much higher than the

rate of traditional innovation activity (19%).

What is most encouraging is that this development is taking place throughout the entire SME sector. An increase in the number of enterprises with completed digitalisation projects can be identified in every size class and in all sectors.

However, significant differences between various types of enterprises can be seen in the percentage of enterprises with completed digitalisation projects.

In large SMEs with 50 and more employees, the share of enterprises with completed digitalisation projects is three quarters higher than in small businesses with fewer than five employees. Noticeably higher percentages of enterprises with digitalisation projects can also be identified in segments that typically play a pioneer role in traditional innovation activity. Enterprises with international operations are more than 50% more likely to implement digitalisation projects than those that supply only a regional market. That rate is three quarters higher in enterprises that employ university graduates and nearly twice as high in enterprises with own R&D activities as in those that have neither.

Most of the projects completed involve digitalising the interaction with the business environment, closely followed by projects aimed at renewing IT infrastructure and introducing new applications. Thus, digitalisation efforts remain focused on achieving efficiency gains. Sophisticated digital transformation projects are much less common. Projects that involve workflow organisation, digitally integrate functional areas or lead to digitalised products and services are usually concentrated in the small group of large enterprises that conduct their own R&D. Digitalisation expertise that often makes more sophisticated projects possible in the first place is being actively developed much more often by SMEs that conduct R&D than by other enterprises.

On the other hand, SMEs spent only a good EUR 19 billion on digitalisation projects in the period under review. That was only a fraction of their expenditure on traditional innovation (EUR 34 billion) and on material assets (EUR 220 billion). What is also disappointing about the sums spent on digitalisation is that average digitalisation expenditure per enterprise has not increased in the past three years. It remains nearly unchanged at EUR 17,000 per enterprise per year.

Along with manufacturing firms, those that spend high amounts on digitalisation continue to be mainly large enterprises and those that conduct own R&D activities. Large enterprises spend around 24 times more on digi-

talisation measures than businesses with fewer than five employees.

The fact that digitalisation projects are more common and more sophisticated precisely in enterprises that are already among the technological pioneers, which are thereby investing higher amounts in digitalisation and more in digitalisation expertise, is cause for concern. After all, in the medium term this may split the SME sector into a group of heavily digitalised, mostly large SMEs with R&D activities and another large body of businesses that is left behind in the digital transformation. There is also a risk that aggregate economic effects, such as the higher growth and productivity rates previously mentioned, cannot be achieved unless digitalisation generates broad and tangible benefits across the SME sector as a whole.<sup>18</sup>

It therefore appears to be appropriate to diffuse digital technologies swiftly and widely across the small and medium-sized enterprise sector. From a business perspective, the main obstacles are unresolved data security and data protection issues, insufficient IT skills, problems in adapting the IT infrastructure, corporate structure and workflow management and unsatisfactory quality of Internet access.<sup>19</sup> Therefore, from the perspective of economic policy, clarifying legal issues, improving data protection, upskilling the workforce through basic and advanced training and expanding broadband access are important starting points.

It also remains important to make businesses aware of the benefits and opportunities offered by the digital transformation.<sup>20</sup> These efforts should continue in the coming years as well. The ongoing coronavirus pandemic can be expected to trigger a surge in digitalisation once the acute emergency situations have been overcome. Businesses will develop a growing awareness of the benefits of automation and location-independent working. They will seek to grow their opportunities in this regard. Workers and consumers will have adapted their habits in many ways in the course of the crisis and will presumably be keen on accepting more offers to work from home, shop online and use online recreation activities as well.

Finally, SMEs often find it difficult to access external finance for digitalisation projects.<sup>21</sup> This is not surprising given the similar characteristics of innovation and digitalisation projects. If the project volumes sought by enterprises in the coming years should increase, this problem will become an even more obvious barrier to digitalisation. Therefore, another helpful economic policy measure will be to provide financial support for the implementation of digitalisation measures.

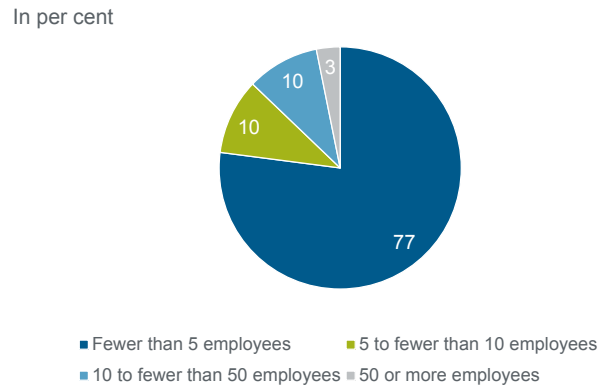
**The structure of SMEs with completed digitalisation projects in 2016/2018**

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 3.81 million SMEs exist in Germany. The SME sector thus accounts for 99.95% of all enterprises. A good 1.5 million of these enterprises have successfully completed digitalisation projects.

