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Digitalisation in Germany: an overview and what lies behind the delays

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The adaptation of the economy and the state to new information technologies – next to the energy transformation (*Energiewende*) – is viewed as one of the greatest civilisational challenges Germany is currently facing. However, progress in this area is lagging behind expectations: it fails to match the level of GDP per capita in relation to Germany's competitors in the EU, the country's export-oriented economy or its ambition to be Europe's economic and political leader. The problems with digitalisation are not due to financial constraints. Their causes are much deeper: the approach to innovation, the lack of specialists on the labour market, Germans' sense of unease towards new technologies, as well as previous mistakes made during the development of the transmission infrastructure.

Germany's progress in digitalisation

The Digital Economy and Society Index[1] (DESI, an index measuring the digitalisation of society and economy) presented regularly by the European Commission (EC), is most frequently cited among the numerous surveys measuring the advancement of the digitalisation process. It focuses on the key dimensions of digital transformation – from human capital and connection quality to the integration of the economy and state with the network. According to DESI 2021, the EU's digitalisation leaders are: Denmark, Finland, Sweden, the Netherlands and Ireland. The worst performers in the ranking are Romania, Bulgaria and Greece. Germany lies outside the top ten – it is ranked 11th (see Chart 1).

Compared to other countries, Germany is doing relatively well in the area of human capital. The widespread presence of basic digital skills among the German public has earned Germany the position of 6th place in the EU. In turn, the availability of specialists in the IT sector is ranked lower. Germany also performs relatively well in terms of connection quality (7th place). It is in the lead as regards preparations for the launch of the 5G network, and can also boast of a fairly wide availability of broadband Internet – albeit not with the highest bandwidth. The problem is the insufficient capacity to expand and improve the quality of internet connections, especially outside larger cities. In another DESI criterion – integration of digital technologies in business and e-commerce – Germany performed much worse and was ranked as low as 18th. Small and medium-sized businesses hinder

[1] Digital Economy and Society Index (DESI) 2021, European Commission, 2021, ec.europa.eu.

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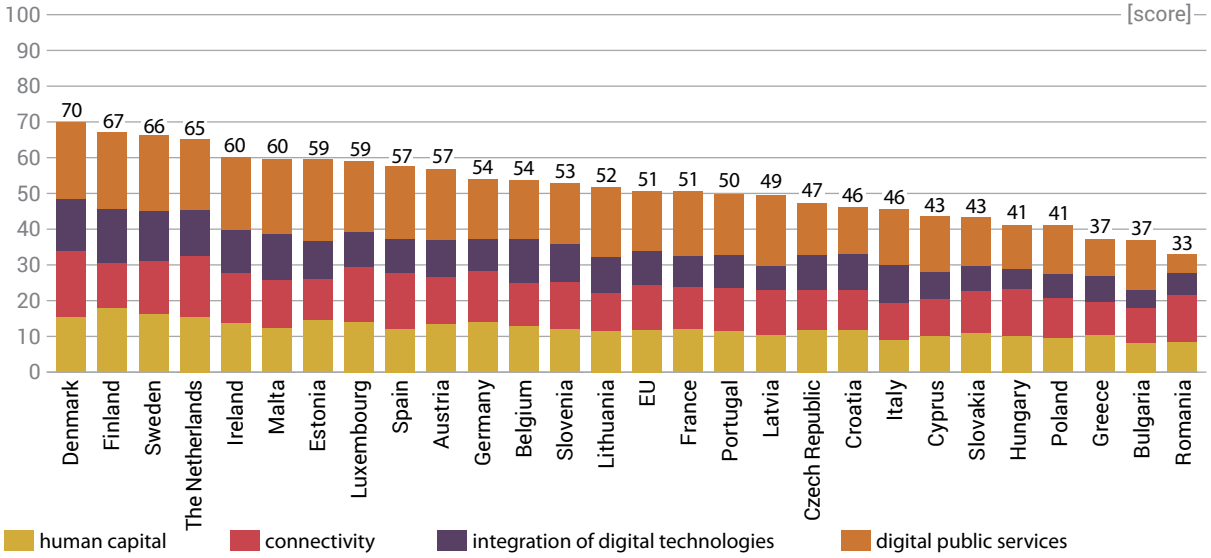
it markedly – only 18% of them use e-invoicing, and less than a third share information electronically. A considerable gap between other countries is also visible in the area of digital public services (e-governance). Despite the progress made in recent years, Germany occupies 16th place in the EU, still lagging far behind the leaders: Estonia, Denmark and Finland.

