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Handling the diverse effects of digitalisation on job quality: technology-positive workers and strong social dialogue in the Danish public sector



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Bjarke Refslund and Andrea Borello

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Bjarke Refslund and Andrea Borello

Aalborg University, Department of Sociology and Social Work

Email : bref@socsci.aau.dk

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EXECUTIVE SUMMARY

Introduction

The Danish public sector is among the most digitalised in the world, and Denmark therefore serves as a good case for assessing the impact of digitalisation on job quality and the work environment. This Research paper addresses the relationship between digitalisation and job quality through a review of the relevant policies, the existing research literature, a European wide survey and through qualitative research conducted for this project. The qualitative data was collected in three specific sectors – the public administration, hospitals and electricity production and distribution – and emphasises the experiences of public sector workers. First, ten interviews were conducted with sector-level (and a few national-level) worker representatives from the relevant unions. Next, a focus group was conducted in each of the three sectors with workers, to probe their daily experiences of what digitalisation means for job quality and their daily work experience. While the focus groups emphasised the personal experiences of the workers, many of them are shop stewards and hence have a broader perspective on what their co-workers may experience. These data were supplemented by a cross-national European survey, which, however, did not get a very high response rate in Denmark. So, the results from the survey mainly supplement the qualitative data.

Key findings

The results show that most of the changes and impact experienced by the workers do not relate directly to the technologies but, rather, to the organisation of work and the organisational handling and implementation of new technologies. Digitalisation of the Danish public sector is quite advanced, and the changes were perceived by the workers as comprehensive, but incremental. The workers in general have a positive attitude towards digitalisation, which in many cases is seen as improving workflows and labour processes as well as making the public sector more efficient. Nonetheless, they would strongly urge a more carefully designed implementation and more reflection on the purpose and advantages of different technologies. The workers in general reported that most policymakers and top management still have an overly tech-optimistic perspective and tend to downplay the implementation challenges. Additionally, workers often feel that there is not enough time for implementing the technologies before new changes and technologies are introduced. This suggests that successful digitalisation requires a close collaboration between workers and management. Many workers in the study felt they have a good collaboration with the local level management, but that digitalisation processes were imposed on them top-down from the political system and top management. While digitalisation and new technologies have been linked in public debates to fear of significant job reductions, this was not evident at all in our data; almost the opposite, the workers stressed the need for improved technology to handle the workload and staff shortages.

Overall, the Danish labour market and industrial relations system is characterised by a consensual approach of the social partners, while at the same time both trade unions and employers' association have the strength to produce outputs that are seen as beneficial by both sides. This is also reflected in how digitalisation is handled, at the national, regional, and local level. Here the social partners have taken a pragmatic approach in finding ways to implement new technologies. The social partners have an overall positive assessment of new technology both in terms of potential improvements in efficiency and in working conditions, but with the unions paying close attention to the potential downsides of the development. Accordingly, the implementation of new technology has not caused much change in social dialogue and industrial relations. Most of the issues are addressed at the local level between the social partners. In the public sector this is mainly handled in the local cooperation committees.

Our data generally shows that workers, like their unions, have a positive stance towards digitalisation across the three sectors, although we found variations. The hospital sector was where we identified most optimism, as new technologies had, generally, both improved productivity and reduced strenuous and repetitive work. While technologies had improved the physical work environment, however, the responses regarding the psycho-social work environment were more mixed, as digitalisation can potentially increase stress owing to the faster pace of work and the blurred lines between professional and private life. Many workers did, in fact, emphasise that stress levels had gone up. This finding was iterated in the public administration sector, where interviewees were calling for common guidelines to ensure a better work-life balance. Further, the need for intra-technological communication was emphasised mainly in the hospitals and in the public administration sector, which are both highly digitalised sectors characterised by a variety of tools and technologies needing cooperation. Our findings from both sectors, therefore, raise the concern that when implementing technologies, the various technologies must be able to work together to ease procedures. In the electricity sector, we found that digitalisation had not changed the work itself much but, rather, the labour processes surrounding it. The electricity sector appears to be where workers were most sceptical about digitalisation, highlighted by the ambiguous relationship between lack of autonomy versus flexibility, depending on the way technologies were utilized in the specific workplace (which appears interlinked with the level of skill-upgrading). This again points to the overarching conclusion that the implementation, upgrading and organisational handling of technologies seem to be of greatest concern.

Despite these cautionary points, it is important to stress that several workers across the sectors highlighted that digitalisation had made their job more interesting and stimulating. In several cases, workers mentioned that the technology had 'moved' professionalism rather than 'removed' it. Clearly, the extent to which workers felt able to 'move along' with technological development varied, and our general impression is that younger workers found it easier to do so than older workers (although this also depends on personal preferences). In sum, the impact of digitalisation

on job quality can best be described as ambiguous and very subjective: what for one worker is an improvement in job quality is a deterioration for another. While the overall impact on job quality is ambiguous, the main tendency seems to be that digitalisation has the potential for improving both public services and the working life of the public sector workers, if implemented and adjusted to the needs of both citizens and these workers.

Conclusion and policy pointers

Based on the research project, we highlight some important implications for future policies, to ensure a balanced trajectory in terms of implementation of new technology, for the consideration of policymakers and other key actors. These cover three broad aspects: Firstly, it is important to ensure the right organisation and management of implementation and decision-making on what technologies to implement. There is a need to ensure that technologies are fully implemented and utilised, and therefore to prioritise certain technological and digital projects; in this way, the public sector workers are not overburdened by implementing new technologies, which may result in poor implementation and stressful working conditions. Secondly, and in concurrence with the existing literature, the workers must be involved in the processes and the implementation if the digital projects are to be successful. Only by involving workers, but also end-users such as citizens, can it be ensured that the solutions are adapted to people working with this on a daily basis and thus applying the technologies. Thirdly and finally, there is a strong need for ongoing updating of the skill level of everybody involved in the digital technologies: this applies to both specific skills and generic digital skills, and to all groups of public sector workers, not only workers with higher, formal educational attainments.

SECTION 1. INTRODUCTION

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

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

- 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 implementation processes of the tasks involved in the jobs of public service workers, as well as the outcomes for the 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 about 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.

The data were collected through ten interviews, three focus groups with workers (one in each sector) and a web-based survey ⁽¹⁾. The DIGIQU@LPUB survey (DGQS) was conducted by the European Social Observatory specifically for the research project DIGIQU@LPUB across the eight countries under scrutiny. However, the Danish part of the survey had only a limited number of respondents ⁽²⁾, and the results must therefore be seen as providing only limited evidence and be read very cautiously as a supplement to the qualitative data. Nevertheless, the survey results do

-
1. Whenever claims in the text below draw on statements from a focus group, the source mentions 'FG X'; the equivalent reference to an interview is 'INT X' (see the Annexes).
 2. Overall, 190 respondents completed the DGQS survey in Denmark, 49 from the public administration, and there were so few respondents from the electricity sector that the survey results are not included in this report. In the hospital sector the number of respondents was higher (n=133), hence providing a stronger input, yet this is not enough to make any quantitative claims.

provide some relevant information on how the workers experience digitalisation, in particular in the hospital sector, where there were most respondents. The interviews were with union and worker representatives in these sectors, but a few more cross-sectional interviews have also been conducted (see list of interviews in Annex 1). Since the DIGIQU@LPUB project looks at job quality and social dialogue from the perspective of the workers, no interviews with employers or employers' associations have been included. While the report includes perspectives from various workers and groups of workers, most data collected for the report concern workers with short- and medium levels of education and training, in particular workers with vocational training (see the overview in Annex 1 and 2).

SECTION 2. SETTING THE SCENE

2.1 State of play and national strategies

Denmark is among the most digitalised societies both in Europe and globally and is hence quite advanced in terms of integrating and applying digital technologies in work and employment, welfare services and in society at large. The Danish public sector is also among the most digitalised globally. Digitalisation has been a key element in modernising and increasing the efficiency of the public sector in Denmark for several decades (Ejersbo and Greve, 2016). Although Danish society and the public sector are among the most digitalised in the world, there have been numerous examples of failures of large digital infrastructure projects, but also of projects directed towards citizens, requiring implementation by workplace-level employees (Christensen and Mortensen, 2018; Nielsen et al., 2020; Petersen and Schou, 2020). It has been argued in the literature that rapid technological changes are nothing new to the Nordic and hence Danish labour market, but that current changes seem to be accelerating the overall development (Rolandsson et al., 2020). Nonetheless, the general findings from a large research project on the future of work in the Nordic countries suggests that technological development and its impact on work is '...more marked by gradual, evolutionary change and institutional continuity than by disruptive transformation' (Rolandsson and Dølvik, 2021: 25).

Denmark is ranked second in the European Commission's 2022 Digital Economy and Society Index (DESI) and has been consistently ranked among the frontrunners in Europe over the years, often together with the other Nordic countries (European Commission, 2022). More specifically, Denmark ranks first in connectivity, second in integration of digital technology and digital services and fifth in human capital (related to digital skills), but only eighth in digital public services. Since 2016, the National Broadband Fund has provided state aid to implement Very High-Capacity Networks in local communities, which means that 84% of all Danish households today have a fixed internet connection of some kind (while the EU connectivity average is 78%) and 99% can access the 5G network. Thus, Denmark has a strong digital infrastructure, which might partly explain why

it has the highest rate of e-government use as well as the highest score of all EU Member States on open data. In addition, Danes generally have strong digital competences, as 69% of adults have basic digital skills and 37% have above-basic digital skills. These skills became widely used during the Covid-19 pandemic, as the educational-network infrastructure saw a 200% increase in the use of digital tools due to the lockdown (European Commission, 2021). Regardless of these strong general digital competences, 30% of all Danish adults (of whom 25% are still part of the active workforce) still lack some digital skills, which has prompted an enhancement of vocational digital skills amongst the Danish workforce (as elaborated in the section below) (Danish Government, 2019: 14).

