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Welcome

Digitalisation is a process of transformation which is changing everyday's life, society and economic activities in a variety of ways. New business models are emerging, work is changing, processes and organizational forms are being redefined. Internet platforms are becoming competitors and rivals. Given the importance of digitalisation, Germany must remain at the forefront of developments. Germany as a business location can only remain successful if the traditional sectors of the economy and above all German medium-sized companies rise to the challenges of digitalisation. This means not only reacting to new developments but also seizing the opportunities to play a leading role in shaping the digital future.

For the first time ever in the Monitoring Report DIGITAL Economy, we have analysed the level of digitalisation in the German economy, split by sectors. On the basis of the current degree of digital business reached, we have then identified key areas for action. 49 index points out of 100 in the DIGITAL Economy Index means that we are still a long way off having a fully digitalised German economy. In the next five years, the DIGITAL Economy Index score will rise to 56 points. This underlines that we need to significantly increase the pace when it comes to the digitalisation of the German economy.

In this study, we have also examined the Digital Economy in Germany and Germany's performance as compared to nine other countries. We need a strong Digital Economy in Germany which develops and provides tailor-made business solutions, services and technologies.



Matthias Machnig,
State Secretary at the Federal Ministry for
Economic Affairs and Energy

Sixth place for the Digital Economy in Germany is not good enough. We must take advantage of the opportunities offered by digitalisation to ensuring our competitiveness and high-quality, professional work. We must ensure a high level of data protection and a reliable consumer protection. Digital transformation, digital innovation and digital supremacy are the cornerstones of sustainable digitalisation.

The extent to which Germany can benefit from the opportunities offered by digitalisation also depend on how we embed digitalisation across society and encourage people to actively shape our changing working and living environments. We need lots of dedicated people who exchange ideas openly and creatively on all levels.

I would like to thank all of the experts who contributed to this successful monitoring study by taking part in workshops, surveys and discussions. I look forward to working with everyone involved from politics, industry, science and society – whether it be during the IT Summit or as part of the “Monitoring Report DIGITAL Economy” project.

Summary of results

49

points in the

DIGITAL Economy Index

6th place in the Global
DIGITAL Performance Index

27 %

of companies generate
> 60 % of their
turnover digitally

5th place for ICT turnover

37 %

very happy with their
current level
of digitalisation

€ 221 billion turnover
generated by the **Digital Economy**

Management Summary

With a score of 53 points out of 100, the German **Digital Economy**, i. e. the information and communications technology (ICT) sector as well as the Internet economy, is in sixth place in the Global DIGITAL Performance Index 2015 which compares ten countries around the world. The average performance of the German Digital Economy is primarily down due to its below-average importance on the world markets (sixth place) and the country's slow pace of digitalisation. Another reason is that the usage of digital products and services by the population, companies and governmental bodies is no more than average around the world (fifth place). In terms of technological and infrastructural framework conditions, the performance of the German Digital Economy is comparatively good (fourth place).

With a turnover of € 221 billion, the German ICT sector is the fifth-largest market after the USA, China, Japan and Great Britain. Accounting for 4.6 percent of commercial value creation in 2014, it ranks above the traditional German mechanical engineering sector and just behind the automotive engineering sector. Its gross value creation amounts to € 93 billion. The turnover of the German Internet economy continues to grow and has now reached € 100 billion. With a per capita turnover of € 1,266, the German Internet economy ranks fifth compared to 9 leading countries around the world.

The outstanding competitive advantages of the Digital Economy in Germany lie in its innovation, market access and the intensive cooperation between the ICT sector and other areas of the economy. Its three main weaknesses are the lack of skilled professionals, the network infrastructure and weaknesses in ICT exports accounting for a small proportion of overall German exports. By 2020, the strengths should be developed further by focusing on three growth areas, namely IT security, mobile computing and transaction services. The second priority is to encourage other promising areas such as cloud services, big data, Industry 4.0, social collaboration, and smart services.

The **digitalisation of the commercial economy** has not progressed very far. In the DIGITAL Economy Index 2015, Germany scored 49 points out of 100 for its level of digitalisation. The index measures the degree of digitalisation in business processes, internal company processes and the level of use of new digital technologies and services. The pace of digitalisation is modest but is expected to reach 56 index points by 2020.

With 51 index points in 2015, service companies are much more digitalised than the processing industry with just 37 index points. By 2020, the level of digitalisation in the processing industry is expected to increase significantly – by 13 points to 50 points. In the same period, the level of digitalisation in the service sector is set to increase moderately – by six points to 57 points. Digitalisation projects need to be carried out more quickly.

The highly digitalised ICT sector remains a pioneer in the digital transformation. Knowledge-intensive service providers as well as the finance and insurance industry are also digitalised to an above-average level. The retail and energy industries show average levels of digitalisation, while the level of digitalisation in transport and logistics, mechanical engineering, other manufacturing, the automotive industry, health care and the chemicals / pharmaceuticals industry is below average.

Companies can significantly boost growth in the digital markets, by increasing the efficiency of internal processes, working procedures and resources, improving innovation and implementing new business models through digitalisation. Digitalisation should be a matter for CEOs, not the IT department. The digital know-how of employees has a significant leverage effect on digitalisation. At the same time, a fully digitalised value chain has a considerable influence over fostering digitalisation. However, such a chain is rarely found because digital sales channels are not available and the linkage between market players need to be improved.

Almost half of companies in the German economy seek help from external service providers for their ICT-supported working procedures and processes, while two thirds obtain digital components for their products or services from external suppliers. However, 78 percent are of the opinion that outsourcing IT services leads to an increasing technical dependency on external providers.

According to companies in the commercial sector, **politicians must take steps** to improve IT security, encourage the development of broadband penetration and increase the pool of skilled personnel. The industry would also like to see state subsidies for digitalisation. It is also calling for the same conditions on the digital markets for all market players.

Digital Economy – Enabler of digitalisation

Summary of results

In the medium and long term, digital progress is a key driver for sustained growth and for our prosperity. However, it is difficult to translate the digital transformation into specific steps from a conceptional, strategic and political point of view. This is where the Monitoring Report DIGITAL Economy 2015 from TNS Infratest and the Center for European Economic Research (CER), Mannheim comes in.

We measure the added value that the Digital Economy, i. e. the ICT sector and the Internet economy, generates for the German economy as whole. On the basis of secondary analysis and an international expert survey, we determine how the German Digital Economy is performing compared to that of other nine countries. We detect the particular strengths and weaknesses of the German Digital Economy.

The Digital Economy paves the way for the digitalisation of the entire economy. On the basis of a representative survey of German companies, we measure how far digital penetration has progressed in different sectors. We identify and assess the critical success factors which influence digitalisation. We also analyse future developments until 2020. The Monitoring Report DIGITAL Economy screens whether digital companies are dependent on external partners or not. Finally, we identify the most important opportunities and challenges when it comes to foster digitalisation. All results have been discussed during an expert workshop.

I The economic importance of the Digital Economy

In 2014, gross value creation within the ICT sector rose again compared to the previous year, reaching almost €93 billion. As a result, the ICT sector contributes 4.6 percent of commercial value creation. This puts the sector ahead of mechanical engineering and closely behind the automotive industry. With a significant increase of around 12 percent compared to the previous year, the ICT sector invested a total of €15.8 billion in 2014. It accounts for 3.2 percent of all investment activity within the commercial sector in Germany. In 2014, the ICT sector generated a turnover of over €221 billion. The sector has therefore recovered from the unexpected slump in the previous year. The key driver is the ICT hardware

sector growing by €6 billion. In 2014, a total of 1,057,213 people worked in the ICT sector. This represents a 2.4 percent increase in the number of employees compared to the previous year and corresponds to 4.3 percent of all people employed in the commercial sector.

In Germany in 2014, a per capita turnover of €1,266 was generated with internet-based goods and services. This means that Germany is in fifth place behind South Korea, Great Britain, the USA and Finland. The German Internet economy generates a total turnover of just under €100 billion.

II The performance of the German Digital Economy in international comparison

German Digital Economy in sixth place in the ten-nation ranking. In the Global DIGITAL Performance Index Germany is in an average sixth place, with 53 index points out of 100.

► **German Digital Economy drops to sixth place after being overtaken by China.** Following an increase of four index points compared to the previous year, Germany managed to pass the 50-point mark but fell back into sixth place owing to China's digital progress. China's Global DIGITAL Performance Index improves by seven to 55 index points. As a result, China has jumped from seventh to fourth place, overtaking Germany, and is now in joint fourth place with Japan.

► **USA, South Korea and Great Britain remain at the top.** With 80 index points, the USA is the clear leader, well ahead of South Korea with 66 points and Great Britain with 57 points.

► **These four countries are closely followed by Germany and Finland. No changes in position for the countries at the bottom of the list.** Finland is in seventh place, improving two points to reach 52 index points. This means a drop of two places because China and Germany have moved ahead of Finland. As in the previous year, the last places were taken by France with 48 points, Spain with 41 points and India with 31 points.

Market, infrastructure, usage: the three cornerstones of the Digital Economy. The progress made by the Digital Economy is measured in three pillars: the position on the world markets, infrastructural framework conditions and the use of digital technologies and services. The main results for these key areas are as follows:

► **German Digital Economy with below-average performance on the world markets – sixth place.** Key market factors here are turnover, demand and exports on world markets. With 36 index points, Germany finished in sixth place in the “Global DIGITAL Performance Index – Market”. The USA was the clear leader with 78 points, followed by South Korea with 56 points, China with 51 points, Japan with 42 points and Great Britain with 40 points.

The “Global DIGITAL Performance Index – Market” clearly shows the extent to which the USA dominates the world markets of the Digital Economy. It shows where Germany most urgently needs to catch up: the proportion of ICT exports (last place), TC expenditure as a share of GDP (eighth place), the ICT sector’s gross value creation and spendings on online content (seventh place in each case). It is not possible to identify a particular strength in the market performance. After all, Germany does not finish higher than fifth place in the digital market ranking for any of the indicators.

► **Above-average performance for basic framework conditions – fourth place.** When it comes to the basic technological, legal and infrastructural framework conditions, Germany scored 79 index points, placing it in fourth place. South Korea was in first place with 82 points, ahead of France and Great Britain in joint second place, each with 81 points. Finland and Germany

were in joint fourth place. In the “Global DIGITAL Performance Index – Infrastructure”, the USA was in sixth place with 77 points, followed by Japan with 74 points, Spain with 66 points, China with 50 points and India with 27 points.

The German Digital Economy has a great deal of catching up to do when it comes to the use of new technologies such as smartphones (seventh place) and tablets (eighth place). The most obvious weakness is the lack of suitable ICT skilled personnel (last place). The most obvious strength of the German Digital Economy is its innovation. Out of all 48 factors analysed, this is the single one where Germany is the leader. The “linkages between the ICT sector and other sectors” can be regarded as a particular strength of the German Digital Economy (third place).

► **Average performance for the use of digital technologies, products and services – fifth place.** In the last chapter, the willingness of citizens, companies and public governmental bodies to use new technologies and services is measured. With 76 index points, Germany is in fifth place. The USA is the leader with 88 points, ahead of Great Britain with 85 points, South Korea with 80 points and Finland with 77 points. Japan with 74 points, France and Spain with 72 points each, China with 70 points and India with 57 points are at the bottom of the ranking.

The German Digital Economy needs to catch up when it comes to mobile Internet use, the use of social networks, e-learning services and e-government services (eighth place for all indicators mentioned). Germany’s best position was reached for the number of music downloads (third place).

The strengths and weaknesses of Germany's digital economy. In an international survey of highly qualified ICT experts from the ten countries, these results were looked at in more detail.

The strengths of the digital Germany economy are as follows:

1. By far the most obvious **strength is its innovation**. Germany is followed by Finland and Spain.
2. **Market access**, i. e. the ability to sell products and services nationally and internationally, is regarded as a particular advantage of Germany. India ranks even higher. Japan and the USA are virtually level with Germany.
3. Germany ranks third when it comes to the **linkages between the ICT sector and traditional sectors** of the economy. Only Finland and Japan do better than Germany here.
4. The basic technological, **legal and infrastructural framework conditions** are a clear competitive advantage for Germany. However, Finland and Great Britain are well ahead of Germany. The basic legal conditions in Spain and Japan are as good as those in Germany.
5. Moderate advantages of the German Digital Economy are **"time to market"**, i. e. the time needed to get ideas onto the market (South Korea leads here ahead of the USA and Spain), the **development of new fields of business** (Great Britain and China are the leading locations here) and the basic **framework conditions for investments** (China, South Korea, Great Britain and India do particularly well here).

The weaknesses of the German digital economy are as follows:

1. By far the most obvious weakness is its **lack of specialist professionals**. The situation is equally severe in China and the USA. Finland does best in this area.
2. **Network infrastructure** is a particular weakness of the German Digital Economy. Great Britain and, to a lesser extent, Spain, India and the USA are in a similar position. Regarding network infrastructure, Japan performs best.
3. Those surveyed were critical of Germans ability to influence relevant developments on the global markets. The same applies to Finland and France. India is the leader in **market power**, ahead of China.
4. Germany is weak in respect to **growth in the ICT sector** (the top countries are China, the USA and Great Britain), the **level of demand** (the top ranking locations are China, India, the USA and Spain) and **growth in the number of start-ups** (top ranking nations are China and Finland).

Building on strengths and reducing weaknesses. According to German experts, top growth areas until 2020 are: IT security with 63 percent, mobile computing with 54 percent and transaction services on the Internet with 52 percent. Promising emerging areas with between 40 and 50 percent of the votes are: cloud services and big data, each with 50 percent, Industry 4.0 with 44 percent, social collaboration with 42 percent and smart services with 40 percent. "Hidden champions" with less than 40 percent of the votes are embedded systems with 39 percent, 3D printing with 37 percent and e-health / telemedicine with 35 percent.

III The level of digitalisation of the German economy in 2015 and 2020

Digitalisation not yet advanced. In the “DIGITAL Economy Index”, the index for digital readiness of the economy, Germany scored 49 index points out of 100 in 2015. This means that digitalisation is not yet advanced in Germany. According to the companies surveyed, Germany should score 56 points in five years’ time.

