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**The impact of
digitalisation on job
quality and social dialogue
in the public services: the
case of Germany**



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EXECUTIVE SUMMARY

Digitalisation has become a crucial topic in the public sector, presenting both opportunities and new challenges. The objective of the European research project is to assess the impact of digitalisation on various aspects of work quality and social dialogue for public service employees in three selected sectors: public administration, health, and power supply.

The impact of digitalisation on working conditions, work organization, and representation of interests in the public services is significant, just as it is in other economic sectors. However, most research focuses on the private sector, leaving the public sector in Germany understudied. The effects of digitalisation on the workloads and health of employees have received limited attention in research. The public sector in Germany faces long-standing problems in addition to the digital transformation of work, as discussed in the following sections. Issues such as work and task design, pressure to meet deadlines, being rushed and interrupted due to understaffing are considered major stress factors in the workplace, that impact job quality. The shortage of qualified personnel increases work intensity and the workload for employees. In other words, job quality issues are partially related to the digital transformation and must be considered within the broader context of the work environment.

In this report, the main findings of our analysis, which is based on both desk research and our own empirical data, are presented regarding the impact of digitalisation on working conditions and representation of interests in the selected sectors. The research also seeks to raise awareness among trade unions and decision makers about the impact of the digital transformation of work on public services.

In recent years, the German Government has initiated various measures to drive digitalisation in various sectors such as the public administration, culture, forestry, education, mobility, artificial intelligence, quantum technologies, 5G, fibre rollout, smart cities, digital sovereignty, and hospital modernization. In general, Germany ranks 11th among the 27 EU Member States in the 2021 Digital Economy and Society Index (DESI). Germany's performance in the core areas of the index is mixed, slightly above the EU average, except for the integration of digital technology in business activities.

The provision and delivery of public services in these sectors are very different from in other economic sectors, due to the historical role of the state in providing welfare and infrastructure. The quality of service and working conditions in these sectors is of utmost importance, given their impact on the well-being and satisfaction of citizens or patients. Products and services in these three sectors are considered to a certain degree as a **common good** and are strictly regulated, with direct influence from politics and limited market mechanisms.

The energy sector in Germany faces a variety of challenges which are of an economic, regulatory, political, social, and technological nature. **Electricity supply** and maintenance are crucial for economic activities and daily life, and their interruption draws attention to their importance. Political discussions and market mechanisms shape the sector, and recent decisions such as price limits and shifts towards renewable energy sources have impacted it. In general, digitalisation, liberalization, decentralization, and the establishment of transparent energy markets can be considered as key factors driving structural changes in the electricity market. Digitalisation is one of the major drivers for structural changes in the electricity sector in Germany. The energy sector in general was one of the early adopters of digital solutions. Digitalisation opened up new ways not only for restructuring the sector but also for developing new business models. Emergence of new virtual energy markets and entry of external suppliers, especially, with respect to distribution and delivery of electricity to the customers, would not have been possible without digitalisation in general.

The **public administration** is responsible for enforcing laws and regulations while ensuring citizens' well-being and satisfaction, which enhances political legitimacy. In light of the ongoing digital transformation, the public sector is facing increased expectations concerning the contact with, provision, and delivery of public services. The major challenge in the public administration is related to the shortage of qualified personnel, as is also the case in several other sectors in Germany. Intensification of work and work overload due to staff shortages have climbed to the top of the agenda in the sector-related discussions. The need for digital solutions, and for measures related to speed and insufficient infrastructure, has become increasingly evident in recent years, particularly during the Covid-19 pandemic. The German government has responded to the challenge of digitalisation with a whole series of action programmes. Initiatives and measures to enhance the digital transformation are still lagging behind the objectives of the government.

The **hospital sector** and the health system in Germany are confronted by long-standing but barely recognised structural problems. Despite some improvements in recent years, the burden of long-term ignorance still endures. Shortage of qualified personnel, high work intensity and relatively low levels of wages together hamper the attractiveness and reputation of these jobs and do not reflect their life-saving importance. The shortage of personnel in German hospitals has resulted in increased workloads and growing dissatisfaction as well as low pay, especially among care workers.

Since the beginning of the 90s, the German hospital sector has experienced major structural changes induced mainly by commercialisation and privatisation. The health sector is, hence, highly subject to political decisions, with recent improvements in care worker wages in Germany driven by political decisions and increased awareness of their importance during the pandemic. The replacement cost-coverage principle has intensified the commercialisation process. Consequently,

a new wave of privatisation of the German hospital sector has been observed in line with a fall in the number of hospitals and the rise of private hospitals. In general, the hospital sector has been regarded as weakly digitalised compared to other sectors. Interview partners claim that digital solutions are implemented not as a part of a general digital strategy, but are, instead, separate stand-alone solutions lacking a comprehensive strategy. The interconnection of such separate strategies results in so-called media breakage.

In general, the issues relevant in other sectors regarding the impacts of digitalisation are also crucial in the hospital sector, such as work intensity, working time agreements, schedules, employee training, teleworking agreements, data protection, transparency through digital tools, and work-life balance. These issues are directly or indirectly related to the overall digital transformation and are closely tied to working conditions, which is a central subject in collective bargaining. Although these topics may not be explicitly mentioned in collective agreements, they will play a decisive role in the future negotiations of trade unions and social partners, particularly in light of the long-standing unresolved problems such as low pay and understaffing in the hospital sector. Given the lack of nationwide agreements on digitalisation issues, the role of works councils in the process of internal workplace agreements will remain important for representing the interests of hospital employees.

The results of a **web survey** indicate that the implementation of digitalisation in the three sectors is still a work in progress. Most participants use digital tools daily and digitalisation has a significant impact on work organization, including improved time management and remote working options. However, the respondents also reported an increase in work intensity, mainly, however, due to a shortage of qualified personnel. The impact of digitalisation on work-life balance was generally viewed positively, and the importance of digitalisation training was emphasized. Participants did not feel fully involved in the early stages of digitalisation implementation in the workplace. The right to disconnect is governed by collective bargaining agreements. Overall, the participants recognized the positive effects of digitalisation, such as reducing physical strain through the use of digital instruments, but also acknowledged the potential negative impact on mental health and well-being as well as the increase in employee monitoring. Job security and job loss due to digitalisation were not seen as decisive factors.

The pace and level of digitalisation in each sector are different and shaped by political decisions, institutional structures, and market competition. Correspondingly, the strategies of the social partners and trade unions differ in part, though there are many similarities. Political decisions have a significant influence on market structures, particularly in the energy and hospital sectors, which have faced challenges due to **privatisation** and **commercialisation**. In the electricity sector, however, besides market competition, political decisions such as **decarbonisation** strategies influence digitalisation decisions. Generally, digital transformation is driven by top-down strategies.

In general, trade unions recognize the positive aspects of digitalisation. They see it as a way to increase the flexibility of work in terms of time, place, and organization. They believe it offers new opportunities for both employees and employers in terms of work structure. In the three sectors analysed in the report, trade unions emphasize the importance of preserving the **common good** character of public services and the need to avoid negative impacts on **working conditions** during digital transformation. Neither the quality of services nor the working conditions of employees should be negatively impacted and a balance must be struck between these two goals.

Digital transformation should not be driven solely by economic and rationalization considerations, but rather should serve to reconcile the quality of services with working conditions. Each digital process should be evaluated from these perspectives. Additionally, trade unions stress the importance of being involved in the decision-making process throughout the digital transformation. This can help alleviate the concerns and resistance of workers and optimize the digitalisation process. With additional training and skill development initiatives, employees can be supported in taking these steps.

Furthermore, digitalisation is having a significant impact on industrial relations and interest representation in Germany. Digitalisation may result in changing work arrangements such as increased remote work and more flexible hours, which can challenge the traditional role of trade unions. During the Covid-19 pandemic, it became increasingly difficult for the trade unions to maintain contact with employees working from home. Due to data protection regulations, many companies are often unable to make internal communication channels such as company e-mail addresses available to third parties. The trade unions stress in general the importance of issues related to the regulation of remote working as well as issues such as the right to disconnect, work-life balance, privacy issues, seamless monitoring, work intensification and increasing stress due to more and more small-scale work steps, the emotionless work of machines on and with people, and the blurring of boundaries between work and life in times of constant accessibility. There is no collective agreement in Germany covering the right to disconnect. This issue is still being discussed publicly, however, so far without any conclusion at national level.

To address these challenges, trade unions in Germany are adapting their strategies and exploring new ways to represent workers in the digital age, which strike a good balance between the benefits of digitalisation and the rights of workers. Trade unions have, however, faced difficulties in securing nationwide agreements to mitigate the effects of digitalisation.

Instead, most agreements are reached at the company level, facilitated by the strong legal rights and actions of works councils. Works and Staff councils have some legally powerful means to shape working conditions with respect to impacts of the digitalisation process at the local level.

Trade unions provide support to works councils through various means, including offering advice and assistance, as well as training programmes and national campaigns. They also participate in discussions about new technologies and digital solutions such as artificial intelligence, platform work, or blockchain, through workshops, policy papers, and themed conferences. They stress the importance of evaluating these developments from the perspective of employees. In general, the trade unions call for comprehensive co-determination in the workplace with regard to the whole digitalisation process, protecting jobs, comprehensive training measures, occupational health and safety adapted to the new requirements and more comprehensive protection of employees' privacy.

Regarding collective bargaining in Germany, **two general agreements** with respect to digital transformation can be regarded as **successes** for the trade unions. One is a recent (2022) agreement in the rubber and chemicals sector which sets out digital access rights for the trade unions, enabling them to use internal communication channels in the companies. The currently established and existing communication channels are to be used for this purpose, for example the company e-mail addresses. These can be supplemented by other company information systems, such as the digital bulletin board on the company intranet or mailing lists. It is still an open question whether trade unions in other sectors can achieve such a digital access agreement in the near future.

Another achievement was the 2021 collective agreement on digitalisation between the Federal Ministry of the Interior and trade unions. The collective agreement on digitalisation establishes rules that prioritize job and pay security. This collective agreement comes into effect when significant changes to work are brought about by digitalisation. For instance, it gives employees the right to training if their job changes, is discontinued, or if they need to take on a new job. The agreement also provides for pay protection if a new job comes with a lower pay scale than the previous one. This agreement with the federal government is seen as a model for others to follow. However, federal states and municipalities have yet to reach such an agreement and trade union efforts have yet to bear fruit.

SECTION 1. INTRODUCTION

1.1 Purpose of the research

Digitalisation is increasingly an important topic in the public sector and offers both opportunities and new challenges. Digitalisation as a process occurs through various channels. This includes the increasingly ubiquitous use of a range of digital tools that influence both the execution of public service tasks and the processes underlying their implementation (task planning and control, human resources).

The aim of the DIGIQU@LPUB European research project is to analyse the impact of digitalisation on various aspects of quality of work and on social dialogue for public service employees in the three selected sectors: public administrations, the hospital and health sector and electricity production and supply. The project is coordinated by OSE (European Social Observatory, Belgium) and implemented with partners in eight EU countries (Spain, Poland, Hungary, France, Finland, Denmark, Italy and Germany).

Objectives and activities:

- To improve the understanding of the concrete impact of digitalisation on job quality, work content and tasks from the perspective of public sector employees and trade unions.
- To raise awareness among trade unions and decision-makers about the consequences of the digital transformation of work in the public sector
- To explore challenges and opportunities and analyse the implications for the dynamics and practice of social dialogue at national and sectoral levels in selected EU Member States.
- To contribute to the discussion on this topic among social partners and to support both European and national trade unions and policy makers by providing practical policy recommendations in the context of the digital transformation of work.

The research methodology is based on a mixture of qualitative and quantitative analysis. Building on the document analyses and literature reviews, 12 interviews have been conducted with various stakeholders in the selected sectors. These interviews are based on guidelines defined together in cooperation with the coordinator of the project. Key resource informants in interviews have included union representatives and other stakeholders at the sectoral, occupational, and cross-sectoral levels.

The DIGIQU@LPUB web survey (DGQS) was aimed primarily at public sector workers in the selected sectors in order to analyse their assessments of quality of work and social dialogue with regard to digitalisation processes. The web survey has delivered a total of 127 questionnaires for

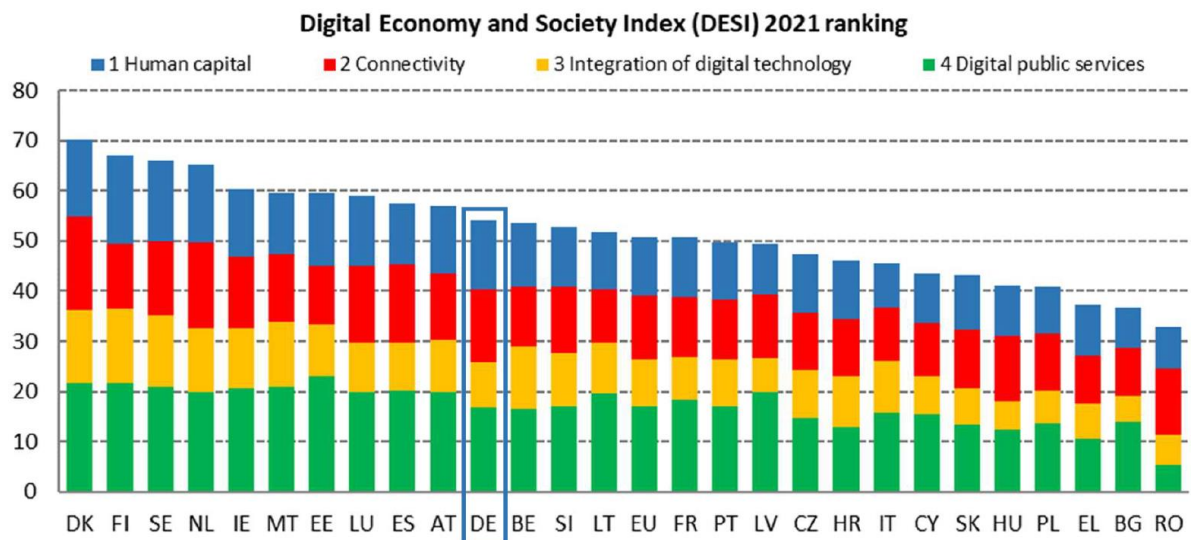
Germany, not considered as representative but useful to provide insights into the digitalisation process in the public sector.

1.2 Digitalisation: state of play and national strategies

1.2.1 Latest DESI Index

The European Commission's annual publication "Digital Economy and Society Index (DESI)" monitors Member States' progress on digital policy areas. The indicators are structured around four main areas: human capital, connectivity, integration of digital technology and digital public services.

Figure 1: DESI Index Germany



Source: Digital Economy and Society Index (DESI) 2021, Country Report Germany.

In general, Germany ranks 11th out of the 27 EU Member States in the Digital Economy and Society Index (DESI) 2021. In recent years, several digitalisation measures have been implemented in the following areas: public administration, culture, forestry, learning, mobility (such as shipping), artificial intelligence, quantum technologies, 5G, fibre roll-out, smart cities, digital sovereignty, and modernisation of hospitals.

In core areas in the index, Germany's performance is mixed. It is ranked slightly above the EU-average, except for in integration of digital technology in business activities. Apparently, large countries like Germany and France perform less well than small countries with respect to digitalisation activities. There is still room for improvement. With respect to 'digital public services', Germany's performance is quite mixed. There is an overall improvement in performance. However, continuous efforts, e.g., to ensure the interoperability of the services provided, are necessary.

1.2.2 Digital national strategy?

In November 2018, the Federal Government published its implementation strategy 'Shaping Digitalisation'. As Germany shifts its focus to implementation of the strategy, the progress achieved is monitored on the digital dashboard 'digitalmade-in.de.' A closely coordinated, targeted approach focused on implementation efficiency gives an overview of the progress of 147 ongoing digitalisation measures. (Agencies involved: Ministries, Chamber of Industry and Commerce, associations, social partners and trade unions).

The implementation strategy offers concrete solutions with implementation plans for every challenge. The strategy is in constant development, and the achievement of goals is measured and checked. The strategy consists of five fields of action:

- digital competence: citizens should be able to help shape digital change in a self-determined manner and deal with the risks responsibly. More provision will be made available in all areas and the education system will be geared even more towards digital life, the digital world of work and business, and the digital knowledge society;
- infrastructure and equipment: by the end of 2025, all of Germany will be provided with gigabit-capable networks. Germany is to become the lead market for 5G applications;
- innovation and digital transformation (extensive support for Industry 4.0, AI-Strategy);
- society in digital change (high level of quality of life and security for all citizens);
- modern state: easy and safe communication with the administration and applications for benefits. All administrative services will be offered digitally by the end of 2022.

In addition to that, in January 2021, the Federal Government adopted its first Data Strategy. With over 240 measures, the Data Strategy aims to improve the innovative use of data and data sharing and covers, for example, data infrastructure, use of data and data competency.

In the framework of the EU 'Recovery and Resilience Facility', Germany, under the title 'Deutscher Aufbau- und Resilienzplan (DARP)' is receiving EUR 25.6 billion. The plan (DARP) aims at further support for the economic recovery, including, in addition to existing digitalisation support programmes, significant investments in digitalisation (50% of the planned allocation), decarbonisation of industry and climate-friendly mobility.

Regarding the public sector, the 'Recovery and Resilience Plan' (DARP) includes measures to address its main digital-related challenges:

- Digital skills are addressed in the Digitalisation component of education, by investments in teacher terminal equipment, an education platform, education competence centres, and modernisation of the educational institutions of the Federal Armed Forces.
- Digitalisation of public services is supported by measures in the Modern public administration component, with projects on a European identity ecosystem, implementation of the Online Access Act and modernisation of registers.
- the Strengthening social participation component includes a measure improving access to information about pension rights for citizens, through a digital platform.
- The Strengthening a pandemic-resilient health system component includes two relevant measures: the digital and technical strengthening of the public health service and the Future Hospital Programme.
- In addition, the Reducing barriers to investment component contains reforms aimed at facilitating and speeding up public investments.

1.3 Research on the impact of digitalisation on job quality at cross-sectoral level: state

There has to date been little research in Germany on the impacts of digitalisation on working conditions and job quality. Compared with the private sector studies, there is a lack of research on the public sector, which may be traced back to some peculiarities of this sector.

Unlike the majority of the private sector, the products and services delivered by the public sector are regarded as of public interest. Therefore, the market mechanism to determine supply and demand factors, and hence the price, does not really come into play. This also limits interest representation systems. In the public administration, the civil servants are organised by staff councils and trade unions, but they are not allowed to strike. In the hospitals, the staff cannot shut down the facility and have an ongoing strike. The patients must not be neglected and should be cared for during the strikes. The supply and maintenance of electricity, along the full spectrum of production and consumption lines, must be secured. Therefore, the public welfare characteristics of the products and services delivered by the public sector account for the major differences with other industries and services in the whole economy.

The majority of the research on digitalisation tends to focus on large companies; it even neglects small and medium companies (SMEs), which form the backbone of the German economy, making up 97% of all companies and employing 60% of all employees. There is therefore limited potential to transfer the strategies and measures developed for big companies to SMEs (Öz 2019).

Digitalisation has long been a subject for trade unions in Germany. In the public sector, however, these issues are rarely addressed. The DGB-Index 'Good Work', for example, conducts annual

surveys and deals with several aspects of digitalisation and digital transformation. The latest focus report on the public sector dates from 2016 and has not been replicated since in such an extended form with sector specific questions. In the following sector analysis, such existing studies will be presented in detail.

Since the beginning of 2020, due to the Covid-19 pandemic, the shortcomings in the digitalisation process, especially in the public administration and hospital sector, have become more evident and have been discussed intensively in the public realm. For example, telework and mobile work have been introduced quickly in the public administration, without adequate infrastructure, to the detriment of employees and citizens, who were confronted by late delivery of documents or related issues.

Working conditions and low pay in the health care and in hospitals, long neglected but so-called system relevant occupations, have attracted wide attention from both the public and politicians (Öz 2020).

This national report aims at contributing to the discussions on the impacts of digitalisation and working conditions in the public sector, especially by providing its own empirical data on the sectors in question. It highlights key issues and seeks to deliver new insights on how to handle and confront sector-specific problems.