In an increasingly digitalised reality, the integration of digital technologies is an important part of Danish national policies, and in May 2022 a new digital national strategy was presented with a view to implementing Denmark's Recovery and Resilience Plan (RRP) (Danish Government, 2022). The strategy is to accelerate technological development, to '...the benefit of all', and to '...maintain Denmark's leading digital position' (Danish Government, 2022: 3). The government stated that they are to invest two billion Danish kroner (DKK) specifically via this strategy (roughly 270 million EUR). The largest share of digital investment is focussed on digitalising enterprises and the second largest share is focussed on implementing new technologies among Danish companies. The former includes grants for expertise on digital implementation as well as tax reductions for companies that purchase ICT equipment in the form of robotics, 3D-printers and artificial intelligence. The implementation part is targeted at enhanced digital public administration and preparation for future challenges in the realm of digitalisation (and has been implemented from 2022). Accordingly, digital investment and implementation is a high governmental priority, as Denmark 'is determined to remain a digital leader in Europe' (European Commission, 2021: 4). The strategy outlines nine visions of strategic interest, several of which are directly linked to the sphere of work and the sectors studied in this project. The relevant visions include 'Coherent service for citizens and companies' (Vision 2); 'More time for the core [welfare] task through increased use of new technologies' (Vision 3); 'The digital health system of the future' (Vision 5); and 'Danes ready for the technological future' (Vision 9). Put succinctly, the political visions directly address the public administration, health care and skills.

Educational priorities and the accompanying funding for digital implementation are important factors that explain Denmark's high ranking in the DESI index. The combination of an integrated digital infrastructure, strong digital competences and the focus on digitalisation in the Danish national plans and budgets makes Denmark a frontrunner in digitalisation both in Europe and globally.

2.1.1 National strategies on digitalisation

There have been various national strategies on digitalisation over the last 10 to 15 years, including the 2022 national strategy on digitalisation, the most recent at the time of writing (Danish Government, 2022). There have also been government-initiated commissions and partnerships to address the issue. The trade unions have been included in the work and in the commissions, however alongside a broad range of other actors who have an interest in digitalisation, including tech companies. The broad range of interest representation in the commissions reflects a general tendency in Danish corporatism to include more actors, particularly in policy fields that have implications beyond narrow labour market interests (Binderkrantz and Christiansen, 2015). In December 2022, a 'Ministry of Digitalisation and equality' was established as part of the new Danish government formation ⁽³⁾. A few years prior, a 'Disruption Council ⁽⁴⁾' was announced in 2019 and following this a 'Digitalisation partnership' in February 2021 aimed at producing more practical solutions to digitalisation challenges. The Digitalisation partnership is comprised of a variety of actors operating on the Danish labour market, such as employers' associations, trade unions, managers and business leaders, legal advisors, experts and researchers (again illustrating the increasingly plural approach to corporatism in Danish politics).

The aim of the partnership is to make recommendations to the Danish government on how to utilise digitalisation opportunities and digital partnerships in the future (Ministry of Finance, 2021). The Digitalisation partnership is largely oriented towards European policies, but with a focus on Danish implementation and on-the-ground practices. To meet this objective, the recommendations from the partnership include public sector management and public-private partnerships and innovation, digital employment, digital workplaces and data management in a globalised labour market. More specifically, a public digitalisation strategy offers recommendations for small and medium sized enterprises, cross-sector coordination, protection of personal digital data as well as future development in accordance with Danish values. In a recent report (Digitaliseringspartnerskabet, 2021), the Digitalisation partnership further presents no less than 46 recommendations on a range of themes. While these specific recommendations are beyond the scope of this report, we will briefly mention three overarching themes. Firstly, the Digitalisation partnership advocated a digital transformation in the form of more counselling, more workers with digital competences and more Danish involvement in European data protection cooperation. Secondly, Denmark should be a frontrunner in establishing so-called European 'data spaces', with the aim to increase digital exchanges across national borders, such as innovation, research and

3. Read more on the website of the Ministry: <https://digmin.dk/>

4. The aim of the Disruption Council is to offer suggestions for how to 'seize technological opportunities' in a context of new and future technological 'disruption'. The Council consists of eight ministers and 32 permanent members including social partners, business representatives and CEOs from major Danish companies, experts and entrepreneurs. Read more: www.fafo.no/images/pub/lysark/170522_karen_thormann.pdf

Artificial Intelligence (AI)-based projects (Digitaliseringspartnerskabet, 2021: 18-19). And lastly, the partnership emphasises that social media must comply with democratic principles, which requires Danish attendance and involvement in EU regulations concerning the tech giants (Digitaliseringspartnerskabet, 2021: 66).

In a similar vein, the Disruption Council's 2019 report grapples with the challenges Denmark faces in the realm of rapid digital growth and offers solutions to practical issues till 2025 (Danish Government, 2019). The report emphasises equality and prosperity amongst Danes as well as social security and protection through four objectives: a) new and higher requirements for the future educational system; b) productive and responsible companies in a digitalised world; c) a modern and flexible labour market; and d) the importance of fair working conditions and free competition in a globalised world with foreign labour and free trade. Furthermore, robotics and alike technologies are mentioned in the Disruption Council's report as a potential challenge for the Danish labour market, as these new technologies could put workers at risk of losing their jobs due to automation. The report identifies several particularly vulnerable professions: operators and transport workers, office workers (with postmen as an example), service workers and craftspersons (blacksmiths, mechanics, manual production workers and the like) (Danish Government, 2019: 41). On the other hand, however, the report also predicts the emergence of new jobs as a direct consequence of digitalisation and automation. Therefore, 400 million DKK (53.33 million EUR) has been allocated to enhance digital skills among low-skilled or semi-skilled workers, 100 million DKK (13.33 million EUR) to new courses in IT and English and 420 million DKK (56 million EUR) to improved vocational training (Danish Government, 2019:44). Educational training is thus a high priority, even though Denmark's educational level is above the OECD average (Danish Government, 2019: 14). That is, the report concludes, digital skills are expected to be in higher demand in every Danish sector, which requires increased educational efforts and highlights the importance of funding.

Overall, as suggested by the Disruption Council's report, there are several state-led initiatives that address digitalisation from different angles and offer funding, strategic implementation and practical solutions. To quote the national strategy for digital health, 'there is really no alternative to increased digital cooperation' (Sundhedsdatastyrelsen, 2018: 8). As this quote suggests, digitalisation is a main objective throughout the various Danish national strategies and initiatives.

2.2 State of play at sectoral level

2.2.1 Overview of the three sectors

Electricity sector

The Danish electricity sector (both production and distribution) was liberalised in the late 1990s, at a time when many other large state monopolies, such as the telecommunications and airport sectors, were being dissolved across Europe. This was politically initiated by the liberalisation of the internal market in the European Union through the 1996 EU directive on liberalisation of the electricity sector (Frederiksen, 2012). The energy supply infrastructure (gas and electricity) is still publicly owned by the public utility company Energinet.dk. During the liberalisation, the public energy companies were turned into private entities – but often with semi-public ownership or owned by local consumers through cooperatives, which remain widespread in the Danish economy. The state-owned energy companies have been sold off by the state: mainly the large company DONG energy, which was a merger of several public utility companies, was partly sold to Goldman Sachs in 2014 in a controversial deal, which ultimately resulted in billions of euros going to the Danish state (the Danish state still owns 50.1% of the stocks in Ørsted, as the company is now called). There are more than 40 different energy companies in Denmark, varying greatly in size.

According to Statistics Denmark, in 2021 there were around 8,800 employees in the 'Electric power generation, transmission and distribution' sector (NACE code 35.1). Of these, more than 70% are male. Besides electricians and technicians, there are many administrative and engineering positions in the sector.

Public administrations sector

Denmark has a large public sector, with public spending higher than 50% of GDP in 2020⁵. The public sector is also an important employer: around 30% of total employment was in the public sector in early 2022⁶. Specifically in the public administration (NACE code 84.1) there are, according to Statistics Denmark, 94,206 employees, of whom two-thirds are female⁷. These workers are performing a multitude of various job functions within the public administration. Moreover, there has over the recent years been a tendency to decentralise the public administration by moving public administration agencies and offices, mainly from Copenhagen to the provinces.

5. <https://data.oecd.org/gga/general-government-spending.htm>

6. Own calculation based on Statistics Denmark (based on register data, data table [LBESK02](#))

7. Statistics Denmark LIGEDB9: Beskæftigede lønmodtagere efter køn, lønmodtagergruppe og branche. <http://www.statistikbanken.dk/>

Hospital sector

Denmark spends around 8.5% of GDP on public health care (2018 figures from the European Commission ⁽⁸⁾). The hospital sector in Denmark is very much dominated by the public hospitals, with very few private, typically specialized providers. In 2021, 132,155 people were employed in public hospitals in Denmark (Sundhedsdatastyrelsen, n.d.), which is around 4.6% of total employment. The majority of the employees are female. The employment is divided into ⁽⁹⁾:

- Doctors: 15%
- Nurses: 32%
- Other health professionals: 24%
- Other staff (including doctors' secretaries, support staff, administrative staff, psychologists, cleaning staff, technical staff, porters etc.): 30%

Part-time work is quite widespread, with around 32% of the health care staff in the regions (who operate the hospitals) being part-time workers ⁽¹⁰⁾. This was reflected in the Danish responses to the DGQS survey: 36% of the respondents were employed part time (see the important caveat on the DGQS survey on page 6). Recently there has been very significant centralisation of the hospital sector, with the introduction of six large new so-called 'super-hospitals'. This will reduce the number of traditional public hospitals from more than 50 hospitals to just above 20 when fully implemented (Mailand and Larsen, 2020).

2.2.2 Patterns and history of digitalisation in the three sectors

Electricity sector

Much of the work in the electricity production and distribution services is manual work, such as maintenance and installation. This remains the case, but there has been an increase in the use of digital tools over the last decade for administering workflow on laptops, tablets, and mobile phones (including apps) (INT6; FG2). Other new technologies include automatic app-based maps of tasks (e.g. servicing local electric supply boxes), but also developments in electric plants and reactors and the use of QR-codes for tasks. Some companies also use GPS-tracking systems as well as laser prints locally (INT10; FG2). On a more experimental level, one company in our FG2 was introducing virtual reality as a tool for on-site problem-solving: a support technician could remotely help the worker to resolve problems on-site (FG2). However, this was still at a trial stage.

