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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 Commission-funded DIGIQU@LPUB 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, hospitals and electricity. The impact of digitalisation on working conditions, work organisation and social dialogue in public services is significant, as it is in other economic sectors. However, most research focuses on the private sector, leaving the public sector in Germany understudied.

In this research paper, the main findings of our analysis, based on both desk research and our own empirical data, are presented. The research seeks to raise awareness among trade unions and decisionmakers about the impact of the digital transformation on work on public services. 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.

Background information

Digitalisation, liberalisation, decentralisation and the establishment of transparent energy markets can be considered as key factors driving structural changes in Germany's electricity market, with digitalisation one of the key drivers. The energy sector in general was one of the early adopters of digital solutions, opening the door not only for sector restructuring but also for new business models. The emergence of new virtual energy markets and new external suppliers, especially with respect to the distribution of electricity to 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. Considering the ongoing digital transformation, public administrations are facing increased expectations in terms of their 'contactability' and the provision and delivery of public services. The major challenge is related to the shortage of skilled staff, as is also the case in several other sectors in Germany. Work intensification and overload due to staff shortages have climbed to the top of the agenda in 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 several of action programmes, initiatives and measures to accelerate the digital transformation. However, actions are lagging behind government objectives.

The hospital sector and the health system in Germany are confronted with longstanding but barely acknowledged structural problems. Despite some improvements in recent years, the burden of long-term ignorance remains. The combination of a shortage of skilled staff, high work intensity and

relatively low pay dampens the attractiveness and reputation of these jobs, while not reflecting their life-saving importance. Staff shortages in German hospitals have resulted in increasing workloads and growing dissatisfaction compounded by low pay, especially among care workers.

In general, the hospital sector has been regarded as weakly digitalised compared to other sectors. Interviewees claim that, even when digital solutions are implemented, they are not part of a general digital strategy, but instead standalone solutions. Their lacking interconnectivity results in so-called media breakage ([1]), in turn causing information loss, delays or ambiguities.

In general, the issues relevant in other sectors regarding the impact of digitalisation are also crucial in the hospital sector, including 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, a central subject in collective bargaining. Given the lack of nationwide agreements on digitalisation issues, the role of works councils in negotiating internal workplace agreements will remain important for representing the interests of hospital employees in Germany.

Key findings

The results of the DIGIQU@LPUB web survey indicate that digitalisation in the three sectors under scrutiny is still work in progress. With most participants using digital tools on a daily basis, digitalisation has a significant impact on work organisation, including improved time management and remote working options. However, most of our respondents also reported an increase in work intensity, mainly due to a shortage of skilled staff. The impact of digitalisation on work-life balance was generally viewed positively, and the importance of digitalisation training was emphasised. Many participants did not feel fully involved in the early stages of workplace digitalisation. The right to disconnect is governed by collective bargaining agreements in Germany. Overall, the majority of participants acknowledged the positive effects of digitalisation, such as reducing physical strain using digital instruments, but also its potential negative impact on mental health and well-being as well as the increase in employee monitoring. Job security and job losses due to digitalisation were not seen as decisive factors.

The pace and level of digitalisation differs from one sector to the next, shaped by political decisions, institutional structures and market competition. Accordingly, social partner and trade union strategies differ somewhat, though there are many similarities. Political decisions have a significant influence on market structures, particularly in the energy and hospital sectors, both of which have

1. An interruption or transition in communication, where information is transferred from one medium or mode of communication to another.

faced challenges due to privatisation and commercialisation. In the electricity sector, however, besides market competition, political decisions such as decarbonisation strategies are influencing digitalisation decisions. Digital transformation is typically driven by top-down strategies.

Furthermore, digitalisation is having a significant impact on industrial relations and interest representation in Germany. It can result in changing work arrangements such as increased remote work and more flexible hours, potentially challenging the traditional role of trade unions. During the Covid-19 pandemic, it became increasingly difficult for 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 such issues 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 private 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, albeit so far without any conclusion at national level.

To address challenges associated with the digital transformation and its impacts on job quality and social dialogue, trade unions in Germany are adapting their strategies and exploring new ways to represent workers in the digital age, trying to strike a good balance between the benefits of digitalisation and workers' rights. Trade unions have, however, faced difficulties in securing nationwide agreements to mitigate the negative effects of digitalisation. Instead, most agreements are reached at company level, facilitated by the strong legal rights and actions of works councils ([2]). The latter have strong statutory powers to shape working conditions at local level with respect to digitalisation impacts. Trade unions provide support to works councils in various ways, including offering advice and assistance, as well as training programmes and national campaigns. They also participate in discussions on new technologies and digital solutions, such as artificial intelligence, platform work or blockchain, through workshops, policy papers and theme conferences. They stress the importance of evaluating these developments from the perspective of employees. In general, the trade unions call for comprehensive workplace co-determination regarding 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. As regards collective bargaining in Germany, two general agreements with respect to digital transformation can be viewed as trade union successes. One is a recent (2022) agreement in the chemicals sector which sets out digital access rights for trade unions, enabling them to use internal

2. Germany makes a legal distinction between Betriebsräte (works councils) in private sector companies and Personalräte (staff councils) in public-sector organisations. For the purpose of this paper, the term 'works council' is used for both.

communication channels within companies. Currently established communication channels are to be used for this purpose, for example company e-mail addresses. These can be supplemented by other company information systems, such as a digital bulletin board on a company's 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 the trade unions. This collective agreement establishes rules prioritising job and pay security. The 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 work 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 level than the previous one. This agreement with the federal government is seen as a template for others to follow. However, Germany's federal states and municipalities have yet to reach such an agreement and trade union efforts have yet to bear fruit.

Conclusions and policy pointers

In general, trade unions acknowledge the positive aspects of digitalisation. Seeing it as a way to increase the flexibility of work in terms of time, place and organisation, 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 emphasised the importance of preserving the common good character of public services and the need to avoid negative impacts on working conditions during the digital transformation. Neither the quality of services nor the working conditions of employees should be negatively impacted, with a balance needing to be struck between these two goals.

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

1. Introduction

This research paper presents the results of the national study carried out as part of European Commission-funded DIGIQU@LPUB study, the 'Impact of digitalisation on job quality and social dialogue in the public services', conducted in eight European Union (EU) Member States: Denmark, Finland, France, Germany, Hungary, Italy, Poland and Spain. Led by the European Social Observatory (OSE), the study is funded from the European Commission's budget line 'Improving Expertise in the field of Industrial Relations'.

The project aims to improve understanding of the impact of digitalisation on job quality in public services, highlighting the perceptions that workers themselves have of the changes generated by digitalisation in the performance of their daily tasks. The study focuses on three sectors: public administration, electricity and the hospital sector. The project also aims to raise awareness among trade unions and decision-makers of the consequences of the digital transition of work for the public services. Specific objectives include:

- To assess the impact of digitalisation on job quality from the perspective of trade unions, but also of public service workers themselves. The intention is to identify the changes affecting the nature, content and execution of the tasks involved in the jobs of public service workers, as well as the outcomes for these workers.
- To explore how the challenges and opportunities for job quality generated by the digitalisation of work in public services are included and addressed in the dynamics and practices of social dialogue at national and sectoral levels in selected EU Member States.
- To enrich the debate on this topic among social partners and to provide advice, through hands-on policy recommendations, to both European and national trade unions and decision-makers on suitable ways to address the digital transformation of work ([3]).

The research methodology is based on a mixture of qualitative and quantitative analysis. Looking specifically at Germany and building on document analyses and literature reviews, 12 interviews were conducted with various stakeholders in the selected sectors. Key interviewees included union representatives and other stakeholders at sectoral, occupational and cross-sectoral levels.