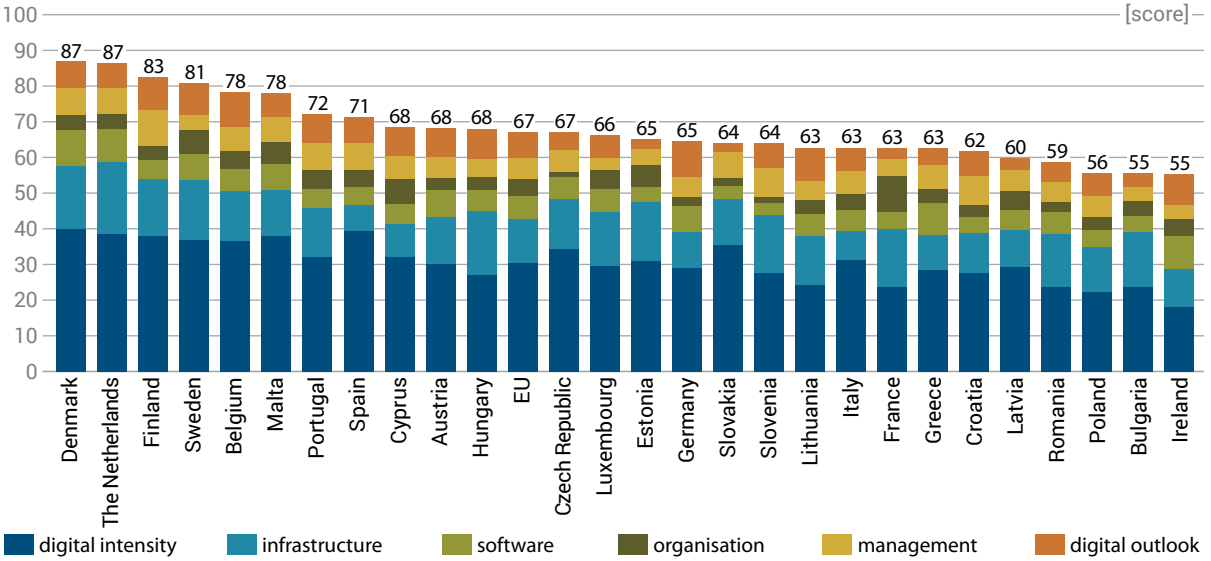
Chart 1. Digital Society and Economy Index (DESI) 2021 – society and economy digitalisation index, EU member states, 0–100 scale



Source: DESI Composite Index 2021, European Commission, 2021, ec.europa.eu.

The second index worth mentioning is the Corporate Digitalisation Index (CDI),[2] developed by the European Investment Bank (EIB). It has a slightly narrower scope and describes the situation of companies in terms of the use of digital technologies (digital intensity), access to transmission infrastructure, investment in software and organisation of digital business processes, the use of strategic digital monitoring systems and the prospects for further digitalisation. EIB experts have divided the member states into four groups in terms of the level of digitalisation: leading, strong, moderate and weak. The first group includes Denmark, the Netherlands, Finland and Sweden. Under this ranking, Germany only scores 15th in the EU.

Chart 2. EIBIS Corporate Digitalisation Index (2020), EU member states, 0–100 scale



Source: *Digitalisation in Europe 2020–2021: Evidence from the EIB Investment Survey*, European Investment Bank, July 2021, eib.org, p. 7.

[2] *Digitalisation in Europe 2020–2021: Evidence from the EIB Investment Survey*, European Investment Bank, July 2021, eib.org.

Germany's advancement in the area of digitalisation, as shown in the reports cited above, is hardly satisfactory. It reflects neither the level of the country's GDP per capita in relation to its competitors from the EU, nor the export orientation of its economy, nor its ambition to be an international leader in this field. The scale of the delays is all the more striking as Germany has not had to reckon with serious financial constraints in recent years. Until the outbreak of the pandemic, it recorded budget surpluses, while public debt continued to decline. Even its subsequent increase to 68.7% in 2020 leaves it in much better shape compared to Italy (155.6% in 2020), France (115%) or Spain (120%). Therefore, the origin of Germany's problems in the field of digitalisation lies outside the financial sphere.