The level of digitalisation is increasing, albeit slowly. With just 37 index points, the processing industry is underdeveloped from a digital point of view. However, its level of digitalisation will increase significantly to 50 points by 2020. In 2015, the service sector will score 51 points. This means that it is much more digitalised than the processing industry. By 2020, its level of digitalisation will improve to 57 points.

In most of the industry sectors observed, digitalisation is not really getting up to speed. The sectors observed differ considerably in terms of their levels of digitalisation and the pace of digitalisation:

- ▶ The ICT sector is the single sector of the economy with a level of digitalisation which is well above average. It remains a pioneer when it comes to the digital transformation (2015: 66 points, 2020: 71 points). This means that business procedures, internal company processes and the level of use of digital technologies are well advanced when compared to other sectors.
- ▶ Today, the knowledge-intensive service providers are digitalised to an above-average level and will remain so in the future (2015: 59 points, 2020: 62 points). The same applies to the finance and insurance service providers (2015: 59 points, 2020: 62 points).
- ▶ Sectors with average levels of digitalisation are retail (2015: 50 points, 2020: 56 points) as well as the energy and water supply industry (2015: 47 points, 2020: 56 points).

Unlike in the sectors with comparatively high levels of digitalisation, there will be significant changes in the levels of digitalisation in the sectors that are less digitalised.

- ▶ Transport and logistics remain sectors with a below-average level of digitalisation (2015: 40 points, 2020: 49 points). The same applies currently to mechanical engineering (2015: 39 points). However, from 2020 onwards (51 points) this sector will show average levels of digitalisation. The chemicals and pharmaceuticals industry is a sector with a low level of digitalisation (2015: 40 points).
- ▶ The level of digitalisation in the health care sector remains very low (2015: 36 points, 2020: 44 points). The automotive industry with 37 points will improve in 2020 to 48 points, showing an average level of digitalisation. Other manufacturing with 36 points currently have a level of digitalisation which is well below average. In 2020, it will score 50 points and will move two categories to an average level of digitalisation. In contrast, the chemicals and pharmaceutical industry will only score 46 points in 2020.

The speed of digitalisation needs to be increased. This study focuses on three pillars. Higher levels of digitalisation and a faster pace of digitalisation can be achieved by:

1. Increasing the digitalisation of existing markets or by introducing new business models;
2. Adapting internal company processes, resources and infrastructures to digitalisation;
3. Making greater use of digital devices, services and infrastructures.

Influence of digitalisation on business success. 80 percent of companies in the commercial sector regard digitalisation as “important”. 88 percent are already “satisfied” with the level of digitalisation attained. However, only 27 percent of products and services in the commercial sector are generated on a predominantly digital basis. In addition, only 25 percent of companies surveyed believe that digitalisation currently plays a highly significant role in their business success.

The index score for the overall digital business activity of companies in the commercial sector is 46 points. The service sector scored 48 points. This figure is much higher than in the processing industry reaching a score of just 35 points.

What can be done to increase the proportion of business activities carried out digitally by 2020? The “Digital Roadmap” prioritizes success factors according to their influence over digitalisation progress. As a matter of priority, companies in the commercial sector should:

1. Concentrate on increasing the efficiency of internal processes, working procedures and resources,
 2. Focus on improving their level of innovation by digitalizing processes and applications.
- Other important factors are:
3. Building on competitive advantages and
 4. Improving the quality of products and services by digitalisation.

Digitalisation of internal processes. 34 percent of companies in the commercial sector have digitalised internal processes or digital value chains by 60 percent or more. Digitalisation is a central part of the company strategy for 64 percent of companies. By 2020, this figure is expected to rise to 67 percent. By 2020, 37 percent of companies in the commercial sector will invest more than ten percent of their overall turnover in digitalisation. In 2015, this figure was 25 percent, only. In 2020, six percent of companies will not carry out any digitalisation projects (2015: ten percent). According to experts interviewed, digitalisation should be a matter for CEOs, not necessarily for the IT department. The index for internal digital company conditions reached 37 points in 2015. While the service sector scored 38 points, the processing industry reached just 29 index points.

What can be done to improve basic conditions that encourage digitalisation by 2020? Employees’ digital know-how is the critical success factor. The more experienced employees are when it comes to digital issues,

the better the progress in digitalisation will be. A fully digitalised value creation chain has considerable influence on internal company digitalisation processes. However, there is a lack of implementation because digital information and sales channels are not used widely, and the links between market players need to be improved. Politicians could offer support here.

The use of digital devices and infrastructures for business purposes is growing. In contrast, the use of digital services is only just beginning. In 77 percent of companies in the commercial sector, more than 75 percent of permanent employees use digital devices. In 69 percent of companies, 75 percent or more of the employees use digital infrastructures. However, 49 percent of companies in the commercial sector do not use any digital services. A score of 65 points was achieved in the digital usage index in 2015. While the processing industry scored 48 points, the service sector reached 68 points.

What can be done to increase the use of digital devices, infrastructures and services by 2020? According to the “Digital Roadmap”, companies in the commercial sector should invest predominantly in developing their digital information channels. This will change their future range of products and services and the way they deal with changing customer demand. The usage of “digital services” which is below-average should be significantly encouraged.

There is a great deal of catching up to do in all three key areas. Companies in the commercial sector have particularly to catch up with their internal digital company conditions.

IV Make or buy – competitiveness or technical dependency?

Almost half of companies in the German commercial sector seek help from external service providers for their ICT-supported working procedures and processes. Two thirds obtain digital components for their products of services from external suppliers. The companies predominantly use domestic service providers here. Around a third of companies regard paid Internet services such as online advertising or cloud services as important for their business activities. However, 78 percent of companies are of the opinion that outsourcing IT services leads to an increasing technical dependency on external providers. Indeed, 64 percent of companies believe that data security could be jeopardised. However, there are benefits – increased quality and a reduction in the burden on resources.

V The challenges of digitalisation

Companies in the commercial sector see the following as the main challenges for politicians:

1. IT security (92 percent)
2. Encouraging the development of broadband (90 percent)
3. Encouraging the training of specialist personnel (78 percent) and data protection (78 percent)

Other factors mentioned by fewer companies were state subsidies (70 percent), the state funding of internal company digitalisation projects (54 percent) and the development of the digital EU domestic market (62 percent).

Only 42 percent of the German IT professionals questioned as part of the international ICT expert survey said that politics and private households are drivers of digitalisation. According to the experts, three groups in particular are encouraging sector developments: global players (67 percent), applications (66 percent) and research and development (62 percent).

The preliminary results of the Monitoring Report DIGITAL Economy were discussed with renowned representatives of industry in September 2015. Other key demands levelled at politicians were the creation of equal market conditions for all players and the support of partnerships between top players.

VI Outlook

This DIGITAL Economy Report which TNS Infratest and the Center for European Economic Research (CER) published in 2015 for the first time shows that the Digital Economy and the digitalisation of the economy are closely linked. Suitable promotion of the Digital Economy has positive effects on all sectors.

We identified specific starting points for encouraging digital productivity, competitiveness and growth. Industry, science, research, politics and society must all tackle digital policy as a central, shared task.

On occasion of the National IT Summit on 18 / 19 November 2015 in Berlin, digitalisation profiles for each sector of the economy and a special assessment of medium-sized companies will be provided on the websites of the Federal Ministry for Economic Affairs and Energy, TNS Infratest and the CER will report on results in detail at monthly intervals.

We would like to thank all experts who took part in workshops and all employees of German companies who participated in our survey. If you would like to find out what progress your company has made on the path to digitalisation, please let us know. You would be welcome to take part in the survey next year and will receive the digitalisation index of your company – calculated by us for you on an exclusive basis.

We look forward to working with you in the future.



S. Graumann

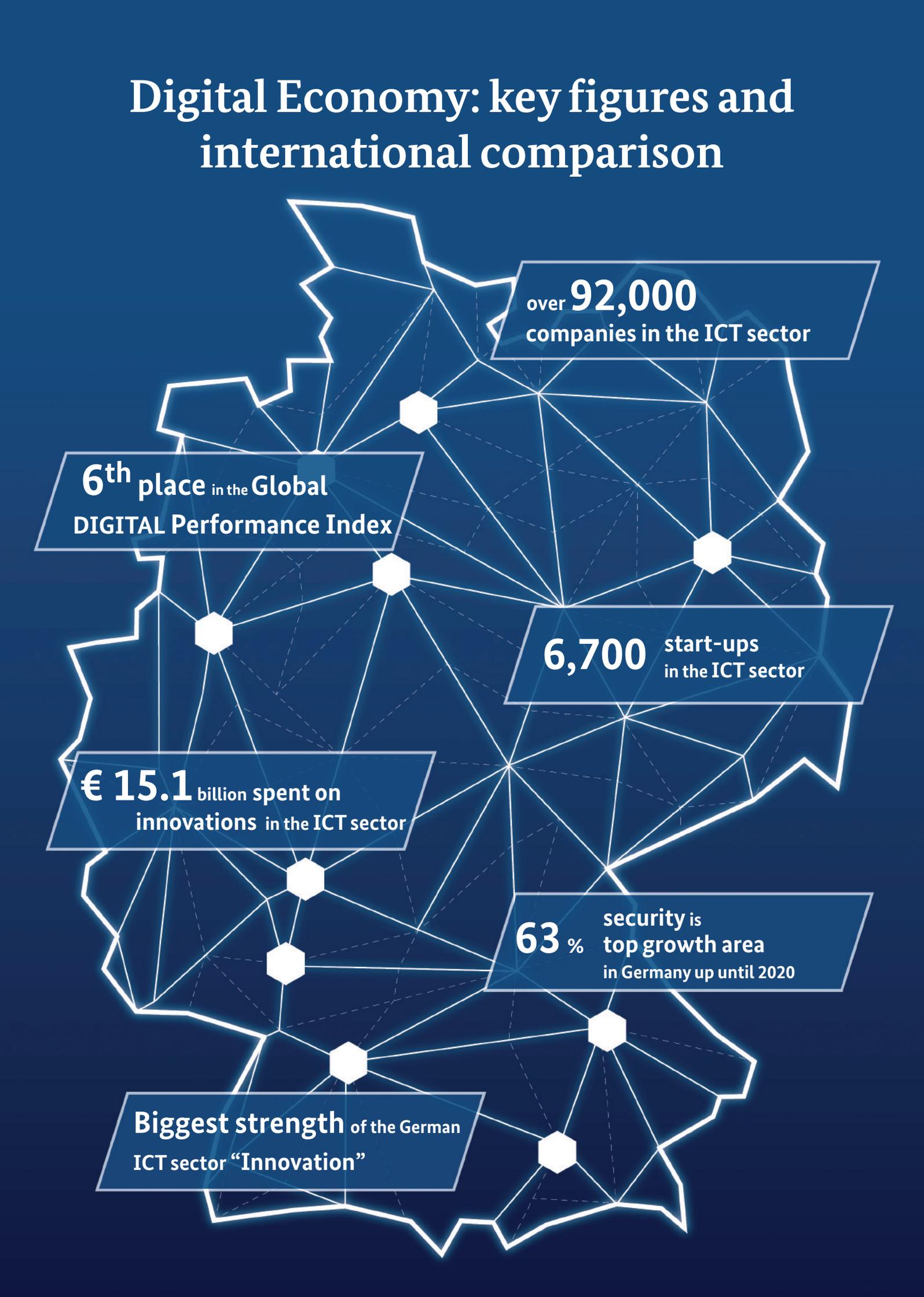
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Digital Economy: key figures and international comparison



over **92,000**
companies in the ICT sector

6th place in the Global
DIGITAL Performance Index

6,700 start-ups
in the ICT sector

€ 15.1 billion spent on
innovations in the ICT sector

63 % security is
top growth area
in Germany up until 2020

Biggest strength of the German
ICT sector "Innovation"

Digital Economy

Summary

Added value of the Digital Economy – innovations – ICT start-ups

The Digital Economy, i. e. the ICT sector and the Internet economy, are central drivers paving the way for the digital transformation. In the first part of this chapter, we analyse the contribution of the Digital Economy to the commercial economy. In particular, we focus on the innovation activities and start-ups that are driven by the ICT sector.

With over 92,000 companies and more than a million employees, the ICT sector creates significant **added value** for the German economy. Contributing 4.6 percent of commercial gross value creation, it is ahead of mechanical engineering. With investments of € 15.8 billion and a 3.2 percent share, it makes a significant contribution towards the long-term growth of the German economy. In 2014, the per capita **turnover of the Internet economy** was € 1,266. This means that Germany is in fifth place behind South Korea, Great Britain, the USA and Finland.

In the German ICT sector, the **innovation quota**, i. e. the proportion of companies that have introduced at least one new product or process within a three-year period, was 74 percent in 2013. In 2013, the ICT sector in Germany spent € 15.1 billion on innovations. This represents an increase of 13 percent compared to the previous year.

In 2014, the **number of start-ups** in the ICT sector in Germany remained almost constant. After four years of declining start-up figures, the downward trend has thus come to an end. Start-up figures in the ICT hardware sector have risen for the second year in succession.

Global DIGITAL Performance Index: the performance of the German Digital Economy compared to that of other nations

In the second part of the study, we analyse the importance of the German Digital Economy on the basis of a ten-nation ranking. In the **Global DIGITAL Performance Index 2015**, Germany is in sixth place with 53 points. With 80 index points, the USA remains the leader, ahead of South Korea and Great Britain. Given the significant progress of the Chinese Digital Economy (55 points), it has moved up from seventh to fourth place.

The measurement of the Digital Economy is based on three pillars: the position on the markets, the infrastructural conditions and the level of use of digital technologies and services. The development of the markets demonstrate the extent to which the USA dominates. While the USA scored 78 index points, Germany achieved a score of just 36 points and, with its below-average performance, is in sixth place in the **Global DIGITAL Performance Index – Market**. In contrast, the German Digital Economy does well when it comes to infrastructural and technological conditions. With 79 index points here, it is in fourth place in the **Global DIGITAL Performance Index – Infrastructure**. The performance of the **Global DIGITAL Performance Index – Usage** is average. With 76 index points, Germany only manages fifth place.