The DIGIQU@LPUB web survey (DGQS) primarily targeted public sector workers in the selected sectors, analysing their assessments of quality of work and social dialogue with regard to

3. A more detailed project description, in-depth case studies and analytical reports can be found on the project website: https://www.ose.be/digiqualpub/

digitalisation processes. The web survey yielded a total of 127 completed questionnaires for Germany, far less than the numbers obtained in the other countries covered by the study. Despite the results not being representative for Germany due to the low number of responses, the survey provided useful insights into digitalisation in the public sector. Due to the uneven distribution of the sample among the different sectors, when interpreting the quantitative results presented, one should consider the methodological limitations which only allow inferences to be made about a group of survey respondents, without allowing conclusions to be extrapolated for the entire sector. Whenever claims in the text below draw on statements from interviewees, the source mentions 'INTx' (see Annex 1).

The paper is structured as follows: Section 2 offers a comprehensive outline encompassing the current status quo, national strategic approaches, and the historical trajectory of digitalisation within the three sectors. Section 3 focuses on the profound influence of digitalisation on job quality, while Section 4 delves into the impacts on social dialogue and the positions held by trade unions. This is followed by a cross-sectional exploration in Section 5, culminating with policy insights and recommendations in Section 6.

2. Setting the scene

Increasingly an important topic in the public sector, digitalisation offers both opportunities and new challenges. As a process, it occurs through various channels. These include the increasingly ubiquitous use of a range of digital tools influencing both the execution of public service tasks and the processes underlying their implementation (task planning and control, human resources).

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

In the following sections, the paper presents the main results of our own analysis, based on both desk research and our empirical data on the impact of digitalisation on job quality and on social dialogue in the three sectors: electricity production and distribution, public administration and hospitals.

2.1 State of play and national strategies

The European Commission's annual publication 'Digital Economy and Society Index (DESI)' monitors Member States' progress in digital policy areas. The indicators are structured around four main

areas: human capital, connectivity, integration of digital technology and digital public services. In recent years, the German Government has initiated various measures to drive digitalisation in such areas as the public administration, culture, forestry, education, mobility, artificial intelligence, quantum technologies, 5G, fibre rollout, smart cities, digital sovereignty, and hospital modernisation. In general, Germany ranks 13th among the 27 EU Member States in the 2022 DESI, with its performance in most of the core areas of the index close to the EU average. On connectivity, however, the country performs well, above the EU average (DESI 2022).

In November 2018, the Federal Government published its implementation strategy 'Shaping Digitalisation'. With Germany shifting its focus to implementing 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 ([4]). The implementation strategy offers concrete solutions with implementation plans for every challenge. The strategy is under constant development, and the achievement of goals is measured and checked (Digital-made-in, 2018). In addition to that, in January 2021 the Federal Government adopted its first Data Strategy ([5]). Featuring over 240 measures, the strategy aims to improve the innovative use of data and data sharing. It covers, for example, data infrastructure, data use and data competency.

Under the title 'Deutscher Aufbau- und Resilienzplan (DARP), Germany is receiving €25.6 billion from the EU Recovery and Resilience Facility (RRF). The plan aims to provide further support for economic recovery, including, in addition to existing digitalisation support programmes, significant investments in digitalisation (50% of the planned allocation), in the decarbonisation of industry and in climate-friendly mobility. Looking specifically at the public sector, the DARP includes measures to address its main digital-related challenges: digital skills, digitalisation of public services, strengthening social participation, improvement of the health system and speeding up public investments.

2.2 State of play at sectoral level

In the public sector, there has to date been little research in Germany on the impacts of digitalisation on working conditions and job quality in the public sector, particularly when compared with the abundance of studies conducted within the private sector. Unlike much of the private sector, the products and services delivered by the public sector are regarded as being of public interest, meaning that the market mechanism to determine supply and demand, and hence the price, does not really

4. Agencies involved: Ministries, Chamber of Industry and Commerce, associations, social partners and trade unions.
5. https://www.bundesregierung.de/resource/blob/998194/1950610/fb03f669401c3953fef8245c3cc2a5bf/datenstrategie-der-bundesregierung-englisch-download-bpa-data.pdf?download=1

come into play. This also limits interest representation systems. In the public administration, civil servants are organised by works councils (Personalräte) and trade unions, but are not allowed to strike. Similarly, staff cannot shut down a hospital through strike action. The patients must not be neglected and should be cared for during the strikes. The supply of electricity, from generation to consumption, must be secured. Therefore, the public welfare characteristics of the products and services delivered by the public sector account for major differences with other industries and services.

Much of the research on digitalisation tends to focus on large companies, neglecting small and medium companies (SMEs), the backbone of the German economy: they account for 97% of all companies and employ 60% of all employees (Lindner 2018). There is therefore limited potential to transfer the strategies and measures developed for big companies to SMEs (Öz 2019).

Since the beginning of 2020, due to the Covid-19 pandemic, the shortcomings in digitalisation, especially in the public administration and hospital sector, have become more evident and have been criticised intensively in the media. Several politicians and trade unions have drawn attention to practical problems. For example, teleworking was introduced quickly in the public administration in this period, without adequate infrastructure, to the detriment of employees and citizens who were confronted with the late delivery of official documents.

This paper aims at contributing to the discussions on the impacts of digitalisation and working conditions in the public sector, especially by providing new 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.

2.2.1 Overview of the three sectors

Electricity sector

There were 852 companies with 20 and more employees operating in the German energy sector in 2019. With a total turnover of €508 billion, they employed a workforce of 215,176, of whom 160,359 worked in the electricity sector. Hence, these large companies are responsible for the majority of employment (over 66%) in the sector (Destatis 2021). The energy sector in Germany faces a variety of challenges of an economic, regulatory, political, social and technological nature (IEA 2017).

Economic factors can be traced back to changing legal and regulatory framework conditions. These changes started in the 1990s with liberalisation, 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. Decarbonisation and decentralisation of energy supply in combination with the rise of renewables resulted in huge

structural changes in the sector. Demand structures have also altered due to demographic change in the form of falling birthrates, 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 (Flögel and Beckamp 2020; Roth 2018).

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 operated in parallel to the existing structures of conventional energy generation, as well as big data applications, mobile payment and smart metering systems, are driving the sector's technological development (Roth 2018).

Due to political decisions, such as the phasing out of nuclear energy (now completed) or the targeted reduction of greenhouse gases (including through decarbonisation), demand for increased efficiency in both energy 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 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 (Flögel and Beckamp 2020).

Public administration sector

In the German public sector, there are two main forms of employment: civil servants (Beamte) and public employees (Angestellte). Of the 4.9 million people employed in the public sector in 2020, 62% were employees, 34.6% were civil servants and 3.5% were soldiers. Between 1991 and 2020, the workforce decreased from 6.7 million to 4.9 million, mainly due to reductions in the public sector following German reunification (Destatis 2021).

Most of the civil servants are employed in the federal 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 workforce paid by the public sector with the total number of dependent employees. Measured against the 38.3 million dependent employees in 2020, the proportion employed by public employers is around 14.5%. This represents around 11% of the whole working force (45 million) (Destatis 2021).

Hospital sector

In the hospital sector, the system is fragmented among numerous payers and providers, leading to inefficiencies and diminished quality of care in certain care settings with high costs (OECD 2019b). Responsibilities for health system governance are highly complex, and divided among three levels: federal, state (Länder) and self-governing bodies. The Federal Ministry of Health is responsible for

policymaking at federal level, i.e., developing laws and drafting administrative guidelines. States are responsible for hospital planning and the financing of hospital investments. There are currently 5.8 million people working in the healthcare sector. This means that around one eighth of the total German workforce is now employed in this sector. According to the annual health report of the German Statistical Agency (2021), the 5.7 million healthcare workers in 2019 increased by 97,000 (up 1%) compared to the previous year (Destatis 2021).

Since the early 1990s, the German hospital sector has experienced dramatic structural changes. Traditionally, it was 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 were mainly run by the two major Christian churches (Catholic and Protestant), but also 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). Due to ongoing privatisation, the sector has undergone a dramatic change, resulting in an overall decrease in the total number of hospitals and an increased share of private hospitals.