SECTION 2. IMPACT OF DIGITALISATION ON JOB QUALITY

Digitalisation is having a huge impact on working conditions, work organisation and, in general, interest representation in the public services, just like in other economic sectors. Existing research, however, concentrates mostly on the private sector and there are fewer studies with a special focus on the public sector in Germany. The question of what role digitalisation actually plays in the world of work and how it affects the workloads and health of employees is largely neglected in research.

In the following sections, the report presents the main results of our own analysis, based on both desk research and our own empirical data on the impact of digitalisation on working conditions and interest representation in the three sectors: electricity production and distribution, public administration and hospitals.

The provision and delivery of public services in these sectors differ considerably from other economic sectors. This can be traced back to the historical role of the state with respect to welfare and infrastructure duties. Hence, market mechanisms apply only to a certain extent. The health and wellbeing of citizens as well as securing infrastructure such as electricity imply limitations regarding exclusion, price determination and delivery of public services and products.

As discussed later on for each individual sector, the public sector in Germany suffers from longstanding problems apart from the digital transformation of work: work and task design, deadline pressure, being rushed and interruptions - caused by thin staffing levels - are regarded as major stress factors in the workplace, with an impact on job quality. The shortage of qualified personnel affects work intensity and the workload for employees. In other words, job quality issues are partly related to digital transformation and must be regarded in a general work environment context.

Regarding the impacts of digitalisation on job quality in the public sector, both negative and positive effects are discussed in the literature, and these do not differ that much from other economic sectors. In general, in the public sector, however, both working conditions and quality of products and services to citizens are equally emphasized, as explained in the following sections for each sector in question (see section 3).

The positive effects of digitalisation are related to increased efficiency (optimization of products and services, shorter waiting times, reducing staff time, improved accessibility for citizens and cost-savings by reductions in manual work and shifts to digital processing, cooperative working, learning and communicating across locations, flexibility, space-saving archiving etc.).

In addition, digitalisation can increase transparency in the public services by improving accountability. It can enable the development of new and innovative services that were not previously possible. It can automate and speed up processes, leading to greater efficiency and productivity. Usage of digital technologies such as robots or machines that can be worn on the body to support muscle movement make work less physically demanding and, hence, can relieve physical strain and thus protect health.

Digitalisation can also improve communication between workers and management, leading to increased collaboration and cooperation, and can allow for more flexible working arrangements, such as remote work and flexible hours, which can benefit both workers and employers. From the employee's point of view, it also opens up a wide range of opportunities, such as mobile, location-independent working - which is increasingly in demand among employees as working from home becomes more widespread.

However, there are also potential negative impacts, such as data privacy and security concerns, the need for significant investment in technology, and the potential for job losses due to automation - this would result in reduced job security for workers by making certain jobs redundant. The content of the work has been changing as well: simple tasks are increasingly being taken over by machines and algorithms, while new jobs are also being created.

With respect to estimations of the effects of digitalisation on jobs, more particularly, two opposing effects - 'substitution' and 'complementarity' - have been discussed in academic circles. On the one hand, intelligent systems, robots and machines have already replaced certain activities, and will do so increasingly in the future, and consequently, some jobs will disappear. On the other hand, it has been argued that the use of digital applications, tools and solutions also has the potential to create new jobs, albeit possibly with changed skill requirements (Dengler and Matthes 2015).

The substitution effects of digitalisation have been widely discussed in Germany in recent years, with the implications for low- and high skilled workers or on the inclusion of older workers during the digital transformation. Dengler and Matthes (2015) use German occupational data as the basis for estimating the probability of automation. In addition, they attempt to calculate the substitutability potentials that already exist and do not estimate future automation potential. Looking at the different occupational segments, manufacturing occupations have the highest substitutability potential at 65%, while the lowest potential is in the occupational segment of social and cultural services, at less than 50%. Dengler and Matthes (2015) argue that 'activities performed by qualified skilled workers can be more strongly affected by digitization because they can be better broken down into programmable algorithms and thus more easily replaced by computers.' Helpers are supposed to perform non-routine tasks that cannot be automated so easily.

In some cases, digitalisation can lead to people having to work in more precarious working conditions, without social security or adequate wages (DGB 2017). In Germany, as in many other European countries, the growth in particular contract types that diverge from the 'standard employment contract', i.e., a full-time dependent employment contract of indefinite duration, is of great concern for trade unions. While the use of temporary or casual contracts and the emergence of platform work may bring advantages, including flexibility for both employers and workers, concerns are being voiced around job quality and the potential negative impact on the sustainability of social protection systems (OECD 2019a).

Digitalisation is also helping to blur the boundaries between work and leisure to an even greater extent, in particular for knowledge workers, as they can actually do their primarily digital work anytime and anywhere. Neglect of personal contacts, however, has been a side effect of digitalisation of some services in the public sector. It is no longer necessary to meet customers or citizens in one place, so personal meetings with them are sometimes neglected. Working from home can cause isolation and additional stress.

Digitalisation is requiring workers to upgrade their skills, leading to a need for ongoing training and development in order to survive in a digitalised world of work. If not used effectively and supported by qualification and training measures, digitalisation could increase work intensity and the workload for workers. A key finding of research institution 'Soziologisches Forschungsinstitut Göttingen (SOFI)' on this topic is that it is not digital technology per se that triggers or intensifies stress, but rather poorly designed or less functional technology. One reason for this is that employees are often not sufficiently involved in the design of new technologies and the modification of processes (Carls et al. 2020). It is important, according to a central finding of the SOFI research, that employees are involved early and extensively in the planning and introduction processes of new digital technology. It has been shown that where far-reaching co-design is implemented, workload is lower and overall well-being at work is higher.

Furthermore, digitalisation is having a significant impact on industrial relations and interest representation in Germany. Digitalisation may result in changing work arrangements such as increased remote work and more flexible hours, which can challenge the traditional role of trade unions.

To address these challenges, trade unions in Germany are adapting their strategies and exploring new ways to represent workers in the digital age that would balance the benefits of digitalisation with the rights of workers. Trade unions emphasise the importance of skills upgrading with an increasing need for ongoing training and development. They try to incorporate training issues into

collective bargaining agreements and seek to support and assist works councils to negotiate these issues at the company level (Dribbusch and Bilke 2019).

Section 2.1 Electricity production and distribution sector

Germany's electrical grid is part of the Synchronous grid of Continental Europe. In 2020, Germany produced 579.1 billion kWh of electricity, of which over 41% was from renewable energy sources (Destatis 2021). Germany will phase-out nuclear power by the end of 2022, and eight nuclear power plants were permanently shut down after the Fukushima accident. Germany also plans to phase out coal, by 2038 or earlier.

The energy sector in Germany faces a variety of challenges of an economic, regulatory, political, social, and technological nature. According to studies on the structure of the energy sector in Germany, the major factors can be as summarized as follows (Roth 2018; Flögel and Beckamp 2020):

Economic factors can be traced back to changing legal and regulatory framework conditions. These changes started in the 1990s with liberalization, in the form of the breaking up of formerly monopolistically structured utilities, the creation of equal network access for all companies active in the energy sector, such as energy producers, energy traders and energy sellers. The growing use by energy companies of modern IT in the provision of services, as well as the lowering of barriers, enabled the entry of new competitors, originally from outside the sector, such as telecommunications companies or start-ups; this resulted in increased competition. Decarbonisation and decentralisation of energy supply in combination with the rise in renewable energies has resulted in huge structural changes in the sector.

Demand structures have also altered due to demographic change, in the form of falling birth rates, the progressive ageing of society and an increase in single households, with far-reaching effects, particularly for energy utilities with mass retail business. These can be regarded as social factors.

Changing consumer behaviour associated with declining consumer loyalty to suppliers and the higher demand for a service portfolio, as well as increased need for transparency with regard to service quality and prices due to the growing importance of the Internet as a sales platform, have created new challenges for the sector.

The energy sector is confronted with intensified pressure to innovate due to technological progress and significantly shorter innovation cycles. The development of large-volume, virtual generation structures, which are operated in parallel to the existing structures of conventional energy generation, as well as big data applications, mobile payment and smart meetings systems, is a driving force for technological development in the industry.

Due to political decisions, such as the move away from nuclear energy or the targeted reduction of greenhouse gases, including through decarbonization, demand for increasing energy efficiency in both generation and energy consumption has increased, especially in the last decade. The use of environmentally friendly, renewable energy sources such as wind, water, solar, and biomass has been the main focus on the political agenda. These political and social decisions and developments are associated with fundamental upheavals, such as declining energy sales volumes and the restructuring of power plant parks in the German energy sector.

2.1.1 Overview of the sector

In Germany, there were 852 companies with 20 and more employees in 2019, which produced 508 billion in turnover, with 215,176 employees, of whom 160,359 are blue-collar workers. Hence, these large companies are responsible for the majority of employment (over 66%) in the sector. Women only make up 33.8% of workers. Only around 17% of the workers have part-time jobs. The number of companies grew from 448 in 1991 to 633 in 2000 and reached its peak in 2019 with 852 companies. The structure of the electricity market is dominated by big companies in Germany. The aggregated market share of the five companies with the highest sales in the electricity market in 2020 was 65.3% in the German market area, including Luxembourg. Employment has experienced some fluctuations in the past. There were 217,575 employees in this sector in 2000, which fell to 191,588 in the year 2010. Since then, their number has increased to 215,176 in 2019 (Destatis 2022).

2.1.2 History and patterns of digitalisation in the sector

Digital technologies enable new technological possibilities and, hence, drive change and make innovations possible in response to the challenges facing the industry. Digitalisation has become one of the major drivers for structural changes in the energy sector.

A recent study conducted by the Institut Arbeit und Technik (IAT) researchers Flögel and Beckamp, in a comparative analysis of the energy and banking sectors, identifies two stages in the past development of digitalisation in Germany (Flögel and Beckamp 2020). The first stage of digital transformation related to the increasing and extensive use of digital technologies and solutions in the sector, where computerisation has accelerated 'internal' digitalisation, enhancing operations and existing business models. In fact, the energy sector has often been an early adopter of large information technology (IT) systems. In the 1970s, power utilities were digital pioneers, using IT to facilitate management and operation of the grid.

Electricity markets are now monitored and controlled in real time over vast geographical areas serving large numbers of customers (IEA 2017). The German energy business was one of the first civilian sectors in which computers were implemented in the 1960s. Applications mainly existed in the field of grid control, e.g., for process data compressing, compensation of measurement errors

as well as voltage loss optimisation. Furthermore, power plant control and communication with the energy markets have been digitalised. During this phase of digitalisation, various digital instruments and solutions were introduced, mainly in operations and connections to the market (Flögel and Beckamp 2020).

The **second stage of digital transition** has been the rise of digital and technology-enabled business model innovation and is associated with new competitors (start-ups, tech companies) in the energy sector. New business models, production methods and the way services are delivered leads to changes, sometimes disruptively. New actors with new business models emerged in the market, which partly challenged long-established strategies and partly fostered cooperation with incumbent actors.

The main features of the second digital transformation can be summarized as follows:

- Increasing importance of data: utilities rely heavily on real-time market data and algorithms to run their business and to guide energy generation and sales.
- Algorithmic solutions with respect to grid control and especially energy trade, developed as a highly digitalised part of the energy sector.
- Market entrances by external players (originating in other fields, especially the ICT sector) and new energy start-ups as 'energy techs'.
- Various companies and start-ups capitalise on the potential brought by digital technologies to offer energy related services. Previously unsolved challenges of the energy transition arising from decentralised generation are increasingly targeted with digital solutions.
- Aggregators, operating virtual power plants, have arisen in the last decade and operate various markets, such as energy exchanges and ancillary service markets. They do not own generation capacities, but virtually combine existing energy generation, storage and demand units and are, thus, able to act as a large energy generator or consumer.
- Municipal utilities have already recognised the potential of digitalisation to meet challenges, with diverse strategies such as: cooperation with scientific institutions and universities for research and pilot projects, cooperation with start-ups or the use of innovative technologies.
- With the rise of E-mobility, more offers and firms will enter the energy sector at the interface of energy provision and mobility, leading to further opening up of the energy sector to new business models and actors.
- Development of cooperative, service-oriented provision as a reaction to the changing role of customers, with specific offers such as contracting models.

- One of the most recent features of the digitalisation process is the introduction of smart meters, a technology allowing real-time metering of decentralised energy consumption.

The two stages are not sequential in the digitalisation process. The first digital transformation of the energy sector is not yet completed, as especially the lower tier grids operate in a fairly analogue way. Rather, elements of both stages can run in parallel, depending on market and company structure.

In general, digitalisation, liberalisation and decentralisation, as well as decarbonisation and the creation of transparent markets for electrical energy and auxiliary services, can be considered as key drivers for structural changes in the electricity market.

'Digitalisation is a process that began in the energy sector decades ago and continues to play out. The "energy industry" is technology-driven. An ongoing process is taking place here, with increasing use of various instruments (power plant, generation, distribution; network technology; storage technology in general whole environment). The process is ongoing and increasingly intensified. The focus is constantly on how to become more efficient, how to make efficient control. This is increasingly relying on AI, because the issue of volatility (injection and withdrawal) requires use of intelligent systems to control the amount of energy (production and withdrawal). This also applies to the issue of metering and payment instruments' (INT4).

2.1.3 Work organisation

In general, the energy sector is regarded as a highly digitalised sector: *'Since the beginning of the '90s, when the last investment cycle started, processes in the industry have been largely automated, telecontrol technology and digital office communication are standard. Digitalisation is not a vision of the future, but already reality in the companies. Many services could not function at all in practice without digitalisation (measuring devices, digital recording of production and data for recording, and communication between interfaces, and customer relations)' (INT5).*

The respondents to the 'DIGIQU@LPUB survey (1)' highlight some aspects of the digitalisation process in the electricity sector. All the respondents regularly use mobile devices such as laptops, smartphones or tablets in their work (100%). The general use of digital technologies affects various fields of the work and tasks. Electronic communication, software-controlled work processes and supporting electronic devices are widely used.

1. In the web survey conducted between April 2022 and September 2022, 26 questionnaires were collected from the electricity sector. In this section, the results are presented in terms of their thematic context, based on the findings of the survey.

In response to the multiple-answer questions about usage, the respondents replied that they used this technology 'to plan/schedule the performance of work tasks' (25.9%), 'to monitor the performance of work tasks' (25.9%) and 'to communicate with colleagues and internal or external services' (23.5). 15.9% of respondents use such devices to measure data, to collect/organise/retrieve information.

To the question related to the main usage of these digital machines at work, respondents stressed various areas: Mainly, 'to monitor and to control parameters of equipment or persons' (31.4%), 'to measure data, to collect /organise/retrieve information' (25.7%) and 'to perform routine repetitive tasks' (22.9%).

In general, survey participants assessed the effects of digitalisation as positive. With respect to the quality of the service to users, the digitalisation of work (the introduction of various digital tools and methods) is assessed as having had a positive impact (52%, somewhat agree or strongly agree). With a 58.3% positive assessment of the improvement of working conditions in the sector and the overall quality of jobs (45.8%), the respondents rated the effects of digitalisation of work as positive.

One interview partner shares the same positive view of digitalisation in general: *'We don't observe any general rejection of digitalisation among employees either. Employees also recognize that digitalisation can improve care and ensure services and processes. From a trade union perspective, it is a matter of participating in the co-determination of these decisions, of taking greater account of employees' interests. In other words, not just focusing on technology, but taking greater account of personnel aspects' (INT4).*

The survey shows that the introduction of digital tools/programmes affected several aspects of the work: For 31.3% of the employees, the scope of decision making at the workplace has remained the same, but a large share, 56.3% report an increase in their decision-making and autonomy to schedule work tasks due to digitalisation. In addition, the time needed for routine repetitive tasks has, they say, been reduced (75%).

Digitalisation also improves coordination of tasks with colleagues (63.2%). In addition, it offers a clearer overview of the implementation of the tasks making up their job time (84.2%) and gives more time to focus on significant aspects of the job (63.2%).

On the other hand, work intensity is also affected by digitalisation at the workplace. 82.4% of the people surveyed consider that the intensity of work has increased. 82.4% of the respondents state that the monitoring of employee performance for the purpose of internal assessment by

supervisors has been especially associated with the introduction of digital tools and devices in the last five years. 73.7% stated the same regarding internal assessment by direct colleagues.

75% of the staff surveyed state that the introduction of digitalised tools and methods at work has triggered the feeling that digitalisation has increased the monitoring of employees' work results.

Interviewees state that, to a great extent, jobs in the electricity sector can be regarded as secure. The general assumption and fear that many jobs will be lost due to increasing digitalisation is not observable in practice: *'Due to a shortage of skilled workers, certain jobs would be eliminated, but the workers can be deployed in other areas. E.g., robots are increasingly being used in operations and plants. These would increase safety at work and minimize possible accidents and health risks. This would allow workers to take on other jobs. This requires training measures in the companies, which must constantly accompany the digitalisation processes and even lead the way' (INT5).*

Interview partners stress the importance of the electricity sector and the provision of services with respect to public welfare and basic provision in the general interest. For this reason, the focus should be on public welfare, in addition to economic and competition-related issues. They emphasise the importance of human factors in the digitalisation process and call on decision-makers in the companies and departments not to simply buy the latest thing, but only to make necessary investments with safe technology. In this context, it is important to note that: *'Investment planning that does not include a human resources development plan is incomplete and, in case of doubt, will lead to bad investments. Safe public services need technology that is functional immediately and at all times, and employees who are qualified to use this new technology (INT2)'.*

2.1.4 Working time

As in other sectors, digitalisation enables and increases the flexibilization of work in terms of time, place and organization. The work can be done, thanks to digital technologies such as smartphones, PCs and tablets, independent of specific locations such as the traditional workplace. Mobile work and 'home office' ⁽²⁾ recently became an immediate response to COVID-19 restrictions in Germany. Nevertheless, the extent to which such digital devices can be used depends on the specific tasks and professions as well as the digital strategies and work organisation of the employers. The advantages of mobile work can be greater personal responsibility and autonomy, more scope for creativity, closer customer contacts and a better work-life balance. On the other hand, negative effects like isolation, control and surveillance of key performance figures by employers and less contact with other colleagues have been raised as issues in the course of discussion. The risks such as self-exploitation, work intensification, a lack of separation between

2. In Germany, the term 'Home Office' is widespread, but it corresponds in general to Telework.

work and private life, and high demands on the ability to organize oneself are negative implications which have also been associated with mobile work and working from home (Casas et al. 2021)

The questions in the DGQS survey show that the majority of the participants (93%) consider that the introduction of digital technologies has not changed the number of working hours in their contract. It has not influenced overtime hours, either paid (86.4%) or unpaid (72.7%). Only 9.1% claim that paid overtime has increased somewhat and 27.3% say that unpaid overtime has increased. With respect to unsocial working time (evenings, nights, Saturday or Sunday), 26% report that it has increased somewhat or significantly. For 73.9% nothing has changed in this regard. Regarding commuting time from home to the workplace, this has decreased (91.3%) due to the use of digital tools and processes.

In the energy industry, the flexibility potential of digital technology can be exploited in particular by employees with commercial and administrative tasks, who already work digitally to a large extent. As a rule, they do most of their work on a PC, a basic prerequisite for local flexibility. In the technical occupations, on the other hand, working from home is not yet an established practice, even though many employees, especially more highly qualified staff such as engineers, could theoretically work from home. In contrast, there is little potential for working from home in occupational groups where on-site presence is urgently required, such as those working shifts in power plants or fitters (Roth 2017).

To some extent, it was possible for some occupations and tasks to be done via mobile work, for example technical personnel carrying out inspections and checks on site and at customers' premises. But due to the specific character of the electricity sector, the staff working on production and network security were only offered limited telework possibilities. Desk staff in the administration and consumer relations could occasionally work remotely. Interviewees state that during the Covid-19 pandemic, there was an unprecedented boom in working from home.

The survey results show that for around 50% of the respondents, their job would allow them to do all or some of their work tasks via teleworking from home. 46.2% of the respondents replied that this was possible only during the pandemic. For 62.5%, it would be possible to do some form of remote working at the user's home or premises. The interviewees believe that telework and remote work are still very popular among workers in the sector and expect that most employees who have worked from home would probably like to retain this option.