The gradual innovation model

One of the general explanations is the nature of German capitalism. Its strengths include the ability to improve product quality, develop available (though rather mature) technologies and integrate them with crucial innovations. Therefore, it is more efficient in dealing with an adjustment than with a radical change. The factors of production markets function according to this logic. Banks offer capital for companies largely on the basis of long-term loans allowing for 'patient' investing. Another feature of German capitalism is stable employment in industrial sector, which is conducive to enhancement of qualifications over the course of a professional career, specialisation and achieving high productivity. Germany's competitiveness is based on these elements, especially in the machinery, automotive and chemical industries.

> **" Germans are specialists in gradual innovation and improving product quality, while digitalisation is a radical change.**

The price for these successes in gradual innovations, however, is the tendency to technological drift and putting off change. There is often a business logic behind it: German companies do not want to give up high margins achieved in narrow, specialised product niches or invest in the qualifications of employees and organisational structures they have developed over the years. However, drifting for too long also carries threats, which was shown, for example, by the long-term disregard of electromobility by German car companies. The same may be true for digitalisation, since analogue habits often prevail, especially in smaller companies. This carries the risk of progressively lagging further behind competitors who effectively combine industrial products with the opportunities offered by digitalisation (e.g. connecting them through platforms and the 'Internet of Things').

The particular way in which the term 'digitalisation'[3] is understood does not help in accelerating the changes in the country. In English, the word 'digitalisation' refers to the technical transformation of analogue content into digital records (e.g. book scanning). That is why, in countries such as the USA, it has been replaced over time by much broader terms, such as 'cyberspace', 'virtual reality' and 'e-business', which in fact relate to a systemic change. Meanwhile, in Germany, 'Digitalisierung' has survived and has begun to coincide in meaning with the traditional concept of innovation in the economy. This has far-reaching consequences: instead of focusing on social relations, learning, new modes of work, organisational issues, etc., Germany places emphasis on tangible investments and retrofitting of existing infrastructure. Digitalisation 'the German way' therefore means buying tablets for schools, installing data clouds, faster connections, new software, or adding a digital controller to machinery. Many managers view the Internet as simply another radical invention that should be integrated as a gradual innovation with mature technologies. In this perspective, the scale of the civilisational change brought about by digitalisation may be less apparent.

[3] A. Kluth, 'German ‚Digitalisierung' versus American innovation', Handelsblatt, 23 February 2018, handelsblatt.com.

The consensus culture and techno-caution

Another element of German capitalism that partially explains the digital lag is the organisational culture built on the primacy of consensus. At a company level, it is expressed by the interaction of the management board with worker councils and trade unions, as well as by a broad, stakeholder-based composition of supervisory boards. The consensus logic also includes wage negotiations conducted at the sector level and the qualifications development system organised with the co-operation of social partners. On the other hand, at the political level, compromises are forced by the federal organisation of the state, the dispersion of competences between different levels of power, and the relative fragmentation of the political scene, one consequence of which are coalition governments.

” Many Germans view digital technologies with reservations. They are concerned about transaction security, privacy protection and the future of their workplaces.

The adopted model has many advantages, including economic ones. Tedious negotiation processes reveal external costs and contribute to developing long-term solutions that take into account a wide variety of interests. Companies highly appreciate the opportunity to operate in such a predictable, stable system. However, challenges are also inherent in the consensus culture. The most important of them include the bureaucratisation of the system, the tendency to over-regulate and difficulties in mustering a rapid, spontaneous response to economic shocks and changes, e.g. to digitalisation.

It is all the more difficult as German society views new digital technologies with reservations: concerns about transaction security, cybercrime and the protection of personal data and privacy are particularly strong.[4] They largely explain the continued popularity of cash among citizens, the reluctance to use contactless cards or the fear of the Google Street View application. The generation factor can also have a significant impact on this state of affairs. According to the government's *Old Age Report* (*Altersbericht*, 2020), the rapidly growing population of people older than 65 is much less prone to use digital services as compared to younger age groups. In 2017, only 39.4% of people aged 79–84 had access to the Internet.

The conservative approach is also visible in the methods of communication, e.g. the still intensive use of e-mail (Germans send more e-mails than the Chinese; according to Statista's data for October 2021, their number reached 8.97 billion a day) and – at least before the pandemic – the moderate popularity of chat rooms, video conferences etc. This is important because e-mails have adopted the formal style of 'paper' communication and their preparation is time-consuming.