2.2.2 Patterns and history of digitalisation in the three sectors

Electricity sector

Digitalisation is one of the major drivers of structural change in the German electricity sector (Flögel and Beckamp 2020; Roth 2018). The energy sector in general was one of the early adopters of digital solutions. The latter 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 improving working conditions and ensuring job security. Digital technologies enable new technological possibilities and, hence, drive change and make innovations possible in response to the challenges facing the industry.

The first stage of digital transformation related to the increasing and extensive use of digital technologies and solutions in the sector, with computerisation accelerating 'internal' digitalisation, enhancing operations and existing business models. In fact, the energy sector was often an early adopter of large information technology (IT) systems. In the 1970s, power utilities were digital pioneers, using IT to facilitate grid management and operations, 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 were 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 the digital transition encompassed the rise of innovative digital and technology-enabled business models 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 led to

sometimes disruptive changes. New players with new business models emerged in the market, partly challenging long-established strategies and partly fostering cooperation with incumbent players. The two transformation stages are not sequential: the first digital transformation of the energy sector is not yet completed, as especially lower-tier grids continue to operate in an analogue way. Rather, elements of both stages can run in parallel, depending on market and company structure (Flögel and Beckamp 2020).

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 of structural change in the electricity market. Liberalisation of energy markets in line with privatisation has 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 customers, would not generally have been possible without digitalisation.

The sector is highly influenced by political decisions., for example regarding the shift to renewables, decarbonisation and the phasing out of nuclear plants as well as the reduction of coal use in the energy sector (IG BCE 2021). The sector is increasingly confronted with new challenges due to recent energy crises since the onset of the war in Ukraine in February 2022. The problem of replacing former suppliers (i.e., Russia) and finding new sources has not yet been fully resolved. It can be expected that this new development will lead to further restructuring in the electricity sector. Political decision-makers have partly postponed the shift to renewable energy and decarbonisation by reactivating coal electricity plants.

Public administration sector

In view of the ongoing digital transformation, the public administration is confronted with increased expectations with respect to citizens contacting administrations, and the provision and delivery of public services. The need for digital solutions as well as the problems associated with speed and inadequate infrastructure became 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, referred to as 'government-to-citizen'. Of key importance is the implementation of the Online Access Act (OZG). This was passed at 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 online authentication processes enabling 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 federal government authorities to introduce the e-file by 2020, making it possible to link and optimise administrative processes. In addition, data-based working would simplify such processes, and enable evaluation of the effectiveness of public-sector services.

Digital service 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 administrative 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, it coordinates the modernisation 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

6. The Online Access Act (OZG) 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.

announcements, electronic record keeping, and a portal network for all administrative services available nationwide.

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 its rigid salary structures, the public sector is less attractive for the skilled IT staff needed to rapidly advance the expansion of eGovernment activities and digital solutions in public services. Combined with the lack of incentives for employees to participate in training and acquire digital skills, this results in slow and inefficient digital transformation processes (Falck et al. 2021).

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 became visible 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. All interviewees complained about the lack of PCs and laptops to enable teleworking. Initiatives and measures to enhance the digital transformation are still lagging behind the government's objectives. The fragmented decision-making and implementation structure featuring the federal government, states and local units are regarded by interviewees as hindering successful implementation.

Hospital sector

Based on available studies, the health and social services sector is considered weakly digitalised, compared to the two other sectors in Germany and to the international health and social care sector (Prognos 2015; Daum 2017).

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

Techniques used in the hospital can be divided into patient-relevant techniques and background techniques. Digital tools and processes with a close patient relevance include such fields as telemonitoring, mobile health (apps, smartphones), wearables or surgical robots. 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 systems, laboratory information systems, clinical workstation systems, etc.

One decisive finding regarding the current state of research is that there is 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 (hereinafter referred to as 'the IAT survey') fills this information gap and provides initial insights. Based on 648 observations which cannot be regarded as representative, it delivers insights into the digitalisation of German hospitals (Öz et al. 2017). In the following paragraphs, the results of this survey are presented in accordance with its thematic context.

Which areas of responsibility and activities are supported by digital technologies in the hospital? The survey respondents were initially questioned about five fields of activity: patient care (75%), management and staff (74%), logistics (73%), communication (73%) as well as information and qualification (81%). Clearly, modern technology is already widespread in the fields mentioned, with penetration having progressed relatively evenly (Öz et 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. Smartphones are also mentioned by about a quarter of the respondents, although it can be assumed that these are usually private devices 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 (Öz et al. 2017).

3. Impact of digitalisation on job quality in the sectors

As discussed below 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 inadequate staffing levels – are regarded as major stress factors in the workplace, with an impact on job quality. The shortage of skilled staff affects work intensity and workloads. In other words, job quality issues are only partly related to digital transformation and must be regarded in a wider 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. These do not differ significantly from other economic sectors (OECD 2019a, DGB (2018); Falk et al. (2021); DBB 2022). The positive effects relate to increased efficiency (optimisation of products and services, shorter waiting times, reduced staff time, improved accessibility for citizens and cost savings achieved through 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 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 (Roth 2018).

All interviewees stated that digitalisation, when properly applied, could have positive effects on job quality. It can 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 benefiting both workers and employers. Furthermore, it can open a wide range of new opportunities, such as mobile, location-independent working – which is increasingly demanded by employees as working from home becomes more widespread, especially after the Covid-19 period.

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 (Dengler and Matthes 2015). 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.

Digitalisation is increasingly blurring the distinction between work and private life, particularly for knowledge workers who possess the flexibility to engage in their predominantly digital tasks at any given time and location. Neglect of personal contacts, however, has been a side effect of digitalisation in some services in the public sector. It is no longer necessary to meet customers or

citizens in one place, meaning that face-to-face meetings with them are sometimes neglected. All interviewees highlighted the potential ramifications of remote work, notably feelings of isolation and heightened stress levels. In some cases, digitalisation can lead to people having to work in more precarious working conditions, without social security or adequate wages (DGB 2017; DGB 2018).

Digitalisation is requiring workers to upgrade their skills, leading to a need for ongoing training and development to survive in a digitalised world of work (OECD 2019a). If not used effectively and supported by qualification and training measures, digitalisation can increase work intensity and the workload for workers.

3.1 Electricity sector

3.1.1 Selected job quality dimensions

The DIGIQU@LPUB survey (hereinafter 'DGQS') respondents highlighted some aspects of digitalisation in the electricity sector. All regularly used 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 were widely used.

In general, survey participants assessed the effects of digitalisation as positive. With respect to the quality of service to users, digitalisation (the introduction of various digital tools and methods) was 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 as positive.

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

Work organisation

Digitalisation was also seen as improving coordination of tasks with colleagues (63.2%), offering a clearer overview of the implementation of the tasks making up their job time (84.2%) and givig workers more time to focus on significant aspects of the job (63.2%).

On the other hand, work intensity is also affected by workplace digitalisation. 82.4% of the people surveyed considered that work intensity had increased. 82.4% also stated that the monitoring of employee performance for the purpose of internal assessment by supervisors had 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.

Working time

As in other sectors, digitalisation enables and increases the flexibilisation of work in terms of time, place and organisation. Work can now be performed independent of the traditional workplace. Mobile work and 'home office' ([7]) were an immediate response to Covid-19 restrictions in Germany.

The DGQS survey results show that, for around 50% of respondents, they could do all or some of their work tasks via teleworking from home. 46.2% replied that this was only possible during the pandemic, while 62.5%, stated that it would be always possible for them to work from home. All interviewees believed that telework was still very popular among workers in the sector and expected that most employees who had worked from home would probably like to retain this option.

Health and safety

The DGQS results shows that the introduction of digital tools and methods into the daily routine has had an impact on physical health. Just over 30% of the participants noted that they were less subject to painful physical strains, while nearly 10% stated being less exposed to the risk of workplace accidents. A similar percentage claimed that it has caused or aggravated a new physical pain/condition (e.g., back pain, neck pain, hand pain and eye problems).