The Global DIGITAL Performance Index 2015 was enhanced by an **international ICT expert survey** carried out by TNS Infratest. According to the survey, by far the most obvious strengths of the German digital economy are “innovation”, “market access” and the “existing links between the ICT sector and other areas of the economy”. By far the biggest weaknesses are the “availability of specialist personnel”, the “telecommunications network infrastructure” and “ICT exports as a proportion of all German exports”. Germany is weak in influencing global digital world markets. Germany needs to concentrate on the top three growth areas up until 2020: IT security, mobile computing and transaction services.

The added value of the Digital Economy in Germany

€ **93** billion gross value creation
in the ICT sector

over **1,050,000**
employees in the ICT sector

turnover in the
€ **221** billion ICT sector

investments
€ **15.8** billion in the ICT sector

over **92,000**
companies in the ICT sector

over € **100** billion turnover
generated by the Internet economy

The added value of the Digital Economy

The digital economy, i. e. the ICT sector and the Internet economy, are central drivers for the digital transformation.

ICT sector, automotive and mechanical engineering show same value creation

In 2014, gross value creation within the ICT sector rose again compared to the previous year, reaching almost € 93 billion. As a result, the ICT sector contributes 4.6 percent of commercial value creation. The ICT sector is ahead of mechanical engineering and just behind the automotive industry.

ICT sector invests € 15.8 billion

With a significant increase of around 12 percent compared to the previous year, the ICT sector invested € 15.8 billion in 2014. This means that it accounts for 3.2 percent of all investment activity within the commercial sector in Germany. The ICT service providers account for 86 percent of all investments in the ICT sector – considerably more than the ICT hardware companies.

ICT sector turnover benefits from upturn in hardware

In 2014, the ICT sector generated a turnover of over € 221 billion. The sector has therefore recovered from the unexpected slump in the previous year, regaining almost € 7 billion. With a turnover of more than € 132 billion and accounting for 2.2 percent of all commercial turnovers, the ICT service providers only managed to increase turnover by € 1.3 billion. In contrast, turnover in the hardware sector rose by € 6 billion, thus driving turnover growth throughout the ICT sector in 2014.

Service providers account for three quarters of jobs in the ICT sector

In 2014, a total of 1,057,213 people worked in the ICT sector. This represents a 2.4 percent increase in the number of employees and corresponds to 4.3 percent of all people employed in the commercial sector. In absolute terms, this means that the employment volume in the ICT sector grew by over 24,000 jobs from 2013 to 2014. When compared to other sectors, the ICT sector is positioned between mechanical engineering and automotive engineering.

Turnover and employment levels expected to increase between now and 2017

74 percent of the experts surveyed by TNS Infratest believe that the German ICT revenues will increase until 2017, while 20 percent believe that they will stagnate. Only six percent expect turnover to fall. 59 percent of the German experts predict that employment in the ICT sector will increase until 2017, while 34 percent expect it to stagnate. Seven percent expect the number of employees to fall.

German Internet economy turnover average compared to other countries

In Germany in 2014, a per capita turnover of € 1,266 was generated with internet-based goods and services. This means that Germany is in fifth place behind South Korea, Great Britain, the USA and Finland. The German Internet economy generates a total turnover of just over €100 billion. One reason for this increase compared to the previous year is the improved foreign trade balance: the import surplus has fallen considerably since 2012.



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Innovations and start-ups in the ICT sector

26.7% of turnover with new products in the ICT sector

The infographic features a dark blue background with a white, glowing network of interconnected nodes and lines. Six callout boxes, each with a white border and a dark blue background, are placed at various points within the network. Each box contains a statistic about the ICT sector's innovation and start-up performance. The statistics are: 26.7% of turnover with new products, 74.2% innovation quota, 10.5% of all spendings on innovations within the ICT sector, 6.9% start-up rate, €15.1 billion spent on innovations, and 4.5% of turnover with new brands.

4.5% of turnover with new brands in the ICT sector

74.2% innovation quota in the ICT sector

€15.1 billion spent on innovations in the ICT sector

10.5% of all spendings on innovations is within the ICT sector

6.9% start-up rate in the ICT sector

Innovations and start-ups in the ICT sector

Three quarters of companies in the ICT sector are innovators

In the German ICT sector, the innovation quota, i. e. the proportion of companies that have introduced at least one new product or process within a three-year period, was 74 percent in 2013. When compared to other sectors, this is the second-highest figure. However, it is two percentage points below the value for the previous year. This fall is in line with the overall trend throughout the economy. There was a significant decline in the innovation quota in the ICT hardware sector (from 80 to 68 percent), while the figure for the ICT service providers fell only slightly (from 76 to 75 percent). Nevertheless, the level of innovation among ICT companies remains very high compared to other sectors. Among comparable sectors, only the chemicals and pharmaceuticals industry has a slightly higher value with 76 percent.

Around € 15 billion spent on innovations in the ICT sector

In 2013, the ICT sector in Germany spent € 15.1 billion on innovations. This represents an increase of 13 percent. In 2013, the ICT sector accounted for 10.5 of all spending on innovations throughout the German economy. ICT service providers account for the largest part of the innovation budget (€ 11.55 billion). With a 15 percent rise in expenditure, they increased their spending on innovations disproportionately.

Compared to other sectors, the ICT hardware sector accounts for a large proportion of spending on research and development (R&D) in relation to overall spending on innovations (2013: 66 percent). Among comparable sectors, only the chemicals and pharmaceuticals indus-

try accounts for a larger proportion of spending (69 percent). The figure for mechanical engineering and automotive engineering is slightly below that for ICT hardware. Among ICT service providers, the proportion of spending on R&D in relation to overall spendings on innovation is 45 percent. This is a fairly low figure which lies below the knowledge-intensive service providers (51 percent). In the ICT sector as a whole, research and development accounted for exactly half of spending on innovations in 2013.

Start-up level in the ICT sector continues to fall

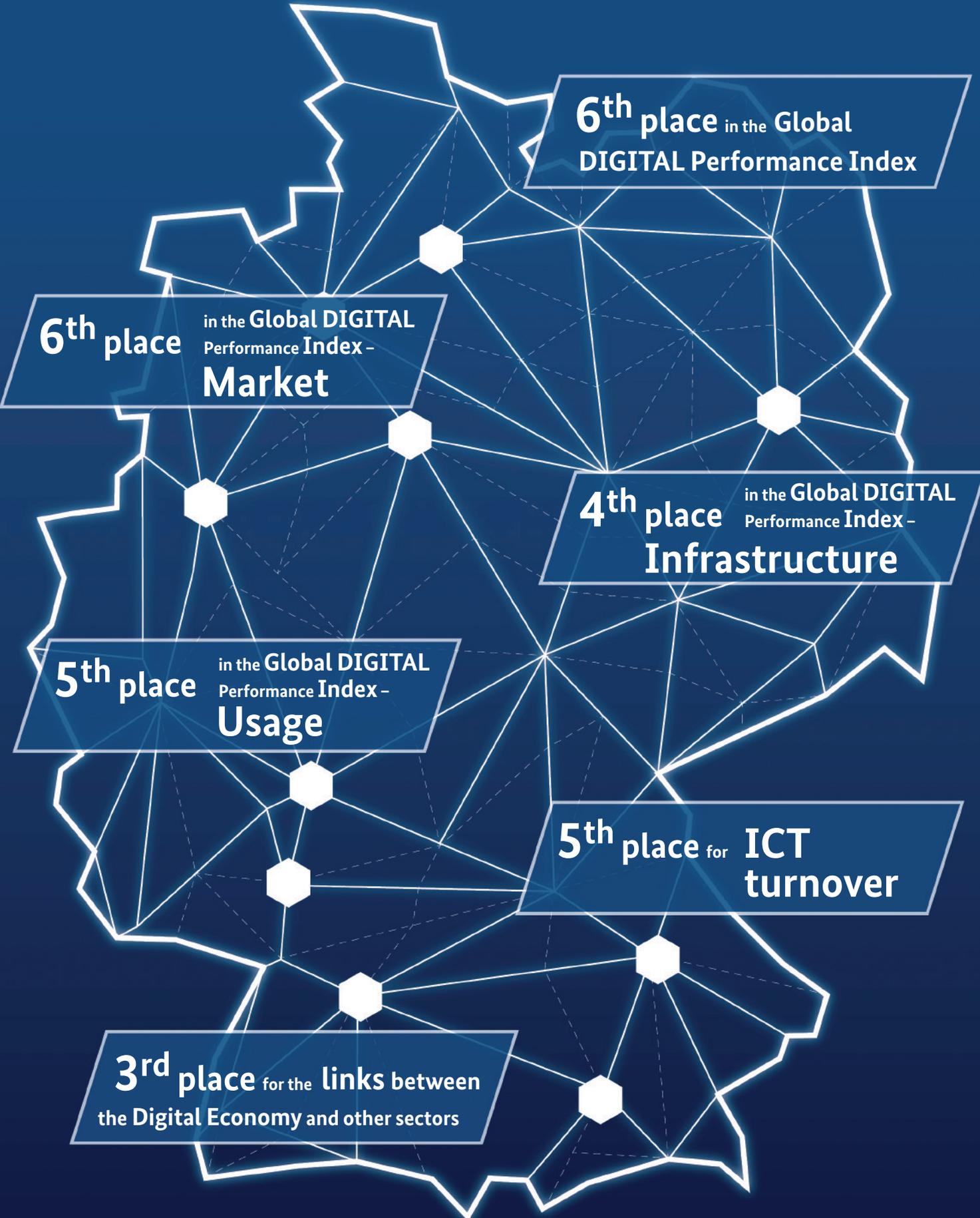
In 2014, the number of start-ups in the ICT sector in Germany remained almost constant. After four years of declining start-up numbers, the downward trend has thus come to an end. Particularly start-ups in the ICT hardware sector continued to rise for the second year in succession. Nevertheless, the number of new start-ups was just under 6,700 – the lowest figure since 2002.

Start-up rate well above average

In relation to the number of existing companies, start-ups reach a penetration of 6.9 percent. This rate is higher than in virtually all the other sectors compared. Only the energy and water supply industry has a higher start-up rate (7.8 percent).

Within the ICT sector, the start-up rate is particularly high among the ICT service providers. The start-up rate here was 7.1 percent – almost three percentage points higher than in the ICT hardware sector. In relation to the number of existing companies, considerably more ICT service provider companies are set up than in the other comparable segments of the service sector.

Global DIGITAL Performance Index



Global DIGITAL Performance Index

Market, infrastructure, usage – Germany in sixth place

The success of the Digital Economy, i. e. the ICT sector and the Internet economy, is based on three pillars: the strengths of the market, the framework conditions and the use of technologies and applications.

In order to compare the performance of different countries, we analyse the **market strength**, i. e. supply and demand, turnover and exports. Furthermore, the **technical infrastructures and basic economic conditions** play an essential role in a well-functioning Digital Economy. The **use of digital technologies, products and services** is crucial when it comes to digital transformation. Only well-informed users with an affinity for technology will enable the market to develop further. Investments will only be worthwhile if there are enough users who are willing to profit from technological innovations.

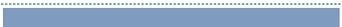
In this report, the performance of the ten most important digital nations is analysed using 48 key performance indicators. A secondary analysis and an international ICT expert survey were carried out by TNS Infratest in ten countries. Furthermore, proprietary survey data from the Center for European Economic Research (CER) and TNS Infratest was used. In order to allow international comparisons, the best location in the ten-nation ranking is given 100 index points. The other nations are then positioned in relation to the best in each class. This results in country rankings.

Global DIGITAL Performance Index – Germany in sixth place in the ten-nation ranking

In the Global DIGITAL Performance Index, Germany is in sixth place, with 53 index points out of 100. Although Germany managed to improve by four index points to pass the 50-point mark, its overall performance remains mediocre.