8. Source: ECHI Data Tool (<https://webgate.ec.europa.eu/dyna/echi/?indlist=77a>) (accessed 27.4.22).

9. Source: Sundhedsdatastyrelsen, n.d. The figures do not add up to 100 as the calculations are in whole numbers.

10. Source :<https://www.regioner.dk/services/nyheder/2022/oktober/danske-regioner-og-foa-flere-fuldtidsstillinger-kan-fremtidssikre-sundhedsvaesnet>

Public administrations sector

The Danish public administrations sector is among the most highly digitalised in the world and has been dubbed the most digitalised public sector world-wide by the United Nations (Petersen and Schou, 2020; Sørensen et al., 2020). Digitalisation has, since the 1990s, been seen by most actors as a necessary way to improve the efficiency of public sector work, reduce costs and mitigate some of the labour shortage in the public sector (although this is mainly within the care sector). The government has launched several strategies and initiatives to improve public sector digitalisation (Petersen and Schou, 2020). A core proposition in many of the initiatives is that digitalisation will increase efficiency and reduce costs (at least in the long run), yet this connection may be less straightforward than anticipated in the government strategies. This view was explicitly questioned by participants in the focus group. While digitalisation overall has led to improvements, the road has been bumpy, and has included notorious failed projects with great cost for the state, most prominently the digitalisation of the tax authorities, when a large national digital system for collecting tax debts (EFI) ended up being trashed (Christensen and Mortensen, 2018).

The main characteristic of the digitalisation of the public administration is the transformation of administrative paperwork – such as registration, filing and actual case work and management – into digital work, what can broadly be termed 'digital administration'. While initially the focus was on back-office tasks, there has been an increasing focus in the last decade or so on citizens' digital access to the public administration, including widespread – often mandatory – self-servicing online, where the citizens are to handle several tasks previously handled by public administrative workers (Schou and Hjelholt, 2019). In recent years there has also been growing public interest in the use of 'big data', for instance in social work and police work. The use of AI is another issue that has been debated publicly, but so far has been less frequent in practice. However, there are ongoing projects in the public administration, giving AI/machine learning a more prominent role. This technology is therefore expected to become significantly more important in the future. Some of the FG3 participants mentioned AI as having huge potential within the public administration, although it is not yet fully developed, but rather is in its infancy. One specific technology applied is Robot Process Automation (RPA), which can provide standardised administrative solutions, including simple actions such as paying bills, but also more complex solutions, for instance handling aspects of hiring processes or opening applications from citizens to construct additional buildings on their property (byggesager) (BFA-VOA, 2019: 26).

The increasing digitalisation has been criticised for producing more bureaucracy and surveillance for both workers and citizens. Many welfare and health workers, for example, have been required to document and register more information than previously, leaving less time to actively engage with citizens and hence conduct their profession. The level of information is described by critical observers as overly abundant and bureaucratic. Accordingly, a public discussion has emerged over 'cold' (administrative) versus 'warm' (care/professional/citizen-oriented) hands in the public sector.

Some of these discussions have been between groups of workers and to some degree their trade union: unions representing care and welfare personnel, such as FOA (the union for, in particular, public sector services, such as health and care workers) have called for less administration and more profession-based autonomy, while DJØF, as the main union for university-educated administrative staff, argues that there are significant gains from the system. Overly bureaucratic processes are sometimes mockingly referred to in public discussions as 'DJØF-isation' (DJØFisering).

Hospital sector

The strategy of the Danish state, at least since the 1990s, has been to digitalise the public sector (Hoeyer and Wadmann, 2020). Hence the hospitals and public health care have a long history of introducing new technologies, resulting in various successes, but also failures or at least less successful cases; an often-mentioned example is the 'Health platform' (Sundhedsplatformen), that was to replace 30 or so other IT systems, but faced severe criticism and problems (Røhl and Nielsen, 2019). This platform is a frequently used digital tool alongside the Electronic Patient Journal System (EPJ): the two systems are used in different regions of Denmark (INT7; INT 9; FG1). Regardless of problems with interaction between the two systems, the overall picture is of highly digitalised public hospitals in Denmark. A recent research-based report suggests that all occupations within health care will be affected by digitalisation and technological development (KPMG and VIVE, 2022). Moreover, the increasing amount of data available has resulted in an approach involving comparisons (and hence benchmarking) between the different Danish hospitals (Triantafillou, 2014).

A variety of technologies are currently being introduced in the hospital sector, and increased attention, strategies and debates are focused on their implementation. These technologies include robotics in the broadest sense: robots that sort, move and deliver biological samples or cut tissue samples, but also those used for cleaning, lifting and carrying and even help with eating. Other technologies are tele-medicine and monitoring systems to reduce the time the patients are hospitalised, AI and machine learning and image recognition (e.g. with PET and CET scans). For laboratory work, machines have taken over the sorting, archiving, cutting etc. (INT4). Moreover, technologies to turn patients over in bed, hence reducing heavy lifting, and electrical wheelchairs to move the patients, are important in the hospitals. Danish authorities are also overall positive about the use of AI in the health care sector, and it is used in hospitals for digital pathology, analysing pictures and scans (INT4). Another concrete example is the introduction of a common information-sharing app for all staff during the Covid-19 pandemic, when all workers were given information through the app, rather than emails (which some workers may not access at all times) (INT7).

In the digital health strategy, the use of new technologies such as AI is a central theme, and it is predicted that prevention, diagnosis and treatment will be more precise in the future due to AI and big data analysis (such as large-scale research data and personal data) (Sundhedsdatastyrelsen, 2018: 46; Ministry of Finance and Ministry of Industry, Business and Financial Affairs, 2019). One aim is, therefore, to implement AI to enhance consistency of patient treatment, provide targeted diagnoses and ensure efficiency within the Danish health sector. As an example, the emergency medical services in the Capital Region have developed an AI solution that can identify symptoms of heart failure by listening when a citizen calls the emergency number. In such cases, the healthcare staff receive alerts and recommendations on their screen so that they can react quicker (Ministry of Finance and Ministry of Industry, Business and Financial Affairs, 2019: 64).

SECTION 3. IMPACT OF DIGITALISATION ON JOB QUALITY IN THE SECTORS

Section 3.1 Electricity sector

3.1.1 Selected job quality dimensions

Job quality is a complex phenomenon with multiple dimensions that may impact it. We present here the dimensions that are assessed as the most important. Other dimensions of job quality have been studied in the more comprehensive Danish country report (see the project [website](#)).

3.1.1.1 Work organisation and health and safety

The increasing use of apps for administrative tasks and for handling the workflow is significantly impacting work organisation in the sector (INT6; FG2). For most workers, daily tasks are now communicated on an app, while they used to be physically handed out upon arrival at the company every morning. This means that electricians are now only physically present at the company when picking up new equipment, as most communication with management and colleagues is online. Consequently, solo work is increasing, which may also affect the psychological working environment (INT6; INT10). The focus group in the electricity-sector (FG2) showcased a striking range of digital tools in work planning across companies. One FG2 participant reported that 28 different apps were being used in a large company (stating that he had to '*reinvent the wheel all the time*') whereas another participant, who worked in a small, local energy distribution company with only 12 electricians/technicians, was still documenting everything manually. These examples show how the electricity and distribution sector is subject to local organisational and practical variation, which appears linked to company size.

While the overall assessment is that new digital technologies are helpful when applied and implemented in the right manner, there was widespread agreement in FG2 that this has not yet

been fully achieved. Numerous examples of malfunctions were given during the focus group. This, however, most likely reflects somewhat the tendency to take more notice of technology when it is not working. As expressed by one participant: *'When the shit is not working, it's a hassle.'* However, as another worker said; *'It is not necessarily the technology's fault!'*, suggesting that it is mainly an organisational and managerial matter of how the technologies are implemented, used and handled. As an example, administrative tasks are increasingly handled by individual workers, which fosters a need for what one worker labelled a *'chain-reaction'* between a multitude of stakeholders within the company to ensure proper procedures. As another FG2 participant said: *'All tasks are now mine.'* He explained that he needed to go to the site, fix the problem, change the drawings afterwards and complete the online reporting. Overall, this development has changed everyday routines, adding administration and reducing communication, and has potentially increased the workload (INT10; FG2). As such, digitalisation can potentially affect the wellbeing of all workers: tasks now have more of a digital dimension and less of an intra-human aspect, and the administrative tasks are seen by some workers in the sector as stressful (INT10; FG2).

Overall, the impact of the implementation of digital tools is seen as mixed: the unionists we interviewed as well as many FG participants were undecided about whether digitalisation had actually in general made work easier or not (INT6; INT10; FG2). On the positive side, digitalisation has removed some practical and routine-based tasks from workers, such as surveillance of installations and equipment. Before, workers needed to drive out to regularly check whether the equipment was functioning correctly, whereas today, workers are notified in the control centre or on their app if action is required. While this was generally thought of as a positive development, there are still problems, as the apps often fail to report the specific problems in detail, for instance what side of the supply box needs fixing (FG2). The FG2 participants ascribed some of the everyday errors to a decline in face-to-face interaction between professionals and the result of moving order-placement to human resources (HR) departments, which may be unable to determine what counts as important information for electricians (FG2). Therefore, FG2 participants identified a need for more specific information on the apps to be able to resolve specific tasks. Nevertheless, FG2 participants noted that technology came with various positive gains, for instance as GPS-tracking systems make it easier to find and contact the closest colleague when they had to urgently handle tasks that require two workers (which increases efficiency). Individual autonomy has also *increased* in some cases, for instance as workers are now able to order specific parts directly from the wholesaler's homepage, rather than waiting for the back-office to do this. This both saves time and reduces the number of faulty deliveries (INT6; FG2). Another example of where digital development is helpful was given by a worker explaining how he uses the internet to find out the technical specifications of various pieces and instalments. This is done on-site, whereas the worker previously had to phone, for instance, the company which made the device to get the specification of a specific part or instalment. In sum, FG2 participants highlighted many

positive outcomes associated with digitalisation, such as flexibility, overview and the opportunity to help colleagues who suffer from dyslexia (as tasks could be read out loud by digital devices).

On the negative side, however, FG2 participants noted that technological solutions sometimes cause rigid systems, which can also decrease autonomy. As an example, route planning had become more difficult since it had been taken over by digital technology, which meant that electricians had to drive illogical routes and spend more time in the car than needed. One FG2 participant said: *'Before, we controlled everything from A to Z. But this independence has been taken away from us... and it is just so inefficient!'* Moreover, participants noted that specific tasks were now allocated fixed time slots. Consequently, a FG2 participant reported that a colleague always brought his bicycle along with him in the car, so he could go for a ride in-between tasks that he finalised earlier than the template had calculated (as the time for the task is fixed he cannot move on to the next task, unlike previously when the workers planned the work processes themselves). These examples highlight the potentially problematic relationship between rigid systems, lack of flexibility and autonomy. Bearing this ambiguity in mind, the FG2 participants felt that digitalisation sometimes caused disregard for professionalism and a decrease in personal autonomy. One participant said:

We are no longer obliged to make professional assessments – the app does this for us. It removes our professionalism. It is no longer up to me to say whether the distribution board needs fixing. No one expects me to open and check, you just get a message about it. But when our responsibilities are taken away from us, you also lose the quality of work (FG2).