'At the beginning of the pandemic, both employees and employers were to a great extent unprepared to shift to telework mostly without much preparation and required infrastructure. Not much attention was paid to central questions relating to working hours, technical equipment or ergonomic design. In future, more attention must be paid to solving such problems' (INT3).

2.1.5 Health and safety and outcomes for workers

In the study 'Digitalisation in the Electricity Sector', Roth (2017) argues that based on interviews and observations, automation would support and increase safety in the workplace, especially in some plants. The advantages of these systems are seen by the interviewees as increasing ease of work for the employees. In addition, fewer mistakes are made, which leads to greater occupational safety overall. In particular, support could still be provided by robots for heavy lifting or work in hazardous zones, for example in a nuclear power plant (Roth 2017).

Our own survey DGQS shows that the introduction of digital tools and methods into the daily routine has had an impact on physical health. 31.8% of the participants note that they are less subject to painful physical strains. 9.1% state that they are less exposed to the risk of accidents at their workplace. On the other hand, 9.1% claim that it has caused or aggravated a new physical pain/condition (e.g., back pain, neck pain, hand pain, eye problems).

With respect to mental health, however, their assessments seem to be rather negative. 42.9% claim that new digital technology has caused psychological problems (stress, mental fatigue, burnout or depression). 33.3% of the respondents make no comment on the question. Regarding mental problems, 33.3% of them suffer from stress and 26.7% from burnout.

2.1.6 Skills and learning

With respect to the estimated effects of digitalisation on jobs, two opposite effects, 'substitution' and 'complementarity', have been discussed in academic circles. On the one hand, intelligent systems, robots and machines have already been replacing certain activities, but will also do so increasingly in the future and consequently, some jobs will disappear. On the other hand, it has been argued that the use of digital applications, tools and solutions also has the potential to create new jobs, albeit possibly with changed qualification requirements (Dengler and Matthes 2018).

Using German occupational data, Roth (2018) estimated the substitutability potential of the energy industry. In the energy supply sector (NACE 35 ⁽³⁾), the substitutability potential is currently 53.9%. This means that more than half of the jobs in the energy supply sector could already be replaced by computers. Compared with the German economy as a whole, where the potential is

3. Equivalent to the German WZ35: Energy supply.

39.6%, the risk linked to automation is therefore particularly high in the energy supply sector. Roth argues that one of the main reasons for the high substitutability potential of the sector is the high proportion of skilled workers employed here, who account for 58.6% of all people employed in the energy supply sector.

With respect to qualification and skills development, it is expected that the need for IT skills in the energy industry will increase overall in all areas as a result of digitalisation. In some areas, the strict separation between electrical and mechanical vocational training in the commercial sector no longer functions today and there is more of a need for mechatronics training in the maintenance and repair of plants and networks, mainly due to use of sophisticated IT components in the electricity sector. Employees have to deal more intensively with signalling technology and, for example, must be able to find and eliminate faults in data transmission, and be familiar with the use of mobile devices and online services (Roth 2018).

The questions on digital literacy in the study mentioned (Roth 2018) show the high importance of both formal and informal training at the workplace. Apparently, the introduction of digital tools and processes in the everyday work encourages employees to develop new skills. 45.5% of the surveyed staff claim that they had to learn both general digital literacy methods and specific digital skills, whereas 22.7% had to develop only some specific digital skills required by digitalised tools and/or software. Only 4.5% of the respondents stated that no new digital skills were required for their job.

Interviewees (INT2, INT3, INT5) underscore the general importance of training and qualification measures in order to meet the challenges of digitalisation in companies or in the public sector. They also asked for such training programmes to take place during working hours, financed by the employers: *'With respect to the miserable situation regarding shortage of qualified personnel in the labour market, training measures would improve working conditions and lessen the problems associated with digitalisation processes. They must include not only technical themes, but also the development of soft skills'* (INT3).

2.1.7 Reconciling work and personal life

The effects of digitalisation at the workplace as well as recently expanding telework measures have been important issues in the discussions. A loss of the physical demarcation between work and the private sphere as well as a lack of human contacts and the general working atmosphere are some of the issues explored.

Our survey shows that 37.4% of the respondents report that the balance between their own personal/family time and working time has improved due to the digitalisation of work. For 37.5%

of the survey participants, the situation has not changed. Only 12.5% say that it has worsened and another 12.5% believe that it has partly worsened.

As digitalisation has progressed, the proportion of mobile work has increased significantly. The process has become widespread, especially during the pandemic. The majority of the participants in our own survey state that working from home/teleworking has been introduced or extended (85.7%).

'Mobile work increased in the industry during the corona pandemic. However, this option was never considered for activities such as production and maintenance. Rather, the activities that can be done in home offices were used more. Office, administration, customer service, etc.' (INT3).

'Remote control of equipment or elimination of faults from the home office provides some relief for employees. This is increasingly used by colleagues. Switching to new technology or software is always an additional burden for employees' (INT4).

In our study, only 14.3% of the respondents state that digitalisation has increased their personal time and the time spent with their family. For 73.5%, this time has not changed. For 4.8%, the situation has become even worse. Negative effects were reported in the answers on the specific effects of digitalisation on private life. It has increased work time (online and offline) at the expense of personal time (47.6%). Some respondents note that it is sometimes difficult to combine this work with their household responsibilities (child or elderly care, etc. ...) when teleworking from home (42.9%). It is also seen as difficult to clearly differentiate between working time and personal time (47.6%).

At the peak of the pandemic, several companies or institutions were obliged to allow their employees to work from home in order to protect against infection. Thus, employees could also save on travel time and acquire, so the expectation went, greater flexibility in planning and scheduling their work. Increasing individual freedom of action would make it easier to reconcile work and private life. In practice, however, some negative effects become evident: *'Mobile working can be described as both a blessing and a curse. Although employees were able to save on commuting to work, the workload continued to increase enormously. Time pressure and work intensity increased. Lack of contact between colleagues as well as cancellation of the division between working time and free time has burdened the employees. Many employees were given business cell phones, which they could not switch off after working hours. Constant availability and calling for duty rosters increased. 't can be assumed, and even is observed, that mobile work will continue to be maintained in part, although not to a similar extent after the pandemic. It is more likely to be modified and targeted. It will be structured predominantly by means of works*

agreements at the company level. The trade unions support the works councils in this process by providing advice and checklists' (INT3).

Particularly in connection with communication via social media, flexibility requirements arise due to changing consumer needs and expectations. Another requirement of mobile work may be the permanent availability of employees. Roth's study of new working time models in the electricity sector shows that increased consumer needs for availability and demands for quick interaction and answers from companies, as well as greater requirements for flexibility may have negative implications on employees (Roth 2017).

2.1.8 Career prospects and employment security

The digital technology used in the energy industry holds enormous potential for automation. This is particularly true with regard to the fully automated control of power plants and grids, but also applies to the expansion of self-services by customers, who enter their data and make requests directly online, as well as the future expansion of 'smart meters'. As a result, significantly fewer staff will be needed.

Nevertheless, only 16.6% of employees in our own study think that their job security and future prospects are at risk due to digitalisation of work. 37.5% see the effects as rather positive, whereas 45.8% expect no differences due to organisational changes or new technologies.

23.8% of the DGQS participants thought that learning the new skills required by digitalisation would reduce their job security in the future. However, many participants believed that learning new skills would on the contrary, open up other job or career opportunities outside the current institution (76.2%) and in the current institution (61.9%). Learning these new skills required by digitalisation would also strengthen their range of personal skills (47.6%).

Roth (2017) argues in the comprehensive study that as the workforce management system is introduced in the electricity sector, more and more administrative tasks are being transferred to the fitters, without the number of specialist tasks being reduced accordingly. Due to such additional tasks and the increasing complexity, the workload would intensify particularly for workforce management system workers (WFM fitters). In the future, the use of digital tools and applications is expected to increase even further.

2.1.9 Workers' rights

With the extensive use of digital technologies, the collection and storage of data, especially data directly related or which can be related to employees, would lead to fears of surveillance and transparency issues. Data can be used to track exactly where employees are and how much time they took to complete a particular work task. The high level of transparency entails the risk that employees may have to justify themselves if they are not on schedule and have been able to complete fewer tasks than planned.

Through intensive use of digital applications and digital assistance systems, the behaviour and performance of individual employees has become transparent and controllable, and this would lead to corresponding challenges for the protection of employees' data and personal privacy (Bömer at al. 2020).

An increased risk of stress can be countered by treating the prescribed times as a guideline rather than as specifications. The extent to which the potential for increased transparency is used to monitor performance and behaviour depends to a large extent on whether there is a works council in the company ⁽⁴⁾. As a rule, the works council is very sensitive to employee data protection issues and restricts the possibilities for data analysis as far as possible (Roth 2017).

In recent years, the 'right to disconnect' (i.e., not to be connected to your work email, work computer, work phone outside working hours) has emerged as a new right for workers in the context of a more digitalised world of work. All the respondents in our own survey regard this right as essential in an increasingly connected professional and social environment. They call for this right to be clearly included in the collective bargaining agendas at sectoral and cross-sectoral levels.

In the course of digitalisation, the degree of flexibility, standardization and automation is rising sharply due to the increasing networking of technical components in plants and the growing use of assistance systems in all areas of work. In the debate about Industry 4.0 ⁽⁵⁾, it was suggested that if the technologies are networked, possibly self-learning and control themselves, this would severely restrict employees' scope for action and devalue their qualifications. Examples of this are IT workflow systems or data glasses that guide employees through the work process according to

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4. The formation of a works council is not mandatory and is initiated by the employees or the trade unions. The size of the works council depends on the number of employees regularly employed in an establishment with at least five or more employees.
 5. Industry 4.0 refers to the intelligent networking of machines and processes in industry with the help of information and communication technology. The central technology is not the computer, but the Internet. The focus lies on the new forms of digitalisation of production: machine-to-machine communication and intelligent production facilities. The new era is referred to as the fourth industrial revolution, Industry 4.0. (<https://www.plattform-i40.de>).

narrow specifications. As a rule, employees' scope for action and decision-making is severely restricted, and the required expertise is usually largely integrated into the IT systems and can thus be called up independently of the person acting. In addition, a high level of technical/IT expertise and knowledge is required when dealing with digital work tools. IT competence and knowledge will still be necessary (Roth 2018).

'Digitalisation does not necessarily have to have an impact on labour relations. The question is always how and in what form it is used' (INT4).

'The Corona pandemic had given the digitalisation process an important boost. Teleworking or home offices were introduced in many areas. However, one negative aspect must be emphasized: Participation and work of interest groups became more difficult. Since some employees had to work at home, contacts with these employees were lost in part because the unions could not access internal company communication systems. On the other hand, several meetings, training programmes, etc. had to be cancelled due to contact restrictions. At the company level, however, works meetings and some activities of works councils did not take place to the same extent as before. Since the relaxation of such restrictions, the situation has improved but depends on future developments (Corona) in the near future' (INT1).

An interviewee (INT4) highlights the problems affecting interest representation in general during the pandemic: *'They have suffered from the fact that contact with works councils, employees and shop stewards was sometimes cut off because they could not be reached in home offices and the trade unions were not allowed to use internal company communication channels. Thus, first in the rubber industry and then in the chemical industry, an agreement was reached between the trade unions and the social partners and employers' associations to allow trade unions access to company information channels. Unions will then be able to inform members about activities (April 2022. Digital access right). At the company level, however, works meetings and some activities of works councils did not take place to the same extent as before. In the energy industry, however, such regulation is lacking' (INT4).*

2.1.10 Conclusions on the sector

Digitalisation is one of the major drivers for structural changes in the electricity sector in Germany. The energy sector in general was one of the early adopters of digital solutions. Digitalisation opened new ways not only for restructuring the sector but also for developing new business models. That is why digitalisation has been regarded as an inevitable process, necessary to survive the intense competition in the sector, but also alleviating working conditions and ensuring security in the working place. The liberalisation of the energy markets in line with privatisation had huge impacts on the structure of the sector. The emergence of new virtual energy markets and the

entry of external suppliers, especially with respect to distribution and delivery of electricity to the customers, would not generally have been possible without digitalisation.

The sector is highly influenced by political decisions. This is the case regarding the shift to renewable energies, decarbonisation and phasing out of nuclear plants as well as the reduction of coal use in the energy sector. The sector is increasingly confronted with new challenges due to recent energy crises since the beginning of 2022 as a consequence of ongoing war in Ukraine. The problem of replacement of old suppliers and finding new sources has not yet been resolved. It can be expected that this new development will lead to further restructuring of the electricity sector. Political decision makers have partly postponed the shift to renewable energy and the decarbonisation process by delaying the exit date of some nuclear plants and reactivating coal electricity plants.

The interview partners from the electricity sector expect that some actors in the distribution sector will disappear from the market due to the rising energy prices in recent months. Some of them are not able to pass on rising costs to costumers. The shortage of qualified personnel is regarded as one of the major challenges in the sector. Digitalisation projects are still ongoing, but for the time being they are not the top priority on the trade union agenda. Nevertheless, the unions assume that digital transformation and its impacts will still be an important issue in the sector.

Section 2.2 Public administration sector

2.2.1 Overview of the sector

In the German public sector, there are two types of employment status: civil servant (*Beamte*) and public employee. Of the 4.9 million people employed in the public sector in 2020, 62% were employees, 34.6% were civil servants and judges, and 3.5% were professional and temporary soldiers. Between 1991 and 2020, the number of employees decreased from 6.7 million to 4.9 million, mainly due to reductions in the public sector after the unification of the two Germanys. The employment structure shows huge differences between the regional units. The majority of the civil servants are employed in the states (*Länder*), whereas the municipal sector has a higher share of employees. The importance of public employers for employment becomes apparent if we compare the personnel paid by the public sector with the total number of dependent employees. Measured against the 38.3 million dependent employees (employees subject to compulsory social insurance, 34.3 million in 2020), the proportion employed by public employers is around 14.5%. This represents around 11% of the whole working force (45 million).

Table 1: Employees by type of service or employment contract, 30 June 2020

	Total in 1.000	Civil Servants	Soldiers	Employees
Federal sector (Bund)	509,9	189,2	172,1	148,7
National sector (Länder)	2.493,3	1 312,0	X	1181,3
Municipal sector (Kommunen)	1.596,8	188,3	X	1408,5
Social security	368,0	27,4	X	340,6
Total	4.968,0	1.716,9	172,1	3.079,1

Source: Destatis 2021.

In 2020, the main areas of staff deployment in the public service were general education and vocational schools (19.4%), social security (17.2%), public security and order including legal protection (13.9%) and higher education institutions (11.8%).

Public employers (public service and institutions in a private legal form with predominantly public participation) employed a total of around 4.9 million employees (including professional and temporary soldiers) in Germany in mid-2020. Of these, around 67 % were in full-time employment and 33 % in part-time employment. The majority of employees in the public sector are women (57.5%). However, a relatively large proportion of women work part time. Women accounted for 42% of full-time employees and 84% of part-time employees. Compared with 1991 data, the share of women in the public sector has increased from 47% to 58% in 2020.

The majority of the employees in the public sector are over 45 years of age (ca. 52%). Among civil servants this figure is 51.5%, and among employees it is 54%. The 45-55 age group represents the highest share, at 25.4% of the total number (26.9% of civil servants, and 25.2% of employees). In 2020, 6.7% of public service employees were under 25 years of age, 20.9 % were between 25 and 35 years of age, and just under half were in the 35 to 55 age group (46.2 %). 14.9% were between 55 and 60 years old, and those 60 and older accounted for 11.4 % of all public service employees.

2.2.3 History and patterns of digitalisation in the sector

The public administration has a wide range of tasks (taxes, distribution of allowances such as unemployment and child benefit, delivery of several services to citizens and business, planning and supervision of infrastructure etc.). Hence, the public administration is in close contact with citizens, business and other institutions.

In view of the ongoing digital transformation, the public administration is confronted with increased expectations with respect to contact, provision and delivery of public services. The need for digital solutions as well as the problems associated with speed and inadequate infrastructure

have become apparent in recent years, especially during the Covid-19 pandemic. In general, the digitalisation of the administration can be divided into three areas (bpb 2020):

- **First**, the digital transformation affects the relationship between the administration and citizens - also referred to as 'government-to-citizen'. Particularly central is the implementation of the Online Access Act (OZG). This was passed at the federal level in 2017 to develop and strengthen eGovernment provision. Citizens and companies would gain access to hundreds of digital administrative services from various authorities via a portal network. Some of these services have already been available digitally for some time: In 1999, for example, the Elster software was introduced as a procedure for submitting income tax returns electronically. In addition, services for citizens are partly linked to the ID card. They can use this via a corresponding device for a previously limited number of services.
- **Second**, digitalisation is changing the processes between the public and private sectors – also known as 'government-to-business'. These include, in particular, online authentication processes, which enable companies to interact with the administration. Correspondence between courts and law firms, for example, is increasingly taking place digitally. Trading in emissions certificates also takes place online with electronic signatures.
- **Thirdly**, processes within the administration and between public institutions are affected. This area is referred to as 'government-to-government'. In the long term, electronic files, e-files, will be used. They capture information digitally and replace paper files.

The German government has responded to the challenge of digitalisation with a whole series of action programmes: starting with the government programme 'BundOnline 2005', adopted in 2001, followed by further programmes and the eGovernment Act of 2013, then the 'Digital Administration 2020' programme and the 2017 Online Access Act ⁽⁶⁾.

In 2013, the German Bundestag adopted the Act on the Promotion of Electronic Administration (E-Government Act), which enables such digitalisation processes. Some state parliaments also passed comparable rules. The E-Government Act obliged the authorities of the Federal Government to introduce the e-file by 2020. It will then be possible to link and optimize administrative processes. In addition, data-based working would simplify such processes, and enable evaluation of the effectiveness of public-sector services.

6. The Online Access Act - (OZG) for short - is intended to create uniform access to digital services from all public administrations nationwide. The OZG obliges the federal, state and local governments to also offer their administrative services electronically via administrative portals by the end of 2022 and to link their administrative portals with each other to form a so-called portal network.

Digital provision by administrations is also referred to as **e-government**. Due to the federal system, the public administration is divided into federal, state (Länder) and local government. Since all three levels are affected by the challenge of digital transformation, **the IT Planning Council** was founded in 2010. This coordinates joint public sector digitalisation projects across federal levels. The IT Planning Council manages concrete e-government projects and adopts overarching standards for the security and interoperability of IT systems. It also coordinates and develops the information technology network of the federal and state governments. In addition, the IT Planning Council coordinates the modernization of public registers. To this end, in 2010 it adopted a national e-government strategy.

What all these objectives have in common is that they list a wealth of individual measures with which the public administration can prepare itself for the digital age - including online publication of official announcements, electronic record keeping, and a portal network for all administrative services available nationwide.

The Digital Government Index (DGI) assesses and benchmarks the maturity of digital government policies and their implementation (OECD 2021). In 2019, the average DGI score across OECD countries was 0.5, with 15 out of 29 countries exceeding this threshold. Germany scores below the OECD average in the Digital Government Index with an overall value of 3.9. The index summarizes the dimensions of Digital by design, Data-driven public sector, Government as a platform, Open by default, User-Driven, and Proactiveness. Germany has the lowest score on the data-driven public sector dimension of the Digital Government Index among the 29 OECD countries. This indicates that the country could do more to capitalize on the value of data to improve service delivery. Especially, effective measures for sharing data across the public sector could reduce the burden on users of services to supply the same information to different government authorities when requesting a service (OECD 2021).

There is a particular need for catch up in the user-friendliness of digital public services, in the exchange of data between authorities and in digital public services for businesses. The main reasons for this are the lack of decision-making powers in the federal structures, procurement in the public sector and the lack of digital skills in the public administration (Falck et al. 2021). A lack of qualified personnel is an ongoing problem in the public sector in general. The public sector is in competition with the private sector for qualified personnel. It is estimated that up to 300,000 additional employees are needed to fulfil the duties and to accomplish tasks in the public sector (DBB 2022).