Digital technologies are also associated with the risk of job losses. According to a survey published in autumn 2021 by the analytical company Ernst & Young, one in eight employees in Germany (12%) share such concerns. They are most often expressed by employees in the banking, insurance and real estate sectors – as many as 20% of them share this concern. This share is slightly lower in industry, and is lowest in the health care sector (8%).

Infrastructure gaps and staff shortages

Moreover, the challenge of digitising Germany is influenced not only by soft institutional and cultural factors, but also by hard constraints on the resources side. In this context, the most common indication is the condition of the infrastructure: there is still a deficiency of connections based on optical

[4] S. Kirchner, *Zeit für ein Update. Was die Menschen in Deutschland über Digitalisierung denken*, Friedrich Ebert Stiftung, 2019, library.fes.de.

fibres that enable fast data transfer and are resistant to electromagnetic interference. This applies in particular to smaller towns and rural areas. According to data from the Ministry of Transport and Digital Infrastructure (Bundesministerium für Verkehr und digitale Infrastruktur, BMVI), at the end of 2020 only 20.2% of households outside larger urban centres had access to top-quality internet connections. Small and medium-sized businesses, many of which are based in the provinces, are also suffering. The shortages could not be compensated for by the mobile network, where a lot remains to be done. It is also assumed in Germany that in business use the mobile network is complementary to high-capacity cable connections offering a stable data transfer.

Table 1. Household access to broadband Internet in Germany by the types of communes, December 2020

Connection speed	Urban municipalities (%)	Suburban communes (%)	Rural communes (%)
≥16 Mb/s	99.4	97.7	92.8
≥30 Mb/s	98.5	94.0	84.0
≥50 Mb/s	98.1	92.6	80.9
≥100 Mb/s	95.9	83.2	65.7
≥200 Mb/s	91.4	68.9	40.3
≥400 Mb/s	86.3	55.8	24.3
≥1000 Mb/s	76.7	42.1	20.2

Source: *Aktuelle Breitbandverfügbarkeit in Deutschland (Stand Ende 2020)*, BMVI, 2021, p. 7.

Despite earlier government announcements that the infrastructure will be capable of being expanded by 2025, 2030 would seem to be a more realistic date. Although there is no single reason explaining this state of affairs, one of the major ones is the policy of the dominant broadband Internet providers (particularly Deutsche Telekom), which focused on profitable metropolises while neglecting the province. Another mistake was the costly modernisation of copper connections: the changes introduced several years ago make it difficult to switch to fibre optic connections. In addition, there is the issue of connecting the architecture for digital communication with other domestic connections: gas, energy and water. Construction sector associations have repeatedly emphasised that the expansion must be planned by taking into account other infrastructure elements managed by the municipalities. However, this rational argument often means that the laying of new cables has to be postponed.

Another serious barrier to progress in Germany's digitalisation is the shortage of suitably qualified employees. According to the Bitkom association, 86,000 jobs offered in the IT industry remained vacant in 2020. As a consequence, the economy is struggling to move faster from analogue to digital technologies.

" The greatest problem in digital infrastructure is the huge gap between the situation in metropolises and outside them, mainly in rural areas.

In very general terms, demographics is the main reason underlying these shortages. Population aging is already translating into an increasing labour deficit, and the situation will soon worsen further: by 2035, according to forecasts from Destatis (the German Federal Statistical Office), the number of people of working age (20–66 years) could fall by as much as 11%. These 'losses' could be compensated for by immigration. In 2019, Germany passed a law making it easier for qualified foreigners from third countries (i.e. from outside the EU) to obtain employment, but the pandemic made its implementation difficult.

Another source of the problem is the education system. Young people are choosing to study in higher education more often than in the past, while companies, especially medium-sized firms from the industrial sector, currently now need specialists with practical professional competences, including

digital ones. It is increasingly difficult to find candidates for acquiring skills as part of the dual education system: according to the Ifo and Randstad survey, in September 2021, 14% of entities were unable to find staff for positions offered. In the case of smaller companies (up to 49 employees) this ratio was even higher and reached 23%. Their situation is even worse due to other factors. Large, globally operating companies, such as SAP or Bosch, can acquire professionals from abroad. The SME sector, often based outside large urban centres, has no such opportunities. The ownership structure based on family capital does not help the sector either: young professionals assume that they will never be able to take over managerial functions, as these are reserved for family members. Consequently, they choose to work for larger companies.