Overall, this results in low incentives to solve problems that the workers might have noticed but are not on the task list in the system, and a tendency to 'work-to-the-book'. This was new to most of the workers, as they used to have more autonomy and feel more responsible for their work. In this vein, the organisation of work was discussed at greater length in FG2 than the actual technologies themselves, and in particular the increased need for documentation was highlighted as time-consuming. This suggests that digital implementation is interlinked with organisational strategies which need to match the workers' everyday practices.

As a result of the rise in digital solutions and accompanying increased administration, several of our interviewees experience what one union worker expressed as: *'...an indirect expectation to finalise the [administrative part of the] job before going home for the day. Otherwise, you are rung up after the documents are sent off [and have to finalise it after work]'* (here quoted from INT10; but also stated in FG2). Moreover, workers said that technology could easily 'serve as a time-consumer'. One respondent said: *'it steals much of the time where we were in reality going to use our hands out on the site – instead we fumble around on computers and tablets and mobile phones or what not'* (FG2). As such, it is not clear from FG2 and interviews whether digitalisation

is a time-saver or time-consumer. This highlights the ambiguity between flexibility on the one hand, and the need for proper skill development and guidelines on the other. Furthermore, urgent assignments that arise just before the working day is over have become more frequent. This is arguably also linked with a current lack of manpower in the sector, which results in many tasks needing to be handled (INT6). Many electricians in the sector have on-call duties, but these remain highly regulated in the local collective agreements, so the workers are (well-) paid extra for these. One local shop steward, for instance, said; *'We don't want to be contacted outside working hours... and we share this understanding with management.'* In this case, a good balance was found locally after discussing it in the local cooperation committee (INT10).

Finally, as the sector is characterised by much physical work, work-related injuries are relatively common, in particular wear and tear, along with falls (typically from ladders). Therefore, initiatives to use digital technologies as health and safety resources are currently being considered by actors in the sector, for instance so-called 'co-bots': a robot that can perform repetitive tasks such as heavy lifting, but also demanding work postures such as twists (INT10). However, these initiatives are still in a preliminary phase, and no concrete examples or collaborations were presented in the interviews or in the focus group. Furthermore, in relation to mental wellbeing, concerns were expressed that a more digitalised everyday working routine may remove human interaction and, consequently, information, recognition and relationship aspects.

Overall, digitalisation appears to have a limited direct effect on health and safety: the main topics discussed revolved around work organisation and increased stress.

3.1.1.2 Skills and learning

Most of the participants in the focus group felt they do not possess the adequate digital competences needed to take full advantage of the benefits of digitalisation. Older electricians, it was emphasised, often feel that the digitalisation of labour processes and work organisation is challenging (many of the participants in the FG were in this category). This fosters a need for increased digital skills and learning, which are currently not matched, and much is left to local solutions. Several workers noted that they had tech-savvy colleagues (referred to as 'super-users' or 'ambassadors' – often younger colleagues) who were able to understand and disseminate new digital solutions to colleagues. This was helpful for workers with less interest or weaker skills in digitalised technologies. In FG2 it was emphasised that those who were interested in technology found it easier to learn new digital skills. Furthermore, workers did not always find it clear what the technology should and can do. One FG2 participant said:

There are all sorts of different systems, and there is rarely information available around how they really should be used or what they can be used for. So, we are often unable to really benefit from them, compared to what they potentially could do (FG2).

The FG2 participants generally stated that courses and training are either lacking or do not function very well. Firstly, the company HR offices are often in charge of the courses, which means that the courses are ill-designed for craftsmen. Secondly, courses tend to be taught via online platforms and, thirdly, in English – a combination many participants noted they were unfamiliar with. One participant said that courses *'are gabbled though and we cannot make head or tail of anything'* (arguing that the HR department's teaching, the English language and the online format were all problematic). A shop steward said in an interview that in his company, workers' skills were updated, for instance, through courses in ICT-handling for those lacking these competences (INT6). Hence, in this electricity distribution company they managed to ensure that workers have the necessary skills.

3.1.1.3 Reconciling work and personal life

Digitalisation has blurred the lines between work and personal life, since administrative tasks as well as ongoing communication can be performed online after the working day ends. The results of this development are not one-sided: while some workers are satisfied with their work-life balance, others are less so; some say that they are over-burdened, while others are happy with the number of tasks. This again highlights the ambiguity of digitalisation, reflecting personal preferences. Participants stated that technology had increased flexibility and the possibility to work from home as an overall positive development; this option, however, remains severely limited, due to the predominant requirement for physical, onsite work for the electricians and technicians in the public electricity distribution companies. The data from the interviews and FG2 do not suggest that challenges related to work-life-balance have been changed to any significant degree by digitalisation. Rather, participants argued that due to digitalisation, managers need to take extra care of the workers' work-life balance, by setting rules and expectations. It is hence not possible to draw a clear-cut conclusion on work-life balance from our data, as we found that personal preferences, skills and competences, the size of the company and implementation by management all affect whether workers felt able to stick to normal working hours and reconcile their work and private life (FG2). There is therefore a need for workers and management to discuss the topics of stress and coping; especially in male-dominated sectors that used to be embedded in a discourse around masculinity, where such vulnerabilities may have been off-topic (INT6). For example, in the company where the interviewed shop steward works, the cooperation committee discussed when workers can be contacted, for instance, by project managers, and have agreed to handle all issues within business hours (INT6).

Moreover, the interviews and focus group left us with the impression that the workers have mixed feelings concerning a potential 'right to disconnect'. While some workers were in favour of fixed guidelines (arguing that it is difficult to strike a balance between work and private life when checking and responding to e-mails due to loyalty, curiosity and excitement), others were against

(arguing for flexibility and autonomy rather than rigidity). As one worker said: *'If things become too strictly divided, we lose our flexibility'* (FG2). These opposing positions show the difficulties with fixed guidelines and highlight the need for joint and flexible adaptations agreed between workers and management in a local setting.

3.1.1.4 Workers' rights

The potential problem of GPS tracking of workers being used to monitor workers and the labour process seems quite predominant in many public and scholarly debates. Many of the workers in FG2 worked in companies where GPS-tracking of their vehicles (and partly of the labour process itself) now takes place. In all companies this caused a lot of commotion before implementation; however, there was a consensus in the focus group that the GPS-tracking had not caused much (if any) disturbance after it was implemented. The general understanding was that management is highly aware that this is a very sensitive issue, and that GPS-tracking and close monitoring of work processes can be a red flag for workers if used unethically, which for the workers in the focus group meant monitoring the workers and labour process. As one worker stated: 'Management is highly attentive not to cross the fine line'. In one case, management agreed not to implement GPS-tracking after a consultation with the shop steward, but rather, to base the relationship on trust (INT6). In another case, some of the FG2 participants reported that management had projected the tracking on a large screen in the management office. The shop stewards immediately confronted the management and demanded that this procedure be stopped, which management then agreed to (FG2). The fact that the workers were able to stop the monitoring so quickly potentially reflects the enduring power that these workers and their representatives hold in the Danish industrial relations system.

3.1.2 Conclusions for the sector

'Ambiguity' seems to characterise our findings from the electricity sector at large. Digitalisation has mainly impacted work organisation and the management of tasks rather than the work itself, although initial experiments with AI were also briefly mentioned. While digitalisation seemed to have overall positive connotations, many drawbacks were also mentioned, and the overall impression is that the advantages of digitalisation are not fully utilised. This mainly relates to organisational and managerial issues. Although digitalisation did enhance flexibility in some cases, it caused more rigidity in others. This appears closely linked with company size, organisational and managerial practices and personal preferences. Further, the need for skill development and dialogue between management and workers was emphasised, to avoid a decline in professionalism due to the increased documentation demands. Overall, digitalisation mostly has implications for work organisation and the autonomy of workers: much planning has been digitalised, which has not only resulted in better planning. Moreover, the workers felt an increased need to document actions and handle digital tools, which increased the workload.

3.2 Public administrations sector

3.2.1 Selected job quality dimensions

3.2.1.1 Work organisation and working time

Overall, the interviews and focus group showed that participants are in favour of new technologies in the public administration, and that technology, when well-functioning, can improve job quality as well as the service provided to the public. The FG3 participants described the technological development as incremental changes over the years. Most of our interviewees had a positive attitude towards digitalisation, saying that it saved time by removing monotonous tasks and freed up resources for more interesting issues and professional development. In the DGQS survey, 78% (see page 6 for important limitations of the survey) of the respondents from the public administration likewise stated that digitalisation improves the public service they are providing (n=41). However, this does not reflect uncritical technological optimism, and the interviewees gave some less successful examples of digitalisation (such as the Danish tax authorities) to illustrate the need for a critical perspective on digitalisation. FG3 participants identified the need to develop well-functioning systems that could communicate internally to reduce work pressure. Documentation and registration demands were generally described as challenging and time-consuming. FG3 participants attributed this to IT-systems that had *'not kept up'* with technological development. One participant mentioned around nine different platforms with different documentation requirements, highlighting issues such as double-documentation and working with various interfaces and passwords. She said: *'We would like to have new and better systems that can do it all'*, highlighting the challenges arising from increased documentation requirements alongside *'old and outdated'* systems (FG3). However, because public procurement officers within the public services by and large always chose the lowest price rather than the best and most durable solution, the participants felt stuck with old and outdated technologies that caused frustration. Data protection regulation was also described as a core challenge when working across different administrative systems. This technological scepticism and duality are also reflected in the DGQS survey, where 58% of respondents stated that digitalisation has reduced repetitive tasks, but 61% said digitalisation had increased work pace and intensity (n=36).