According to a study by the IT industry association Bitkom, there is a shortage of 96,000 IT specialists in Germany in 2022 (Bitkom 2022). Due to rigid salary structures in the public sector, it is less attractive for the qualified IT personnel who are needed to rapidly advance the expansion of

eGovernment activities and digital solutions in public services. Consequently, the lack of incentive structures with respect to participation in training and digital skill acquirement for employees and, hence, the lack of technical know-how in the public administration as well as a general shortage of skilled workers, leads to slow and inefficient digital transformation processes (Falck at al. 2021).

2.2.3 Work organisation

In the public sector, digitalisation increasingly influences the work processes and delivery of services for both employees and citizens. In the citizens' offices (⁷), initial contact and initial consultation take place online: for example, via an online module for day care registration or via an open data module for appointment management for several services. The work done manually has been replaced by the introduction of electronic files in the job centres or automation in the land registry offices.

Using the data from the nationally representative employee survey for the 2016 DGB Good Work Index, digitalisation in the public services have been analysed in depth. The sample evaluated for the year 2016 includes 9,341 dependent employees from all sectors, income and age groups, company sizes and employment relationships, both unionised and non-members. The proportion of employees working in the public sector was 24% (2,242) (DGB 2018). Of those employed in the public sector, **69%** are affected by digitalisation to a very high or high degree. By comparison, this share is 57% in the private sector.

Figures were calculated for the four areas of public service (public administration and social insurance, education and training, health and social services, other areas of public service): the proportion of those affected by digitalisation 'to a very high degree' and 'to a high degree' is **83%** in public administration/social insurance/defence, 65% in education and training and 57% in health and social services.

Our own online survey confirms widespread digitalisation in the public administration (⁸). Regarding questions about the usage of digital tools at the workplace, the respondents reported that they are used in several fields daily. In response to the multiple-answer questions about usage, the respondents replied that they use these tools 'to plan/schedule the performance of work tasks' (78.9%), 'To measure data, to collect/organise/retrieve information' (73.7%) and 'To communicate with colleagues and internal or external services' (84.2).

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7. Bürgeramt: these Citizen Offices, part of local government, bring together public-intensive services for citizens in the form of local units. Interaction and transactions between citizens and the administration take place increasingly on service portals, mainly due to the growing use of electronic communication.
 8. In the online survey (DGQS), 43 questionnaires have been collected from the public administration.

In general, survey participants assess the effects of digitalisation as positive. With respect to the effects on the public service in general, the digitalisation of work (the introduction of various digital tools and methods) is assessed as positive (50%, somewhat agree or strongly agree), also for the quality of the service to users (47.4%). 47.4% report the impact of digitalisation as positive in terms of working conditions in the sector and 31% say that it has improved the overall quality of jobs.

The interviewees regard the digitalisation process in general as a positive and somehow inevitable development but point out problems associated with work organisation, increased pace of work and involvement of employees in the digitalisation process: *'The employees, who are not exactly the most tech-savvy, were overburdened in some cases, and as a result, their work was compressed and overloaded. This then gives rise to reservations about digitalisation because it doesn't mean something nice at the beginning'* (INT6).

The German government's new digitalisation strategy includes measures that also strongly affect public services. The interviewees complain about the pace and content of such measures and assess them as inadequate. One (INT6) summarised his views as follows:

'#Technical and organizational efforts are mostly underestimated. Digital return on investment and reduction of costs seems to be main targets in such processes.

Too few personnel. The on-site too little knowledge. Often knowledge is purchased from external consultants, resulting in external dependency, costs and a further lack of in-house expertise. Consultants sell new trends or fashions (agile working in the public sector, for example, was also fashionable for a while). The question is whether this is sustainable after so much effort and cost.

IT staffing shortage. Public service is also not lucrative enough to attract these people. Job security in the public sector is not enough.

Non-optimal digitalisation processes are then at the expense of employees and also end customers: citizens. The impact on companies due to insufficient digitalisation is also underestimated' (INT6).

The online survey shows that the introduction of digital tools/programmes has affected several aspects of the work. For 30.6% of the employees, the scope of decision-making at work has remained the same, but 44.4% report an increase in decision-making and autonomy to schedule work tasks due to digitalisation. In addition, digitalisation has reduced the time needed for routine repetitive tasks (54.1%).

It also improves coordination of tasks with colleagues (38.9%). In addition, it offers a clearer overview of the implementation of the tasks making up their job time (84.2%) and gives more time to focus on significant aspects of the job (54.2%). The most important aspect has been improvement of the quality of their interaction with public service users (63.9%)

On the other hand, work intensity is also affected by digitalisation at the workplace. 43.2 % of the people surveyed consider that the intensity of work has increased. The monitoring of employee performance for the purpose of internal assessment by supervisors (22.2%) and by direct colleagues (18.9%) was mentioned by quite a few respondents. 13.8% of the participants state that the introduction of digitalised tools and methods at work triggered the feeling that digitalisation has increased the monitoring of employees. These findings with respect to control and monitoring issues seem to be much lower than in the electricity sector.

The interviewees appreciated the recent shift and acceleration of digitalisation processes but speak of challenges.

'Within the city administration, individual areas have already been digitalised with fixed specialized procedures. However, full digitalisation of internal processes is still a long way off' (INT7).

'Although everyone is talking about digitalisation, it is not being implemented satisfactorily everywhere in everyday practice. Communication takes place digitally, but beyond that there is a lack of real digital implementation. The 'service laptops are (...) only better typewriters'. Extensive and coherent digital procedures take place to a very small extent. Only individual structures have been digitalised to some extent and not the entire administration. In this context, a fully comprehensive concept development is required' (INT9).

Apart from poor technical issues, one interview partner stresses the importance of personnel structure and calls for measures to avoid neglect of some personnel groups in the public sector:

'Older employees in particular are overwhelmed and awkward with the new digital processes. There is no support in the form of training. Individuals are responsible for successful implementation. Those who fall away in the process are effectively left behind and given other tasks aside from the digitalised processes. This also changes the work methods and content for these individuals.' (INT8).

'For many older employees, digitalisation is a challenge. It is expected that some routine activities will be eliminated. There is a need for further training and qualification. Employees will also notice this change in the personnel structure' (INT6).

2.2.4 Working time

The responses to the questions in the DGQS survey show that the 89.2% of the participants consider that the introduction of digital technologies has not changed the number of working hours in their contract. There has been no influence on paid overtime (91.9%) or unpaid overtime hours (91.9%). Only 8.1% claim that paid overtime has increased somewhat and 10.8% say the same for unpaid overtime. With respect to unsocial working time (evenings, nights, Saturday or Sunday), 21.6% report that this has increased somewhat or significantly. 56.8% report that it has not changed at all. Regarding commuting time from home to workplace, this has decreased (83.5%) due to use of digital tools and processes.

In public administration, the amount of mobile work has increased with digitalisation, especially during the Covid-19 pandemic. According to our own survey results, 92% of the respondents say that their job would allow them to do all or some of their work tasks via teleworking from home.

Interview partners point to a considerable increase in teleworking due to the lockdowns and Covid measures in recent years. However, for a large proportion of employees, working from home is virtually uncharted territory, with some advantages, but these are usually associated with a high level of effort.

'Social structure in the office is enormously important and, even with a fully successful implementation of digitalisation, social interaction is made more difficult by the home office' (INT7).

'Even before Corona, there were service agreements regarding mobile working, which was also used by employees on a selective basis with the agreement of their superiors. Since the introduction of home office through the Corona situation, no clear rules exist in this regard. The old company agreements regarding working hours, core working hours and flexitime were adapted for the home office. The approval procedures for teleworking are very complex, as regulations on occupational health and safety are very important.' (INT7).

The interview partners believe that most employees who have worked from home would probably like to retain this option. On the other hand, there are still some unsolved regulatory issues, as one interview partner highlights: *'In the case of mobile work, on the other hand, the regulatory systems regarding the recording and verification of work (time) are very complex and regimented,*

which often leads to circumvention of these regulations and to critical processes from a data protection perspective. In addition, it is important to note that not every employee is suitable for telecommuting. One third of all employees prefer to work in the office and would not even want to give up their office workplace. Overall, however, it can be said that Corona in particular has helped to open people's minds with regard to digitalisation and teleworking and to increase motivation in this regard' (INT7).

Another interviewee expects that the requirement to be present in the workplace will be relaxed in some areas in the public sector, as some people had good experiences with working from home during the pandemic: *'The old human image of "monitoring of tasks and personnel" still prevails in the public sector. This image will probably persist longer in the public sector than elsewhere. In the future, however, this will also decrease there. Technical equipment must be improved and expanded with respect to telework' (INT6).*

With respect to more flexible working, one interview partner expresses the opinion that such issues are regulated mostly at the company level : *'If deviating agreements are flanked by local service agreements in companies or institutions, they are less problematic. Minimum standards are usually regulated by law. It is not the goal of the unions to address and regulate this globally. Deviating rules are arranged mostly in individual cases and locally' (INT6).*

2.2.5 Health and safety and outcomes for workers

The impact of digital tools and processes on the health of employees has been a central issue in digitalisation discussions. Our own survey (DGQS) shows that the introduction of the digital tools and methods into the daily routine has had an impact on physical health. 44.4% claim that it has caused or even worsened a new physical pain/condition (e.g., back pain, neck pain, hand pain, eye problems).

With respect to mental health, however, their assessments seem to be less negative. 19.5% claim that it has caused or even worsened psychological problems (stress, mental fatigue, burn-out or depression). 80.6% of the respondents make no comment on the question. Regarding mental health problems, 20% of them suffer from stress, 12% from burn-out and 16% from mental fatigue.

The DGB survey (DGB Index-Gute Arbeit) has also focused on disruptions during work as a result of digitalisation. Nearly two-thirds (63%) of public sector workers who are very or highly affected by digitalisation report being disturbed or interrupted at work very often or often, e.g., by technical problems, phone calls or colleagues. Among employees who are only slightly or not at all affected by digitalisation, only 50% report this. In the private sector, digitalisation has had an even more serious impact; here, 65% feel very often or often disturbed or interrupted when the level of

digitalisation is high, while only 34% report this when digitalisation is absent. Digitalisation has had a particularly strong influence on disruptions and interruptions in the public administration (67% to 50%). More than half of the respondents in this survey (51%) believe that the monitoring and control of their work performance has increased in connection with growing use of digitalisation (DGB 2018).

One interview partner notes that telework was most welcome by employees because they could theoretically determine working time by themselves. This was mainly due to less external setting of working time, however, it can be associated with additional stress : *'In general, over time it has become apparent that working in a home office is not so free (willing) after all. 'Voluntariness' turned into 'reverting to old-established ways,' such as frequent online meetings at fixed times. Online meetings in particular mean increased tension and stress for employees, as a high level of concentration is required over longer periods of time. Another major criticism of the home office in general and online meetings in particular is the "lack of humanity" in the meetings' (INT8).*

2.2.6 Skills and learning

There is a shortage of qualified IT-personnel. Training and further qualification of existing staff in the public administration could alleviate the situation and help to resolve the current qualification problems. Recent studies show, however, that the public sector can hardly compete with the private sector in terms of pay - and it lags far behind in the further training of existing staff ⁽⁹⁾.

With respect to digitalisation challenges, the study highlights the need for an expansion of further education days and budgets as well as the significant expansion of digital further education formats in the public administration.

The questions related to digital literacy in our DGQS survey show the high importance attached to both formal and informal training at the workplace. Apparently, the introduction of digital tools and processes into everyday work encourages the employees to develop new skills. 24.3% of the surveyed staff claim that they had to learn both general digital literacy methods and specific digital skills, whereas 32.4% had to develop only some specific digital skills required by digitalised tools and/or software. Only 8.1% of the respondents stated that no new digital skills are required for their job.

9. A recent survey by the Stifterverband and McKinsey among 500 German companies and public authorities reveals major strategical and financial differences between the private and public sectors with respect to training and skill development measures: Only 24 % of the administrations record the new skills needed by their employees in a structured manner; in contrast, 52 % of companies do so. Companies also state that they already allocate more than twice as much money to further training as the public authorities (974 euros versus 418 euros per person). The German administration in particular is under pressure here, as it is at a financial competitive disadvantage in the fight for skilled workers. (Stifterverband 2021).

Interviewees (INT6, INT7, INT8 and INT9) and trade unions stress the importance of training and qualification measures on digitalisation processes. However, the responses to our own survey DGQS from the public administration show that training measures are not always available when needed. 39.4% of the respondents reported that they have not received any formal training from their employer. Furthermore, 36.4% claim that they learn informally at work (i.e. on-the-job learning; exchanges with colleagues). Only 15.1% reported that either they have acquired both general and specific digital skills or only skills related to the use of specific digitalised tools (machines, software).

The trade unions ver.di and DBB reached an agreement with the federal government on training measures ⁽¹⁰⁾ related to the digitalisation process. This agreement, however, regulates the measures applied at the federal state institutions and ministries. States (Länder) and local governments have not yet approved this agreement.

'With the collective agreement, we are responding to the rapid changes in the world of work. It provides the basis for employees to benefit from the opportunities offered by digitalisation. Qualification and participation in new forms of work create prospects for the professional future. Job and pay security, on the other hand, protects employees from the risks and dangers. This creates confidence in the face of change' (INT6).

This agreement provides a 'right to training': Whenever the job changes as a result of digitalisation, there is a right to training. This ensures that employees will be able to cope with future changes in activities and requirements. The costs of the training are generally borne by the employer.

2.2.7 Reconciling work and personal life

The DGB Survey results show that digitalisation has only slight influence on the work-life balance (DGB 2018). Almost three quarters of public sector employees (73%) who are affected by digitalisation to a very high or high degree see **no change with regard to the work-life balance**. As many as 20% of people working in the public administration observe an improvement and 7% a deterioration. In the private sector, an improvement is reported slightly more frequently (23%) as well as deterioration (12%). Around 65% of private sector employees say that digitalisation has not changed their work-life balance.

10. The 'Collective agreement on digitalisation' concluded with the federal government came into force on January 1, 2022.

Our own survey (DGQS) shows that 84.2% of the respondents think that the digitalisation of work (the introduction of various digital tools and methods) is positive for a better balance between personal/family time and working time. 63.2% report, with respect to their own personal situation, say that the balance between personal/family time and working time has improved due to the digitalisation of work. Personal time and the time spent with family have also been affected positively (37.8%).

As digitalisation progresses, the share of mobile work has increased significantly. The process has become widespread especially during the pandemic. 41.7% of participants in our own survey state that working from home/teleworking has been introduced or extended.

Responses to questions concerning the specific effects of digitalisation on private life have also reported negative impacts. It has increased working time (online and offline) at the expense of personal time (16.2%). Some respondents note that it is sometimes difficult to combine this work with household responsibilities (child or elderly care, etc. ...) when teleworking from home (18.9%). It is also regarded as difficult to clearly differentiate between working time and personal time (21.6%).

One interviewee pointed out that the extension of teleworking can have a negative impact on social interaction: 'Social structure in the office is enormously important and, even with a fully successful implementation of digitalisation, social interaction is made more difficult by the home office. In addition, a balance between home office and office is essential for the social climate in the office environment' (INT7).

2.2.8 Career prospects and employment security

In recent years there has been a lot of discussion related to studies focusing on the replacement of on jobs by computers and elimination of jobs through digitalisation in general. According to a study by the Institut for labor market and occupation research (IAB), administrative occupations in the public sector have a comparably low substitutability potential: only 16.2% of the activities can be done by computers. (Dengler and Matthes 2018). In the case of social occupations, the figure is as low as 5.3%. However, the situation is different for office support occupations, where the computer could take over more than 50% of the tasks. The public/civil service comprises very many different professions and activities and, in reality, the pace of digitalisation and substitution is also slow. Not everything that could be replaced is also fully digitised (FührDiV 2019). Digital transformation in the public sector results in new activities for employees, the jobs are not reduced as estimated. When activities are digitalised, it is important to offer the employees prospects, through other work and by providing them with the necessary skills.

Reduced job security due to digitalisation of work is apparently not a serious concern for the employees in our survey. 15.8% of employees in our own study believe that their job security and future prospects are at risk. 44.7% see the effects as rather positive, whereas 39.5% report no differences due to organisational changes or new technologies.

Only 8.1% of the survey participants thought that learning the new skills required by digitalisation would reduce their job security in the future. Learning new skills, in the opinion of participants, would rather open up other job or career opportunities outside the current institution (33.2%) and in the current institution (33.1%). Learning these new skills required by digitalisation would also extend the range of their personal skills (33.6%).

Interviewees stress the importance of qualification and training in digitalisation processes:

*'The lack of support from the employer is an important factor and a barrier to the successful implementation of the measures in particular and digitalisation in general' .
'The majority of employees are not aware of how much digitalisation will change their work in the near future. Precisely because of this, concrete fears about the future prevail among employees. In general, employees show great inhibitions, lack of practice and training' (INT9).*

2.2.9 Workers' rights

The public administration has a strong hierarchical structure. That is probably one of the main reasons why employees regard their own decision-making possibilities as rather small. This is matched by the fact that only 21% of respondents say they can influence the way digital technology is used in their workplace. The proportion of employees with the ability to influence the use of technology is above average among men (32%) and among employees with highly complex jobs (37%) (DGB 2018).

In recent years, the 'right to disconnect' (i.e., not to be connected to the work email, work computer, work phone outside working hours) has emerged as a new right for workers in a more digitalised world of work. All the respondents in our own survey regard this right is essential in an increasingly connected professional and social environment (50%). They call for this right to be clearly included in the collective bargaining agendas at sectoral and cross-sectoral levels (83.3%). Trade unions accompany and support employees and works councils with several activities. The respondents welcome such negotiations as part of the socially sustainable management of digitalisation and technological change. Only 27.3% state that such negotiations at the sectoral level on safeguarding employment or the quality of working conditions are not effective at all. 33.3% assess them as moderately effective and only 9.5% as very effective. At the workplace,

however, the negative assessment is rather lower (16.7%). 47.6% regard negotiations at the workplace as moderately effective and only 9.5% as very effective.

One interview partner highlights problems faced by the trade unions when they seek to achieve adequate solutions at the workplace:

'Working time regulations and working conditions are negotiated by the staff councils at the local level. The councils suffer from a lack of knowledge and competencies in technical issues. In some processes, they are overwhelmed. Trade unions try to give guidance to the staff councils on how to negotiate service agreements locally. However, this is also difficult for the unions; it is also a question of resources (money, personnel, know-how). Interference from outside in the internal negotiations is also difficult for the unions' (INT8).

According to one interview partner, shortcomings related to inefficient digitalisation processes became apparent in a city administration, especially during the pandemic.

'Under the 'cover of Corona', many processes were tested, although 'the possibilities were already there before Corona'. Corona was thus the 'initial spark' for the digitalisation of the administration. A critical aspect is that the processes and regulations were introduced without employees and staff representatives having much say. The staff council was only able to 'oppose it a little' and the 'employee was not asked'. The problem here is that for many employees the digitalised processes were uncharted territory, little competence was built up before Corona and only 'basics' were available (INT8).

2.2.10 Conclusions on the sector

In the public administration, political decisions and regulatory measures have been major drivers of digital transformation. The pace and spread of digital solutions have been broadly regarded as inadequate. This has become visible, especially during the COVID-19 pandemic when huge numbers of employees in several administrative units had to move to telework. This aggravated the situation and hampered the delivery and provision of public services. Public administrations seemed to be unprepared regarding digital infrastructure. Our interviewees complained that in this period there were not enough PCs or laptops to enable teleworking. Initiatives and measures to enhance the digital transformation are still lagging behind the objectives of the government. The fragmented structure of the decision-making and implementation processes between the central government, states and local units are regarded, by the interview partners, as hindering successful implementation.

The age structure and shortage of qualified personnel have been considered as major challenges in the public administration, impacting the quality of the work as well as staff well-being. Rising work intensity due to staff shortages also, they say, impedes the pace of digitalisation. Job security is not regarded by employees and trade unions as a particular issue. On the other hand, such security would not be enough to attract new qualified personnel because of the relatively low level of pay for jobs requiring a high level of IT-skills. Interview partners stress the importance of training and qualification measures to cope with the digital transformation.

Older workers are faced by new challenges regarding implementation of new software and digital tools. Teleworking has been introduced and implemented during the pandemic. Probably, some employees would prefer to keep working partly from home. One interview partner has complained, however, that the public administration will still insist on the traditional and conservative way of working in the office itself, even in the near future.