Most SMEs with completed digitalisation projects are small businesses. The majority of SMEs with digitalisation projects – just under 1.2 million enterprises, or 77% – 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. Around 7% of enterprises with digitalisation projects are manufacturers and 84% are service providers.

Eighty-six per cent of SMEs with completed digitalisation projects do not conduct any R&D of their own. A mere 7% have conducted own R&D activities continuously or occasionally in the past three years.

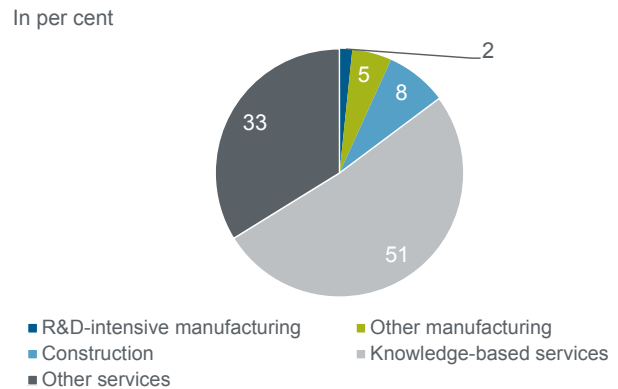
**Figure 20: SMEs with completed digitalisation projects by enterprise size**



Note: Figures extrapolated to the number of enterprises.

Source: KfW SME Panel, own calculations

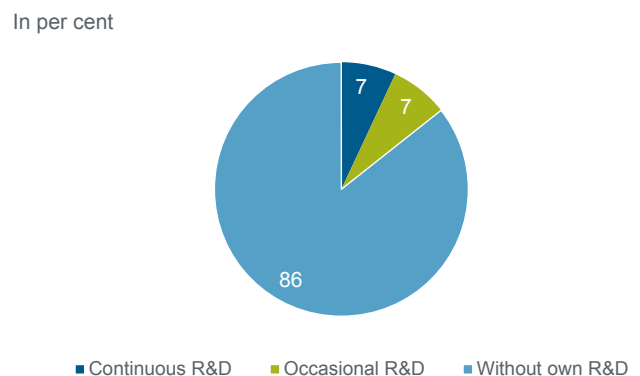
**Figure 21: SMEs with completed digitalisation projects by sector**



Note: Figures extrapolated to the number of enterprises.

Source: KfW SME Panel, own calculations

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



Note: Figures extrapolated to 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 10,222 SMEs took part in the current wave.

Analyses of long-term structural developments in the SME sector are performed on the basis of the KfW SME Panel. 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 and financing structure. This tool is the only way to determine 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 the Financial Services Division of GfK SE 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 17th wave was conducted in the period from 11 February to 21 June 2019.

<sup>1</sup> Cf. Bresnahan, T.F. and Trajtenberg, M. (1995): General purpose technologies, engines of growth? *Journal of Econometrics* 65(1), p. 83–108.

<sup>2</sup> Cf. Kretschmer, T. (2012), Information and Communication Technologies and Productivity Growth: A Survey of the Literature; OECD Digital Economy Papers, No. 195, OECD Publishing; Cardona, M.; Kretschmer, T. et Al. (2013), ICT and productivity: conclusions from the empirical literature, *Information Economics and Policy* 25, p. 109–125, Bertschek, I. et Al. (2013), More Bits – More Bucks? Measuring the Impact of Broadband Internet on Firm Performance, *Information Economics and Policy* 25(3), p. 190–203, Niebel, T. et Al. (2019), BIG Data – BIG gains? Understanding the link between Big Data Analytics and Innovation; *Economics of Innovation and New Technology* 28(3), p. 296–316; Gal, P., et Al. (2019): Digitalisation and productivity: In search of the holy grail – Firm-level empirical evidence from EU countries; OECD Economics Department Working Papers No. 1533.

<sup>3</sup> Cf. Dauth et Al. (2017), German Robots – The Impact of Industrial Robots on Workers, IAB Discussion Paper 30/2017.

<sup>4</sup> Cf. DESI (2019); <https://ec.europa.eu/digital-single-market/en/desi>; last retrieved on 1 April 2020.

<sup>5</sup> Cf. latest version: BMWi (2018): Monitoring-Report Wirtschaft DIGITAL 2018. Der IKT-Standort Deutschland und seine Position im internationalen Vergleich (*Germany as an ICT location and its position in international comparison* – our title translation, in German only).