Moreover, the union representatives interviewed underlined the need to maintain and develop a professional administrative workforce alongside digitalisation (INT3). The unionist from HK (the union for clerical and administrative workers without university degrees) voiced some concerns that their profession was somewhat overlooked in the digitalisation process, since some policymakers seem to think that *'everybody can do administrative work'* (INT3). Accordingly, *'do-it-yourself-administration'* (where parts of the administration are outsourced to every individual employer rather than being handled by administrative staff) was thought to potentially be both time-consuming as well as threatening to water down the administration profession (INT3). There

are also concerns that the increasing use of algorithmic management will lead to reduced autonomy for individual workers (INT2). Here, HK emphasized a distinction to be made between algorithmic processes that support human decisions and those which take their own decisions. In general, the union official we interviewed emphasised that algorithms should be supporting worker autonomy and that there is a need for professionals who can make sense of the algorithmic conclusions (INT3). When used mindfully, however, such technologies were thought to be beneficial for all parties involved. As an example, one FG3 participant said that her tasks had expanded to include more interesting 'micro-investigations' that she was conducting alongside the social workers, thus both moving her professionalism forward and simultaneously saving time for her colleagues. Another participant mentioned the introduction of machine learning in the police department as a tool to facilitate working procedures.

The overall picture from the interviews and FG3 in relation to the impact of digitalisation on working time is two-sided: technology can, on the one hand, eat up time, especially time spent on 'do-it-yourself-administration' and system failure, and it can also blur the lines between personal life and work (as with the increased need to be online). On the other hand, it can free up more time for core tasks and professional and personal development. In general, the focus group participants did not say that digitalisation had increased their working time. Nevertheless, the pace of change has increased. To quote one of our interviewees: '*We are used to the change. It is the pace that is hard to handle*' (INT3). However, whether the technological developments have freed up more time than they consume remains an open question. In the DGQS survey, 44% of the respondents from the Danish public administration agreed that digitalisation has 'given me more time to focus on significant aspects of my job', while 28% disagreed (n=36).

3.2.1.2 Health and safety and outcomes for workers

The focus group participants did not find that digitalisation had had much impact on occupational health and safety in general, but a few examples of improvements were given. For instance, the task of pipetting in the labs was now done by robotic technology, greatly reducing the ergonomic wear and tear on fingers and shoulders, thus significantly reducing the work-related health problems caused by this task. Another perhaps less influential example of digitalisation was the elimination of the need to carry around heavy case files (mainly in the police and prison system), since the case files are now digital. Most workers in the DGQS public administration survey had not noticed any changes (positive or negative) in health and safety due to digitalisation (64% for physical health and 61% for mental health) (n=33), and for the workers that reported changes these were mainly negative: 27% reported worse physical health and 30% reported worse mental health, while only 6% (for both physical and mental health) reported improvements in the DGQS (n=33).

While FG3 participants were overall in favour of new technologies, challenges were mentioned in terms of the need to provide quicker and better services. One participant said:

It is definitely easier to provide a better service [with new technology], but there are also increased demands to respond quicker than you are perhaps ready to do (...) so, it is definitely a huge advantage, but it also has some accompanying challenges (...) 'now, I have been waiting for an hour, do I really need to do that?' (FG3).

The higher expectations from citizens can be stressful for workers in the public administration and may be one of the reasons why stress (according to the FG3 participants) is increasing.

3.2.1.3 Skills and learning

The general impression given by the unionists and focus group participants is that there is a strong need for further investment in upgrading skills among public sector workers, in particular digital competences, which were not considered to be sufficient in the current context (FG3; INT2; INT3). Participants noted that the responsibility for acquiring new digital skills had become highly individualised and that task-based peer-to-peer-training was still the main form of skill development across professions. This lack of formal training was also confirmed in the DGQS survey, where 64% of respondents had not received any formal training on digitalisation (n=33). The need for formal training has also been highlighted by national researchers (Nielsen and Holm, 2020). Skill upgrading and training is therefore a recurring theme for unions and their members. This includes enhancing understanding of the intersection between digital systems as well as bridge-building between professions about the functions of digital systems introduced in new areas (INT3). Representatives from for instance HK stressed the importance of skill development several times during the interview, and the union has launched initiatives to accommodate the need for skill development in a digital age. Among other things, the union has developed a so-called 'digital competence wheel': union members can fill in their skills and profession and be advised on where their digital skills need improvement, in line with recent technological developments in their sector. Additionally, certain amounts in the 'Competence Funds' (established through the collective agreements and to which workers can apply for funding for upgrading of their skills and competences) are earmarked for digital skills.

While focus group participants identified a need for technological learning and skill development, they also emphasised that not all colleagues were equally 'curious' about attaining new digital skills. Older colleagues, especially, felt less comfortable attaining new skills, and many prefer doing things 'the good old way'. A focus group participant said: 'Those who are not curious [in new tasks] get to do the standard tasks' (FG3): although this was said in a semi-joking manner, there is some truth to it. Those workers who do not attain new digital skills, may be left with tasks which require lower skills and are more repetitive, potentially reducing these workers' job quality and

putting them in a more vulnerable position on the labour market, contributing to labour market dualisation.

3.2.1.4 Reconciling work and personal life

A main concern amongst the unionists interviewed and FG3 participants concerned the increased blurring of private life and work as a direct consequence of digitalisation (INT3; FG3). Most participants reported that their work was performed mainly 'within normal working hours' as their profession required a high level of physical presence. This was also indicated in the DGQS by public administration workers from Denmark: 89% (n=36) stated that digitalisation had not changed the hours they work. However, the Covid-19 crisis had led to increased attention to working from home and other distance-work. Since many aspects of public administration could be handled from home during the lockdowns, the topic of remote work has become more salient for the social partners. Our FG3 participants across professions were all given better options to work from home; this was done either through local collective agreements or in dialogue with management. Many employees see the increased flexibility and reduced transport time as potential gains. While this has positive implications among workers in general as it fosters flexibility, it may also compromise the sharp division between personal life and work. One FG3 participant said:

People send e-mails out at half past five and expect to have a response at eight in the morning. They cannot expect a response while you are having dinner! We need to find some common guidelines (...) otherwise, it can become too fluffy, and then it is a dangerous road for all of us.

This suggests that although participants were overall in favour of increased flexibility, they noted that the 'need to be online' had created undesirable work procedures.

3.2.1.5 Career prospects and employment security

In general, our interviewees did not support the narrative that digitalisation brings about more employment insecurity. Rather, they said that much work cannot be automated or done by robotics or AI, hence the importance of having qualified professionals (INT3). Overall, our FG3 participants did not think of technology as a threat to their job security. Rather, they found that with digitalisation, there was an increased need to '*assure the quality of the work, and technology is just a tool to aid this process*', as one FG3 participant said. Another elaborated: '*Personally, I would like to soon quell the statement that when we get a new system, we need less staff. It is really tiring to hear this! We do not save hands or heads anywhere – sometimes, it is almost the opposite*'.

In this regard, job security was not a concern in our data. Rather, the way professionalism had shifted was emphasised as a positive development which could potentially increase job security.

Similarly, in the DGQS survey, 53% of the public administration respondents felt that digitalisation had improved their job security and job prospects, while only 10% felt it had reduced these (n=40).

3.2.1.6 Workers' rights

FG3 participants agreed that 'the right to disconnect' was a good idea in theory, but perhaps difficult to implement in practice. One participant said that it was 'fundamentally a genuinely great idea' but that he 'felt a little ambivalent about it' as it could potentially reduce flexibility. He went on to argue that rather than dealing with when the manager was allowed to contact the worker, the discussion should be about where – referring to the fact that work-related communication can happen on other digital platforms apart from e-mails. As such, the 'right to disconnect' is becoming increasingly important, and as one union official expressed it: 'we, as individuals, need help with defining these borders between private life and work' (INT3). The union were advocating more regulation, helping their members to draw the boundaries between work life and private life, identifying a need for professional organisations (including the unions) to collaborate with employers and draw up feasible guidelines and statements concerning the right to disconnect. However, the union argued that this should be handled through the collective agreement system. As an example, HK was currently revisiting the 2007 guidelines on remote work, to update them to current needs, with the aim of including the guidelines in the next renewal of the collective bargaining framework (INT3).

Based on FG3, the general impression is that the participants did not see digital surveillance as a central problem – although there are some concerns over who owns the data generated by electronic surveillance of workers and citizens (INT2). Overall, both the unionists and FG3 participants emphasised that technology might bring about changes in the tasks that need to be accommodated – and that the workers' voice is crucial in this process (INT3; FG3). The importance of including the workers' perspective on new technologies was expressed on several occasions, and correlates well with the findings from the research literature.

3.2.2 Conclusions for the sector

Public administration work is highly digitalised in Denmark, and the workers (and citizens alike) have a hard time imagining the public sector without this level of digitalisation. Since digitalisation started early in the Danish public sector, the administrative ICT systems are an integral part of the work, and the ongoing changes are perceived as incremental by the workers, although very extensive. Self-servicing systems are becoming widespread, which has altered the way public administration workers interact with citizens. AI has the potential to be a generator for a more abrupt transformation of work processes in the sector, but is still in its infancy. Workers in the public administration are, based on our results, positive overall about the implementation of new technologies, arguing that digitalisation has, on the whole, made their work more interesting and

has moved their profession forward towards new (and often more interesting) tasks. The unionists interviewed described digitalisation as a recurrent issue: it required the union to take a proactive role to help members see its possibilities rather than its limitations (INT3). Nevertheless, they expressed scepticism as to how, when and where the technology is used. FG3 participants generally identified a need for more intra-technological communication, to ease working procedures and ensure that the different administrative systems can work together. The workers in our data moreover advocated common guidelines on administrative systems, to achieve a better work-life balance.

3.3 Hospital sector

3.3.1 Selected job quality dimensions

3.3.1.1 Work organisation and tasks

As foregrounded in Section 2.2.2, Danish hospitals are highly digitalised. Along with the increasing digitalisation have come growing demands for documenting the workflow, actions and decisions of hospital workers, and the challenges stemming from this increased demand for documentation and coordination took up a lot of time in the focus group (FG1). While most actors acknowledge the need for data, to increase accountability, ensure better allocation of resources and improve the quality of health services, there are increasing complaints of overly bureaucratic practices and, to quote Hoeyer and Wadmann (2020: 433), even a 'yoke of Kafkaesque idiocy' among health care professionals. The critics describe a shift experienced by health care workers from patient-centred work to data-centred work, due to what the authors call 'data intensification' (Hoeyer and Wadmann, 2020: 435). This was a recurrent theme in our interviews, for instance when one shop steward said: '*Sometimes, you get the feeling that you could leave your brain on the stairs before you go in [to see the patient]. We are of course still concerned with the patient, but sometimes there is a clash [between patient contact and increased bureaucratic practices]*' (INT7).