With respect to mental health, however, their assessments seemed to be rather negative. No less than 42.9% claimed that new digital technology had caused psychological problems (stress, mental fatigue, burnout or depression). 33.3% of the respondents made no comment on the question. Regarding mental problems, 33.3% of them suffered from stress and 26.7% from burnout.

Skills and learning

45% of respondents confirmed that they had had to learn both general digital literacy methods and specific digital skills (e.g., digital literacy) due to the introduction of digital tools and processes in their day-to-day work. 23% believed that they only had to learn for some specific digital skills required for digitalised tools and/or software in their job. 27% had already acquired the required digital literacy skills through previous education and/or work experience. Only a small percentage of respondents considered that no new digital skills were required for the job (5%). The majority of respondents thought that learning the new skills required by digitisation would open up other job or career opportunities either with the current employer (62%) or elsewhere (67%).

7. In Germany, the term 'home office' is widespread, but it corresponds in general to telework.

The majority of respondents (72%) had received training from their employer to acquire or develop both general and specific digital skills. For 5% of them, no formal training was provided by the employer. Only 20% of respondents confirmed that the training provided met their needs. 33% required additional training opportunities and 27% required regular updates. 7% indicated that insufficient time and resources were devoted to training in the workplace.

Interviewees (INT2, INT3, INT5) underscored the general importance of training and qualification measures 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.

Reconciling work and personal life

The effects of workplace digitalisation as well as recently expanding telework measures have long been an important issue for the trade unions. 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. All interviewees in this sector pointed to this aspect.

37.4% of the respondents reported that the balance between their own personal/family time and working time had improved due to the digitalisation of work, while 37.5% stated that it had not changed. Only 12.5% said that it has worsened and another 12.5% that it had partly worsened.

Due to increasing digitalisation, the proportion of mobile work increased significantly, especially during the pandemic. Most respondents stated that working from home/teleworking had been introduced or extended (85.7%).

Career prospects and employment security

The digital technology used in the energy industry holds enormous potential for automation. This is particularly true for the fully automated control of power plants and grids, but also applies to the expansion of self-service by customers who are now able to enter their data and make requests online, as well as the future expansion of 'smart' meters (Flögel and Beckamp 2020).

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

The extensive use of digital technologies, the collection and storage of data, especially data (potentially) directly related to employees, could lead to fears of surveillance and transparency issues. Data can be used to track exactly where employees are and how much time they spend on 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 only been able to complete fewer tasks than planned (Roth 2018).

Workers' rights

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 survey respondents regarded this right as essential in an increasingly connected professional and social environment. They called for this right to be clearly included in the collective bargaining agendas at sectoral and cross-sectoral levels.

3.1.2 Conclusions for the sector

Digitalisation is a key driver of structural changes in the German electricity sector, itself an early adopter of digital solutions.

In general, both survey participants and interviewees assessed the effects of digitalisation on job quality as positive. The introduction of various digital tools and methods and the concomitant improvement in sector working conditions and job quality were rated as positive. Increased work intensity and the monitoring of employee performance for the purpose of internal assessment by supervisors were regarded as negative aspects of digitalisation.

The sector is highly influenced by political decisions, for instance regarding the shift to renewable energy, decarbonisation and the phasing-out of nuclear plants as well as the reduced use of coal in the energy sector. The sector is increasingly confronted with new challenges as a consequence of the ongoing war in Ukraine. The problem of replacing former suppliers (mainly Russia) and finding new sources has not yet been fully resolved. Political decision-makers have partly postponed decarbonisation and the shift to renewable energy, even reactivating coal electricity plants. It can be expected that the consequences of the war in Ukraine will lead to further restructuring in the sector.

One interviewee expected that some distribution companies will disappear from the market due to the rise in energy prices in recent months (INT 4), especially those unable to pass on rising costs to consumers. The shortage of skilled staff was regarded as a key challenge in the sector. Digitalisation projects were ongoing, but were currently not the top priority on the trade union agenda. Nevertheless, the trade unions assumed that the digital transformation and its impacts will remain an important issue in the sector (INT1, INT4).

3.2 Public administration sector

3.2.1 Selected job quality dimensions

In the public administration sector, digitalisation is increasingly influencing work processes and the delivery of services for both employees and citizens. In citizens' offices ([8]), initial contacts and consultations take place online, for example via an online module for daycare registration or an open data module for managing appointments for several services. Manual work has been replaced by electronic files in job centres or automation in land registry offices.

The DGQS survey confirmed widespread digitalisation in the public administration ([9]). 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-choice questions on usage, they replied that they used 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%).

Work organisation

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

All interviewees regarded digitalisation in general as a positive and somehow inevitable development, However, they spoke of problems associated with work organisation, the increased pace of work and employee involvement in digitalisation measures. The German government's new digitalisation strategy includes measures such as the Online Access Act (OGZ) and E-Government Act (as stated in Section 2.2.2), targeting public services. The interviewees complained about the pace and content of such measures and assessed them as inadequate (INT6, INT7).

As shown in the survey, the introduction of digital tools/programs has affected several aspects of the work. For 30.6% of the employees, the scope of decision-making at work remained the same, while 44.4% reported an increase in decision-making and autonomy to schedule work tasks due to

8. Bürgerämter: 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 are increasingly taking place via service portals, mainly due to the growing use of electronic communication.
9. In the online survey (DGQS),43 completed questionnaires were collected from public administrations in Germany.

digitalisation. In addition, digitalisation has reduced the time needed for routine repetitive tasks (54.1%).

It has also improved coordination of tasks with colleagues (38.9%), as well as offering a clearer overview of the status of tasks making up their job time (84.2%) and giving them more time to focus on significant aspects of the job (54.2%). The most important aspect was the improved quality of their interaction with users (63.9%).

On the other hand, work intensity has also been affected by workplace digitalisation. No less than 43.2% of those surveyed considered that work intensity had 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 several respondents. 13.8% stated that the introduction of digitalised tools and methods at work triggered a feeling that digitalisation had increased the monitoring of employees. These findings on control and monitoring issues are much lower than in the electricity sector.

Working time

In public administrations, the share of mobile work has increased with digitalisation, especially during the Covid-19 pandemic. According to the survey results, 92% of the respondents stated that their job would allow them to do all or some of their work from home.

All interviewees spoke of a considerable increase in teleworking due to the Covid-19 lockdowns and other measures in recent years. However, for a large proportion of employees, working from home was virtually uncharted territory, with some advantages, but these were usually associated with a high level of effort. Some interviewees believed that most employees who had worked from home would probably like to retain this option (INT7, INT6).

Health and safety

The impact of digital tools and processes on employees' health has been a central issue in digitalisation discussions. The DGQS shows that the introduction of the digital tools and methods into daily routines has had an impact on physical health, with no less than 44.4% claiming that it had caused a new or worsened an existing physical pain/condition (e.g., back pain, neck pain, hand pain, eye problems).

With respect to mental health, however, their assessments seemed less negative, with only 19.5% claiming that it had caused or even worsened psychological problems (stress, mental fatigue, burnout or depression). 80.6% of the respondents made no comment on the question. Regarding

mental health problems, 20% of them suffered from stress, 12% from burnout and 16% from mental fatigue.

Skills and learning

There is a long-neglected shortage of skilled IT staff in the public sector (Bitkom 2022). (Further) training of existing staff could alleviate the situation and help resolve the current skills problems (INT6, INT7, INT8, INT9). Recent studies (Stifterverband 2021; Bitkom 2022) show, however, that the public sector can hardly compete with the private sector in terms of pay – and that it lags far behind in the further training of existing staff ([10]).