Section 2.3 Hospital sector

2.3.1 Overview of the sector

In the Covid year 2020, Germany spent 440.6 billion euros. This was €5,298 per inhabitant. Health spending as a percentage of gross domestic product (GDP) was 13.1% in 2020, 1.2 percentage points higher than in 2019. There are currently 5.8 million people working in the healthcare sector. This means that around one eighth of the workforce is now employed in this sector. According to the annual health report of the German Statistical Agency (2021), the 5.7 million health care workers in 2019 increased by 97,000 (up 1%) compared to the previous year. Since 2000, the number of people employed in the healthcare sector has increased by 1.7 million. Using a broader definition (including wellness, health tourism, etc.) around 7.4 million people were working in the health economy in 2020 (Destatis 2021).

Germany also has some of the highest rates of beds, doctors, and nurses per population in the EU, providing a broad benefit basket, high level of service provision, high level of coverage and good access to care. However, the system is fragmented among numerous payers and providers, leading to inefficiencies and diminished quality of care in certain care settings, and the costs do not match often average health outcomes (OECD 2019b). Responsibilities for health system governance are highly complex, and divided among three levels: federal, state (Länder) and self-governance bodies. The Federal Ministry of Health is responsible for policymaking at the federal level; that is, developing laws and drafting administrative guidelines. Länder are responsible for hospital planning and the financing of hospital investments (Bölt 2022).

Since the beginning of the 1990s, the German hospital sector has experienced dramatic structural changes. Traditionally, it has been divided mainly into a public and a non-profit segment. While

the public hospitals are mostly run by municipalities or – in the case of university clinics – by the Länder, the non-profit hospitals are dominated by the two major Christian churches (Protestant and Catholic), but also involve some other welfare organisations. Up until the early 1990s, Germany had only a few specialised and mostly smaller private for-profit hospitals (Schulten and Böhlke 2019).

Major drivers have been the process of commercialisation and privatisation:

- The fundamental change in the mode of hospital financing has intensified the commercialisation of hospital services. The previous financing 'cost-coverage' principle, where the health insurance funds reimbursed almost all expenditure incurred by hospitals, has been replaced by the so-called Diagnosis Related Group (DRG) system by means of several health care reforms. In the new structure, hospital admission is no longer reimbursed on the basis of per diem costs, but according to a uniform flat-rate payment (Schulten and Böhlke 2019).
- As a result of such health sector reforms - the abolition of full cost-based reimbursement, the establishment of capped budgets and the introduction of the DRG system - it became possible for German hospitals to accrue large-scale profits or deficits. This has created preconditions for a wave of privatisations and eased entry of new private for-profit hospital corporations into the hospital sector. Till the 1990s, there were only a small number of private hospitals in Germany. Consequently, due to the ongoing process of privatisation, the sector has undergone a dramatic change, due to an overall decrease in the total number of hospitals and increased share of private hospitals.

Most hospitals (724 or 37.8%) were privately owned in 2019, followed by non-profit (645 or 33.7%) and public hospitals (545 or 28.5%). A structural change took place not only in the size structure, but also with regard to hospital operators. While the total number of hospitals decreased by 170 (-8.2%) facilities from 2009 to 2019, the number of private hospitals increased by 57 (+8.5%) to 724 facilities. The overall decline in the number of facilities affected public hospitals (-15.9%) and, to an even greater extent, non-profit hospitals (-16.1%).

As a long-term trend, the proportion of privately owned hospitals, 14.8% in 1991, has been rising steadily for years. In 2020, more than one in three hospitals (37.8%) were privately owned. In the same period, the proportion of public hospitals fell from 46.0% to 28.5%. The share of non-profit hospitals has fallen from 39.1% in 1991 to 33.7%.

On December 31, 2019, there were nearly 1.3 million hospital employees. In other words, around 23% of all workers in the health sector are employed in hospitals. 196,470 employees were full-time physicians; 1.1 million employees (including 102,787 students and trainees) were in the non-

physician service. 27.8% of physician and 49.6% of non-physician staff are employed on a part-time or marginal basis.

Table 3: Number of full-time workers in Hospitals

	Total Hospitals	Public Hospitals	Non-profit Hospitals	Private Hospitals
Medical staff	167.952	92.480	48.591	26.881
Nursing service	345.407	179.601	106.217	59.590
Medical-technical service	157.243	98.086	38.948	20.209
Functional service	110.837	58.020	34.119	18.698
Economic and supply service	36.142	21.604	10.601	3.937
Administrative service	65.956	38.327	18.257	9.372
Other personnel	44.560	28.306	11.125	5.130
<i>Clinical house staff</i>	8.743	4.745	2.156	1.842
<i>Technical service</i>	16.314	10.193	4.546	1.575
<i>Special services</i>	5.499	3.626	1.165	707
<i>Other personnel</i>	14.005	9.741	3.258	1.006
Total	928.097	516.423	267.858	143.816

Source: Destatis 2021.

All in all, hospitals are a female-dominated sector (Destatis 2021): around three-quarters of all hospital workers are women. Among care workers the proportion of female workers is even higher, at 85%, while among doctors it is almost half (47%).

Table 3: Number of full-time workers in Hospitals

	Total Hospitals	Public Hospitals	Non-profit Hospitals	Private Hospitals
Medical staff	167.952	92.480	48.591	26.881
Nursing service	345.407	179.601	106.217	59.590
Medical-technical service	157.243	98.086	38.948	20.209
Functional service	110.837	58.020	34.119	18.698
Economic and supply service	36.142	21.604	10.601	3.937
Administrative service	65.956	38.327	18.257	9.372
Other personnel	44.560	28.306	11.125	5.130
<i>Clinical house staff</i>	8.743	4.745	2.156	1.842
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Total	928.097	516.423	267.858	143.816

Source: Destatis 2021.

2.3.2 History and patterns of digitalisation in the sector

Based on available studies, the health and social services sector is considered - in contrast to, for example, the media industry, the financial sector or consulting firms – as a weakly digitalised sector of the economy. In an international comparison, too, the German health and social care sector is also considered to have a low level of digitalisation (Prognos 2015, Daum 2017).

In practice, a high degree of technical specialization may coexist with traditional, hardly technological person-related services in the hospitals. Hospitals are becoming, however, increasingly digitalised, especially in some areas, with major successes in modern imaging as well as other specific functional areas (e.g., surgical robotics, operating room robotics or in intensive care). On the other hand, in many cases there is a lack of uniform infrastructure for digital processes, to consistently link them with each other and to enable cross-sector communication and patient/case data to other service providers, as shown by a Europe-wide comparative study on digital hospitals (Price Waterhouse Coopers/WifOR 2016).

Techniques that are used in the hospital can be divided into patient-relevant techniques and background techniques. Digital tools and processes with a close patient relevance include fields such as telemonitoring, mobile health (apps, smartphones), wearable computing or surgical robots. On the other hand, technologies that control background processes are related to documentation of case data, digital communication of patient information and image data, hospital information systems, electronic health records, patient data management system, laboratory information system, clinical workstation system etc.

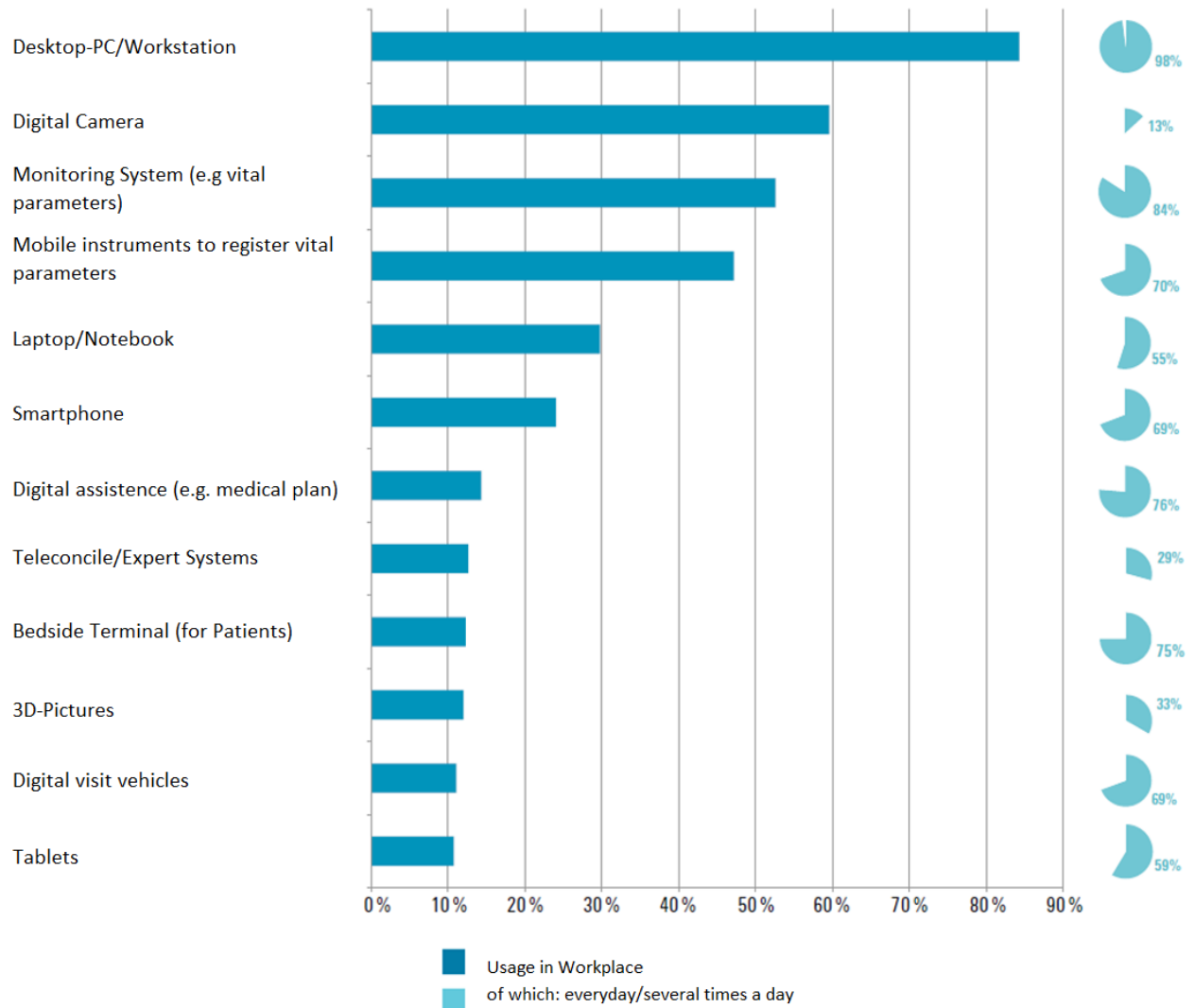
A decisive finding regarding the current state of research is that there are no reliable data available on the extent of digital technologies and their penetration in the world of work. A survey 'Digitalisation in Hospitals', carried out by the Institute for Work and Technology (IAT), hereafter referred to as the IAT survey, fills this information gap and provides initial insights. This IAT-Study is based on 648 observations, which cannot be regarded as representative; however, it delivers insights about the digitalisation process in German hospitals (Öz at al. 2017). In the following section, the results of this survey will be presented in accordance with its thematic context.

Which areas of responsibility and activities are supported by digital technologies in the hospital? In the IAT survey, the respondents were initially questioned about five fields of activity: patient care (75%), management and personnel (74%), logistics (73%), communication (73%) as well as information and qualification (81%). It can be seen that modern technology is already widespread in the fields mentioned and that the penetration of these areas has progressed relatively evenly (Öz at al. 2017).

The IAT survey shows the **degree of use** (including the devices named by at least 10% of the respondents) and the respective share of devices used daily or several times a day. Stationary and mobile computers, digital cameras and monitoring systems are very widespread. The smartphone is also mentioned by about a quarter of the respondents, although it can be assumed that these are usually private devices that are used on duty. All other devices are used much less frequently by the respondents. Service robots, wearables or 3D printers seem to be particularly 'exotic', with

less than 2 % of respondents mentioning them, even though such products are often cited in the general discussion as an example of digitalisation in the health sector.

Figure 2: Use of digital technologies in hospitals



Source: Öz at al. (2017); bars in the diagram shows usage of digital technologies in workplaces, the circle percentages on the right describes daily use of such technologies.

On the one hand, a look at the frequency of use shows great differences in individual usage. For example, desktop PCs are used daily or several times a day by almost all respondents. This is presumably explained by the fact that PCs are often used for documenting work and are the primary interface for orders, data retrieval, etc. and therefore very frequently needed. In contrast, digital cameras, which are also very widespread, are rarely used on a daily basis, presumably because they are mostly used for documenting wound healing and comparable processes that do not take place every day.

However, it should be noted that these results reflect the working reality of the individual employees. Statements about the spread of digital technologies in the German hospital landscape cannot be derived from these results.

2.3.3 Work organisation

The IAT (2017) survey shows that the introduction of digital technology has had an impact on the respondents' immediate area of work (Öz at al. 2017). From their point of view, the effects on the number of jobs vary somewhat, with a minority of respondents recognizing the loss of jobs (19% in public sector hospitals) or the creation of additional jobs (29%) as a consequence of digitalisation in their immediate working environment. In contrast, around three quarters of the respondents (79% in public sector hospitals) say that new tasks have been added to existing jobs as a result of digitalisation. From their perspective, digital technologies have had an impact on their work that is more qualitative, by adding new tasks to the existing content of the work, rather than quantitative, destroying or creating jobs.

Changes in work processes due to digital technology are also described. The majority of respondents in the IAT survey (2017) report an increase in the number of work situations in which work instructions reach them digitally. Decisions about specific work steps are also influenced by computer programs: 42% of respondents report an increase in such situations. However, only around a quarter of respondents believe that work steps can increasingly no longer be planned independently. Digital technology is changing people's own work processes, as 78% of those surveyed agree. There is no clear answer to the question of whether such changes tend to be positive or negative.

Our own online survey gives some insights into the prevalence of digitalisation in hospitals ⁽¹¹⁾. Regarding questions about the usage of digital tools at the workplace, the respondents reported that they are used in several fields daily. To the multiple-answer questions about usage, the respondents replied that they use these tools 'to plan/schedule the performance of work tasks' (23.8%), 'to measure data, to collect/organise/retrieve information' (28.7%) and 'to communicate with colleagues and internal or external services' (22.1%). Low levels of use have been reported for interaction with users (e.g. patients, customers) (13.9) and for monitoring the performance of work tasks (11.5%).

The main usage of the digital machines in this work was related to data collection and data management. All respondents use these tools. 24% report that they are used to monitor and to control parameters of equipment or persons, followed by 'to perform routine repetitive tasks' (22%).

11. 52 questionnaires responding to the online survey were collected from the hospital sector.

Digitalisation has taken place in many areas. Interviewees note digitalisation in several processes; however, these are at a different level in each department within the hospitals (surgery, documentation, patient transport, logistics, housekeeping - kitchen, laundry and parking guidance system). It can be seen both inside and outside the hospital, and affects information about patients and communication with patients (information about hospital services, questions from patients).

'There are a lot of construction sites in this topic: Interface problems: Digitalisation could lead to job losses if certain processes are optimized: Simplification of documentation systems would minimize time losses due to interface problems, allow patients to view their files without being tied to a specific location and tablet system. Employees should see such digital aids and solutions as facilitating their work in stressful everyday life, but should not have to deal with the associated problems if such systems do not function optimally and cause additional workload and stress. For example, documentation is important for employees and patients, so it should be optimally recorded and accessible' (INT10).

In general, compared with other sectors, survey participants in the hospital sector have a less positive view of the effects of digitalisation. With respect to the effects on the public service in general, the digitalisation of work (the introduction of various digital tools and methods) is assessed as positive by 24.5% (somewhat agree or strongly agree) and the effects on quality of the service to users are seen as positive by 37.5%. 24.5% give a positive assessment of the improvement of working conditions in the sector and 22.4% see an improvement in the overall quality of jobs. Only 8.2% of the participants expect positive effects on wages in the hospital sector. The majority of the participants do not share this expectation (65.5%).

The online survey shows that the introduction of digital tools/programs has affected several aspects of work: For 29.3% of the employees, the scope of decision making at work has remained the same, but 46.4% report increased decision-making powers and autonomy to schedule their work tasks as a result of digitalisation. In addition, it reduces the time needed for routine repetitive tasks (58.7%).

Digitalisation also improves coordination of tasks with colleagues (40.9%). In addition, it offers a clearer overview of the implementation of the tasks making up their job time (28.8%) and gives more time to focus on significant aspects of the job (51.2%). Another important aspect has been improvement of the quality of their interaction with public service users (51.4%)

On the other hand, work intensity has also been affected by digitalisation at the workplace. 50% of the people surveyed consider that the intensity of work has increased. The monitoring of employee performance for the purpose of internal assessment by supervisors (30.1%) and by direct colleagues (37.2%) also receives high scores. 28.6% of the participants state that the introduction of digitalised tools and methods at work has triggered the feeling of increased monitoring of employees. These findings with respect to control and monitoring issues seem to be much lower than in the electricity sector.

Interview partners stress in general the importance of service quality for patients as well as welfare of the employees in the hospital and health sector.

'The question is whether digitalisation is in the interest of good work. It must help to reduce the workload, but not to Taylorisation. Employees' work must be eased and, above all, patients should receive a higher quality of care. The unions cannot support processes in which jobs are rationalized away and cut. Digitalisation should be designed in the interests of good work and better care' (INT10).

Interviewees point to a disparity in the development and diffusion of digital solutions in the hospitals.

'Big hospitals and big care providers drive the development, but not always with a smart strategy, but in small steps, which leads to an interface problem. Ambulance services, for example, are highly digitalised, but hit limits in delivering patients to emergency when it is not digitalised and documents have to be printed out' (INT11).

'How the digitalisation projects are inserted into the existing infrastructure should be thought through in advance. 'Stand-alone' solutions still prevail, which then cause considerable problems with the interfaces and also do not produce the desired effect because they are poorly implemented and there is no coherent strategy behind them' (INT11).

'The majority of employees have high hopes that digitalisation will ease the burden of care documentation, for example. However, this hope often collides with the practical reality of everyday work. The systems introduced are not aligned with the needs of employees in practice, but 'employers select "great" programs that do not work in practice'. The 'benefits are' thus 'not visible to everyday workers.' However, the potential is there, since there is generally rather little fear of contact with digitalisation and, as already mentioned, the hope of relief' (INT12).

2.3.4 Working time

The 'diagnosis-related groups' (DRG) system is a flat-rate billing system in which inpatient hospital treatment is billed at a flat rate per case, largely independent of the patient's length of stay. A case is charged a flat rate on the basis of various criteria (main diagnosis, secondary diagnosis, procedures, patient age, ventilation hours, etc.) by means of software that is standardised throughout Germany.

In Germany, this system came into force in 2003, and had a structural impact on the health care system in Germany. It has been particularly criticised for commercialisation of the health care system and an associated significant increase in the workload of nurses and doctors.

The studies refer, among other things, to psychological and physical strain on health care workers in comparison to other sectors, to the specific working conditions of different occupational groups such as nursing and medicine, as well as to long-term effects of the DRG system. According to these studies, many jobs are characterised by inadequate organisational structures, atypical and unreliable working hours, high mental and physical stress, administrative activities, little ability to plan and influence work tasks, inadequate occupational health and safety, a high difference between time demands and resources, and an increase in objective stresses and subjective stress perceptions (see Öz et al. 2014).

As a major consequence of the staff reductions in the 1990s and the shift to the DRG-system, the ratio between patients and care staff has continued to increase. While in 1991 a full-time care worker had to treat, on average, 45 cases, this had risen to 60 cases by 2015. With respect to the number of cases to be cared for per doctor, there has been a continuous reduction since 2008. The number of cases to be cared for per non-physician employee rose continuously over the observation period, from 18.7 in 1991 by about 50% to 27% in 2014 and only declined slightly in 2015 to 26.3 per employee. Simultaneously with the reduction of beds and the decreasing length of stay, the number of calculation or occupancy days for which each nurse is responsible has fallen from 0.63 to 0.44 (Geraedts 2017).