Yet, all focus group participants stated that it is not the technology in itself that is the problem, but rather that the extent of '*continuous changes*' was a core challenge (FG1), again illustrating that digitalisation is as much about organisation and management as it is about the actual technologies. Furthermore, it was highlighted, as in the other focus groups, how breakdowns and malfunctions (such as updates, restarts or slow uploading) are a source of frustration, causing stress in an already busy everyday, with a participant saying, '*It is when the technology is not working, we notice how central it has become*'. Interviewees as well as focus group participants, moreover, emphasised the need for technical solutions to match and be tested by the end users. As an example, when lifts and similar helping-equipment cannot be made to work together, the respondents felt unable to use this technology. Consequently, they stated, it would '*end up in the*

basement. This calls for inclusion of staff, to determine what new digital tools to select and acquire, in dialogue with management (FG1).

The worry among professionals as to whether new technologies will reduce patient contact was also echoed by several workers and worker representatives (NT5; INT8; INT9; FG1), partly due to an increased need for documenting more aspects of the workflow. This was supported by evidence from the DGQS survey, where only 11% of the health workers found that digitalisation had led to a closer relationship with patients, while 44% disagreed or strongly disagreed with this (n=75). However, 56% stated that digitalisation has improved the *public service* the respondents give, with only 15% disagreeing (n=105). The focus group discussion qualified this sharp division between documentation and patient care: participants highlighted, on the one hand, how immediate digital documentation requirements are a challenge that decrease patient contact and cause *'breaks in the conversation'*, while, on the other hand, stating that it *'made so much sense as a time saver'* (FG1). However, the increased documentation possibilities also have an inherent risk of over-documenting and repeating. This requires increased attention and self-reflexivity around what to document and when (INT7).

While technology might reduce some monotonous tasks, these may be replaced by other similarly monotonous tasks in relation to, for instance, technological maintenance (FG1). This was seen as problematic if workers are unable to see the new duties as possibilities and professional development. For instance, the medical laboratory technologist reported that some of them reportedly feel like *'blood-sampling robots'*, since the actual robot cannot take blood samples (with the needle in the patient's arm), unlike most of the other monotonous tasks. This highlights the ambiguity between increased technological implementation alongside the need for human staff to check for potential technological errors or delays (FG1). This may result in a strong increase in time spent looking at a computer screen instead (INT4). Accordingly, there is a need to strike a balance between professional skills in cases where they are needed, and the introduction of technological solutions for monotonous tasks that can be relieved by technological tools (INT4). The heterogeneity of the sector further requires thorough inclusion of workers at a multitude of levels when new technologies are implemented.

For some professionals, such as nurses, digitalisation touches upon almost all their daily tasks. Digital tools are used, ranging from practical technologies such as beds, thermometers, blood pressure monitors and robots, to electronic documentation and communication devices such as video-consultations, patient communication through apps and electronic patient documentation systems (FG1; INT8; INT9). While such technologies were seen as indispensable in everyday work practices, our interviewees reported that it may be problematic if such technologies influence the intra-human and emotional aspects of the profession and result in reduced patient care. We found this aspect to be especially frequently raised by nurses, who described how their professional

identity is intimately linked with caregiving and close relations with patients (INT8; INT9). As an example, the potential introduction of 'feeding robots' (which have been demonstrated at a health care technology exhibition) had faced strong opposition amongst the nurses, as these robots encroached too much on their professional identity (INT9). This point was also expressed in the focus group by a participant: *'I think there is also an element of culture here (...) we keep hearing that 'this is about human lives!' – this is not just a factory. This lives on, and rightly! (...) we don't dare trust the technology (FG1).*

Nevertheless, the vice chair of the Nurses' Union also emphasised the importance of abandoning normative ideas about good practice of care as a non-technologically embedded phenomenon. She used a research project as an example, where patients from the remote island Ærø had been diagnosed with cancer over Facetime. Those patients had preferred an online consultation where they could sit comfortably in their home surrounded by their family, rather than having to take the ferry, bus and train to the hospital, and thus possibly not be accompanied by relatives to the consultation (INT8). This experience was confirmed by participants in FG1. In this vein, reflexive practices are needed around when technologies are used and for what purposes, to avoid normative ideas around 'right' forms of care (INT8).

Technological development and digitalisation mean that most professions in hospitals are being constantly reshaped, as one participant (a radiographer) explained: *'The profession has changed. Now, we need to describe more, we are assisting the radiologists, helping them out...'*. Most workers felt this was a welcome development as it brought new challenges and required new skills, but some were a bit more cautious about the changes, basically worrying about their professional identity (FG1). For certain professionals in the hospital sector, a processual workflow approach (where tasks overlap with co-workers' professions) was emphasised, to ensure variety and future work prospects. Management's willingness to allocate time and resources to such changes was, it was argued, key to achieving better results from digitalisation (FG1; INT8; INT9).

3.3.1.2 Working time

A general impression from the focus group and the interviews is that the hospital sector is busy with very high workloads, but that respondents generally found that technology was a major time-saver in everyday working practices. However, this overall positive view did not ignore the pros and cons: on the positive side, professionals can *'treat a higher number of patients than previously'* and have a more efficient everyday routine (FG1). On the other hand, the increased use of technology placed increased pressure on health care professionals and sometimes compromised breaks and *'small talk'* with colleagues (which was emphasised as important in order to hand over correct information). One participant said:

We are able to do so much more [with the new technology], it is definitely time-saving. We produce more, but this includes digital material. In our [radiographers'] case, a million, billion pictures. And the technology is able to handle that (...) But we also have to work at an even faster pace. Before, people used to smoke in the dark rooms while the pictures were being processed, have a cup of coffee... but all this has been cut back. So, for the patients and the relatives, it is definitely the right development. But for us and our breaks? Not so much. (FG1)

The ambiguous relationship between increased and reduced task pressure can also be seen in the DGQS survey: 39% of hospital workers agreed that digitalisation has increased their work pace, while 34% disagreed (n=90). There were the same mixed results on repetitive tasks: in the DGQS survey, only 34% agreed that digitalisation had reduced the time needed for repetitive tasks, while 50% disagreed (potentially indicating an increase in repetitive tasks, n=88).

As a direct consequence of technological development, work that used to be restricted to the hours of nine to five can now be done over a longer time span. As an example, certain samples can be taken and analysed by intelligent technology during the night-time: more employees therefore need to be present to monitor and ensure quality, leading to more working hours outside the traditional nine-to-five working hours than previously (INT4).

Importantly, our interviews suggested that not all professions within the hospital sector were equally affected by the introduction of electronic systems. While the medical laboratory workers had mixed experiences with the implementation of new digital tools (for instance, increased workloads during the night-time), a shop steward we interviewed, representing care and service assistants, highlighted the positive impact of digitalisation as a time-saver (INT7). In this case, new technology made it possible, for instance, to wash entire beds in large washing machines rather than washing them by hand, hence releasing time for more important tasks such as patient care (INT7).

3.3.1.3 Health and safety and outcomes for workers

New technology in the health and hospital sector have helped reduce heavy lifting and reoccurring work postures, such as patient-lifting and cleaning tasks, which of course is mostly relevant for certain groups of workers engaged in caring and cleaning for the patients, improving overall occupational health and safety (OHS) in the industry (FG1; INT7; INT8; INT9). Another example of improved OHS was given by the medical laboratory technologist (in Danish bio-analytics): here, machines and robots have reduced many of the repeated tasks that often resulted in tear and wear of fingers and arms in this profession, since most of this was related to the process of taking samples and conducting analyses (INT4). While digitalisation may result in better working conditions and more healthy work, as suggested by several interviewees, it may also just shift the

burdens to new tasks. For example, the union representative for medical laboratory technologists assessed that OHS was roughly at the same level, with some improvements, yet with new demanding and repetitive tasks (INT4). Furthermore, while lifts and similar digital assistance tools are implemented and in use at the hospitals, they may still require more workers to operate them, for instance when patients are severely obese (FG1; INT9). Finally, stress arising from time pressure in the hospitals was mentioned several times during the focus group and the interviews. Several focus group participants mentioned so-called 'capacity screens' which made it possible to see the *number* of patients in a ward, but neither the *conditions* of the patients nor the *competences* of staff. While this was overall viewed as positive in terms of capacity, it could potentially simultaneously increase the work pace, workload and reduce communication, potentially resulting in errors and increased psychological constraints on workers, including stress (FG1). The changes in health and safety described in the focus groups and interviews were however, somewhat contradictorily, not reflected in the DGQS survey: most workers had not noticed any changes (positive or negative) in their physical (67%) or in their mental (72%) health (n=79).

3.3.1.4 Skills and learning

A recent report by KPMG and VIVE (2022) highlights the need for constant updating and developing of new skills for all groups of employees in the health care sector, so that the workers feel confident about the technological changes and can develop their skills alongside the technological development. The researchers find a consensus among the actors in the sector that skill updating is already taking place, but some interviewees ask for a more systematic skill upgrading. In the DGQS survey, 56% of the hospital workers indicated that they had received formal training, while 30% had not (n=81). Therefore, there is also a need for additional training in digital tools and new technology, particularly in the vocational schools, where many of the care staff, including the nurses, are educated (INT2). Furthermore, for some groups of workers, for instance older workers or those with a non-native background, the increased demand for written documentation can be challenging (INT5; INT9). As one interviewed shop steward said: '*It is important not to create an A and a B team, digital-wise*' (INT9). This fosters a need for ongoing skills upgrading and equal opportunities to develop digital competences, which again requires time and practical solutions (INT8; INT9). One FG1 participant had benefited from so-called '*resource persons*' whose tasks were to help implement new technological changes and educate co-workers. However, a recurrent issue was management's failure to allocate the time and resources needed for implementation. As emphasised both in the focus group and by the vice chair of the nurses' union, it is not enough 'just' to teach the skills needed for the specific technology. Both spoke of a need to teach '*technology understanding*', as the ability to understand digitalisation and new technology in the relevant context (FG1; INT8). One concrete example of increased attention to digitalisation is a so-called 'digi-tech apprenticeship' for health care assistants, where extra attention is devoted to the digital skills of some chosen students. A shop steward we interviewed,

representing health and service assistants in the hospitals, stated that they feel their members are often forgotten and left out of the additional training and skills upgrading (INT5).