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

The responses to DGQS questions related to digital literacy showed the high importance attached to both formal and informal workplace training. It would seem that the introduction of digital tools and processes into everyday work encourages employees to develop new skills. 24.3% of those surveyed claimed 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% stated that no new digital skills were required for their work. The German responses from the public administration to the DGQS survey revealed that training measures were not always available when needed. 39.4% of the respondents reported not having received any formal training from their employer. Furthermore, 36.4% claimed that they learned informally at work (i.e., on-the-job learning; exchanges with colleagues). Only 15.1% reported that they had either acquired both general and specific digital skills or only skills related to the use of specific digitalised tools (machines, software).

Reconciling work and personal life

84.2% of survey respondents thought that workplace digitalisation (the introduction of various digital tools and methods) allowed a better balance between personal/family time and working time. With respect to their own personal situation, 63.2% reported that this balance had improved due to

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

workplace digitalisation. Personal time and the time spent with family had also been positively affected (37.8%).

With the spread of digitalisation, the share of mobile work has increased significantly, especially during the pandemic, with 41.7% of participants stating that working from home/teleworking had been introduced or extended.

Reponses to questions concerning the specific effects of digitalisation on private life also indicated negative impacts, for instance with working time (online and offline) increasing at the expense of personal time (16.2%). Some respondents noted that it was sometimes difficult to reconcile work with household responsibilities (child or elderly care, etc.) when working from home (18.9%). It was also regarded as difficult to clearly differentiate between working time and personal time (21.6%).

Career prospects and employment security

Digital transformation in the public sector is resulting in new activities for employees, albeit without any job cuts. When activities are digitalised, it is important to offer employees other 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 surveyed employees: only 15.8% believed that their job security and prospects were at risk. 44.7% saw the effects as rather positive, whereas 39.5% reported no differences due to organisational changes or new technologies.

Only 8.1% of those surveyed thought that learning the new skills required by digitalisation would reduce their job security in the future. In their opinion, it would instead open other job or career opportunities outside the current institution (33.2%) or in the current institution (33.1%). Learning these new digital skills would also extend their skills portfolios (33.6%).

Workers' rights

In recent years, the 'right to disconnect' has emerged as a new right for workers in a more digitalised world of work. All survey respondents regarded this right as essential in an increasingly connected professional and social environment (50%), calling for it to be clearly included in the collective bargaining agendas at sectoral and cross-sectoral levels (83.3%).

Trade unions supported employees and works councils with several activities. The respondents welcomed negotiations as part of the socially sustainable management of digitalisation and technological change. Only 27.3% stated that negotiations at sectoral level on safeguarding employment or the quality of working conditions were not effective at all. 33.3% viewed them as

moderately effective, but only 9.5% as very effective. At workplace level, however, the negative assessment was rather lower (16.7%), while 47.6% regarded workplace negotiations as moderately effective, but only 9.5% as very effective.

3.2.2 Conclusions for the sector

In the public administration, political decisions and regulatory measures have been major drivers of the digital transformation, though the pace and spread of digital solutions has been broadly regarded as inadequate, as seen during the Covid-19 pandemic when large numbers of employees in several administrative units had to move to telework, interfering with the delivery and provision of public services. Public administrations seemed to be unprepared regarding digital infrastructure. All 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 government objectives. The fragmented structure of decision-making and implementation processes between the central government, the federal states and municipalities was regarded by the interviewees as hindering successful implementation (INT6, INT7, INT8).

The age structure and shortage of skilled staff were considered a major challenge for the public administration, impacting the quality of the work as well as staff well-being. Rising work intensity due to staff shortages, as stated by all interviewees, also slowed down digitalisation. Job security was not regarded by employees and trade unions as a particular issue. Such security, however, was not viewed as an incentive to attract new skilled staff due to the relatively low pay for jobs requiring a high level of IT skills. All interviewees stressed the importance of (further) training measures to cope with the digital transformation.

Older workers were faced with new challenges regarding the introduction of new software and digital tools. With teleworking introduced during the pandemic, many employees would probably prefer to keep working partly from home. One interviewee complained, however, that the public administration still insisted on conservative office-bound ways of working, even in the future (INT6).

3.3 Hospital sector

3.3.1 Selected job quality dimensions

The DGQS survey gives insights into the prevalence of digitalisation in hospitals ([11]). Regarding questions about the usage of digital workplace tools, respondents reported using them in several fields daily. Answering the multiple-choice questions on usage, they replied that they used 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 usage levels were reported for interaction with users (e.g., patients, customers) (13.9) and for monitoring the performance of work tasks (11.5%).

Work organisation

The main usage of the digital devices was related to data collection and data management, with all respondents using them. 24% reported using them to monitor and control equipment parameters or people, followed by 'to perform routine repetitive tasks' (22%).

Interviewees flagged digitalisation in several processes, albeit at different department levels (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).

In general, compared with other sectors, survey participants in the hospital sector had a less positive view of the effects of digitalisation. With respect to its effects on the service in general, workplace digitalisation (the introduction of various digital tools and methods) was assessed as positive by 24.5% (somewhat agree or strongly agree), while the effects on service quality for users were also viewed positively by 37.5%. 24.5% gave a positive assessment of the improved working conditions, while 22.4% saw an improvement in overall job quality. Only 8.2% expected positive effects on wages, while most did not share this expectation (65.5%).

The survey results show 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 remained the same, though 46.4% reported increased decision-making powers and autonomy to schedule their work tasks as a result of digitalisation. In addition, it reduced the time needed for routine repetitive tasks (58.7%).

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

Digitalisation also improved coordination of tasks with colleagues (40.9%), while also offering a clearer overview of the status of the tasks making up their job time (28.8%) and giving them more time to focus on significant aspects of the job (51.2%). Another important aspect was the improved interaction with users (51.4%).

Moreover, work intensity had also been affected by workplace digitalisation, with 50% of those surveyed considering it had increased. Monitoring of employee performance for the purpose of internal assessment by supervisors (30.1%) and by direct colleagues (37.2%) also received high scores. 28.6% of participants stated that the introduction of digitalised tools and methods had triggered a 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.

All interviewees stressed the importance of service quality for patients as well as employee welfare in the hospital and health sector.

The survey revealed that the possibilities for telework in the hospital sector were very limited. Since the healthcare sector is a personal service, it involves very close relationships with patients. 41.5% of respondents stated that their work allowed them to do all or some of their work tasks by means of teleworking from home. For 7%, teleworking from home was only possible during the Covid-19 period.

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

Working time

The answers to the questions in the DGQS survey provided insights on working time. Most participants (86%) stated that the introduction of digital technologies had not changed the number of working hours in their contract, while 10% reported that the number of hours had changed somewhat. A majority said that paid (80%) and unpaid overtime (76%) had not been influenced. 14% reported that paid overtime had increased somewhat, while 20% said the same for unpaid overtime. With respect to unsocial working time (evenings, nights, weekends), 54% reported it having increased somewhat or significantly, though 40% reported no change at all. Regarding commuting time from home to work, this had decreased (54%) due to use of the digital tools and processes. For 40% of the participants, the commuting time had not changed.

Health and safety

As shown in the DGQS survey, the introduction of digital tools and methods has had a relatively low impact on physical health. It would seem that survey participants did not regard their own problems

as linked to digitalisation. Only 8% claimed that it had caused or 10% aggravated a physical pain/condition (e.g., back pain, neck pain, hand pain and eye problems). 70% reported not having noticed any such effect.

Turning to mental health, however, their assessments tended to be negative: no less than 18.2% reported psychological problems (stress, mental fatigue, burnout or depression) attributable to digitalisation. Among participants reporting such, 25% suffered from stress, 17.9% from burnout and 25% from mental fatigue.

Skills and learning

The answers to the survey questions on digital literacy show the importance of both formal and informal workplace training. 22% of those surveyed claimed 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% stated that no new digital skills were required for the job.