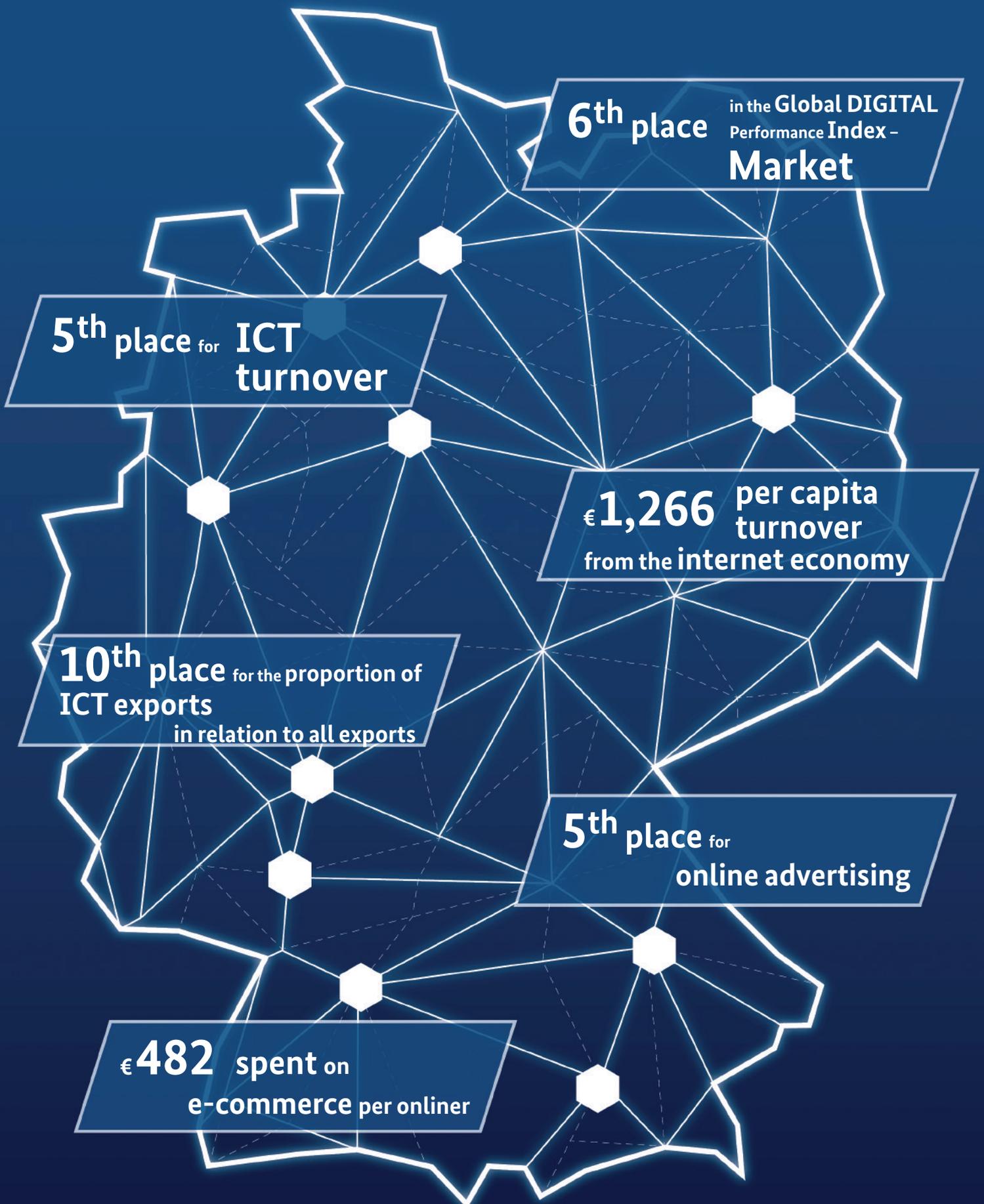
The biggest improvement was seen in China. The performance of its Digital Economy improved by seven index points. As a result, China has jumped from seventh place in the previous year to fourth place and has caught up with Japan in fourth place. After two fourth places in the ranking, Germany can only manage **sixth place**. With 52 points, Finland is closely behind Germany in seventh place. The USA dominate the Digital Economy world markets as a clear leader. With an improvement in the index of three points, the USA achieved 80 points out of 100. South Korea is in second place with 66 index points – no changes as compared to the previous year. Although it has dropped one point to 57 index points, Great Britain follows in third place. As in the previous year, the last three places were taken by France, Spain and India.

Global DIGITAL Performance Index

1.	(1.)	USA		80	(77)
2.	(2.)	South Korea		66	(66)
3.	(3.)	United Kingdom		57	(58)
4.	(7.)	China		55	(48)
4.	(4.)	Japan		55	(53)
6.	(6.)	Germany		53	(49)
7.	(5.)	Finland		52	(50)
8.	(8.)	France		48	(47)
9.	(9.)	Spain		41	(39)
10.	(10.)	India		31	(33)

Source: TNS Infratest, 2015; as at 2014, previous year's values in brackets

Global DIGITAL Performance Index – Market



Global DIGITAL Performance Index – Market

Germany below average in sixth place

In order to assess the global performance in the digital markets, the supply and demand of digital markets, turnover developments and exports were analysed. The results for the 17 factors observed in this area are as follows:

China's importance on world markets increased significantly

The USA is the clear leader in the global digital market assessment. With 78 points out of 100, the country's score has improved by four index points compared to the previous year. South Korea is in second place with 56 index points, followed by China with 51 points. The biggest improvement – ten index points and one place in the ranking – can be seen here.

Germany below average in sixth place

In spite of improving five points to reach 36 index points, Germany remains in sixth place. Germany's performance is below average. Eight fifth places, five sixth places, two seventh places, one eighth place and one last place for the 17 indicators observed in the market assessment show that the German Digital Economy needs to catch up significantly.

Fifth place for the performance of the ICT and Internet economy

Although Germany has increased "turnover growth in the areas of telecommunications and information

technology", Great Britain has overtaken Germany when it comes to the shares of global ICT turnover. It has pushed Germany into fifth place behind the USA, Japan, Great Britain and China. When it comes to the "shares of IT and TC turnover on the world market" and "IT and TC turnover growth", Germany is in fifth place in each case. The same applies to "per capita Internet economy spendings". This is also valid for the shares of "Internet advertising turnover on the advertising market", "e-commerce spendings per Internet user" and "per capita ICT spendings".

Below-average scores, particularly for the importance of ICT to the economy

Germany's performance is below average when it comes to a number of indicators. These are "production value in the ICT sector" (sixth place), "gross fixed capital investments" (sixth place), "IT spendings in relation to GDP" (sixth place), "gross value creation in the ICT sector" (seventh place) and "TC spendings in relation to GDP" (eighth place). The same applies to the "shares of turnover with Internet connections in relation to TC turnover", "employees in the ICT sector" (sixth place in each case) and "spendings on online content" (seventh place).

Share of ICT exports a clear weakness in Germany

Regarding the "share of ICT goods and ICT services exported in relation to all exports", Germany is in last place.

Global DIGITAL Performance Index – Market

1.	(1.)	USA		78	(74)
2.	(2.)	South Korea		56	(55)
3.	(4.)	China		51	(41)
4.	(5.)	Japan		42	(40)
5.	(3.)	United Kingdom		40	(42)
6.	(6.)	Germany		36	(31)
7.	(6.)	Finland		35	(31)
8.	(8.)	France		29	(28)
9.	(9.)	India		23	(27)
9.	(10.)	Spain		23	(20)

Source: TNS Infratest, 2015; as at 2014, previous year's values in brackets

Global DIGITAL Performance Index – Infrastructure

4th place in the Global DIGITAL
Performance Index –
Infrastructure

1st place for **innovation**

89.5% internet penetration
in households

90.6% computers
in households

120.4%
mobile phone penetration

10th place for availability
of specialist personnel

Global DIGITAL Performance Index – Infrastructure

Germany in a good fourth place

The infrastructural analysis looks at the basic technical and industrial conditions and frameworks. The results for the 17 factors observed are as follows:

South Korea leader – Germany in fourth place with good performance

South Korea leads the ten-nation ranking with 82 index points out of 100. Great Britain and France are in joint second place with 81 index points each. Regarding the framework conditions, Germany moved up a place (improvement of two index points) and is thus in joint **fourth place** with Finland (79 index points each). With 77 index points, the USA only achieved sixth place. The growth markets China (50 points) and India (27 points) were last in the ranking.

Germany leader for innovation

Out of all the factors observed, Germany performs best when it comes to “innovation”. The international ICT expert survey carried out by TNS Infratest shows that Germany is ahead of Finland, Spain, France and the USA. When it comes to “links of the ICT sector with other traditional sectors” Germany achieved third place. Finland and Japan are ahead of Germany. Germany is in a good third place when it comes to “Internet access in households”, the “penetration of mobile phone contracts”, “investment security when developing the TC network infrastructure” and the “quality of mathematical and scientific teaching”.

Average performance for three factors

Germany’s performance is good to average when it comes to the “penetration of broadband connections” (fourth place), the “proportion of ICT start-ups in relation to all start-ups” (fourth place) and the “quality of basic tax conditions” (fifth place).

Room for improvement regarding the penetration of end devices for Internet use

Although Germany achieved a good second place when it comes to the “penetration of desktops”, Germany has to catch up regarding the penetration of new hardware. For example, Germany performed poor when it comes to the “penetration of smartphones” (seventh place) and the “penetration of tablets” (eighth place). This is also valid for the “availability of venture capital” (sixth place), the “quality of basic regulatory conditions” (sixth place) and the “share of ICT patent applications in relation to all patent applications” (eighth place).

Availability of specialist personnel – the biggest weakness in Germany – last place

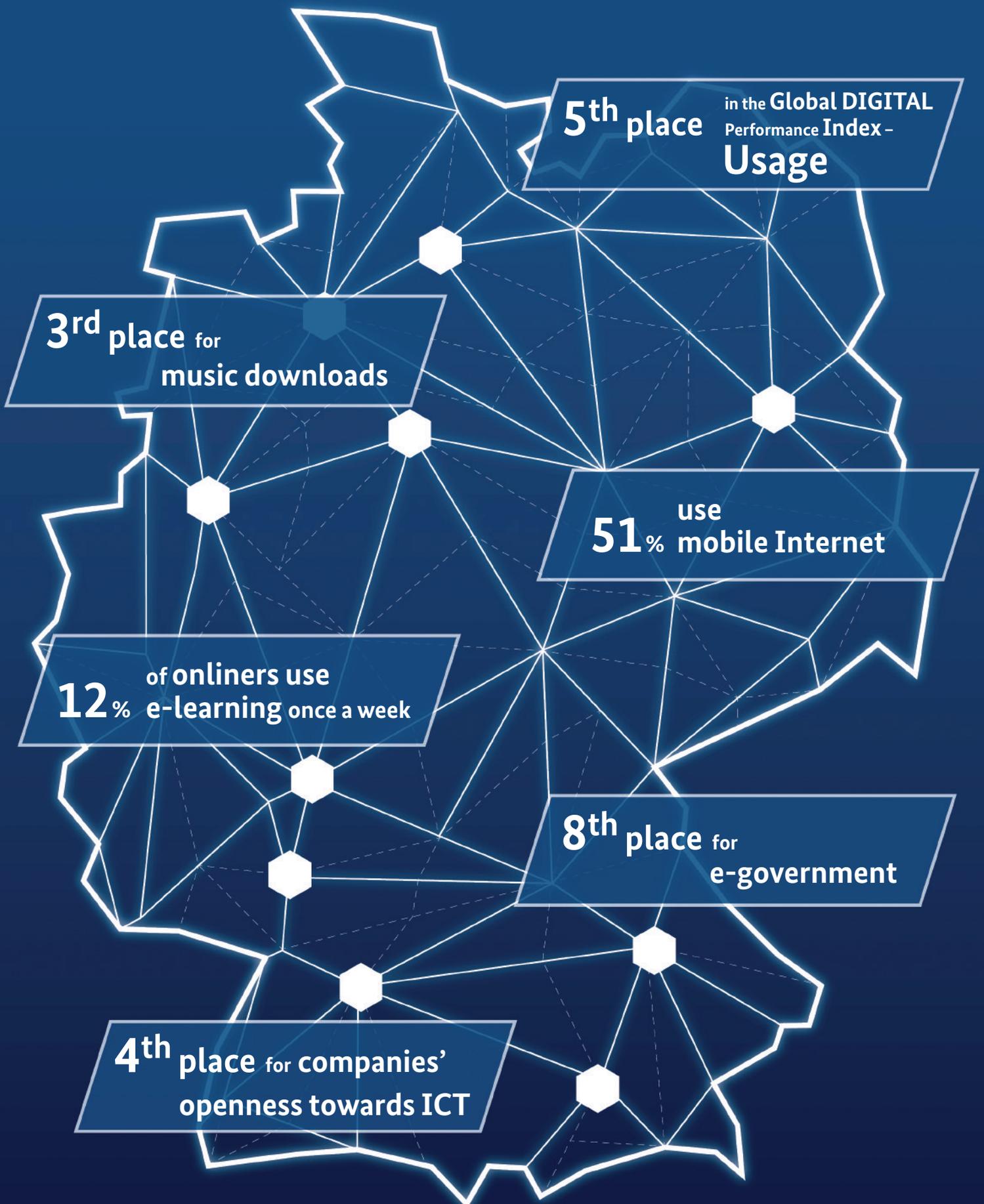
In the strengths and weaknesses analysis of the international ICT expert survey carried out by TNS Infratest, Germany was in tenth place, i. e. last, when it comes to the “availability of specialist personnel”. The experts regard Germany’s (imminent) lack of ICT professionals as a particular weakness.

Global DIGITAL Performance Index – Infrastructure

1.	(1.)	South Korea	82	(83)
2.	(3.)	France	81	(80)
2.	(2.)	United Kingdom	81	(81)
4.	(5.)	Germany	79	(77)
4.	(3.)	Finland	79	(80)
6.	(6.)	USA	77	(76)
7.	(7.)	Japan	74	(72)
8.	(8.)	Spain	66	(66)
9.	(9.)	China	50	(49)
10.	(10.)	India	27	(26)

Source: TNS Infratest, 2015; as at 2014, previous year's values in brackets

Global DIGITAL Performance Index – Usage



Global DIGITAL Performance Index – Usage

Germany in an average fifth place

In this chapter, we analyse the use of new technologies and services by citizens, companies and public administrative bodies. The results for the 14 factors observed in this area are as follows:

USA leader, Germany in fifth place with an average performance

The USA leads regarding the usage of new technology and services with 88 index points out of 100. Great Britain is in second place (85 points) and South Korea is in third place (80 points). These countries improved their performance slightly. Compared to the previous year, Germany dropped down a rank to fifth place. Germany's performance remains at 76 points. In contrast, Finland which was in joint fourth place with Germany in the previous year improved by one index point to reach 77 points and thus remained in fourth place. Germany is followed by Japan with 74 index points. France and Spain are in joint seventh place, each with 72 points. The growth markets China (70 points) and India (57 points) were last in the ranking.

Germany mainly average when it comes to private use

Overall, the use of new technologies and applications for private purposes is average only. Germany's best performance is third place for the "number of music downloads per Internet user". However, Germany only scored 36 index points here. The clear leader is the USA (100 points), followed by Great Britain (69 points).

In none of the other factors observed are the top three countries so far apart as they are for music downloads. Germany is in fourth place for "B2C e-commerce usage". Germany achieved also a good fourth place for both "companies' openness towards digitalisation" and the "use of new technologies and applications in companies". When it comes to the "downloading of apps", Germany was in fifth place, as it was for "Internet use among the population".

Public administrative bodies: Germany in good fourth place

German administrative bodies achieved fourth place for "boosting the use of ICT". Germany also achieved a good fourth place for the "willingness of governmental bodies to digitise their services and products".