<sup>6</sup> The following analysis is based on the KfW SME Panel, a representative longitudinal data section for small and medium-sized enterprises in Germany with an annual turnover of up to EUR 500 million.

- <sup>7</sup> Cf. Zimmermann, V. (2019): **Business Survey 2019. More and more businesses have firm plans for digitalisation, hurdles also more widely acknowledged**, KfW Research.
- <sup>8</sup> 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.
- <sup>9</sup> Cf. Zimmermann, V. (2020), **Financing of digitalisation and capital expenditure in SMEs – a comparison**, Focus on Economics No. 280, KfW Research, or Zimmermann, V. (2018): **Business Survey 2018. Digitalisation is gaining momentum**, KfW Research.
- <sup>10</sup> Cf. Zimmermann, V. (2018): **Determinants of digitalisation and innovation behaviour in the SME sector**. Focus on Economics No. 236, KfW Research.
- <sup>11</sup> Cf. Schlegelmilch, B. (1988): Der Zusammenhang zwischen Innovationsneigung und Exportleistung (*The correlation between innovation propensity and export performance* – our title translation, in German only). Ergebnisse einer empirischen Untersuchung in der deutschen Maschinenbauindustrie (*Results of an empiric survey of the German engineering industry* – our title translation, in German only), in: Zeitschrift für betriebswirtschaftliche Forschung 50(3), p. 227–269; Greenaway, D. and Kneller, R. (2007), Firm heterogeneity, exporting and foreign direct investment, The Economic Journal 117(517), S. F134–F161, and Anderson, M. and Löf, H. (2009), Learning by Exporting Revisited – the role of intensity and persistence, Scandinavian Journal of Economics 111(4), p. 893–913.
- <sup>12</sup> Cf. Hottenrott, H and Peters, B. (2012): Innovative capability and financing constraints for innovation – more money, more innovation? Review of Economics and Statistics 94(4), p. 1126–1142 and Zimmermann, V. (2018): **Determinants of digitalisation and innovation behaviour in the SME sector**, Focus on Economics No. 236, KfW Research.
- <sup>13</sup> Cf. OECD (2015) (publisher), Frascati Manual 2015. Guidelines for collecting and reporting data on research and experimental development.
- <sup>14</sup> Cf. Zimmermann, V. (2019), **Business Survey 2019. More and more businesses have firm plans for digitalisation, hurdles also more widely acknowledged**, KfW Research, and Zimmermann, v. (2017): **Business Survey 2017. Digital transformation of industries: broad basis, multiple barriers**, KfW Research.
- <sup>15</sup> Cf. Zimmermann, V. (2018): **Business Survey 2018. Digitalisation is gaining momentum**, KfW Research.
- <sup>16</sup> Cf. Schwartz, M. (2019), **KfW SME Panel 2019. After a record year, dark clouds are gathering – businesses between all-time highs and recession fears**, KfW Research, and Zimmermann, V (2020): **KfW SME Innovation Report 2019. Innovator rate drops to 19%**, KfW Research.
- <sup>17</sup> Cf. Zimmermann, V (2020): **KfW SME Innovation Report 2019. Innovator rate drops to 19%**, KfW Research.
- <sup>18</sup> Cf. Andrews, D. et al (2015), Frontier Firms, Technology Diffusion and Public Policy: Micro Evidence from OECD Countries, OECD Productivity Working Paper no. 2, Andrews, D. et Al. (2016) The best versus the rest: The global productivity slowdown, divergence across firms and the role of public policy, OECD Productivity Working Paper No. 5, or Gal. P. et Al (2019), Digitalisation and productivity: In search of the holy grail - Firm-level empirical evidence from EU countries, OECD Economics Department Working Papers No. 1533.
- <sup>19</sup> Cf. Zimmermann, V. (2019): **Business Survey 2019: More and more businesses have firm plans for digitalisation, hurdles also more widely acknowledged**, KfW Research, and Zimmermann, v. (2017): **Business Survey 2017: Digital transformation of industries: broad basis, multiple barriers**, KfW Research (in German).
- <sup>20</sup> Cf. Arntz, M. (2019), Digitalization and the Future of Work: Macroeconomic Consequences, ZEW Discussion Paper No. 19-024.
- <sup>21</sup> Cf. Zimmermann, V. (2020), **Financing of digitalisation and capital expenditure in SMEs – a comparison**, Focus on Economics No. 280, KfW Research; Zimmermann, V. (2016), **Access to credit varies considerably depending on the purpose**, Focus on Economics No. 148, KfW Research, and Zimmermann, V. (2018): **Business Survey 2018. Digitalisation is gaining momentum**, KfW Research.