With respect to skills and training, the survey revealed that training measures were not applied as needed. 23.9% of respondents reported not having received any formal training from their employer. Furthermore, 30.4% claimed that they informally learned at work (i.e., on-the-job learning; exchanges with colleagues). Only 15.2% responded that they had either acquired both general and specific digital skills or only those related to the utilisation of specific digitalised tools (machines, software).

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 of its employees. 59.2% of the respondents thought that workplace digitalisation (the introduction of various digital tools and methods) had a positive effect on the balance between personal/family time and working time.

The spread of digitalisation has resulted in the share of mobile work increasing significantly in several sectors. Telework became widespread, especially during the pandemic. The hospital respondents, however, stated that working from home/teleworking had been introduced or extended only at a low level (26%).

Negative effects on private life were found in the answers regarding the specific effects of digitalisation. It had increased working time (online and offline) at the expense of personal time (14.8%). Some respondents remarked that it was sometimes difficult to reconcile work and

household responsibilities (child or elderly care, etc. …) when working from home (22.9%). It is also regarded as difficult to clearly differentiate between working time and personal time (23%).

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 substitutability was apparently no significant issue. Losing job security due to digitalisation was apparently not a great concern: only 16.3% of respondents thought that their job security and prospects were at risk. 45.8% instead saw the effects as positive, whereas 31.3% saw no differences resulting from organisational changes or new technologies.

Only 16% 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 their opinion, would instead open up new job or career opportunities either outside the current institution (36.7%) or within it (34%). Learning the new skills required by digitalisation would also enhance their personal skills portfolio (18.8%).

Workers' rights

With respect to the 'right to disconnect', a high share of DGQS respondents regarded this right as essential in an increasingly connected professional and social environment (60%). They called 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%).

3.3.2 Conclusions for the sector

Although the hospital sector has been regarded as weakly digitalised compared to other sectors, digitalisation has taken place in different departments at a differing pace and intensity. Nevertheless, all interviewees claimed that such digital solutions were not implemented as part of a general digital strategy, but rather as standalone solutions with no comprehensive strategy. Employees should be involved early in decision-making processes and needed to be supported by further training and other measures during the digital transformation. Given the lack of financial incentives and structural problems, in practice hospitals face difficulties implementing digital solutions. The insufficient interconnection of separate digital measures results in so-called media breakage. For instance, their effectiveness diminishes significantly in such scenarios as digitalisation within emergency vehicles for functions like patient registration and emergency services. Indeed, registration could be incomplete on a patient's arrival at the hospital, with such information still needing to be processed in paper form (INT10).

All interviewees stated that digital tools and solutions made the work of employees easier and, hence, had an impact on job quality. The survey results show that the introduction of digital tools/programs has influenced several aspects of work, reducing the time needed for routine repetitive tasks, improving the coordination of tasks with colleagues or providing more time to focus on significant aspects of the job and improve the quality of interaction with users. Negative impacts pertained to increased work intensity, monitoring of employee performance for the purpose of internal assessment by supervisors as well as by direct colleagues. The introduction of digital tools and methods into the daily routine had a relatively low impact on physical health. With respect to mental health, however, some assessments were rather negative: psychological problems (stress, mental fatigue, burnout or depression) were in part attributed to workplace digitalisation.

The hospital sector and the health system in Germany are confronted by longstanding but little-recognised structural problems, as became evident to citizens during the pandemic which highlighted the systemic importance of such jobs (Öz 2020). Despite some improvements in recent years, the burden of the past remains. A shortage of skilled staff, high work intensity and relatively low pay dampen the attractiveness and reputation of these jobs, not reflecting their life-saving importance.

4. Impact of digitalisation on social dialogue

The German system of employee interest representation is characterised by the 'dual' system of trade unions and works councils. The two most important pillars of the German industrial relations model are collective bargaining agreements and workplace co-determination. Trade unions set the framework for working conditions at sector level or within individual companies and negotiate collective agreements on wage levels and working time. Works councils are elected by employees and represent their interests at company level in the form of workplace arrangements.

4.1 The trade union position on digitalisation

Digitalisation brings challenges for employment, work organisation and working conditions and the way employee interests are represented. The German system of social dialogue must therefore respond when digitalisation triggers a dramatic reduction in industrial employment or undermines agreed pay and working conditions. Both government and trade unions have initiated several measures to confront the challenges associated with the digital transformation of work.

The Federal Ministry of Labour and Social Affairs introduced the term Arbeit 4.0 (Work 4.0) in its 2016 White Paper, initiating a dialogue on the future of labour in society. Following the discussions on Industry 4.0 with their focus on the industrial sector, Arbeit 4.0 concentrates on forms of work and the working relationship. Fundamental topics include several aspects of social dialogue: participation in work, a 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'.

Given 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 the consequences (Haipeter 2020).

In general, trade union demands include comprehensive workplace co-determination on all aspects of digitalisation, employment protection, comprehensive training measures, occupational health and safety adapted to the new requirements and more comprehensive protection of employee privacy. The major views of the German trade unions focus on introducing a human-centred perspective to the discourse instead of only focusing on technological aspects (ver.di 2015, DGB 2018). Digitalisation is seen as requiring:

- 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, with bogus self-employment needing to be avoided in digital work as much as in any other kind.

4.2 Social dialogue on digitalisation in the electricity sector

The main trade unions in the German energy sector are ver.di, IG BCE and IG Metall whereby municipal employees are mostly represented by ver.di. In general, trade unions appreciate the positive aspects of digitalisation, acknowledging that it enables and enhances work flexibilisation in terms of time, place and organisation. It opens a range of work organisation options for both employees and companies. As is the case of the two other public services in this paper, the trade unions stress the 'common good' character of services providing infrastructure for the whole of daily and working life. However, the digital transformation should be based not only on economic and rationalisation considerations, but should also serve the general aim of reconciling service quality with working conditions. Each digital process should be examined with regard to such aspects.

The trade unions stress the importance of co-determination throughout the digital transformation, with a view to alleviating fear and resistance among workers and helping optimise digitalisation. Accompanied by further training and skill development measures, employees would be supported in

further steps. Interviewees expected no further reduction in employment due to digitalisation (INT1, INT3, INT5). In their view, job losses and substitution belong to the past, since digitalisation started in the electricity sector long before other sectors. The sector is now confronted with other problems: a shortage of skilled staff and recent upheavals due to the war in Ukraine.

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

Mobile work is used in the electricity sector to a limited extent. It is used particularly by employees performing commercial and administrative tasks who already work digitally to a large extent. However, it has made few inroads in electricity production. Workplace agreements are reached at company level in cooperation with employers, but not through collective bargaining.

Data privacy, protection and transparency concerns within the electricity sector were underlined by all interviewees. With a digital environment generating a wealth of data, the behaviour and performance of individual employees become transparent and open to monitoring, posing challenges for the protection of employee data and privacy.

In their collective bargaining, German trade unions have been unable to conclude general agreements on the digital transformation (Dribbusch, Bilke 2019). One exception is the recent agreement in the chemical sector, as stated by one interviewee (INT5).

During the pandemic, it became increasingly difficult for trade unions to maintain contact with employees working from home. Due to data protection regulations, many companies were 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 ([12]). 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. Existing communication channels are to be used for this purpose, for example company e-mail addresses. These can be supplemented by other company information systems, such as the digital bulletin board on a company's intranet or mailing lists. Company videoconferencing systems may also be used for trade union meetings (online consultation hours, online shop stewards' meetings).

12. https://igbce.de/igbce/adk-und-ig-bce-schliessen-sozialpartnervereinbarung-189342

The company and the responsible IG-BCE organisational 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 cover the whole chemical sector, with a social partner agreement between the German Chemical Employers' Association (BAVC) and the chemical union IGBCE ([13]). This framework applies to around 580,000 employees in the chemical and pharmaceutical industry, making it the largest industry agreement in Germany. It is still an open question whether the trade unions in the electricity sector can reach a similar digital access agreement in the near future. But it serves as a pioneering starting point for trade unions.