3.3.1.5 Reconciling work and personal life

Several focus group participants and interviewees identified an increased need to be online after work to be able to respond to e-mails and help colleagues out (for instance covering shifts during illness and the like) (FG1; INT7; INT8). Yet, 60% of the health care workers who responded to the DGQS survey stated that there was no pressure or no need to connect outside of business hours, while 16% stated there was pressure (n=88, multiple answers). The focus group provided some further insights into why the work-life balance could be challenging, by emphasising how the job is *'saving human lives'*. One participant said: *'we are talking about humans. We cannot just leave at 11.30 if a family is sitting there and the child is not breathing'*. This unpredictability makes it difficult for staff to plan time off and requires a degree of flexibility from both the worker and management. This further suggests that clear-cut guidelines are difficult to establish for the heterogeneous and unpredictable hospital sector. Further, the blurred lines between professional and personal life, such as work-related Facebook-groups, makes this even more difficult, as messages about shifts, illness and the like are sometimes conveyed on private platforms (INT8). As a counterreaction, this fosters an increased need to disconnect to better reconcile work and personal life, but as one unionist argued, it is also about *'daring to disconnect'* (INT8). In *'the good old days'* it was possible not to be home to pick up the phone if work called, while today, it is impossible not to be disturbed, as everyone is constantly online and carries their phone with them – which arguably makes it hard not to be disturbed (INT8). Moreover, technology has changed the everyday routines for some professionals – particularly analysts, as tasks previously restricted to daytime can be conducted at night. This may make achieving a good work-life balance difficult, for instance, for parents and single parents, as there are more evening and night shifts (INT4).

One joint shop steward had raised the issue of *'the right to disconnect'* in the local cooperation committee and argued against the expectation that certain professions should be online to respond to e-mails every day (for instance the social health care assistants). Rather, this interviewee emphasised that important information should be given face-to-face to avoid the stress of being constantly online, and called for guidelines that explicitly stated how often e-mails were expected to be checked. That could, for instance, be once a week (INT7). FG1 participants were not entirely in favour of set-in-stone rights (such as the right to disconnect). Rather, they said that the issue of accessibility was a matter of personal boundary setting rather than something for clear-cut rules and regulation. In the DGQS survey, 19% of Danish respondents replied that they logged in in their off-time due to personal behavioural choice.

3.3.1.6 Workers' rights

As in other sectors, there are concerns about the increasing surveillance and control of workers following digitalisation. A logistics IT system that can log workers' activities has recently been implemented in certain hospitals and has sparked debates around the use of personal data and the degree of surveillance of workers (INT7; FG1). While overall guidelines are in place at regional level, it is up to the individual hospitals to implement them in practice. One shop steward interviewed had specifically asked management to discuss a more transparent use of the system to ensure workers' rights, and mentioned a case where a hospital porter had been dismissed based on the tracking in the system (INT7). On the other hand, FG1 participants found GPS-tracking positive as it became possible for the rest of the staff to contact the closest service assistant directly, rather than having to call around randomly for help. One participant further said that the service assistants in her hospital felt that tasks were assigned more equally to everyone following the introduction of the GPS-tracking system. This has generated less mistrust (as it had become more visible to everyone who was doing the tasks) and fostered a better working environment. This suggests that ethical dilemmas around tracking are not one-sided but depend on the motivations of the manager and the ways the systems are used. When managers use these systems to put staff under surveillance, the FG1 participants agreed it was abuse. They argued that good practices, on the contrary, made such systems meaningful. However, it is worth noting that none of the workers in FG1 were themselves under GPS surveillance (but, rather, service assistants in the hospitals). A different example was given in an interview. In this case, a patient had died due to over-medication (which potentially was given intentionally), whereupon video cameras had been set up in the medicine room. In this situation, the nurses had welcomed the increased surveillance as it could dispel suspicion about mishandling of medication, and hence, provide some sort of personal security for those who were mistakenly under suspicion (INT8). All examples suggest an increased need for transparency and information and consultation around when surveillance can be introduced and how, as well as how data can be accessed and used (INT7; INT8).

3.3.2 Conclusions for the sector

The findings show that respondents in the hospital sector are positive (more so than in the public administration and the electricity supply sectors) towards digitalisation and find that digitalisation has improved overall productivity in the sector and helps meet the high requirements of busy daily work. The effect on job quality is perceived as mixed, as both positive and negative effects were reported by the respondents, who furthermore tend to have varying views on this. Nevertheless, most respondents welcomed technological development, which helps to develop the professional knowhow and skills required. Moreover, digitalisation has in many cases also improved the work environment, albeit mainly the physical work environment, for instance by reducing heavy lifting, repetitive tasks and strenuous postures. The impact on the mental work environment is less clear, as digitalisation produces many benefits, but also an increased risk of stressful working conditions.

So, digitalisation should be seen as a double-edged sword, as it requires careful consideration and reflexive practices on implementation and application and on the interaction with professional standards in the sector. Worries were often repeated, about the autonomy of care professionals and about professional norms, for instance in balancing care and human-centred ethics with the demands of digitalisation.

SECTION 4. IMPACT OF DIGITALISATION ON SOCIAL DIALOGUE

4.1 Trade unions' position on digitalisation

Generally, both historically and nowadays, Danish trade unions have taken a positive stance on digitalisation and on technological transformations in the labour market (INT1; INT2). The unions have from quite early on been attentive to technological development and tried to address the challenges associated with it. Nevertheless, it is difficult to foresee such development, so many new technologies and their consequences must be discussed 'on the go', so to speak (INT2). Overall, Danish unions have a positive attitude towards technological change and in general perceive it to be important for maintaining high levels of competitiveness in the global economy and to achieve cost reductions and handle increasing workloads, for instance in public and welfare services (see also Alsos and Dølvik, 2021).

Already in 1986, the Confederation of Danish Employers (DA) and the main union confederation (LO, the Danish Trade Union Confederation, nowadays FH) concluded an agreement on technological development (which later became part of the general 'Cooperation agreement' between the partners). The agreement compelled the employers to discuss the consequences of new technologies with local union representatives (Kamp et al., 2007). There have not been many disputes in the industrial relations (IR) system at the national level on how to deal with such technologies, but there have been various discussions on the implications at national level, and on how different groups of workers may be affected differently. A main finding from *The Future of Work in the Nordic countries* project was that both management and workers see the Nordic industrial relations model not as a hindrance but rather as an advantage when Nordic companies are to implement technology associated with the 'fourth industrial revolution'. Moreover, it suggests that management and worker representatives see close cooperation and mutual respect as prerequisites for successful adaptation to increased digitalisation and to achieve its potential gains (Rolandsson and Dølvik, 2021).

Thus, the union movement seeks to have a constructive approach, while at the same time also taking the potential challenges, pitfalls and worsening of working conditions seriously. This includes assessing and discussing the potential implications of digitalisation, to avoid an overly optimistic view of digital elements (INT2). Here, the broad influence of the Danish union movement comes into play, and, according to the trade unionist interviewed, the unions should try

to keep a broad perspective, focusing on what is best for 'society at large', and seeking to achieve equality in digital development, not only benefits for the members (INT2). This also includes contributing as a legitimate actor to the public debate on digitalisation of the labour market, as well as from a broader societal perspective. Hence, the unions seek to act as responsible players with an enduring legacy by contributing to discussions on broader societal developments. Additionally, the trade union movement also see it as their task to inform their members about digitalisation and its potential implications for their working life and working conditions (INT2).

Overall, this indicates that digitalisation as such is not causing serious disagreement between trade unions and employers in Denmark. However, different perspectives and policy positions can be found between them, as well as across different trade unions. Some technological developments may affect certain groups of workers more strongly than others and may result in discussions and disagreements in the union movement. Nevertheless, the trade unions and employers have a positive stance and seek to cooperate regarding new technology, reflecting the consensual and cooperative approach characteristic of the 'Danish model' (Hasle and Sørensen, 2013; Hvid and Falkum, 2018). While the unions may emphasise different aspects and risks of digitalisation, there is a broad consensus across the unions that digitalisation in general is a positive thing.

4.2 Social dialogue on digitalisation in the electricity sector

The unions in the sector (in particular the electricians' union, as the main union) take digital and technological development seriously and seek to address the challenges it causes, for instance in terms of work organisation (see section 3.1.1. above). However, it is mainly addressed in the various cooperative fora, and at the workplace level (cooperation committees and daily interactions) rather than in collective bargaining. The shop steward also said; *'We don't discuss digital and technological development; when we negotiate wages, we don't want that to interfere with the potential wage increases'* (INT10). Along with the Danish Working Environment Authority, the social partners in the sector have had tripartite discussions on the work environment. One of the main topics for these discussions is the effects of the working environment on psychological wellbeing, initiated by a 2020 update of the legislation on the psycho-social work environment. Based on this agreement, practical solutions and guidelines explaining the legal requirements and offering suggestions have been developed by the Danish Employers' Confederation and the Electricians' Union (while the Danish Trade Union Confederation and the Danish Employers' Association are negotiating the agreements) (INT6).

To conclude, there is good cooperation between the employers and workers (through the unions) in the electricity production and distribution sector, also on digitalisation. This topic is addressed both at the national level in bi-partite (employers and unions) and tripartite bodies (together with the State in the Working Environment committee), as well as locally through daily contact between

shop stewards and management and more formally through the cooperation committees. In sum, digitalisation has not altered the cooperation between the social partners in the sector.

4.3 Social dialogue on digitalisation in the public administrations sector

The unionists interviewed stressed that the sectoral collective agreements are generally not used to address issues related directly to digitalisation. However, some issues have been addressed (but more indirectly), such as the 'Competence Funds', which enabled workers to apply for funds for upgrading their digital skills (13% or so of the funds were earmarked for digitalisation issues). In other words, digitalisation remains a challenge that is mainly debated between the social partners, particularly at local level, but also occasionally at sector level. However, it is not integrated in the collective bargaining system as such (INT3). Also, in the public administration sector, discussions on the psychosocial impact of digitalisation have taken place in the sector tri-partite Council on Work Environment (BFA-VOA). Overall, the representatives of the public administration unions we interviewed, and particularly, in this project, HK, have a positive view of digitalisation, but are still seeking to examine critically the potentially negative aspects for their members. These challenges are often associated with local implementation, and for this reason the impacts of digitalisation on union members are something to be discussed and assessed as part of the local formalised cooperation between employers and unions.