Politics in the slow lane

Politicians who have long underestimated the importance of this process for a long time, and certainly not to the extent that they have recognised the problem of climate change, are also responsible for the moderate pace of digitalisation in Germany. The online sphere seemed to be the source of several new and interesting technologies that 'young people' are interested in. In this context, Angela Merkel is often quoted as saying in 2013, clearly flirting with more conservative voters, that "the Internet is a new land (*Neuland*) for all of us". In turn, other politicians have tried to improve their results in the polls, presenting digitalisation as a potential threat to the security and employment of citizens.

" The pandemic has forced Germany to radically speed up the reforms promoting digitalisation. The Internet is no longer a 'Neuland', to paraphrase Angela Merkel's words.

Only the coalition agreement of the cabinet formed in 2018 which formulated a number of commitments regarding the development of digitalisation, may be considered a breakthrough. The government began to strengthen competences in this area through various political and advisory bodies, such as the 'digital government' (*Digitalkabinet*, an informal super-ministry for digitalisation), the Digital Council (*Digitalrat*) or Innovation Dialogue (*Innovationsdialog*). In the government, Helge Braun, head of the Chancellery, was put in charge of digitalisation. Political influence was also built by Dorothee Bär (CSU), a government plenipotentiary for digitalisation (with ministerial rank), and Eva Christiansen, advisor to the chancellor and specialist in digital policy.

The weakness of German politics, unlike in the case of *Energiewende*, remained the lack of a comprehensive vision encompassing a plan for social change that would take advantage of the opportunities offered by digitalisation while mitigating its threats. As a consequence, the implemented changes fell into a number of separately managed areas: education, infrastructure construction, cybersecurity, health, etc. What was clearly missing was a separate federal ministry in charge of the strategy and coordination of action. The tedious bureaucratic procedures, which generally acted as a brake on the implementation of investments, did not facilitate progress. The problem affected not only the digital infrastructure: in recent years, delays in the construction of the Berlin Brandenburg airport, the Stuttgart 21 transport node or more recently the Tesla car factory, have been widely commented on.

Digitalisation clearly gained momentum during the pandemic. The lockdown forced the state to improvise and introduce new solutions practically overnight. This was particularly evident in the areas of health care, education and the functioning of the administration, which are strategic to combat the crisis. This is probably why the overall summary of the steps taken by Merkel to promote digitalisation in the last four years is better than expected. In July 2021, the sector association Bitkom published a report according to which out of 135 commitments regarding this issue included in the coalition agreement, 64 were fully implemented, 47 partially implemented, and 24 (i.e. 18%) were unfulfilled.

The priority for the new government

Despite recent progress, the digitalisation process in Germany can hardly be considered a success. Germany is a long way behind its main economic competitors due to problems with the infrastructure, slow implementation of e-governance, the conservative attitude of many companies (especially smaller ones) and the fear of new technologies prevalent among the German public. While highlighting the deficits, it is worth noting at the same time that the critical mass needed to radically accelerate change has been exceeded. During the Bundestag election campaign in 2021, practically every party aspiring to rule the country pointed to digitalisation as the main challenge the country needs to face.

Therefore, no one was surprised when the newly formed SPD-Greens-FDP coalition opened its 'probing document' with a chapter titled *The Modern State and the Digital Breakthrough*.[5] It envisages, among other solutions, reducing bureaucracy, which has hitherto inhibited the expansion of infrastructure, and a rapid expansion of the range of public services available online. The future government will also try to build synergies between the 'green transformation' and digital technologies. It remains an open question as to whether a separate ministry for digitalisation, responsible for systemic issues and coordinating decisions made in other ministries, will be established. While introducing the changes, the cabinet will be able to take advantage of the country's favourable financial outlook. Despite the serious repercussions of the pandemic crisis, Germany has relatively low public debt and a stable budget. This affords ample opportunity to make up for the delays and turn digitalisation into an asset rather than a source of economic weakness.

[5] *Ergebnis der Sondierungen zwischen SPD, Bündnis 90/Die Grünen und FDP*, SPD, 177/21, 15 October 2021, spd.de.