To sum up, 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 regarding discussions about supply security 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. In addition, the current weakness of renewables (wind power and photovoltaics) has become very evident in this phase. The expansion of wind energy has been sluggish for years, partly because of 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 faced by certain industries and citizen groups with respect to rising energy prices and possible supply shortages. These issues are now high on trade union agendas, although unions remain 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 further restructuring in the near future with respect to energy suppliers and distribution companies.

4.3 Social dialogue on digitalisation in the public administration sector

Public sector employees are represented by ver.di (*Vereinte Dienstleistungs-gewerkschaft*), with about two 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 the 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.

13. https://igbce.de/igbce/bavc-und-igbce-schliessen-sozialpartnervereinbarung-zum-digitalen-zugangsrecht-in-chemieindustrie-210864

Collective bargaining coverage (93%) and trade union density (60%) are traditionally higher in the public sector than in the private sector, demonstrating the sector's relative industrial relations stability (Dribbusch and Bilke 2019; Schulten 2021). Nevertheless, the far-reaching privatisation and liberalisation of public services has had a major impact on industrial relations and working conditions in these formerly public sectors. Consequently, substantial fragmentation of the former collective bargaining system, a decrease in collective bargaining coverage and a deterioration in working conditions have been observed in the liberalised sectors (Schulten 2021).

Both trade unions, ver.di and DBB (*Beamtenbund und tarifunion*), have similar arguments and demands with respect to digitalisation in the public administration (DBB 2022; Schulten 2021).

The top priority is to ensure job security or securing an equivalent job, as well as binding agreements safeguarding pay and training. No one must be placed in a worse position as a result of a digital measure. The DBB calls for a binding entitlement to genuine training to promote a forward-looking skilled workforce, in terms of lifelong learning and innovation policy (DBB 2022). 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 or the costs borne by the employer. There is also a need for specific regulations on working time, data protection, the avoidance of performance and behaviour monitoring, and the right to disconnect to protect employees from overwork. Flexible working must not become an obligation for employees and must not entail any occupational disadvantages.

One recent success is the collective agreement on digitalisation concluded at the end of June 2021 between the Federal Ministry of the Interior, ver.di ([14]) and the DBB. Though this agreement could serve as a template, the federal states and municipalities have so far rejected any such agreement, despite trade union endeavours.

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. The collective agreement has been in force since 1 January 2022and applies to around 126,000 employees in federal administrations.

14. https://www.verdi.de/themen/nachrichten/++co++fa3832e8-d427-11eb-bc8b-001a4a16012a

There are no collective agreements with respect to the right to disconnect in Germany. This issue is still being discussed in the public realm, albeit without any conclusion reached at national level. Standalone solutions exist at local level, concluded between works councils and individual institutions.

As discussed in previous sections, the trade unions emphasise the importance of co-determination with respect to digitalisation. All interviewees demanded that employees and their representatives must be involved as experts and mediators at an early stage of the digital transformation. The heads of departments and state governments must organise co-determination in an orderly manner right from the start and allow for participation in steering committees (INT2, INT3, INT6, INT10).

The DGB emphasises that digitalisation has increased pressure to use third-party services and products due to a lack of in-house competences and IT staff (DGB 2017). 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 privatisation of public tasks as a result of the digital transformation (INT6). Likewise, the state must not become so dependent on third parties that it loses control of a product or is tied to support from specialist companies for digital services.

To conclude, the major challenge in the public administration in Germany is the shortage of skilled staff, as is similarly the case in several other sectors. Work intensification and overload have climbed to the top of the agenda in sectoral discussions. According to DBB estimates, there is currently a shortage of up to 300,000 employees (DBB 2022). Bearing in mind that around one third of the sector's workforce 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 work intensity and improve working conditions is assessed by the trade unions as an open question.

The unions have long grasped the importance of the digital transformation and have sought to attract attention to its work-related aspects, stressing the importance of local co-determination. 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 federal, state and municipal levels is set to remain a major obstacle for enhancing digitalisation in the near future, despite intense work by the central IT coordination agency. Works councils have certain statutory powers to shape working conditions with respect to the impacts of digitalisation at local level. The trade unions support them and inform them of ways to play an active role in shaping the digital transformation.

4.4 Social dialogue on digitalisation in the hospital sector

The three-fold ownership structure of 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 Public Sector Collective Agreement (TVöD). Some public hospitals – in particular, university clinics – belong to the Länder and are therefore covered by the Public Sector Collective Agreement for the Länder (TV-L). Both agreements include special provisions for hospital staff, including a special pay scale for care workers.

Most non-profit hospitals adhere to the 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.

Ver.di is by far the largest union in the sector, covering all types of hospital providers. For special occupations such as doctors, the Marburger Bund has been negotiating separate collective agreements since the mid-2000s. It negotiates collective bargaining agreements with the federal states (TdL) for university hospitals, with municipalities for 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).

Understaffing in German hospitals and the concomitant intensification of work and growing dissatisfaction, as well as low pay especially among care staff, have been major discussion items in recent years, especially during the pandemic. Due to increasing awareness of care workers' systemic importance, politicians have reacted by improving pay in the German health sector, especially for care staff.

Trade union interviewees claimed that the trade unions widely welcomed digital solutions, stating that even in such sensitive areas as nursing, digital assistance and automation systems offered great potential for reducing workloads and making (physically) hard work easier. But they could also increase stress. From the trade unions' point of view, the risks were 'simplification, de-qualification and a devaluation of human work'. Employees should not have to function more and more like machines themselves (INT10).

With regard to digitalisation, employees should be at the centre. Work intensification and the blurring of work-life boundaries were considered a new aspect of digital work. Trade unions generally criticised employers for the lack of any discernible overall strategy for the development of digital hospitals (INT10, INT11, INT12). The reason was seen as being linked to low levels of digitalisation in the hospital sector. Compared to other sectors, there was also little research and few empirical surveys analysing digitalisation and associated problems in the hospital sector.

Co-determination allowed employees to help shape the digital workplace transformation. However, some trade union respondents pointed out that works council members were not always fully informed: they often lacked the skills required to play a leading role in the process and were unable to assess consequences for employees (INT10, INT12). As stated by our interviewees, the trade unions try to support works councils through several actions, including training, checklists and information workshops, as well as providing documents on how to formulate certain relevant issues in the workplace agreements with the employer.

To sum up, the issues relevant in other sectors regarding digitalisation impacts are also relevant in the hospital sector: work intensity, agreements on working time, work schedules, staff training measures, agreements on teleworking, data protection, transparency via digital tools and work-life balance. These issues are directly related to the digital transformation and have a close correlation with working conditions, making them a pivotal focal point within collective bargaining.

Alongside longstanding and still 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 the future. Due to the lack of nationwide agreements on digitalisation issues, the role of works councils in negotiating internal workplace agreements will remain important to express the interests of hospital staff.

The state is and remains an important player with respect to hospital digitalisation. In a recent investment measure, for example, the Federal Health Ministry approved a €3 billion support package, available from 1 January 2021 onwards, 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. The funds are to be spent on improving the 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 staff measures can also be financed by the support programme.

5. Cross-cutting conclusions

The evolution of digital transformation has followed diverse trajectories in the three sectors under scrutiny in this national report. These variations encompass historical antecedents, pacing, dissemination dynamics, and overall progression. The strategies adopted by the social partners and trade unions differ in certain aspects, while sharing notable parallels. Trade unions are vociferous advocates of the "common good" ethos intrinsic to public services, contending that these sectors should not be entirely left to market mechanisms.

Furthermore, trade unions underscore their concerns about how digitalisation influences working conditions, asserting that it must not come at the expense of employees. Evident within these sectors is the palpable impact of political decisions on market structures. Notably, the energy and healthcare sectors have navigated significant challenges stemming from privatisation and commercialisation. While digital transformation apparently follows a top-down trajectory, all interviewees from trade unions complained about the lack of a comprehensive and integrated strategy in all three sectors.