Weaknesses when it comes to Internet use in companies, online banking, e-government, mobile Internet use

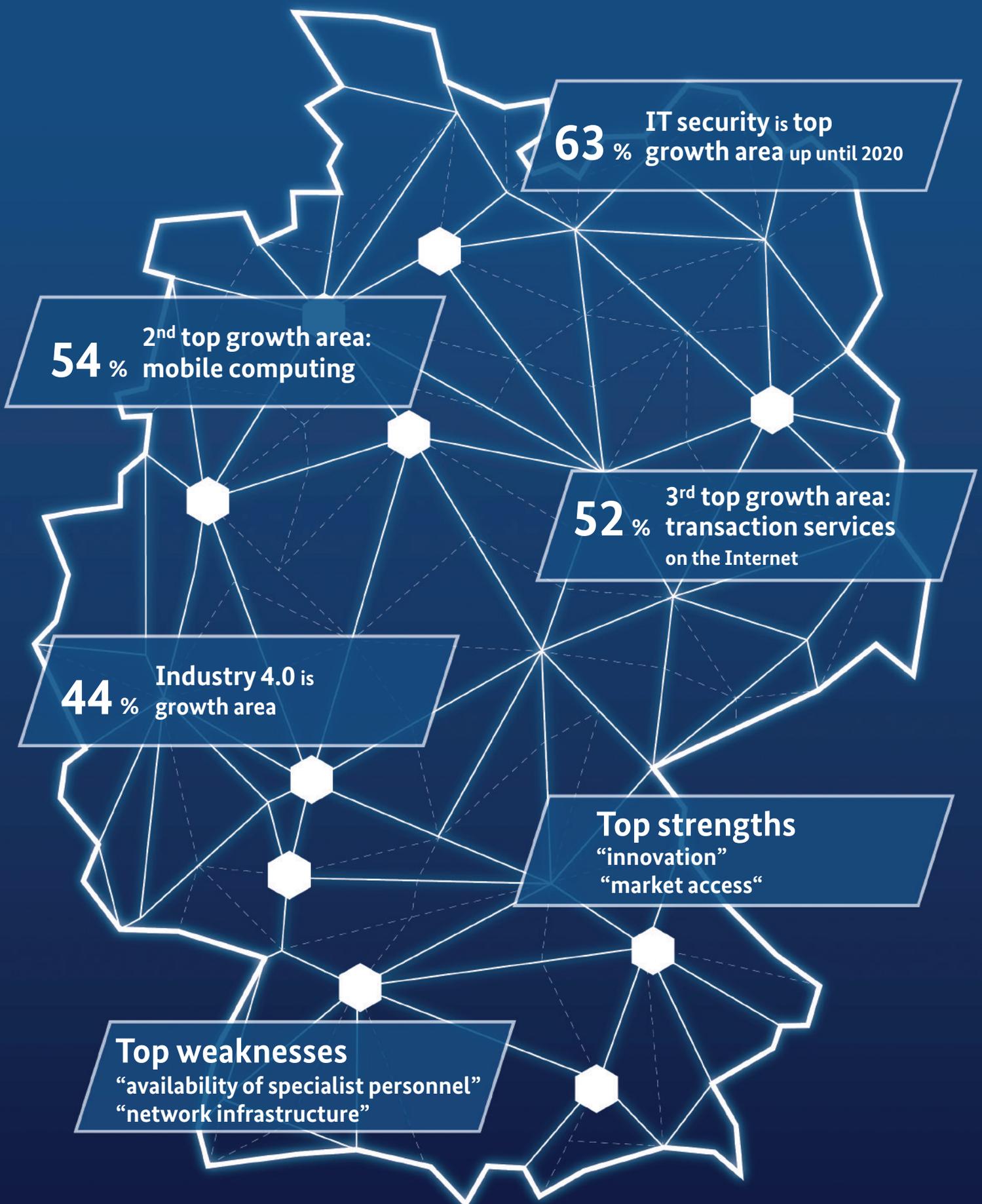
Compared to other countries, Germany only achieved sixth place for "B2B Internet use in companies" and thus dropped a place compared to the previous year. With sixth place, Germany's performance when it comes to the "use of online banking" is not satisfactory either. There is still some catching up to do when it comes to "mobile Internet use" as well as the "use of social networks" and "e-learning services" (eighth place in each case). The same applies to the "use of e-government services".

Global DIGITAL Performance Index – Usage

1.	(1.)	USA		88	(86)
2.	(2.)	United Kingdom		85	(83)
3.	(3.)	South Korea		80	(81)
4.	(4.)	Finland		77	(76)
5.	(4.)	Germany		76	(76)
6.	(6.)	Japan		74	(73)
7.	(7.)	France		72	(71)
7.	(7.)	Spain		72	(71)
9.	(9.)	China		70	(68)
10.	(10.)	India		57	(57)

Source: TNS Infratest, 2015; as at 2014, previous year's values in brackets

Location factors, growth areas and top players



Location factors, growth areas and top players

Summary

The international expert survey

In August 2015, 1,001 ICT experts took part in an international survey. The enquiry was carried out online in ten countries (Germany, the USA, South Korea, India, China, Japan, Great Britain, France, Spain and Finland) and in eight languages by TNS Infratest. The survey supplements the results of the Global DIGITAL Performance Index.

Top strengths “innovation” and “market access” – Advantages regarding “links” and “legal framework”

When analysing the relative strengths and weaknesses, a statistical expected value is calculated. Values above this figure are strengths and values below it weaknesses of the locations.

In Germany, innovation in the ICT sector was highlighted as a particular strength by those surveyed (increase of 7.5 percentage points, first place). The interviewees also regard market access, i.e. the ability to sell products and services nationally and internationally, as a particular strength (6.6 percentage points). With a rise of four percent in each case, both the links between the ICT sector and other traditional sectors and the basic legal conditions were assessed very positively by German ICT decision-makers. Further advantages are the “time to market”, the development of new business areas and the basic conditions for investments.

Top weaknesses availability of specialist personnel and network infrastructure – Market power a clear disadvantage

The decision-makers surveyed regarded the availability of specialist personnel (decrease of eight percentage points) as the most obvious weakness. According to the survey, the network infrastructure (decrease of 6.4 percentage points) is the country’s second key weakness. The interviewees were also critical of the sector’s market power (decrease of 3.5 percentage points), i.e. its ability to influence relevant developments and decisions on the global markets. Moderate weaknesses were seen in the growth rates in the ICT sector, the level of demand, interest in technology within the population and the start-up companies.

Growth areas until 2020: IT security is top growth area

Top growth areas until 2020

(> 50 percent of votes): More than half of the experts regard three specific growth areas as particularly promising on an international level: IT security (53 percent), transaction services on the Internet (51 percent) and cloud services (51 percent). In Germany, mobile computing services (54 percent) are positioned between IT security (63 percent) and transaction services on the Internet (52 percent).

Promising breakthrough areas until 2020

(Between 44 percent and 49.9 percent of votes): In Germany, these include cloud services and big data (50 percent each, fourth place) as well as Industry 4.0 (44 percent, sixth place), social collaboration (42 percent, seventh place) and smart services (40 percent, eighth place).

Hidden champions

(< 40 percent of votes): Hidden champions are embedded systems (39 percent, ninth place), 3D printing (37 percent, tenth place) and e-health / telemedicine (35 percent, eleventh place).

Top players: global players – applications – research and development

According to the German experts four areas will encourage the future developments: the “global players” (67 percent), the “applications” (66 percent) and “research and development” (62 percent). “ICT start-ups” are also regarded as a driver, albeit to a lesser extent (55 percent). Politics and private households (41 percent each) have less of an influence.

The digitalisation of the German economy

27% generate **60%** or more of overall turnover digitally

37% will invest more than **10%** of total turnover in digitalisation in 2020

56% of services in the service sector already highly digitalised

7% have not yet digitalised any internal company processes

32% see digitalisation as key part of business strategy until 2020

49% do not use digital services

The digitalisation of the German economy

Summary

Digitalisation not yet advanced

In 2015, the DIGITAL Economy Index achieved 49 points out of 100. According to estimates from companies surveyed, the DIGITAL Economy Index score should rise to 56 points in the next five years. The predicted growth rate is moderate.

Pace of digitalisation in the service sector only half what it is in the processing industry

In 2015, the level of digitalisation in the service sector (51 points) was significantly higher than in the processing industry. With just 37 index points, the processing industry is digitally underdeveloped. However, the level of digitalisation will improve significantly in the processing industry until 2020. In the service sector, it is expected to improve more slowly.

Different levels of digitalisation in commercial sectors in 2015 / 2020

With 66 points, the level of digitalisation in the ICT industry is far above the commercial sector (49 points). Knowledge-intensive service providers as well as the finance and insurance industry are digitalised to an above-average level. Retail and the energy industry are digitalised to an average level, while the level of digitalisation in transport and logistics, mechanical engineering, other manufacturing, the automotive industry, health care and the chemical / pharmaceutical industry is below average.

Usage of digital technologies best, although it could be further improved – digital business and digitalisation-friendly conditions need to be improved

The levels of digitalisation can be influenced by three key components: the use of the latest digital technologies, the digitalisation of business activity and digitalisation-friendly processes, working procedures or resources. In the commercial sector, the usage of digital technologies within companies scored 65 points. In the digital business activity index, it scored 46 points. In the digitalisation-friendly conditions index, it scored just 37 points. Companies need to improve in digitalisation-friendly frameworks.

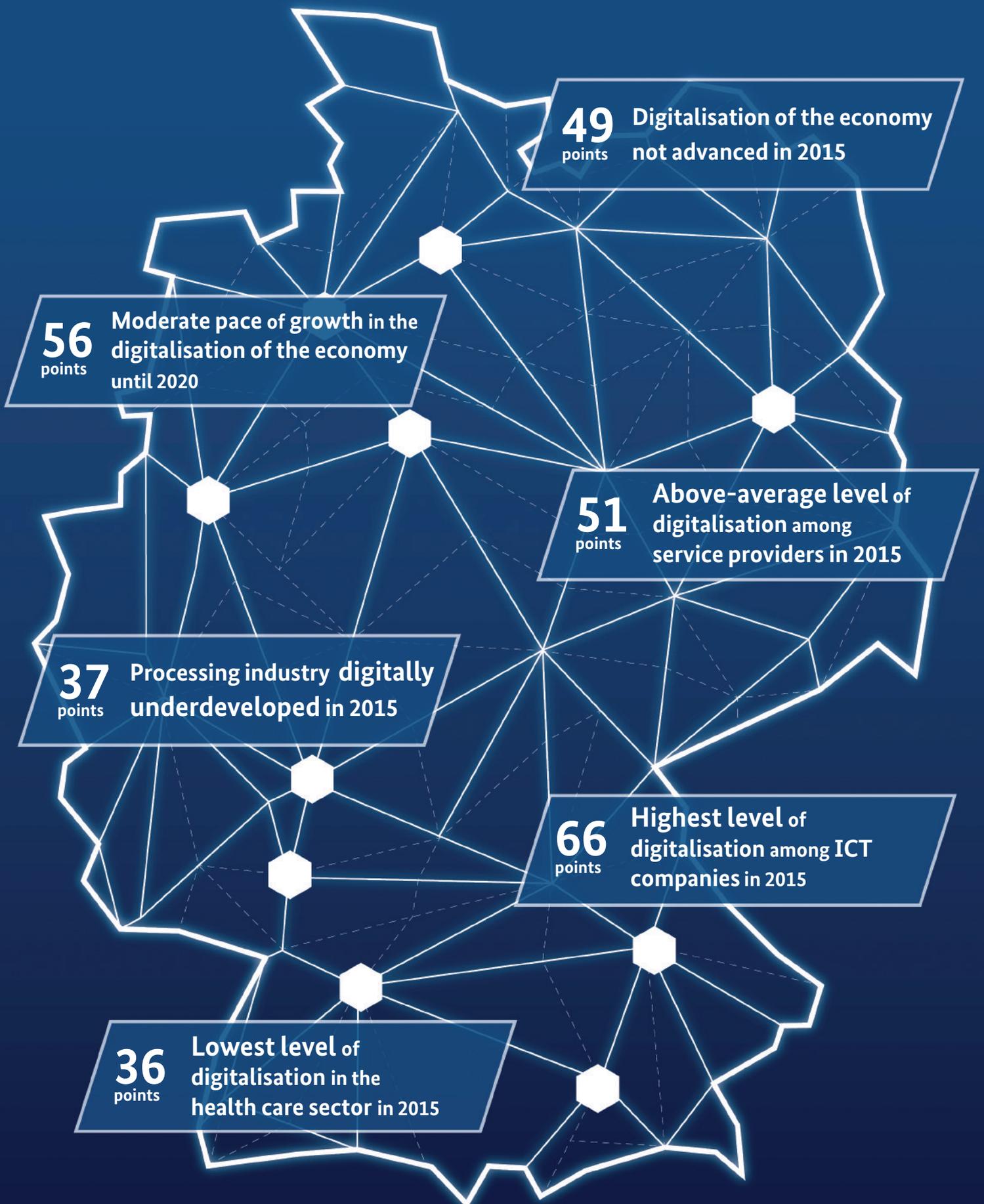
Critical success factors

Companies in the commercial sector can significantly boost growth in the digital markets, provided that they concentrate their digitalisation efforts on increasing efficiency, improving innovation and implementing new business models. The digital know-how of employees has a significant leverage effect on digitalisation. At the same time, a fully digitalised value chain has a considerable influence over ongoing digitalisation. However, there is a lack of its implementation because digital services are not yet widely used. Furthermore, widespread digital information and sales channels also have significant influence over digitalisation progress.

What politicians can do

Which are the areas politicians should encourage to support digitalisation? 92 percent of companies believe that politicians should take care of “IT security”, 90 percent of “encouraging broadband development” and 78 percent each of “training specialist personnel” and striving for “better data protection regulations”. State subsidies for digitalisation as well as developing the digital EU domestic market are less important.

DIGITAL Economy Index



Measuring the level of digitalisation

Basics

The survey

Between 17 August and 11 September 2015, TNS Infratest carried out a representative survey among German companies regarding the current level and future development of digitalisation in Germany. The questionnaire was developed in close partnership with the Center for European Economic Research (CER), Mannheim.