An older IAT report from 2014 'Arbeitsreport im Krankenhaus', with a main focus on working conditions in German hospitals, shows that nearly 80% of healthcare workers think that their working conditions have deteriorated over the past five years. Understaffing of German hospitals and sharp intensification of work have been stated as major reasons for growing dissatisfaction, especially among healthcare personnel. In line with general research on work intensification, the IAT-survey mentioned shows that there is a consensus that a large number of hospital employees are affected by performance intensification and that this is seen as negative by them. A decisive aspect in the negative assessment of working conditions is the perceived lack of time of the

employees. Both nursing staff as well as doctors report a reduction in the number of jobs, while their tasks remain the same (Öz at al. 2014).

Our own survey shows that the possibilities for telework or remote work in the hospital sector are very limited. Since the health care sector is a personal service, it involves very close relationships with patients. 41.5% of the survey participants state that their job allows them to do all or some of their work tasks by means of teleworking from home. For 7% of the survey participants, teleworking from home was possible only during the Covid period.

Remote working at the user's home or premises (e.g. patient's home/ customer's home) is not possible for 80% of the respondents, and remote working at a satellite office or structure is impossible for 94.9%.

The questions in the DGQS survey give some insights regarding working time. The majority of the participants (86%) consider that the introduction of digital technologies has not changed the number of working hours in their contract. 10% of respondents report that the number of hours has changed somewhat. A majority said that paid (80%) and unpaid overtime hours (76%) have not been influenced. 14% reported that paid overtime has increased somewhat and 20% said the same for unpaid overtime. Regarding unpaid overtime, these values were 76% and 20% respectively. With respect to unsocial working time (evenings, nights, Saturday or Sunday), 54% report that it has increased somewhat or significantly. 40% report no change at all. Regarding commuting time from home to work, this has decreased (54%) due to use of digital tools and processes. For 40% of the participants, this commuting time has not changed.

2.3.5 Health and safety and outcomes for workers

The respondents to the 2017 IAT survey estimate that work pressure has tended to increase in the past as a result of digital technologies. Although neutral, more than a third observe more pressure to perform, while only a small minority came to the opposite conclusion. The trend is particularly clear in the case of tasks to be performed in parallel, where 53% state that the number of such situations have increased due to digitalisation.

In the experience of the respondents, digital technologies tend to lead to an increase in workload, with hardly any saying that their workload has lessened. This development is experienced above all in the normal wards, where the respondents stated significantly more frequently that work pressure has increased. There, 39% confirm that the number of work situations in which they are subject to deadlines and performance pressure has increased. 37% of respondents report that the number of situations where they need to work more quickly has increased due to digitalisation.

The DGQS survey shows that the introduction of digital tools and methods into the daily routine has had a relatively low impact on physical health. Apparently, the survey participants do not regard their own problems as linked to digitalisation. Only 8% claim that it has caused or 10% aggravated a physical pain/condition (e.g., back pain, neck pain, hand pain, eye problems). 70% report that they have not noticed such an effect.

With respect to mental health, however, their assessments seem to be rather negative: 18.2 % report psychological problems (stress, mental fatigue, burn-out or depression) which can be traced back to digitalisation.

Of the participants who have reported that they experience psychological problems and specify the kind of problems, 25% of them suffer from stress, 17.9% from burn-out and 25% from mental fatigue.

2.3.6 Skills and learning

The IAT-report (2017) shows that the picture is somewhat more positive when it comes to the question of training in use of specific technologies in the workplace. In each case, 38% of respondents feel they have received sufficient training, and 44% report the availability of additional training, if necessary. However, here, too, rather high numbers responded 'partly/partly' and 29% do not feel sufficiently qualified and do not receive any additional training if required (28%).

The assessment of the way in which new technologies are introduced at company level paints a critical picture, particularly with regard to employee participation. In each case, 27% feel they are informed in good time and comprehensively before new technology is introduced; more than 40% disagree or tend to disagree. A large proportion of respondents therefore feel that they are informed too late and inadequately about the introduction of new technologies in their own workplace.

The questions related to digital literacy in our DGQS survey show the importance of both formal and informal training at the workplace. 22% of the surveyed staff claim that they had to learn both general digital literacy methods and specific digital skills, whereas 50.4% had to develop only some specific digital skills required by digitalised tools and/or software. Only 8% of the respondents stated that no new digital skills are required for the job.

With respect to qualification and training, our own survey in the hospital sector shows that training measures are not applied as needed. 23.9% of the respondents reported that they had not received any formal training from their employer. Furthermore, 30.4% claim that they informally learnt at work (i.e. on-the-job learning; exchanges with colleagues). Only 15.2% responded that

either they acquired both general and specific digital skills or only those related to the utilisation of specific digitalised tools (machines, software).

One interviewee highlighted the use of different systems in hospitals:

'Hospitals use different digital systems, which can be challenging for employees when changing employers if they have to learn some new things from the start' (INT10).

'Another problem is that the new digital systems are introduced within everyday nursing practice. There is often only minor training for this, and employees tend to be overburdened by these processes instead of being relieved. Overall, the basic problem is that there are coordination problems between IT-experts and nurses, as they have differing views and concepts. IT systems should be thought of in terms of the needs of the nursing staff. Standardization of the care process through digital systems reduces the complexity of the holistic approach to care' (INT12).

2.3.7 Reconciling work and personal life

As the healthcare sector is becoming more demanding, it is crucial to pay adequate attention to the Work Life Balance (WLB) of its employees. Since the work in hospital requires a great deal of personal contact, the employees must have good physical and mental health, which can be achieved by appropriate working conditions, a healthy and safe working environment, a flexible work schedule, and strong family support (Rao and Shailashri 2021). In general, by improving the WLB of healthcare workers, the healthcare industry would gain a competitive advantage by attracting and retaining highly skilled and experienced employees who will be more efficient and effective due to working in a flexible and employee-friendly environment.

The DGQS shows that 59.2% of the respondents think that the digitalisation of work (the introduction of various digital tools and methods) is positive for the balance between personal/family time and working time. 37.5% assess with respect to their own personal situation that the balance between personal/family time and working time has improved due to the digitalisation of work. Personal time and the time spent with family has been affected positively as well (24.5%).

As digitalisation has progressed, the share of mobile work has increased significantly in several sectors. The process has become widespread, especially during the pandemic. The participants in our own survey in the hospital sector, however, state that working from home/teleworking has been introduced or extended only at a low level (26%).

Negative effects on private life have been reported in the answers on the specific effects of digitalisation. It has increased work time (online and offline) at the expense of personal time (14.8%). Some respondents remark that it is sometimes difficult to combine this work with their household responsibilities (child or elderly care, etc. ...) when teleworking from home (22.9%). It is also regarded as difficult to clearly differentiate between working time and personal time (23%).

2.3.8 Career prospects and employment security

One of the frequently discussed questions in the context of digitalisation is the substitutability of people and their work by technology. In the hospital sector, the potential for the substitutability of occupational activities and even the disappearance of entire jobs is apparently not a significant issue. In the 2017 IAT-Survey, almost no one (less than 2 %) fear that their own work could become superfluous due to digitalisation. 92% do not have such fears. Respondents agree more that individual activities could be replaced. However, here too most respondents rejected the statement that digital technology is already replacing activities at the individual's own workplace (57%, strongly disagree) (Öz et al. 2017).

In Germany, the risk of jobs being eliminated and work activities being substituted to a greater or lesser extent, resulting in profound changes to work and occupations, has become a prominent topic of discussion in recent years. For clinical professions in nursing and medicine, changes in the spectrum of tasks and work content are predicted, but not the loss of the clinical professions in nursing and medicine: there is little fear of job losses. The situation is different in areas such as administration. For nursing, there could be a move towards elimination of routine activities and monitoring functions. Substitution is predicted particularly for low-skilled workers, who, however, make up a relatively small proportion of the hospital workforce. In general, no job losses are expected in the core professions, but rather an increase in the number of jobs, due to other developments such as demographic changes and an increasing share of elderly people in society with health care needs (Öz et al. 2017).

Loss of job security due to digitalisation of work is apparently not a great concern for the employees in our survey. Only 16.3% of employees in our own study think that their job security and future prospects are at risk. 45.8% see the effects as rather positive, whereas 31.3% see no differences resulting from organisational changes or new technologies.

Only 16% of the survey participants think that learning the new skills required by digitalisation would reduce their job security in the future. Learning new skills, in the opinion of participants, would rather open up other job or career opportunities outside the current institution (36.7%) and in the current institution (34%). Learning these new skills required by digitalisation would also enhance their range of personal skills (18.8%).

2.3.9 Workers' rights

The respondents in the IAT survey (2017) state that participation in the implementation of new technology at their own workplace is particularly critical. Only 15 % see themselves as fully involved in the development of such innovations, i.e. in the early stages of an implementation process. Even in the subsequent selection of technical products offered in the process, only 12% of the respondents are fully involved.

After the introduction of new technical solutions, employees are also only involved in the evaluation to a limited extent: less than a quarter are involved at this stage (23%), and more than half of the respondents disagree or tend to disagree with the statement 'I am involved in the evaluation of new technology'. Overall, the participation of employees in the digitalisation process at their own workplace appears to be only low, from their perspective. (Öz at al. 2017).

With respect to the 'right to disconnect' (i.e., not to be connected to your work email, work computer, work phone outside working hours), a high share of the **DGQS** respondents regard this right as essential in an increasingly connected professional and social environment (60%). They call for this right to be clearly included in the collective bargaining agendas at sectoral and cross-sectoral levels (92%) and at their own workplace (90%).

'Many companies use WhatsApp to create duty schedules, for example. It is faster and costs nothing, but data security remains questionable. A side effect also concerns demarcation, if constant connection thereby becomes possible. Only a few employees in the healthcare sector have a cell phone that can be switched off. Employees are thus contacted via WhatsApp and asked if they can step in when needed. Private cell phones are usually not switched off, so employees are always reachable. Not to the advantage of the employees' (INT11).

The interviewees draw attention to the data security and monitoring issues.

'Data protection and personal rights are also given little consideration. The danger is that digitalisation will give rise to new monitoring options that can be applied in practice. Not only monitoring of time spent (e.g., on patient care: how long patients are kept, time spent on certain activities, etc.), but also exploration of potential savings from the employer's perspective if these temporal components are digitally recorded and monitored' (INT10).

The use of assistive devices in patient care is also monitored. Accurate recording through digital technologies can also lead to a negative evaluation of employees. For example, if you can see where the equipment trolley is and what this contains, you can constantly

monitor this. Then the employee and caregivers are not able to make their own decisions and evaluate which patient should get what (how much time, which aids etc). In the end, this increases the control and monitoring possibilities of the controllers but can limit the freedom of decision of the employees' (INT11).

Interviewees stress that employees must be involved in the processes early enough to eliminate possible resistance and concerns and to ensure a better process: *'There are fears and concerns from the employees' point of view: e.g. surveillance. The task of the employer is to convince the employees and try to involve them' (INT12).* *'What is important, especially with regard to the use of technology, is that employees are constantly involved in the decision-making processes and in the implementation of the processes in advance, during development and implementation. Keyword here: employee perspective: user-friendliness of applications and technical devices. It must also take data protection into account'.*

Regarding the trade unions' work to accompany and support employees and works councils, the respondents to the DGQS survey are quite positive about such negotiations in the context of the socially sustainable management of digitalisation and technological change. Only 8% state that such negotiations at the sectoral level on safeguarding employment or the quality of working conditions are not at all effective. At the workplace, however, this negative assessment is lower (4%). The majority of the respondents regard such measures as moderately effective at the workplace (60%) and at the sector level (54%).

2.3.10 Conclusions on the sector

Since the beginning of the 1990s, the German hospital sector has experienced major structural changes induced mainly by commercialisation and privatisation. The replacement cost-coverage principle has intensified the commercialisation process. Consequently, a new wave of privatisation of the German hospital sector has been observed, with a reduction in the number of hospitals and a rise in the number of private hospitals. Although the hospital sector has been regarded as weakly digitalised compared to other sectors, digitalisation has taken place in various fields. Nevertheless, the studies and interviewees claim that such digital solutions are implemented not as a part of a general digital strategy, but rather as separate stand-alone solutions with no comprehensive strategy.

With a lack of financial incentives and structural problems, there are, in practice, difficulties in implementing digital solutions in hospitals. The interconnection of these separate strategies results in so called media breakage. It is regarded as less useful, for example, if emergency services and patient registration are digitalised, but if there is then a problem if such systems are not compatible or absent in the hospital when patients are brought in.

The hospital sector and the health system in Germany are confronted by long-standing but hardly recognised structural problems. This became particularly apparent to citizens during the pandemic, which highlighted the systemic importance of such jobs. Despite some improvements in recent years, the burden of the past remains. A shortage of qualified personnel, high work intensity and relatively low levels of wages together hamper the attractiveness and reputation of these jobs, which does not reflect their life-saving importance.

Digitalisation takes place in different units at a differing pace and intensity. The interviewees stress that digital tools and solutions alleviate the work of the employees. The employees should, however, be incorporated early enough into the decision-making process and must be helped by additional training and supporting measures during the digital transformation.

Section 2.4 Overall sectoral cross-cutting conclusions

The three sector studies in this report have some peculiarities which differ partly from other sectors. The market mechanism functions differently from supply and demand structures, in how the products and services are delivered and how prices are set. The public administration is in charge of implementing and securing compliance with laws and regulations. On the other hand, well-being and customer satisfaction with the state and government are of great importance and can strengthen the legitimacy of the political system.

A secure and well-maintained electricity supply is the basis for all kinds of economic activities and is an inseparable part of the daily life of citizens. Its importance is noticed, especially, if its functioning is disturbed or interrupted. The citizens are now seeing this in the ongoing public discussions as to how to secure the supply at reasonable prices. Beside market mechanisms, political discussions influence the structure of the sector. Liberalisation and privatisation had an enormous impact on the sector. Political decisions to shift to renewable energy and shut down nuclear plants or reduce coal-based electricity production are only a few examples. In addition, recent decisions to set limits on prices can be also regarded as interventions in the market mechanism.

The health sector and hospitals are also subject to political decisions. Changing cost calculation regulations in the hospitals may affect both the working structure and the treatment of patients. Political decisions also have a huge influence on cost and wage structures. Recent improvements of care worker wages in Germany were based on a mainly political decision, as a consequence of the positive image these workers acquired during the pandemic, as well as rising awareness of their importance to the system. In sum, these three sectors are highly influenced by political decisions and are characterized by limited market mechanisms.

In addition, the products and services delivered by these sectors can be labelled as benefiting the common good. This means that their provision affects the wellbeing and satisfaction of citizens and, regarding the electricity sector, is of great importance for the functioning of whole economy. This would explain the strict regulation and control mechanisms applied. These sectors are not left to market mechanisms alone, but are strongly regulated in Germany.

Especially in the hospital sector, there is intense personal contact between staff and patients in some tasks. In the public administration, this is the case in the citizens' bureaus which deal with citizens partly face to face.

'Common good' characteristics and the intense influence of politics have influenced several aspects of these sectors. The interviewees stress the importance of quality issues as well as working conditions in the digitalisation process. This may not be the case, for example, in the automotive industry, where the employees have no direct contact with consumers and need not take into account consumer wellbeing, as long as the competitiveness of the company concerned is not affected.

Well-being and satisfaction of citizens or patients, however, is vital in these three sectors. Their absence and malfunctioning are noticed immediately. These general characteristics of the sectors in question has effects on wages, working conditions as well as interest representation, as explained in section 3.

The pace and level of digitalisation proceeds differently in these sectors. In the public administration, it may be regarded as a top-down-process, as well as in the hospital sector, depending on the institutional structure. Political decisions set targets and provide resources in the public sector, determining how and to what extent and what kinds of tasks should be digitalised. In the electricity sector, in addition to market competition, political decisions such as decarbonisation strategies influence decisions on digitalisation.

SECTION 3. DIGITALISATION AND SOCIAL DIALOGUE

Section 3.1 Introduction: contextualizing the national system of industrial relations

The German system of employee interest representation is characterized by the 'dual system' of trade unions and works councils. There are two most important pillars of the German industrial relations model: collective bargaining agreements and worker co-determination at the workplace. Trade unions set the framework for working conditions at the sector level or within single companies and negotiate collective agreements with respect to wage levels and working time. Works councils ('Betriebsräte') in companies and Staff Councils (Personalräte) in the public sector are elected by employees and represent their interests at company level in the form of workplace arrangements.

The main trade union confederation in Germany is the DGB (Deutscher Gewerkschaftsbund). The eight different unions that belong to it cover many sectors of German industry, public services such as the police, and higher and vocational education. The following list shows the unions belonging to DGB:

- IG Metall (IGM)
- Vereinte Dienstleistungsgewerkschaft (ver.di)
- IG Bergbau, Chemie, Energie (IG BCE)
- IG Bauen-Agrar-Umwelt (IG BAU)
- Gewerkschaft Nahrung-Genuss-Gaststätten (NGG)
- Eisenbahn- und Verkehrsgewerkschaft (EVG)
- Gewerkschaft Erziehung und Wissenschaft (GEW)
- Gewerkschaft der Polizei (GdP)

The other confederations are the dbb (Deutsche Beamtenbund), which represents public sector workers and has around 1.3 million members, and the Christian confederation, CGB, which has around 280,000 members. The majority of the dbb's members have civil servant status (Beamte) and their pay and conditions are not negotiated but rather set by law. Around a third of its members are workers with normal employment status whose pay and conditions are negotiated.

Trade unions in Germany have traditionally been organised along industry lines. The metalworking union IG Metall, the services union Ver.di and the chemical and energy workers' union IG BCE are the biggest unions. Certain specialized branches have their own separate unions, such as the Marburger Bund, which represents hospital doctors and Cockpit, which represents airline pilots.

A collective agreement regulates the rights and obligations of employees and employers. Its negotiation is solely a matter between employees and their representatives and the employers (collective bargaining autonomy). Collective wage agreements only apply to the collective bargaining sector for which they were concluded, i.e., a specific industry, a specific collective bargaining district or an individual company. A collective agreement includes working conditions such as wages, trainee allowances, salaries, working hours and vacation entitlement, special vacation bonuses and Christmas allowances and periods of notice for a termination.

The parties entitled to negotiate are the members of the employers' associations (or, in the case of an in-house collective agreement, the individual company) and the employees who are members of the concluding trade union. However, in order not to create an incentive to join a union, most employers apply collective agreements to all their employees.

Collective bargaining in Germany predominantly takes place at sectoral level between sectoral trade unions and employer organisations. Sectoral agreements are usually concluded at regional level, which means that there may be some regional variation. Bargaining usually follows a pattern, with one region taking the lead. The pay provisions of collective agreements usually cover one or two years. Other provisions run for longer periods. There can also be collective wage agreements that the Federal Ministry of Labour and Social Affairs has declared as being 'generally binding', i.e. applying to all employees and employers in the collective bargaining sector. The concrete implementation and monitoring of industry-level collective agreements is often relegated to works councils and management at the plant level.

The other pillar of the German dual system, the '**Works councils**', are not involved in collective bargaining over pay or working time, which is the prerogative of trade unions. Nevertheless, works councils have been involved to a greater extent in the implementation of **opening clauses**, which are clauses in a sectoral collective agreement that allow works councils to negotiate, under specified conditions, company arrangements that are less favourable than the terms in the sectoral agreement.

Under the Works Constitution Act (Betriebsverfassungsgesetz), **works councils** can be established in all workplaces with at least five employees. However, in practice, many smaller workplaces do not have a works council. They must be elected by the entire workforce in the establishment, and employees are free not to set up a works council. A majority of larger workplaces of over 500 employees have a works council. The size of the works council (and of the equivalent 'staff council' in the public sector) is fixed by law and increases according to establishment size.

The works council has the right to be informed and consulted about a number of issues connected to the workplace, such as economic and employment-related issues, and can engage with the employer and make proposals. It also has some codetermination rights, which means that decisions cannot be taken against its wishes. **Codetermination rights** cover areas such as the organisation of working time, start and finish times, overtime, short time working, paid holidays, methods of payment, the setting of bonuses and targets and the organisation of canteens and sports facilities. Co-determination rights are prescribed by law on 'social matters' such as remuneration arrangements, health and safety measures, and the regulation of working time. Unlike trade unions, they cannot call strikes or negotiate with the employer on wages or working conditions, which are normally settled by collective agreements between trade unions and employers' associations at industry level.