While trade unions acknowledge the inherent potential of digitalisation to yield positive outcomes, they firmly uphold that these advancements must not compromise service quality or employee well-being. Harmonising these twin objectives while providing robust backing is of paramount importance. Trade unions are actively engaged in broader discussions around emerging technologies and digital solutions, such as artificial intelligence, platform work or blockchain. This active involvement takes the form of workshops, policy papers and thematic conferences, underscoring the pivotal role of evaluating the impact of these developments through an employee-centric lens.

In the electricity sector, the consequences of the Ukraine conflict are becoming evident, not solely through sharp rises in electricity prices in the immediate and intermediate periods, but also, notably, through discussions on supply security. In response to this scenario, the German government has taken proactive steps, including rigorous gas stockpiling protocols and the activation of coal-based power facilities. At the same time, the existing vulnerabilities of renewables, particularly wind power and photovoltaics, have been accentuated, in part due to protracted approval procedures.

Confronted with such tumultuous shifts and unanticipated circumstances, the electricity sector is grappling with new challenges. Trade unions are vigorously highlighting the potential perils faced by specific industries and segments of the population due to the surge in energy costs and the potential supply shortfalls. While remaining actively engaged in endeavours pertaining to digital transformation and its concomitant issues, these new concerns have now taken centre stage on trade union agendas. The ongoing armed conflict, alongside other external factors, has laid bare the inherent fragility of the energy supply sector, exposing its susceptibility to disruption. As a consequence, the unfolding scenario may potentially usher in a new wave of sectoral restructuring, particularly concerning energy providers and distribution entities.

Within the realm of **public administration** in Germany, a pressing challenge resonates with the shortages of skilled staff, mirroring a predicament pervading numerous sectors. Work intensity and overload have surged to the forefront of sector-specific discussions. According to DBB estimates (2022), current staff shortages amount to a staggering 300,000 employees. This challenge is compounded by the fact that approximately one-third of the workforce is poised for retirement within the next decade, thereby underscoring the scale and urgency of the issue. The potential scope and efficacy of digital transformation in alleviating this challenge, while concurrently mitigating work intensity and augmenting working conditions, remains an open inquiry in the eyes of trade unions.

The course of action to be undertaken hinges substantially on political decisions at various administrative levels. The intricate matrix of decision-making, dispersed competencies spanning federal, state and municipal echelons, will likely persist as a formidable obstacle to expeditious digitalisation progress, despite concerted efforts by the central IT coordination agency.

Empowered by legal prerogatives, works councils possess potent tools to shape working conditions in light of digitalisation impacts at local level. Trade unions provide unwavering support to these councils, fostering awareness and facilitating their active participation in shaping the contours of digital transformation within their respective workplaces. In this symbiotic partnership, trade unions are pivotal conduits, equipping works councils with the know-how to effectively navigate and influence the ongoing digital transformation.

It is evident that the concerns over the impact of digitalisation in other sectors are equally significant in the **hospital sector**. These encompass a wide spectrum of issues, including but not limited to work intensity, delineation of working hours, work scheduling, employee training initiatives, telecommuting arrangements, data protection, transparent utilisation of digital tools, and the delicate balance between work and personal life. These issues inherently intersect with the digital transformation journey and maintain an inherent symbiosis with working conditions, forming a focal point that reverberates through the echelons of collective bargaining. The absence of comprehensive nationwide agreements concerning digitalisation nuances underscores the enduring significance of works councils in shaping internal workplace protocols. These councils will continue to play an instrumental role in articulating and safeguarding the interests of hospital staff, thereby perpetuating their pivotal function in the ongoing dialogue surrounding digitalisation impacts.

Notwithstanding a few exceptions, trade unions in the three sectors have enjoyed only limited success in reaching nationwide agreements aimed at mitigating the repercussions of digitalisation. Predominantly, negotiations regarding digitalisation's ramifications occur at the organisational level, largely due to the robust legal rights and proactive work of works councils. In this arena, trade

unions offer invaluable support, rendering assistance, guidance, and orchestrating specialised training programmes or nationwide campaigns.

6. Policy recommendations

Drawing on the analysis of the German case, we suggest several new fields of action for social partners in the organisation of work during the digital transformation, particularly in the following areas:

- Considering the profound influence that mobile and remote work have on both work dynamics and employee well-being, it is imperative to devise mechanisms that ensure the effective representation of employees' interests despite the absence of a fixed workplace. To address this challenge, it is recommended that organisations explore innovative means of engagement, such as utilising digital platforms for communication and feedback, to foster a sense of connectedness and participation. Additionally, the establishment of adaptable co-determination frameworks within such agile workplaces is crucial, enabling employees to actively contribute to shaping company policies, even in the absence of a traditional physical work setting.
- Recognising the escalating prominence of mental health concerns arising from heightened work intensification, it is imperative for regulatory bodies to adopt proactive measures. To mitigate the adverse impact on employees' well-being, we propose the implementation of comprehensive workplace mental health support programmes. These initiatives should encompass regular psychological assessments, accessible counselling services, and awareness campaigns to destigmatise mental health challenges. Additionally, fostering a culture that values a proper work-life balance and encourages open communication can contribute significantly to reducing work-induced mental stress. By integrating these measures into labour regulations, organisations can create an environment that prioritises employee mental well-being, ultimately enhancing both productivity and overall work quality.
- In the realm of emerging data collection and analysis methodologies such as big data, and considering the implications for transparency, it is recommended to establish a comprehensive framework for monitoring performance and conduct. To strike a balance between organisational objectives and individual privacy, we advocate the implementation of robust data governance policies. These should include clear guidelines on data collection, processing and utilisation, accompanied by mechanisms for informed consent and data anonymisation. Moreover, fostering transparency through regular communication about the purpose and outcomes of data-driven evaluations can alleviate concerns and build trust among employees as well as promote a culture of transparency and accountability.

- Addressing the persistent hurdles stemming from understaffing necessitates immediate attention. The acute shortage of skilled staff is unequivocally regarded by both trade unions and works councils as the foremost imperative requiring resolution. Considering this, we advocate the formulation and implementation of policies targeting a bolstering of workforce capacity. This could encompass strategic recruitment drives and comprehensive skill development programmes. Sustainable solutions are needed that not only mitigate the challenges of understaffing but also fortify organisational resilience and overall workforce well-being.
- Clear communication of the overarching purpose, specific objectives, milestones and anticipated results of digital initiatives should be extended to employees and their representatives throughout all phases. This communication should be coupled with the provision of essential training programmes. It is paramount to enhance employee engagement in the digital transformation.
- It is imperative for the public sector to cultivate and enhance its internal IT competences, avoiding exclusive reliance on external consultants or IT service providers. This proactive approach is essential in light of the continued significance of cyber security and data protection throughout the digital transformation journey.
- The success of the digital pact with the Interior Ministry should be expanded to encompass not only the federal states and local governments within the public administration but also other public service domains.
- In the aftermath of the Covid-19 crisis, a substantial rise in remote work occurred. Consequently, works councils often encounter constraints in their ability to conduct on-site visits or may be entirely precluded from such actions. In Germany, trade unions have effectively brokered a digital access arrangement with the chemical industry. This precedent should serve as a template for other sectors, including the public domain. By establishing comparable digital access protocols, works councils and trade unions can seamlessly engage with employees, ensuring that their representation and advocacy efforts remain unhindered.
- Trade unions ought to formulate innovative strategies aimed at encompassing individuals engaged in precarious employment, self-employed professionals, and those involved in burgeoning work modalities such as crowdworkers or platform workers, within the framework of collective agreements. This concerted effort is essential to establish standardised working conditions spanning diverse sectors and across the entirety of the value chain.
- It is imperative for national governments and the European Union to establish distinct digital strategies and chart a collective European trajectory towards digitalisation with respect to public services.

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Annex 1. List of interviews

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