The survey is representative for the commercial economy, i. e. for the following eleven sectors: mechanical engineering, automotive engineering, the chemical / pharmaceutical industry, other manufacturing, the information and telecommunications sector, the energy and water supply industry, retail, transport and logistics, the finance and insurance sector, the knowledge-intensive service providers (e. g. consultants, market researchers, etc.) and the health care industry.

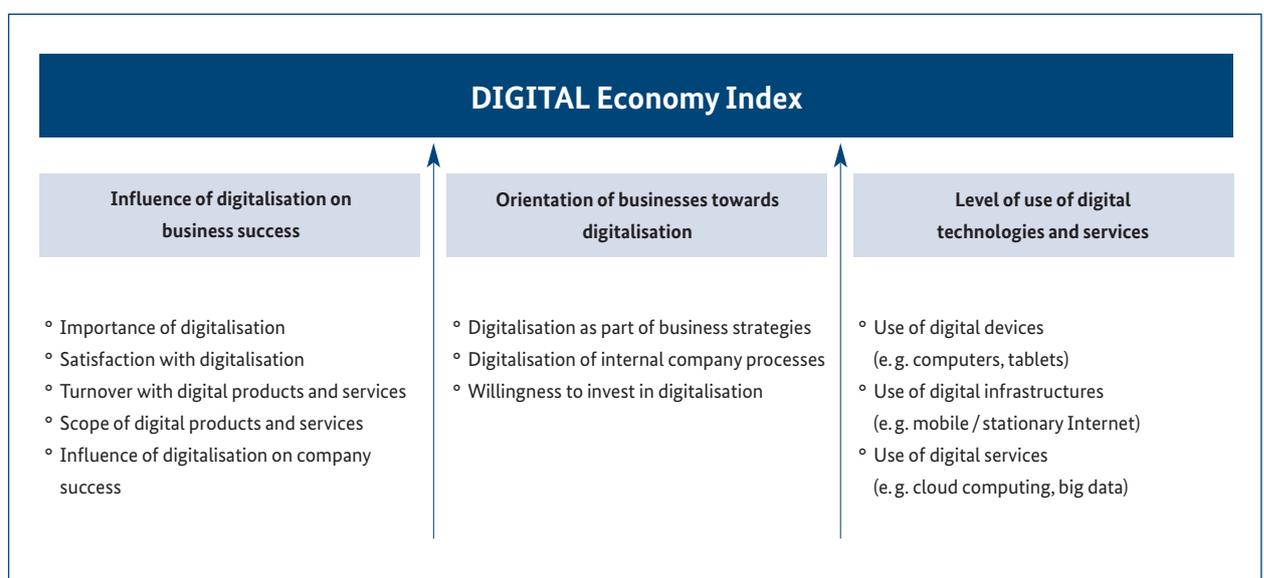
The success of the Digital Economy is based on three key pillars: the importance on the world markets, infrastructure framework conditions and the use of digital technologies and services. The following questions have to be answered:

- ▶ To what extent does digitalisation influence business success?
- ▶ To what extent are companies already geared towards digitalisation?
- ▶ What is the usage intensity of digital devices, services and technologies in the companies?

The results of the survey are summarised in the DIGITAL Economy Index. The index measures the extent to which German companies are currently digitalised and how this will develop up until 2020. The DIGITAL Economy Index measures the level of digitalisation in the German commercial economy and its sectors for 2015 and 2020 using a figure between 0 and 100 points. Zero points means that no business procedures, internal company processes are digitalised and that no digital technologies are used. The maximum value of 100 points would indicate that the economy is fully digitalised.

With the DIGITAL Economy Index, the eleven sectors in the commercial economy can be compared with one another. Furthermore they can be classified according to their level of digitalisation. Critical success factors encouraging the digitalisation process within the commercial economy can be identified.

In a separate report, eleven DIGITAL sector profiles provide information as to how far digitalisation has progressed in each sector, what the pace of digitalisation will be in the future and which barriers exist. The sector-specific, critical success factors help to focus industrial policy and gear it towards digitalisation progress. A separate analysis of German medium-sized companies will also be carried out. The separate reports will be available for downloading on the websites of the Federal Ministry for Economic Affairs and Energy, TNS Infratest and the Center for European Economic Research (CER).



DIGITAL Economy Index

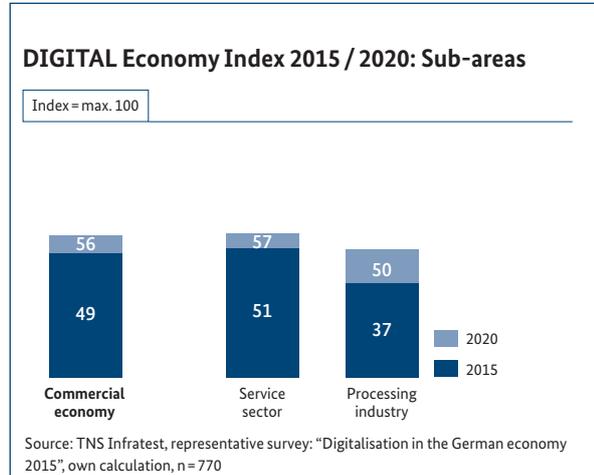
The digitalisation of the commercial economy and its sectors

Half way to digitalisation with 49 points out of 100

In 2015, the DIGITAL Economy Index which measures the level of digitalisation of the commercial economy achieved 49 points out of 100. This value below the fifty-point mark shows that we have not made much progress with digitalisation. According to estimates from the companies surveyed, the DIGITAL Economy Index score should rise to 56 points in the next five years. The predicted pace of growth is moderate only.

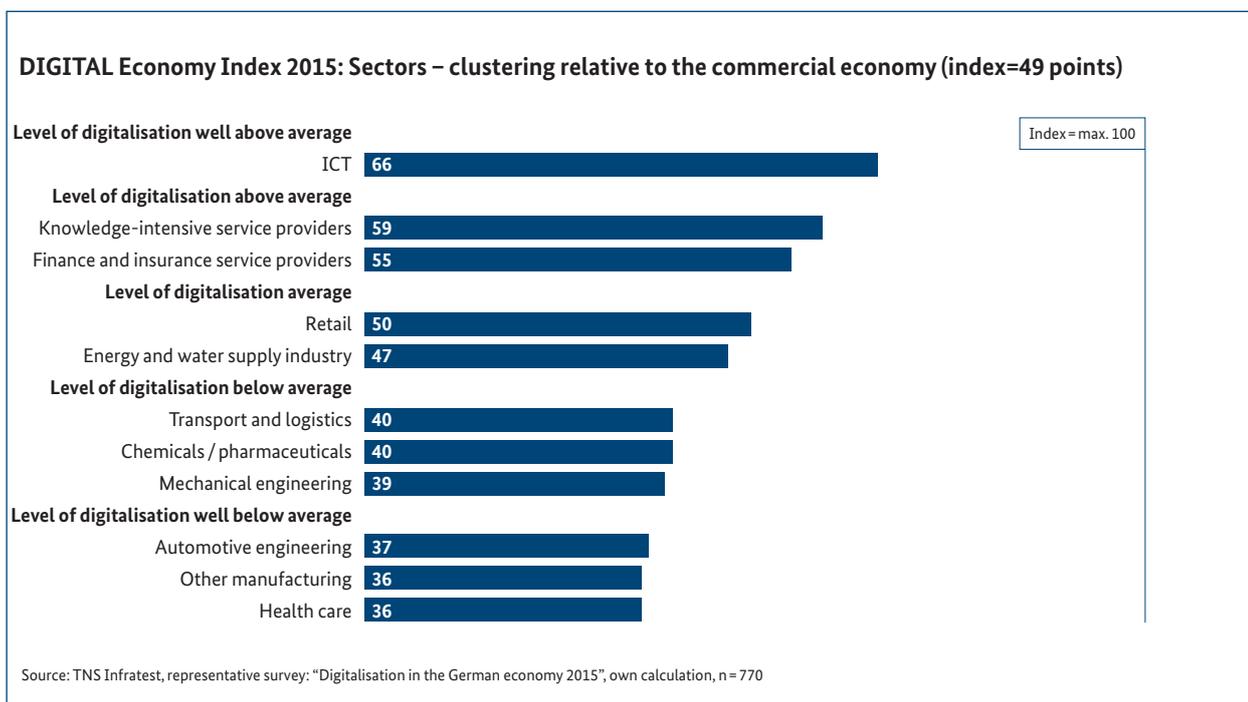
Service sector with much higher level of digitalisation than processing industry in 2015 – Moderate pace of digitalisation until 2020

In 2015, the level of digitalisation in the service sector (51 points) was significantly higher than in the processing industry. With just 37 index points, the processing industry is digitally underdeveloped. Up until 2020, the level of digitalisation in the processing industry will improve significantly – by 13 index points. This means that half of the maximum of index points will have been achieved by 2020. Digitalisation is expected to progress much more slowly in the service sector. The DIGITAL Economy Index for the service sector will increase by six index points to 57 points. The pace of digitalisation will therefore be only half what it is in the processing industry; however, the departing level of digitalisation is already much higher.



Most economic sectors will digitalize slowly

The DIGITAL Economy Index shows that the eleven sectors observed can be subdivided into five digitalisation dimensions.



Progress in digitalisation 2015 / 2020

Level of digitalisation well above average: With 66 points, the ICT sector is well above the DIGITAL Economy Index with a score of 49 points. In 2020, the ICT sector will have achieved a score of 71 points and will remain the sector where the level of digitalisation is highest. The ICT sector is the single sector of the economy where the level of digitalisation is well above average and is thus a pioneer in the digital transformation.

Level of digitalisation above average: With 59 index points, the knowledge-intensive service providers are in second place in 2015. By 2020, their score will improve by three index points. The finance and insurance service providers achieve 55 index points in 2015 and will have a score of 62 index points in 2020. As a result, they will draw level with the knowledge-intensive service providers.

Level of digitalisation average: With 50 index points, retail was in fourth place in 2015. This means that half of the maximum index points has been achieved. Although retail will achieve 56 index points in 2020, it will drop a position to fifth place because digitalisation will be progressing more quickly in other sectors. The energy and water supply industry (2015: 47 points) will improve by 12 points and will achieve a score of 59 index points in 2020. As a result, it will rise from fifth to fourth place in the ranking.

No significant changes in these digitalisation dimensions are expected in 2020. In contrast, digitalisation is gathering pace in the areas currently with low levels of digitalisation. Sectors are moving up to the next digitalisation dimension or moving down to the next class if their pace of digitalisation is comparatively slow.

Level of digitalisation below average: Transport and logistics (2015: 40 points, 2020: 49 points) will remain a sector with a low level of digitalisation. Mechanical engineering (2015: 39 points, 2020: 51 points) will rise up to the next digitalisation dimension. The chemical and pharmaceutical sector (2015: 40 points, 2020: 46 points) will likewise remain a sector with a low level of digitalisation.

Level of digitalisation well below average: Health care (2015: 36 points, 2020: 44 points) will remain a sector with a very low level of digitalisation. Automotive engineering (2015: 37 points) has a very low level of digitalisation, but with 48 points will rise to the next digitalisation dimension up in 2020. The pace of digitalisation is very high in other manufacturing (2015: 36 points, 2020: 50 points). This sector will improve by two digitalisation dimensions to reach an average level of digitalisation.

DIGITAL Economy Index 2020: Sectors – clustering relative to the commercial economy (index = 56 Points)

Level of digitalisation well above average

ICT 71

Level of digitalisation above average

Knowledge-intensive service providers 62

Finance and insurance service providers 62

Level of digitalisation average

Energy and water supply industry 59

Retail 56

Mechanical engineering 51

Other manufacturing 50

Level of digitalisation below average

Transport and logistics 49

Automotive engineering 48

Chemicals / pharmaceuticals 46

Level of digitalisation well below average

Health care 44

Index = max. 100

Business success in digital markets

80% digitalisation is important

88% are satisfied with the degree of digitalisation reached

63% of turnover in the ICT sector generated predominantly digitally

34% do not generate any turnover digitally

56% of service companies provide digital services

58% digitalisation has significant influence over companies

Business success in digital markets

Summary

In this chapter, we analyse the extent to which digitalisation influences business success.

Influence of digitalisation over business success still low in 2015 – greater in service companies than in the processing industry

80 percent of all companies surveyed regard digitalisation as **important**. In the service sector, this figure is 81 percent – ten percentage points higher than in the processing industry.

88 percent of the companies are **satisfied** with the current level of digitalisation reached in their companies. At 89 percent, the level of satisfaction in the service sector is even higher than in the processing industry where it is 84 percent.

The commercial economy generates just 27 percent of **turnover predominantly digitally** (> 60 percent of turnover). This figure is 29 percent for service providers and 15 percent for the processing industry. 14 percent of companies in the commercial sector generate between 31 and 60 percent of overall turnover digitally, while just 27 percent of companies generate between one and 30 percent of overall turnover in this way. 21 percent of companies do not generate any turnover digitally.

While service companies **sell** 56 percent of their products and services **predominantly digitally**, the processing industry clearly has some catching up to do. Its digitalisation quota is just 37 percent. 38 percent of the commercial sector, 36 percent of the service providers surveyed and half of those in the processing industry

think that the level of digitalisation of products and services is low. Products and services are not digitalised in 12 percent of companies in the processing industry. Among service providers, this figure is six percent.