Another characteristic of German industrial relations is a high degree of employee participation, sometimes even co-determination, in companies' boards ('Aufsichtsrat'), where trade unionists and works councils elected by employees have full voting rights. By law, employee representatives have a right to sit on the **supervisory board** of large companies. They have the right to **one-third of the seats** in companies with between 500 and 2,000 employees, and **half of the seats** in companies with more than 2,000 employees.

The structure of German industrial relations is coming under pressure, with dramatic changes in coverage levels and union density in recent decades. Coverage by collective agreement has been declining over the past few decades, and particularly since the unification of Germany: coverage in the east has always been lower than that in the west. In terms of coverage by collective agreement, the Institute for Employment Research (IAB) of the Federal Employment Agency notes that for 2021, 49% of employees in the west are covered by a collective agreement (45% at sectoral level and 9% at company level). Coverage is lower in the east, at 43% (34% at sectoral level and 11% at company level) (Ellguth and Kohaut 2022).

Union density has also experienced a sharp decline, with only some 20% of employees now union members. As a consequence, the dual system of industrial relations no longer shapes the majority of employment relationships in Germany. (Haipeter 2020)

This steady erosion of the German collective bargaining system has prompted several initiatives aimed at boosting bargaining coverage. These include, on the one hand, the various organising projects run by trade unions aimed at building new forms of workplace organisational power and through this extending and consolidating the scope of collective bargaining. On the other, there have been proposals for political steps to boost collective bargaining, such as easing the requirements for collective agreements to be extended and become applicable to all relevant jobs or tying public procurement to compliance with collective agreements (Schulten 2021).

Section 3.2 Trade unions' position on digitalisation at national level

The German system of interest representation is the dual system, which stipulates the separation of the conflict regulation procedure between employers and employees into two fora: works councils and trade unions. Wages and working hours are reserved for collective bargaining, and action such as strikes and lockouts are also only permitted within the framework of collective bargaining autonomy. At the company level, works councils negotiate supplementary agreements with the management on these subjects by means of so-called 'opening clauses'. Two types of works councils exist, in respectively the public and private sector.

The German Trade Union Confederation (DGB) is the largest umbrella organization of affiliated trade unions in the Federal Republic of Germany. It has eight member unions. Other umbrella organizations that are not part of the DGB are: the Christian Trade Union Confederation (CGB) and the Deutscher Beamtenbund (DBB). The DBB focuses on civil servant representation in the public sector and competes with member unions of the DGB. There are smaller, independent trade unions in different areas, such as the Marburger Bund, which represents the interest of medical staff and doctors in hospitals.

Digitalisation brings challenges for employment, work organisation and working conditions and the way employee interests are represented. The German system of interest representation must therefore respond, if digitalisation should trigger a dramatic reduction in industrial employment or the undermining of agreed pay and working conditions.

Confronted by these prospects, trade unions in Germany have opted to go on the offensive and adopt a strategy aimed at securing active participation in shaping change, as opposed to rejecting it and then fighting over the consequences (Haipeter 2020).

In general, trade union demands include comprehensive co-determination in the workplace with regard to all digitalisation processes, protecting jobs, comprehensive training measures, occupational health and safety adapted to the new requirements and more comprehensive protection of employees' privacy. With regard to Work 4.0 ⁽¹²⁾, the fundamental topics are of equal importance for society as a whole: 'participation in work,' 'good corporate culture,' 'democratic participation,' 'life-phase oriented employment and social policy,' 'fair wages' and 'good pay,' 'social security,' as well as 'getting good work in the digital transformation'.

12. The Federal Ministry of Labour and Social Affairs introduced the term Arbeit 4.0 (Work 4.0) in its 2016 White Paper, to initiate a dialogue process on the future of labour in society. Following the discussions on Industry 4.0, which focuses on the industrial sector, Arbeit 4.0 concentrates on forms of work and the working relationship.

The major views of the German trade unions focus on bringing a human-centred perspective into the discourse instead of only focusing on the technological side of the topic

- Digitalisation requires new forms of participation and regulation in the face of increased flexibility;
- Effective workers' rights to limit power and control in the context of big data and privacy
- Education and training as the key to social change and social justice;
- Development and expansion of occupational health and safety and emphasis on decent work and a participation culture
- A modern working-time policy and collective bargaining as cornerstones of the welfare state;
- All forms of employment should be protected by inclusion in the social security system, and bogus self-employment needs to be avoided in digital work as much as in any other kind.

In a policy paper adopted in 2015 under the title 'Gute Arbeit und Gute Dienstleistungen in der digitalen Welt' (Good Work and Good Services in the Digital World), ver.di points out that digitalisation could also be an opportunity to improve working conditions, if it is shaped in the interest of employees (ver.di 2015). Similar demands are also made by IG Metall. At company level, IG Metall is aiming to shape digitalisation in a way which enables more self-determination and individual flexibility. With a large number of training events and seminars, ver.di and IG Metall are both trying to take the debates on the consequences of Industry 4.0 and the digital transformation, as well as the associated regulatory requirements, into their trade unions and into the workplace.

Section 3.3 Electricity production and distribution sector

3.3.1 Collective bargaining in the sector

The main trade unions in the energy sector are ver.di, IG BCE and IG Metall. The employees in the municipal units are mostly represented by ver.di. In recent years, however, there has been strong competition between the trade unions to recruit new members, so that the traditional distinctions between competence fields of the trade unions are blurring.

Collective agreements in the electricity sector are concluded at different levels: single-employer or multi-employer collective agreements. In general, industrial relations in the electricity sector are characterised by established collective bargaining rounds for the top electricity producers. The major producers RWE, E.ON/Tennet, AVEU and AVE have recently concluded collective wage agreements for their companies, in place in 2022. Germany's IG Metall trade union has reached an

agreement with employers to boost pay for metal and electrical workers by 8.5% over two years, a compromise aimed at taking the sting out of decades-high inflation in the country.

Employees of municipal utilities are generally paid according to the collective agreement for utilities (TV-V) and are represented by ver.di.

As in other two sectors, German collective agreements regulate a wide range of issues. Apart from pay, agreements also deal with issues such as shiftwork payment or pay structures, working time, the treatment of part-timers and training, appointment and dismissal, premium payments for night and shift work, holidays and sick pay.

Municipal utilities may be public or mixed-economy enterprises, majority-owned by one or more municipalities. They provide technical services and utilities to the public. They are in charge of electricity supply (supply of electricity, metering point operation, operation of distribution networks, in some cases also of power plants).

In recent years, unions have undertaken efforts to represent employees in the renewable energy sectors and have them covered by collective agreements. At Bosch Solar Energy and the Freiburg-based Solar-Fabrik, it was possible, thanks to the organizing efforts of IG Metall, to conclude collective bargaining agreements. In these sectors, the number of workers are estimated at between 200,000 and 300,000, depending on sources. The level of workforce representation is rising but is still at low levels. For example, in the wind energy sector, in most of the companies, there is no collective agreement.

The Institute for Employment Research (Institut für Arbeitsmarktforschung, IAB) uses data from its establishment panel (IAB-Betriebspanel; 15,200 companies) to estimate collective bargaining coverage. According to the latest data from 2021, 66% of employees in Germany were covered by a sectoral collective agreement in the energy, water supply, waste disposal and mining sectors. This compares to 5% of employees in the same sectors who were covered by a company-level agreement. On the other hand, 29% of the employees are not covered by collective bargaining. 40% of them, however, are working in the companies which apply or are guided by a sectoral collective agreement. 66% is much higher than the general mean value in all other sectors (43%) (Ellguth and Kohaut 2022).

3.3.2 Role and importance given to digitalisation in the national industry-wide agreements

In general, trade unions appreciate the positive aspects of digitalisation. It enables and enhances the flexibilization of work in terms of time, place and organisation. It opens up a range of work organisation options for both employees and companies. As in the case of the two other public

services in this report, the trade unions stress the 'common good' character of such services which provide infrastructure for the whole of daily and working life. The digital transformation should be implemented not only on the basis of economic and rationalisation considerations, it should rather serve a general aim of reconciling quality of services with working conditions. Each digital process should be examined with regard to those aspects. Furthermore, the trade unions stress the importance of participation in the decision-making process throughout the digital transformation. This would alleviate fear and resistance among workers and would help to optimise the digitalisation process. Accompanied with further training and skill development measures, the employees would be supported in further steps. The interview partners do not expect a further reduction in employment due to digitalisation. In their view, job losses and the substitution process have been left behind, since digitalisation started in the electricity sector long before other sectors. The sector is now confronted with other problems: a shortage of qualified personnel and recent upheavals due to the war in Ukraine and associated with the energy shortage and rising prices.

Company-level agreements with the works councils are in fact the rule. Trade unions support the works councils at the company level with guidance, checklists and information material.

The trade unions did not manage, in their collective bargaining, to conclude general agreements on the digital transformation. One exception is the recent agreement in the rubber and chemicals sector:

During the pandemic, it became increasingly difficult for the trade unions to maintain contact with employees working from home. Due to data protection regulations, many companies are often unable to make internal communication channels such as company e-mail addresses available to third parties.

The Employers' Association of the German Rubber Industry (ADK) and the IG BCE trade union concluded Germany's first social partner agreement on digital access rights in April 2022. It applies to the 30,000 employees in 100 rubber companies nationwide.

According to the agreement, IG BCE is to be given digital access rights in the industry's plants. The currently established and existing communication channels are to be used for this purpose, for example the company e-mail addresses. These can be supplemented by other company information systems, such as the digital bulletin board on the company intranet or mailing lists. It is also possible to use company video conferencing systems for trade union digital meetings (online consultation hours, online shop stewards' meetings). The company and the responsible IG-BCE organizational unit must reach an agreement at company level on the concrete form of the digital access right.

In September 2022, this digital access agreement was widened to the chemical industry, with a social partner agreement between the German Chemical Employers' Association (BAVC) and the chemical union IGBCE. This framework applies to around 580,000 employees in the chemicals and pharmaceutical industry, making it the largest industry agreement in Germany.

In future, the IGBCE is to be granted digital access using standard company communications, in addition to analogue access in plants in the chemical and pharmaceutical industry. Which communication channels are actually used depends on the company and is coordinated locally with the responsible IGBCE organizational units.

It is still an open question whether the trade unions in the electricity sector will achieve such a digital access agreement in the near future. But it serves as a starting point and pioneer work for the trade unions.

Mobile work has been used in the electricity sector to a limited extent. It has been particularly used by employees performing commercial and administrative tasks, who already work digitally to a great extent. It has been not widely used in production or in the plants. Such agreements are regulated at the company level in cooperation with the employers, but not in collective bargaining. Trade unions point out data privacy, protection and transparency issues in the sector. A digital environment brings a wealth of data. The behaviour and performance of individual employees become, hence, transparent and open to monitoring. This poses corresponding challenges for the protection of employees' data and privacy.

Trade unions continue their efforts to raise awareness of the protection of personal rights in working life and provide information about current activities and events. The works councils, if they exist in the company, are aware of employee data protection issues and restrict the possibilities for data analysis as far as possible. The trade union confederation (DGB) draft of the new 2021 version of the Works Constitution Act contains a number of improvements to employee data protection, such as a duty of co-determination for the works council with regard to company data protection measures.

The trade unions are in favour of the energy turnaround. The German Trade Union Confederation (DGB), the trade unions ver.di, IG Metall, IB BCE and EVG which fall under its umbrella, and the German Renewable Energy Federation (BEE) have agreed on joint demands to be put to the next German government in 2022. The central task of the next legislative period is to translate the ambitious climate protection targets into concrete measures. For example, the expansion of renewables must be massively accelerated, and the cost advantages of renewables must be passed on to electricity consumers. At the same time, the labour market must be geared to the

coming challenges, for example through a training offensive and skill enhancement programmes. According to the DGB and BEE, a faster expansion of renewable energies is not only the key to achieving climate policy goals - but also a prerequisite for the necessary modernization programme for Germany as an industrial location.

In their statement, the DGB ⁽¹³⁾ and BEE emphasize that the transformation affects different industries and companies to varying degrees. While jobs will be lost in some places, new business models with new products, production processes and value chains will emerge elsewhere. The requirements for professions and activities are changing, while at the same time the shortage of skilled workers is creating problems for many companies. This makes it more important to align the labour market with these challenges in order to create secure and good jobs. The next federal government therefore needs to launch a comprehensive training offensive with a focus on the energy transition. At the same time, accompanying measures are needed to increase the attractiveness of collective agreements in the renewables sector. Likewise, they say, the framework conditions for opportunities for co-determination in companies must be steadily improved.

3.3.3 Trade union approaches and priorities for the collective bargaining agenda on digitalisation

The unions in the industry have highlighted the advantages and pitfalls of the digital transformation in Germany. They point out that IT and telecommunications skills are gaining in importance and want to foster a debate on future skills needs in energy companies. Alongside IG Metall, ver.di additionally criticizes the 'poor' collective agreements and co-determination structures in companies especially in the renewable energy sector. Whilst ver.di wants to set up a campaign aimed at extending the usual collectively agreed standards and co-determination rights of the energy industry to the renewable energy sector, IG Metall calls for the conclusion of separate collective agreements in this sector, e.g. a sectoral collective agreement in the solar industry.

The trade unions stress, in general, the importance of points related to the regulation of remote working as well as issues such as: the right to disconnect, work-life balance, privacy, seamless monitoring, work intensification and increasing stress due to more and more small-scale work steps, the emotionless work of machines on and with people, and the blurring of boundaries between work and life in times of constant accessibility.

Trade unions try to accompany the digital transformation with many events and seminars as well as publications and provide comprehensive information and advisory services for their members.

13. See: www.dgb.de/themen/++co++634db526-6562-11eb-ac9f-001a4a160123, as at 10.12.2022

In recent years, ver.di, for example, has adopted guidelines on ethical and good design of digitalisation and on the use of artificial intelligence. In addition, there are brochures and guides on digital practice in the workplace.

In the course of the Covid pandemic, some developments accelerated even further, such as working from home. How to shape developments in the spirit of good work with company agreements, with collective agreements, and with solidarity among employees are regarded as the main challenges facing the trade unions and interest representation in general.

3.3.4 Conclusions on the sector

The effects of the Ukraine war on the energy industry are becoming apparent, not only in the form of massively increased electricity prices in the short and medium term, but also and especially with regard to discussions on the subject of security of supply in electricity production. To counter this, the German government has introduced or initiated measures such as stringent gas stockpiling and the activation of coal and oil-fired power plants, as well as extending the life time of nuclear plants. In addition, the current weakness of renewable energies (wind power and photovoltaics) has become very evident in this phase. The expansion of wind energy has been sluggish for years, partly because of the long approval procedures.

Due to such upheavals and unforeseen events, the electricity sector is confronted with new challenges. Trade unions are drawing attention to the risks for certain industries and citizen groups with respect to rising energy prices and eventually supply shortages. These issues are now high on the daily agenda of the trade unions, although they are still involved in work on the digital transformation and the associated issues. External events such as the recent and ongoing war have shown how susceptible and vulnerable the energy supply sector is. This may result in new restructuring of the sector in the near future with respect to energy suppliers and distribution companies.

Section 3.4 Public administration sector

3.4.1 Collective bargaining in the sector

Public sector employees and civil servants are represented by ver.di (Vereinte Dienstleistungsgewerkschaft), with about 2 million members, GEW (Gewerkschaft Erziehung und Wissenschaft), with about 279,000 members, and GdP (Gewerkschaft der Polizei), with about 191,000 members. The main representative organisation for civil servants is DBB (Beamtenbund und Tarifunion). At the end of 2018, all DBB affiliated trade unions had a combined total of 1,317,000 members. Its 40 affiliated industrial and professional trade unions predominantly represent civil servants, but also employees covered by collective agreements at all levels of public service.

The collective bargaining system for the public sector is highly centralised at the national level. Before the mid-2000s, the federal state, the Länder and municipalities formed a bargaining association and negotiated jointly with the trade unions on the working conditions of public sector employees at all levels of government. In 2003, the Länder left the bargaining association of public sector employers; they no longer accepted the role of the federal government as leader of the negotiations. Since then, the bargaining association of the Länder, the Tarifgemeinschaft deutscher Länder (TdL), has negotiated and continues to conclude its own collective agreements independently, with the exception of Hesse, which left the TdL in 2004.

As a consequence of the reform of the German federal system in 2006, the Länder (States) are themselves responsible for regulating the working conditions of civil servants. This new 'sovereignty' has resulted in more heterogeneous working conditions for civil servants in the states (Keller 2020). The most recent collective bargaining agreement for the states was reached in November 2021 and runs retroactively from October 2021 through till September 2023. The collective bargaining negotiations for the state and municipalities focus in particular on the remuneration of employees (pay-scale employees) of the federal government and the municipal employers, represented by the Federation of Municipal Employers' Associations (VKA). For the period of 2023-24, the negotiations have not yet been concluded. The results of the 2023 collective bargaining round apply directly to the approximately 134,000 federal government employees and the more than 2.4 million employees of municipal employers brought together under the umbrella of the VKA.

The wage level in the TV-L in the states is significantly lower than the corresponding wages at the federal government or for those subject to a local authority pay scale. The difference in income was up to 6.8 % in 2018 and is particularly pronounced in higher pay groups. The negotiating union ver.di justified this by the lack of willingness to strike of the affected employees in the federal states. Whether as an employee or a civil servant, a job in the public sector is considered secure. In the old federal states, for example, the principle of permanency applies at both federal and state level. According to this, people who have been employed for more than 15 years and have reached the age of 40 cannot be dismissed.

In the public sector, collective bargaining coverage (93%) and trade union density (60%) are traditionally higher than in the private sector. This demonstrates the relative stability of industrial relations in the public sector (Dribbush/Birke 2019; Schulten 2021). Nevertheless, the far-reaching privatisation and liberalisation of public services had a major impact on industrial relations and working conditions in these now private, formerly public sectors. Consequently, substantial fragmentation of the former collective bargaining system and a decrease of collective bargaining coverage as well as a deterioration working conditions have been observed in the liberalised sectors (Schulten 2021).

3.4.2 Role and importance given to digitalisation in the national industry-wide agreements

Both trade unions, ver.di and DBB (Beamtenbund und tarifunion), have similar arguments and demands with respect to digitalisation in the public administration.

The top priority here is job security or securing an equivalent job, as well as binding agreements in relation to safeguarding pay and training. No one must be placed in a worse position as a result of a measure. The DBB calls for a binding entitlement to genuine training in order to promote a forward-looking skilled labour force, in terms of lifelong learning and innovation policy. In deciding on the suitability of a training measure, account should also always be taken of the work-life balance. All costs related to a training measure must be borne by the employer, and all time spent on agreed training measures must be regarded as working time.

Another central point is the introduction and use of modern and flexible forms of work. The necessary work equipment must be provided by the employer, or the costs must be borne by the employer. There is also a need for specific regulations on working time, data protection, the avoidance of performance and behavioural monitoring, and establishment of a right to be unavailable, to protect employees from overwork. Flexible working must not become an obligation for employees and must not entail any professional disadvantages.

One recent success has been the collective agreement on digitalisation concluded at the end of June 2021 between the Federal Ministry of the Interior, ver.di and the DBB (Beamtenbund und Tarifunion). The Digitalisation agreement with the federal government could serve as a role model in this regard. States and municipalities, however, have so far refused such an agreement, and the endeavours of the trade unions have to date borne no fruit.

This collective agreement takes effect whenever there are serious changes to work as a result of digitalisation. For example, it entitles employees to training if their job changes, is discontinued, or if they have to take on a new job. In addition, the collective agreement provides for pay protection if a new activity is associated with a lower wage than the old one. The collective agreement has been in force since January 1 and applies to around 126,000 pay-scale employees in the federal administrations.

The collective agreement on digitalisation contains rules that ensure job and pay security in particular.