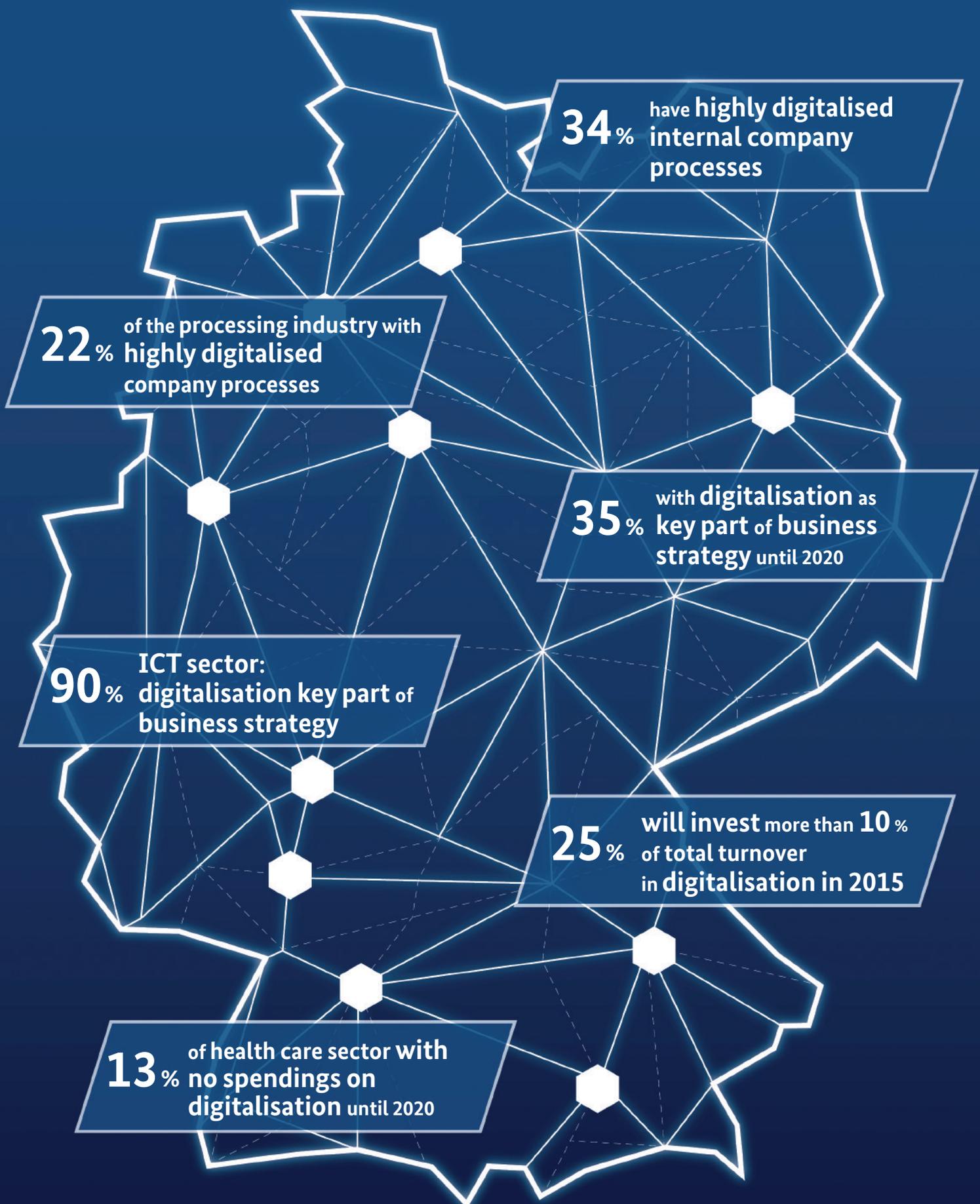
60 percent of service companies regard the **influence of digitalisation over their company success** as high. In contrast, 57 percent of companies in the processing industry are of the opinion that its influence is “fairly small or very small”. Only in the ICT sector is the majority of companies – 52 percent – convinced that the influence of digitalisation over company success is “extremely high” or “very high”.

What can be done to increase the proportion of business activities carried out digitally by 2020?

The DIGITAL Roadmap 2015 / 2020 confirms that “increased efficiency” through digitalizing internal processes, working procedures and resources has a significant influence on the progress of digitalisation. The “innovation” of companies which is encouraged by the digitalisation of processes and applications will also become a permanent driver by 2020. The “competitive advantages” that can be achieved through digitalisation and the “improvement in the quality of products and services” are also regarded as key drivers.

Increased efficiency and innovation are the permanent growth drivers on the digital markets and the areas where companies should mainly invest if they are to be successful digitally. Investments in developing the range of digital products and services will also help to ensure greater digital business success.

Orientation of businesses towards digitalisation



Orientation of businesses towards digitalisation

Summary

In this chapter, we look at the extent to which companies are internally geared towards digitalisation.

Digitalisation of internal company processes much more advanced in the service sector than in the processing industry

34 percent of companies in the commercial sector have already digitalised 60 percent or more of their internal company processes (service companies 36 percent, processing industry 22 percent). Such highly digitalised processes are currently only encountered on a majority basis in ICT companies (51 percent). In 27 percent of companies in the commercial sector, internal processes are between 31 and 60 percent digitalised. 24 percent of companies in the commercial sector have digitalised up to 30 percent of internal company processes. Seven percent of companies have not digitalised any processes yet.

Strategic role of digitalisation to increase until 2020 – service providers are forerunners

Digitalisation plays a significant role in service companies' business strategies and will continue to do so in the future (2015: 65 percent, 2020: 70 percent). In contrast, it tends to play a minor role in the business strategies of companies from the processing industry (2015: 49 percent, 2020: 51 percent). Up until 2020, institutions in the health care sector (54 percent) will be the only ones where digitalisation plays only a "minor role" in business strategies.

Investments in digitalisation to increase significantly by 2020

In 2015, 25 percent of companies in the commercial sector invested more than ten percent of their overall turnover in digitalisation. In 2020, this figure will be 37 percent. The proportion of companies with a very high willingness to invest is increasing in all sectors. Up until 2020, 20 percent of companies in the commercial sector will invest between six and ten percent of their overall turnover in digitalisation, while this figure was just 18 percent in 2015. Ten percent of companies in the commercial sector did not invest in 2015. By 2020, this figure will have fallen to six percent.

What can be done to ensure that internal company processes, resources and framework conditions are geared towards digitalisation more quickly?

The "digital know-how of employees" is proving to be a permanent driver. A "fully digitalised value chain" has considerable influence over the digitalisation progress, even if there will be a lack of its implementation up to 2020. Greater efforts in this area are worthwhile and foster internal company digitalisation processes.

Use of digital devices, infrastructures, services

6% of the processing industry works without any digital devices

77% use digital devices very intensively

49% use no digital services

31% of ICT companies use no digital services

69% use digital infrastructures very intensively

7% use no digital infrastructures

Use of digital devices, infrastructures, services

Summary

In this chapter, we look at the extent to which digital technologies and services are used.

Very intensive use of digital devices in virtually all sectors

Digital devices are used very intensively in virtually all sectors. In 77 percent of companies in the commercial sector, more than 75 percent of permanent employees use digital devices. This applies to 82 percent of service companies and 51 percent of the processing industry. An exception here is automotive engineering where only 46 percent of employees use digital devices. In the ICT sector as well as the energy and water supply industry, virtually every company uses digital devices. In contrast, other manufacturing has the highest level of non-use (seven percent).

Intensive use of digital infrastructures, especially in service companies

In 69 percent of companies in the commercial sector, 75 percent or more of permanent employees use digital infrastructures for business purposes. The same applies to 73 percent of service companies and 45 percent of companies in the processing industry. In most sectors, more than 75 percent of permanent employees use digital infrastructures for business purposes. Exceptions here are chemicals / pharmaceuticals and automotive

engineering, each with 48 percent, transport and logistics with 46 percent and other manufacturing with 44 percent. In seven percent of companies in other manufacturing and service companies, no digital infrastructures are used.

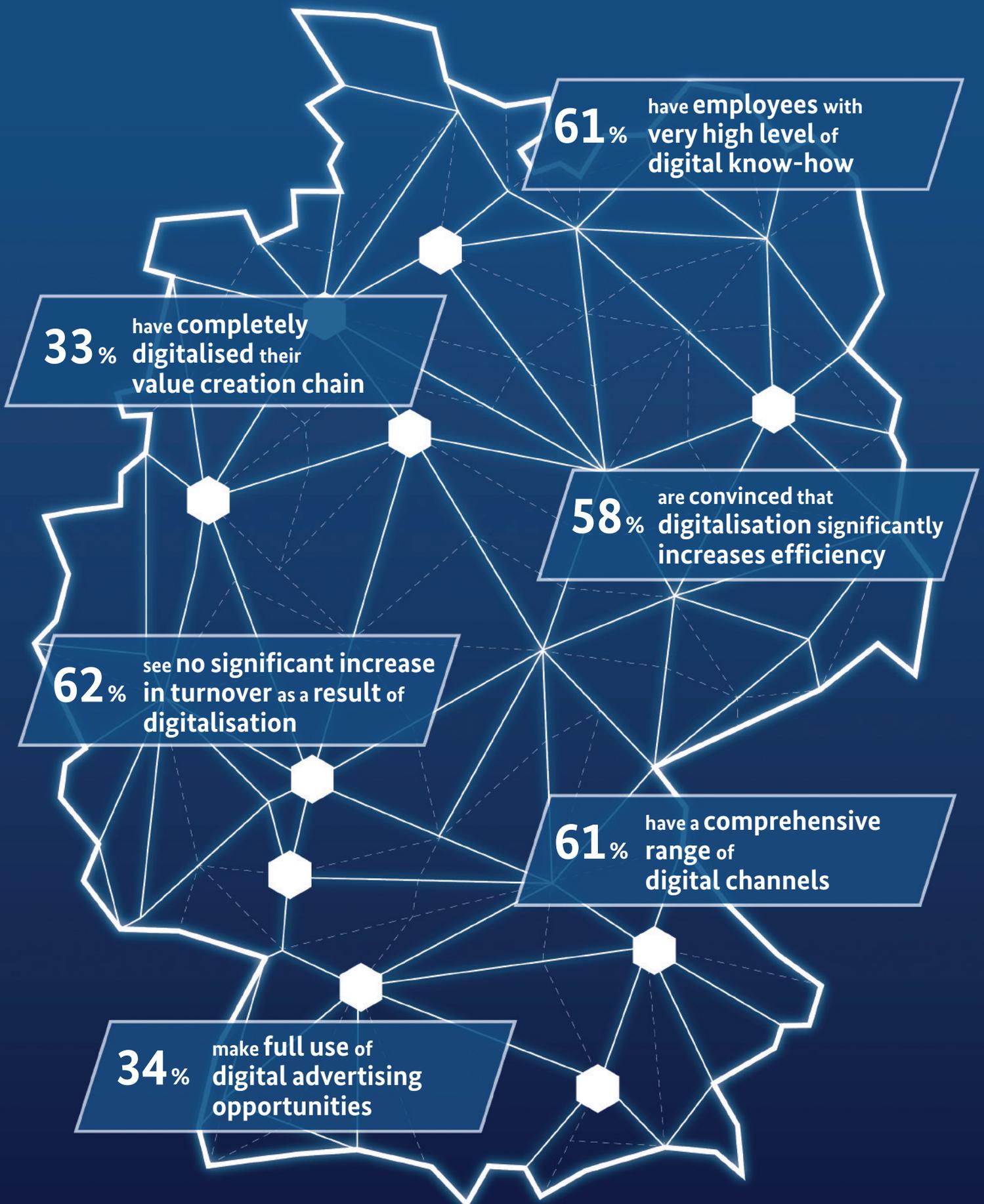
Use of digital services not widespread

49 percent of companies in the commercial sector do not use any digital services. The same applies to 49 percent of service companies and 47 percent of the processing industry. In 39 percent of ICT companies, more than 75 percent of permanent employees use digital services. Even in the ICT sector, however, 31 percent of companies do not use these services at all.

What can be done to ensure that the use of digital devices, services and infrastructures is geared towards the changing needs of customers and external partners?

The “comprehensive availability of digital channels for individualizing products and services” has a very high influence on digitalisation. Companies in the commercial sector should invest primarily in developing their digital channels. They are of great importance to the new range of products and services and changing customer needs. The use of “Digital services” should be encouraged as they will further drive digitalisation in the companies.

Critical success factors for digitalisation



Critical success factors for digitalisation

What are the critical success factors which most encourage progress in digitalisation? On one hand, the interviewees were asked to assess the importance of 18 different critical success factors (“totally applies”, “applies to some extent”, “does not really apply”, “does not apply at all”).

On the other hand, we measured the extent to which these factors influence the digitalisation process in the companies. Depending on the level of influence, we differentiate between the following factors:

- *“Drivers”*: Factors which mainly drive forward the digitalisation processes in companies
- *“Hidden opportunities”*: Factors which have great influence over digitalisation and encourage the digitalisation process in companies
- *“Hygienics”*: Factors which accompany the digitalisation process but have hardly any influence over the digitalisation process in companies
- *“Potential savers”*: Factors which have no influence over internal company digitalisation processes

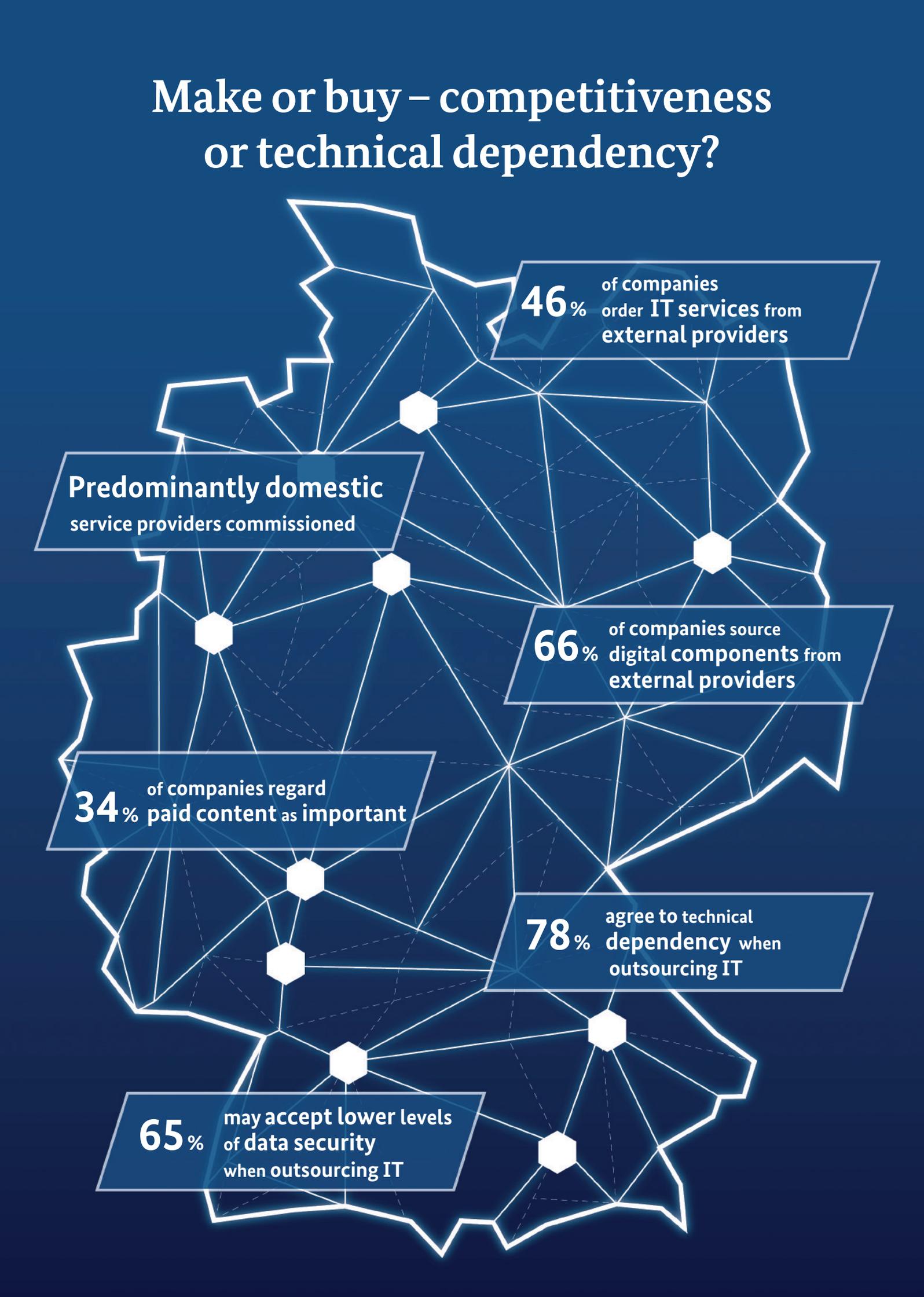
All results are summarised in three different “DIGITAL Roadmaps” showing the influence of the diverse factors on business success (“market”), on internal processes (“infrastructure”) and external communication and collaboration (“use”).

DIGITAL Roadmap “business success on digital markets”. “Increased efficiency” is the most important motivator which drives digitalisation. The “innovation” of companies which can be encouraged through the digitalisation of processes and services will become a strong motivator by 2020. The “competitive advantages” that can be achieved through digitalisation and the “improvement in the quality of products and services” are also regarded as “hidden opportunities”. Companies are not being deterred from carrying out further digitalisation projects because of the “very high costs”. The “very large amount of time needed” when carrying out such projects is regarded as unavoidable. Companies tend to expect “significant increases in turnover” through digitalisation in the long term only.

DIGITAL Roadmap “internal processes”. The “digital know-how of employees” is proving to be a strong driver. A “fully digitalised value creation chain” has considerable influence over the digitalisation process, even if there will be a lack of implementation up to 2020. The majority of players in the economy believe that “excellent levels of data security and data protection” as well as “easy access to high-speed networks” are fundamental hygienics. In contrast, the “political conditions” are fairly unimportant for the digitalisation progress.

DIGITAL Roadmap “changing needs of customers and partners”. The “comprehensive availability of digital channels for individualizing products and services” is a strong motivator driving digitalisation. The “improvement in communication with customers via digital information channels” is regarded as self-evident. Although “tailor-made services from external partners for digitalisation projects” and “links to external partners” will gain in importance until 2020, they will continue to have only a minor influence over digitalisation. The same applies to “digital sales channels” and the “use of digital advertising opportunities”.

Make or buy – competitiveness or technical dependency?



46% of companies order IT services from external providers

Predominantly domestic service providers commissioned

66% of companies source digital components from external providers

34% of companies regard paid content as important

78% agree to technical dependency when outsourcing IT

65% may accept lower levels of data security when outsourcing IT

Make or buy

Competitiveness or technical dependency?

While digitalisation played a fairly minor role in companies up until a few years ago, it is currently becoming a major issue. For 80 percent of companies in Germany, being up to date digitally is important. In sectors with a high level of digitalisation such as the ICT sector, knowledge-intensive service providers or finance and insurance service providers, this figure is over 90 percent.

Digital components give to numerous products and services their characteristic functions. Nowadays, hardly any work process is still entirely analogue. Rapid technological developments, the interaction between digital applications and the merging of the digital and analogue world generate a high complexity and contribute to a growing importance of digitalisation as part of company's strategies.

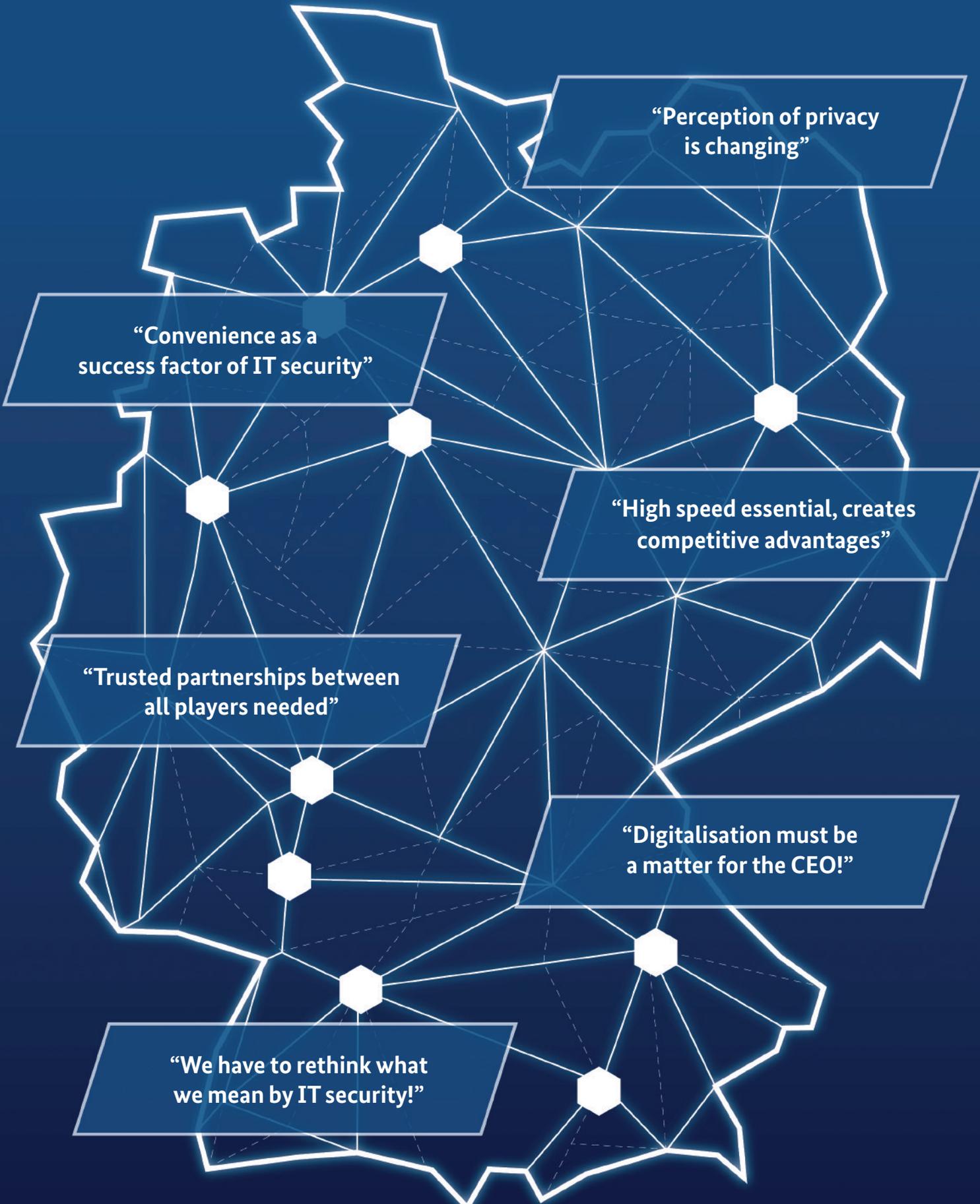
Numerous companies in all sectors already have a high level of digitalisation. Companies often take advantage of the services and expertise of external providers not only when it comes to implementing and further developing their IT-supported work and business processes but also when sourcing digital components for

their own products and services. Companies are aware that this may result in greater technical dependency and that they may have to accept lower levels of data security. However, they see potential for innovations when using cutting-edge technologies and processes. Furthermore, the quality of their own products and services can be improved. Digital transformation results in advantages and disadvantages. On the one hand, it is important to take full advantage of the potential for innovations. In many cases, this is only possible through participating in partnerships with or commissioning (external) IT experts. On the other hand, companies must manage technical dependency or data security risks.

Own digitalisation strategies required

Politicians should set out a regulatory framework here as they did recently with the law on IT security. Ultimately, however, each individual company must develop and implement a suitable digitalisation strategy – with the help of external IT experts if necessary. Trust will play an important role here. This is why many companies rely primarily on domestic external providers when it comes to digitalisation.

Expert workshop



Expert workshop

As part of the long-term monitoring project, an expert workshop took place at the Federal Ministry for Economic Affairs and Energy on 24 September 2015.

Decision-makers from central key sectors took part in a lively discussion of the preliminary results of the study. The experts came from the following sectors: information and communications technology, mechanical engineering, automotive engineering, chemicals / pharmaceuticals, energy and water supply, retail, transport and logistics, finance and insurance services and knowledge-intensive service providers.

Representatives from nine ICT companies, 19 industrial, energy and retail companies as well as representatives from four industry associations, business consultancy companies and public bodies took part. Among them were chief executive officers, managing directors and chief information officers. The workshop was chaired by Bernd-Wolfgang Weismann, Head of the Division VI B1, Digital Agenda, Digital Economy, National IT Summit of the Federal Ministry for Economic Affairs and Energy.

The workshop focused on how the strengths and weaknesses of digitalisation in the German industry compare to those in other countries and what opportunities and challenges lie ahead for Germany as a business location. The workshop participants came up with key statements regarding digitalisation in Germany and developed strategies for encouraging digitalisation.

Improve digitalisation of markets and business activities

- ▶ **Pace:** Speed in digitalisation creates competitive advantages.
- ▶ **Business models:** New business models are drivers for digitalisation.
- ▶ **Production:** Industrial ICT production will only be possible with intelligent factories.
- ▶ **Level playing field:** The market conditions must be the same for all players (global, national, international).

Digitalisation-friendly framework conditions

- ▶ **Cooperation:** Trusting partnerships between players is of central importance.
- ▶ **Digital competencies:** Digital know-how must be an integrated part of the education system.
- ▶ **Prioritization:** Digitalisation in a company must be a matter for the CEO.
- ▶ **Working conditions:** The working conditions must be adapted to the digital world.

More intensive use of digital products and services

- ▶ **Data clearance:** The perception of privacy is changing.
- ▶ **IT security:** We have to rethink what we mean by IT security. Politicians should bundle initiatives together.
- ▶ **User friendliness:** Convenience is a key success factor of IT security.
- ▶ **Added value:** Digitalisation should be seen as a business opportunity.



Study fact file



Study fact file

The Monitoring Report DIGITAL Economy 2015 analyses the digital economy in Germany and the country's position in an international comparison of the leading ten digital economies. This year's Monitoring Report for the first time analyses the digitalisation level of Germany's trade and industry broken down by sectors. In this report, TNS Infratest Business Intelligence – the specialist for global market analyses within the TNS Group – along with the Center for European Economic Research (CER) answers the following questions:

- ▶ How does the German digital industry perform compared to that of other countries?
- ▶ What are the key German strengths and weaknesses compared to those of the other countries?
- ▶ What contribution does the Digital Economy make to the German economy?
- ▶ How far has digitalisation progressed in the German industry, its sectors and in medium-sized companies?
- ▶ What can be done to accelerate the digitalisation progress?
- ▶ What are the key challenges of the digital policy? What are the key areas of action?

Digital Economy: Key figures and international comparison

In the first part of the report, we examine the Digital Economy in Germany and analyse its performance as well as its strengths and weaknesses compared to the leading digital world countries. We look at the ICT sector as well as the Internet economy.

Added value analysis: In this section of the report, we present key performance indicators relating to the Digital Economy. The degree of innovation in the German ICT sector is also assessed in detail. In addition, we analyse ICT start-up activities and visualize their regional distribution.

Global DIGITAL Performance Index: The Global DIGITAL Performance Index examines the German Digital Economy compared to that of other leading digital economies. Their performance is assessed with the help of 48 key performance indicators identified through secondary research and expert surveys. We measure the international competitiveness in one index, as well as in separate indices for digital markets, infrastructural conditions and the use of digital technologies in private households, in companies, and in public bodies. We also determine the top growth areas up until 2020.

The digitalisation of the German economy

In the second part of the report, we analyse the current situation and the future outlook of the digital industry in Germany and its sectors.

DIGITAL Economy Index: The DIGITAL Economy Index shows the extent to which German companies are digitalised and how the situation will change between now and 2020. The DIGITAL Economy Index measures the level of digitalisation in the German industry and its sectors using a score between 0 and 100 index points.

DIGITAL Roadmap: We show which factors are driving the digitalisation of the German economy. We have analysed the extent to which 18 different factors are fulfilled and influence the DIGITAL Economy Index. As a result, we are able to identify key drivers, hidden opportunities, hygienics and potential savers.

Make or buy – competitiveness or technical dependency?: Finally, we looked at the extent to which the outsourcing of ICT-based products is used and how this is assessed.

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