- If digitalisation leads to changes that affect the workplace or working conditions, a variety of safeguarding mechanisms are in place to preserve the job. Priority is given to securing an equivalent job. If securing the job involves a permanent change in the place of work with an

additional distance of at least 50 kilometres, there is an entitlement to a one-off mobility payment. The amount of the payment is between 2,000 euros and 6,000 euros and depends on the additional distance to the new place of work.

- If a digitalisation measure results in a transfer to another job with lower pay, there are long-term arrangements for personal pay protection.
- Right to qualification agreed: Whenever a person's job changes as a result of digitalisation, there is a right to training. This ensures that employees will be able to cope with the changed activities and requirements in the future. The costs of the training are generally borne by the employer.
- Regulation on mobile working through a service agreement: During the Covid pandemic, work from home and mobile working increased significantly. Many employees were happy to accept this, but the problems associated with mobile working have become apparent. This will also apply to civil servants. The agreement must include, for example, provisions on working hours, reimbursement of technology costs, and the outlawing of monitoring, performance and behavioural monitoring.

There were no collective agreements with respect to the right to disconnect in Germany. This issue is still being discussed in the public realm, however, so far without any conclusion at national level. Stand-alone solutions prevail at the local level, with staff councils and separate units.

3.4.3 Trade union approaches and priorities for the collective bargaining agenda on digitalisation

Based on the collective agreement on digitalisation concluded with the Federal State, the DBB aims to enter into collective bargaining with public sector employers and create reliable framework conditions for all employees, also seeking to extend the scope and to incorporate further employees into such an agreement.

Similarly, the DGB calls on state governments and public employers to use the digitalisation of the public sector to shape good work. The interests of employees must now be taken into account. Digitalisation must therefore not be allowed to exacerbate the situation. It must be designed in such a way that it does not create more work, but good work. This is not only in the interests of employees, but also good for citizens and the economy - because it is the only way to maintain a functioning public service in the future. In several position papers and publications, ver.di and DGB stress the good work aspects and call for actions to enable more participation in several issues regarding the digital transformation, with an emphasis on new digital solutions such as artificial intelligence and blockchain technologies.

The DGB is calling for establishment of a protective framework for employees in the public administration. The position paper 'Employees First' summarises the federation's key demands: Employees must be protected from the new flexibility arising from digitalisation. Negative effects such as work pressure, increasing work intensity and problems in connection with copyright and data protection must be resolved through appropriate regulations and training courses.

At the same time, flexible working time models that focus on the sovereignty of employees need to be expanded. Occupational safety and health protection must be equipped with financial and human resources to meet the new challenges. Employees must be provided with up-to-date work equipment.

The trade unions stress the importance of participation in decision making. Employees and their representatives must be involved as experts and mediators at an early stage of the digital transformation. The heads of departments and the state government must organize the participation of employees and their representatives in an orderly process right from the start and allow for participation in the steering committees.

The DGB highlights that digitalisation has increased the pressure to use third-party services and products due to a lack of in-house competencies and IT personnel. The provision, quality and standard of the products or services in the public sector are of general interest for citizens, and the state bears responsibility for them. In this context, the DGB rejects the privatization of public tasks as a result of the digital transformation. Likewise, the state must not become so dependent on third parties that it loses control of a product from a specific manufacturer or is tied to support from specialist companies for digital services.

3.4.4 Conclusions on the sector

The major challenge in the public administration is the shortage of qualified personnel, as is also the case in several other sectors in Germany. Intensification of work and work overburden for the staff have climbed to the top of the agenda in the sector-related discussions. According to the dbb estimates, there is currently a staff shortage of up to 300,000 employees. Bearing in mind that around one third of the employees will retire in the next 10 years, the scale of the problem becomes evident. How and to what extent the digital transformation would alleviate the problem and reduce working intensity and improve working conditions is assessed by the trade unions as an open question.

The trade unions have long grasped the importance of digital transformation and have sought to attract attention to work related aspects of it. The importance of local participation has been particularly stressed in this context. The actions to be taken depend highly on political decisions at

all levels of the administration. The fragmented structure of decision-making and competencies dispersed between central, federal and local levels will remain a major obstacle for enhancing digitalisation in the near future, despite intense work by the central IT-coordination agency. Staff councils have some legally powerful means to shape working conditions with respect to the impacts of digitalisation at the local level. The trade unions support them and inform them of ways to play an active role in forming the digital transformation in their own workplaces.

Section 3.5 Hospital sector

3.5.1 Collective bargaining in the sector

The three-fold ownership structure of the hospitals in Germany (public, private and non-profit hospitals) has resulted in different industrial relations regimes. In the public sector, most municipal clinics are still covered by the Collective Agreement for the Public Sector (TVöD). Some public hospitals – in particular, university clinics – belong to the Länder and are therefore covered by the Collective Agreement for the Public Service of the Federal States (TV-L) ⁽¹⁴⁾. In both cases the public sector agreements include some special provisions for hospital staff, including a special pay scale for care workers.

Most non-profit hospitals adhere to the particular industrial relations regime that operates within organisations run by the Christian churches, closely oriented to the public sector collective agreements, though this connection is becoming somewhat looser. Other welfare organisations usually have company agreements, either for the entire welfare organisation or at for individual clinics.

Table 4: Collective bargaining structure in the German hospital sector, 2018

Hospital provider	Collective agreements
Public	Nationwide public sector collective agreements for municipalities federal states
Non-profit	'In-house arrangements' (church-run hospitals) Company agreements (other welfare organisations)
Private for-profit	Company agreements for entire hospital corporation at national level individual clinics at regional or local level No collective agreement

Source: Schulten and Böhlke 2019, based on WSI Collective Agreement Archive, 2018

14. TVöD stands for 'Tarifvertrag für den öffentlichen Dienst' and TV-L for 'Tarifvertrag für den öffentlichen Dienst der Länder'. TdL means 'Tarifverträge der Tarifgemeinschaft deutscher Länder'.

The private for-profit hospitals have also developed their own industrial relations regimes. Since privatisation, the companies have largely withdrawn from the public sector agreements in order to undercut existing labour standards. The agreements cover the clinics separately, or all clinics in hospital cooperations, or may be only regional or local. There are also some private hospitals that still refuse to sign any collective agreements (Schulten and Böhlke 2019).

Ver.di is by far the largest union in the sector, covering all types of hospital provider. For special occupations such as doctors, the Marburger Bund has been negotiating separate collective agreements since the mid-2000s. The Marburger Bund negotiates collective bargaining agreements with the federal states (TdL) for the university hospitals, with the municipalities for the municipal hospitals and with private hospital groups. Other trade unions in the healthcare sector are the Civil Servants' Federation and Tariff Union (dbb) and the Christian Trade Union Federation (CGB).

The CGB see themselves as the voluntary association of employees and civil servants in independent and autonomous trade unions. With over 280,000 members, the Christian Trade Union Confederation of Germany is the third largest trade union umbrella organization in Germany. Fourteen individual trade unions are united in the CGB. Within the CGB, two main affiliates represent the health sector: The DHV is the trade union which represents the interests of members in the commercial and administrative professions working in private industry, in the health care and welfare sector, in statutory health insurance, and with municipal employers and public corporations at the local level. DHV had 65,000 members in 2022. The other affiliate of the CGB which represents employees in the healthcare sector is the Public Service and Services Union (GÖD). The church union (formerly: 'vkm - Verband kirchlicher Mitarbeiterinnen und Mitarbeiter') represents the interests of all employees in the church, diaconia and Caritas. Unlike other trade unions, they see themselves as partners of all church and diaconal institutions that act as employers vis-à-vis church employees. They negotiate collective agreements for church health care facilities.

In contrast to trade unions, which often represent employees in the public and private sectors, employer organizations are typically divided into private and public providers of health care services. In Germany, collective bargaining for public hospitals takes place almost exclusively at the state and local level. The employer associations are the Vereinigung Kommunaler Arbeitgeberverbände (VKA) and the Tarifgemeinschaft deutscher Länder (TdL). Private hospitals are predominantly members of the Bundesverband (DBPK), which with its 13 associations represents the legal and political interests of more than 1,300 privately owned hospitals and rehabilitation clinics.

A smaller proportion of the workforce is employed in hospitals covered by the Employers' Association for Nursing Care, which in 2009 represented eight health care service companies and the Federal Association of Private providers of social services.

The Association of Diaconal Employers in Germany e.V. (VdDD) is the nationwide business association of Protestant institutions across the entire spectrum of social services. It represents the interests of more than 180 diaconal providers and facilities as well as seven regional associations, with around 500,000 employees in 2022. The federal association Arbeiterwohlfahrt (AWO) negotiates collective agreements for employees in social and health care facilities.

The Catholic Hospital Association of Germany (KKVD), which organizes clinics employing around 165,000 employees, does not take part in collective bargaining but acts as a lobbying association and is represented on the committees of the German Hospital Federation (DKG).

In the past, German trade unions have conducted various campaigns against the privatisation and commercialisation of hospitals (for example the 2008 campaign calling for more public financial resources for hospitals, with more fundamental criticism of the commercialisation of hospital services, and the 2010 campaign under the slogan 'Get rid of the pressure!' - 'Der Druck muss raus!' - with respect to understaffing and work pressure). These campaigns did not have much success at all. The unions tried to ensure that the growing number of private for-profit hospitals would be covered by collective bargaining and provide similar conditions to those laid down in the public sector collective agreement. They were quite successful in establishing collective bargaining in private clinics, but, with some exceptions, they were unable to introduce in legally binding agreements in church-run companies.

In general, Germany has a highly differentiated hospital ownership structure with fragmentation and dispersion of the collective bargaining landscape. The central line of differentiation therefore runs between public, private and public, private and non-profit hospitals. Whereas in public hospitals (the TVöD for the federal and local governments and the TV-L for the states) agreements cover the majority of employees, in private hospitals there is a patchwork of collective and non-collective agreements. In some hospitals, group and/or in-house collective agreements apply, while in other hospitals no collective agreements are concluded at all. In church hospitals, no collective agreements are concluded, but rather so-called 'labour contract guidelines' as part of the 'church special path'. In the past, these agreements tended to be oriented toward the collective bargaining level of the public sector but have increasingly deviated from this in recent years. Within the public hospital sector, too, we can see more variety of collective bargaining and working conditions.

Schulten and Böhlke (2019) summarize these developments as a process of triple fragmentation. Fragmentation processes take place, first, between the various hospital owners (public, non-profit and private); second, between the core hospital workforce and employees in outsourced areas; and third, between the various professional groups such as physicians, nursing staff and other employees.

The diversified structure of industrial relations in the German hospital sector makes it difficult to secure equal conditions for all hospital workers. In view of the growing competition between hospital providers, there is also a need to establish a level playing field in order to prevent downward pressure on working conditions. As a consequence, the trade unions have tried to coordinate collective bargaining between all hospital providers and establish public sector conditions as a benchmark for all hospitals (Schulten and Böhlke 2019).

3.5.2 Role and importance given to digitalisation in the national industry-wide agreements

The DGB has proposed a position paper on improving the existing Works Constitution Act, setting binding rules to ensure the timely involvement of works councils and to make the new approaches viable across the board. Regarding digitalisation, employees should be at the centre. Work intensification and the removal of work-life boundaries are considered as a new phenomenon of digital work. The trade unions welcome widely digital solutions and state that even in a sensitive area such as nursing, digital assistance and automation systems offer great potential for easing the burden. Digital technologies could make hard work easier and reduce the workload. But they could also increase stress. From the trade unions' point of view, the risks are 'simplification, de-qualification and a devaluation of human work'. Employees should not have to function more and more like machines themselves.

The understaffing of German hospitals and the associated intensification of work and growing dissatisfaction, as well as low payment structures, especially among care personnel, have been some of the major discussion points in recent years, which became much more evident during the pandemic. Due to increasing awareness of their importance to the system, political actors have reacted to improve pay structures in the German health sector, especially for care personnel.

Recently in two Berlin hospitals, Charité and Vivantes, the services trade union ver.di had conducted negotiations to limit the growing stress on workers, through provisions on workloads at these institutions, having already secured measures for the recruitment of additional staff at a number of university hospitals in so-called 'burden easing' agreements (Entlastungstarifverträge) In the autumn of 2021, after more than 30 days of strike action and a wide-reaching public campaign by hospital workers, ver.di agreed a comprehensive package with Charité and Vivantes on workloads and staffing. The agreement, covering clinical and specialist staff at Charité, sets out

minimum levels of staffing in all treatment wards, as well as in functional areas such as surgery, anaesthetics, radiology, accident and emergency, and delivery rooms. In January 2022, ver.di began a campaign for similar provisions at university hospitals in North Rhine-Westphalia.

Trade unions are considering the impact of digitalisation on employees, however, there is not yet a hospital sector-specific strategy. The reason is linked to low levels of digitalisation in the hospital sector. That is why, compared to other sectors, there is also little research and few empirical surveys which analyse digitalisation and associated problems in the hospital sector.

3.5.3 Trade union approaches and priorities for the collective bargaining agenda on digitalisation

Trade unions generally criticize employers for the lack of a discernible overall strategy for the development of digital hospitals.

'Hospital operators, health insurers, IT providers - each of the players is tinkering with a different idea for "digital health". They question if this is always about providing the best possible care for patients. Yet this is precisely what should be the focus. For that reason, legal requirements and compliance with ethical standards are needed. Health must not become a commodity' (INT11).

The Works Constitution Act stipulates that the works council has the right to be informed by the employer in good time in the event of the introduction of digital technologies (i.e. also human-robot systems or the use of apps in the workplace. It has the right to participate in the design of workplaces, work processes and working environments. The participation of work councils in the decision-making on digital transformation at the workplace allows them to shape the process. The interview partners (INT10, INT11 and INT12) from the trade unions pointed out that the members of the work councils, however, are not fully informed: they mostly lack the skills required to play an essential role in the process and are unable to assess consequences for the employees. The trade unions, as stated by the interview partners, try to support the works councils through several actions, including training, checklist and information workshops, as well as providing documents on how to formulate certain relevant issues in the workplace agreements with the employer.

3.5.4 Conclusions on the sector

In general, the issues which are relevant in other sectors regarding impacts of digitalisation are also essential in the hospital sector: work intensity, agreements on working time, work schedule, training measures for the employees, agreements on teleworking, data protection, transparency via digital tools, work life balance. Such issues are directly or indirectly relevant to the digital transformation in general and are closely linked to working conditions, which are a central subject for collective bargaining. Apparently, the importance of these issues related to digitalisation may not be explicitly mentioned in the collective agreements. Besides long-standing unresolved

problems in the hospital sector such as low pay and understaffing, the topics mentioned above will play a decisive role in the work of trade unions and social partners in future. Due to the lack of nation-wide agreements on digitalisation issues, the role of works councils in the process of internal workplace agreements will remain important to express the interests of hospital staff.

The state is and will be an important actor in the digitalisation of hospitals. In a recent investment action, for example, the Federal Health Ministry has approved a €3 billion support programme from January 1, 2021, to enable hospitals to invest in modern emergency capacities, digitalisation and their IT security. The federal states are to provide a further €1.3 billion in investment funding. Funding is provided for investments in modern emergency capacities and in improved digital infrastructure, e.g. patient portals, electronic documentation of care and treatment services, digital medication management, IT security measures, and cross-sector telemedicine network structures. Necessary personnel measures can also be financed by the support programme.

Section 3.6 Overall cross-cutting sectoral conclusions

Digital transformation has had differing histories, paths, speed and dissemination processes in the three sectors analysed in this national report. Correspondingly, the strategies of the social partners and trade unions are partly different, although there are many similarities. Trade unions stress the 'common good' character of the public services, which cannot be left to market mechanisms alone. In addition, trade unions emphasise the impacts on working conditions and stress that digitalisation should not be implemented at the cost of employees. The influence of political decisions on market structures is highly visible in these three sectors, especially in the energy sector and the hospital sector, which has been confronted with challenges due to privatisation and commercialization. In general, digital transformation is a consequence of top-down strategies, even though, as some interview partners stated, there is no integrated comprehensive strategy.

Trade unions are less successful in achieving nation-wide agreements to alleviate the impacts of digitalisation. Most agreements are negotiated at the company level, due to strong legal rights and actions of work councils. Trade unions support them in this process by assistance and advice, as well as organising certain training programmes or nation-wide campaigns. Trade unions acknowledge the potential positive effects of digitalisation. They stress, however, that the quality of services and working conditions of employees should not be affected negatively. The two objectives should be reconciled and supported. Trade unions participate in the general discussion regarding new technologies and digital solutions, such as artificial intelligence, platform work or blockchain, through workshops, policy papers and thematic conferences, and emphasise the importance of assessing the impacts of such new developments from the perspective of employees.

SECTION 4. RECOMMENDATIONS TO NATIONAL AND EU STAKEHOLDERS

Section 4.1 Recommendations to national stakeholders

In summary, there are a number of new fields of action for social partners in the organization of work, particularly in the following areas:

- The decoupling of work location and company through mobile working and working from home has far-reaching effects on the work situation and the well-being of employees. How can employees be reached by organisations representing their interests if there is no fixed place of work? And how can co-determination be organized in such a company?
- Mental health is an increasing issue in the regulation of work due to work intensification.
- Monitoring of performance and behaviour in connection with new forms of data collection and evaluation (Big Data, transparency issues).
- Ongoing challenges due to understaffing. The shortage of qualified personnel is seen by trade unions and works councils today as the most important topic to be addressed.
- Digitalisation should be accompanied by training measures; new demands are being placed on lifelong learning and continuing education.
- The participation of employees in digital transformation should be strengthened.
- The general aim, objectives, targets and expected outcomes of the digital measures should be communicated to employees and their representatives at all stages and should be accompanied by the necessary training programmes.
- The public sector should keep and develop its own IT-competencies and not rely solely on external consultants or IT-service providers. Cyber security and data protection will remain major issues in the course of the digital transformation.
- The success of the digital pact with the Interior Ministry should be extended to the Federal States and local governments in the public administration, as well as to other public services.

Section 4.2 Recommendations to European stakeholders

National governments and the European Union should develop their own digital strategy and set out a European path to digitalisation. Dependence on the US (Silicon Valley corporations) and China with their authoritarian approach to digitalisation is rated currently as high.

As a result of the Covid-19 crisis, many more people now work from home. Works councils are often only able to visit the plants to a limited extent - or not at all. IG Metall in Germany has successfully negotiated a digital access agreement with the rubber and chemical industry; other sectors and the public sector should follow this example, so that works councils and trade unions can reach employees.

Trade unions should develop new strategies to incorporate workers in precarious jobs, the self-employed and those in newly emerging forms of employment, such as crowd workers or platform workers, into the collective agreement mechanism, in order to ensure uniform working conditions across all sectors and along the entire value chain.

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Annex 1. List of interviews

ID	Gender	Age	Institution	Sectors	Occupational Group	Position	Date	Method
INT1	M	55-60	IG-Metall NRW, Strukturpolitik	Electricity		Sectoral delegate	07.09.2022	Face-to-face
INT2	W	55-60	IGBCE-Stiftung Arbeit und Umwelt	Electricity		Department leader	23.09.2022	ZOOM
INT3	W	45	IGBCE-Düsseldorf	Electricity		District responsible	22.10.2022	Phone
INT4	M	55-60	Ver.di, Department Energy	Electricity		Department leader	08.06.2022	ZOOM
INT5	W	-	Ver.di, Berlin	Electricity		Sectoral delegate	31.05.2022	Phone
INT6	M	45-50	DGB, Deutsche Gewerkschaftsbund, Berlin	Public Sector		Political delegate	06.09.2022	ZOOM
INT7	M	-	Staff Council, Düsseldorf City Administration	Public Sector		Head of the staff council	11.07.2022	ZOOM
INT8	M	-	Staff Council, Köln City Administration	Public Sector		Head of the staff council	12.07.2022	Phone
INT9	W	-	Staff Council, City administration Köln	Public Sector		Member of the staff council	11.08.2022	Phone
INT10	M	50-55	Ver.di; Berlin	Health		Sectoral delegate	24.07.2022	ZOOM
INT11	W	50-55	Ver.di, Berlin	Health		Sectoral delegate	11.08.2022	ZOOM
INT12	W	-	Ver.di, Berlin	Health		Sectoral delegate	05.08.2022	ZOOM