To conclude, the unions stressed that digitalisation should be discussed within the cooperation system, rather than directly through collective bargaining, which ultimately means that the social dialogue mainly takes place at the local level, in line with the traditions in the Danish industrial relations model.

4.4 Social dialogue on digitalisation in the hospital sector

As in the two other sectors, the national collective agreements do not directly deal with digitalisation. The local agreements in general tend not to include issues related to digitalisation (INT8), but under the 1986 agreement (mentioned above in section 4.1), new technology, when implemented, must be assessed for potential issues and outcomes such as working conditions. This requires the management and the shop stewards to enter into dialogue when new technology is to be implemented. The interviewees in the hospital sector in general emphasised that digitalisation was handled in the local cooperation committees, and a few interviews mentioned local negotiations on related issues, for instance a local policy paper agreed between the unions and management in one of the hospital units (INT7). However, there may be variations in how far-reaching the cooperation actually is, since it depends also on the local actors and the local context. There is a highly institutionalised and formalised setting for the consultation of workers and for cooperation between workers and management. The local cooperation councils (*samarbejdsudvalg/medarbejderudvalg*) have a prominent role in relation to digitalisation, since

they serve as a local forum for discussing implementation, advantages, challenges, and policies in the local context.

Overall, the union representatives interviewed in the hospital sector were quite happy and positive about the opportunities to influence digitalisation and the impact it may have, yet they would like to be even more included. Often when workers did not feel sufficiently included, it was typically because decisions on as well as implementation of new technologies had been rushed. They generally stated that it is important to acknowledge that digitalisation requires time and resources, and that there is no inherent productivity gain (although there may sometimes be).

SECTION 5. Cross-cutting conclusions

While the process of digitalisation, and in particular the growth of ICT systems, is seen as inevitable by workers in the public sectors scrutinised in this study, they in general perceive digitalisation as positive. The workers reported that digitalisation has overall improved the quality of public services, and in many cases increased productivity. Although the overall picture is positive, it is not rosy: rather, it is often best described as ambiguous, as many aspects of digitalisation can have both positive and negative effects, particularly on job quality. The main problems raised relate to work organisation: digitalisation in some cases has generated more time-consuming administration, with some workers describing high demands for documentation that feels unnecessary. Other groups of workers reported that digitalisation has made work systems more rigid, and hence reduced workers' autonomy, which ultimately may reduce job quality. The problematic aspects highlighted by the workers (besides when the technology is not working, which was a constant source of frustration for them) mainly concerned the implementation and managing of digitalisation. Digitalisation projects whose gains and sometimes even purpose were unclear to workers were seen as problematic, as well as digitalisation that removes worker autonomy (mainly reported in the electricity sector, but also in the two other sectors). This points to the important role of managing and organising digitalisation, for instance by allocating time and resources to implementing new technologies; this makes it possible to mitigate these problems, but also to include the workers in the processes so that the solutions are adapted to their work life and make sense to them. Failing this, there is a serious risk that otherwise well-designed projects and technology could be unsuccessful.

An important finding from this study is that the impact of digitalisation on job quality is subjective and that it varies across professions, jobs and tasks as well as depending on personal preferences. Accordingly, what for some workers is a welcome development is seen by others as highly problematic and challenging. It is therefore important to assess the impact in different contexts. While it is difficult to highlight any patterns in who perceives digitalisation as positive and negative, there is a tendency for older workers to be more insecure in adapting to the new technologies.

Digitalisation has in general had a positive effect on occupational health and safety, yet mainly on the physical work environment, where it has removed heavy lifting, repetitive tasks and strenuous work postures for some workers, although not resolving all issues. The effect on the mental and psychosocial work environment was more disputed. While digitalisation has done away with certain tasks, it has also created new ones, with many related to administration and documentation, and for many workers this has reportedly resulted in increased work pace and/or workload. So, digitalisation may lead to stress and lower autonomy for some workers. Moreover, the ability to be online 24 hours a day and receive work-related information was stressful for some workers, whereas others enjoyed the flexibility it creates.

Digitalisation has, in some sectors such as logistics and private services, been associated with increased monitoring of workers and the labour process. While there were numerous technologies in place that could monitor the workers, there were only very few concerns about this among the workers in this study. The implementation of monitoring technologies was in general designed for practical purposes such as route and task planning, rather than for generic surveillance of workers and labour processes. Many workers reported that management in the public sector is very aware that surveillance and monitoring is a 'red flag' for the workers. So here the three public sectors in Denmark may deviate from findings in, for instance, the logistics sector. This may also reflect the fact that workers in the studied sectors remain highly organised and are in a strong position to oppose close monitoring of their labour process. Another concern often raised in the social sciences – that digitalisation could result in fewer (and worse) jobs – was not encountered among any of the workers (or the union representatives) in the study. Rather, they felt that digitalisation was needed to resolve future tasks in the public sector, but that this also requires more formal training and updating of existing skills. Both workers and unions stressed that skills upgrading should be improved and made more formal and systematic to fully achieve the potential gains of digitalisation. For most workers, the changing tasks and work context were welcome, as they presented them with new opportunities and new tasks in their working life. They also acknowledged that jobs and hence working lives are dynamic, and that the skills they acquired when they first started working now needed updating.

There is a consensus in the Danish industrial relations system (both in the private and the public sector) that digitalisation is a positive development, yet with some possible negative aspects, which should be addressed and handled. Accordingly, digitalisation only has a limited direct effect on social dialogue. Only very few aspects of digitalisation are directly addressed in the nation-wide sector collective bargaining, but policy and national level implications and developments are discussed among the social partners at national level – for instance through the various corporative and bilateral structures. Most elements of digitalisation are handled in local or union-specific negotiations or at the workplace level, when the social partners feel this is relevant. For

instance, unions and shop stewards can bring up issues they feel are important for discussion with the local management and the cooperation committees in the public sector.

SECTION 6. Policy recommendations

Based on the research conducted for the project, we put forward a range of policy recommendations to both national and European stakeholders. The recommendations are a mix ranging from more general, policy-oriented suggestions to more practical recommendations concerning daily work processes. However, there are three overall, main components in the recommendations that we think should be taken into consideration.

The **first** is that for digitalisation to achieve its full potential, organisation and management of the processes of digitalisation and implementation of technologies are vital. The majority of problems reported by the workers in this study related to malfunctioning systems, a lack of coordination and cooperation between systems and technologies, insufficient time and resources to implement the digital technologies, digitalisation not adapted to the workers' job and tasks, and sometimes seemingly without a clear purpose for workers, along with digital overburdening through excessive projects and what feels like excessive documentation and handling of digitalisation. **Second** there is a general need for involvement of the relevant actors – workers, end-users, citizens and managers – if digitalisation processes are to be effective and successful. This echoes the literature, which also highlights the involvement of a variety of actors such as educational institutions, unions, employers' associations and employers as key to successful digital policy implementation (Nielsen et al., 2021). **Third**, and finally, we emphasise the need for continual skills development for the *entire* workforce. It is important to stress the inclusion of the whole workforce, ranging from support workers (such as service assistants in hospitals), care workers, to craftspeople (such as electricians and technicians in the electricity distribution sector), to administrative workers and management. The skill upgrading should include both generic digitalisation skills like 'understanding technology', basic digital skills and digital communication, and training in specific technologies and systems etc. The skills upgrading is important in the sectors, workplace, educational system and in society.

Some more specific recommendations include the following:

- Allocate the time and resources needed to fully implement digital changes, to overcome problems with the organisation and implementation of new technologies.
- Design for worker involvement in the development, selection and implementation of new technologies; this can improve efficiency and can also help make the purpose and benefit of digitalisation clear to workers.

- Adapt the technology and digital tools to end-users, for instance design the interfaces so they can work for the different groups of workers.
- Emphasise policies and initiatives that provide solutions across systems, professions and localities to improve cross-sectional coordination and communication, which is often problematic.
- Prioritise inter-technological communication when implementing new technologies on top of existing ones.
- Prioritise skills upgrading both specifically aimed at the task or profession and more general upgrading of digital skills for all workers:
 - Increased formal skills training and upgrading
 - utilizing the different venues for skills upgrading
- Improve the decision-makers' understanding of the impact of technology at multiple levels, for everyday practitioners to implement successful digital tools. This can for instance be through on-site visiting, joint meetings and workshops.
- Prioritise training in digital management to ensure better implementation of digital technology.
- Set clear priorities on where digitalisation can be most successful and efficient, and prioritise thorough and high-quality implementation in these policy areas and of these technologies, rather than broad implementation of various technologies across multiple areas.
- Create a framework for policies on monitoring workers and labour processes that ensure decent and humane monitoring of work, rather than excessive monitoring that results in unhealthy work and poor working conditions.
- Identify further the potential problems associated with digitalisation in terms of job quality and occupational health and safety and address these actively in policies.

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Annex 1. List of interviews

ID	Gender	Age	Institution*	Sectors**	Occupational Group***	Position****	Date	Method*****
INT1	One male and one female	NA	OAO: Organisations of Public Employees	Collaborative organisation between public sector unions	Public employees	Consultants	14.2. 2022	Online, Zoom
INT2	Male	NA	Danish Trade Union Confederation (FH)	Confederation		Political consultant (specialising in digitalisation in the public sector)	26.4. 2022	Online, Zoom
INT3	One male and one female	NA	HK/Stat, union for salaried employees, section for state employees	Public administrations		Chairperson and Analytical chief officer	17.5. 2022	Online, Zoom
INT4	Female	NA	Danske Bioanalytiker, union for Medical Laboratory Technologists	Health and hospitals	Medical Laboratory Technologist	OHS and work environment specialist	19.5. 2022	Online, Zoom
INT5	Female	NA	FOA, union for in particular public sector services, like health and care workers	Mainly health and hospitals		Health policy specialist	23.5. 2022	Online, Zoom
INT6	Male	NA	Dansk El-forbund, Danish Electricians' union	Electricity	Electricians	Elected national union representative (Forbundssekretær)	10.6. 2022	Online, Zoom
INT7	Female	NA	FOA, union for, in particular, health and care workers, but also hospital cleaners and service personnel	Health and hospitals		Joint shop steward	27.6. 2022	Online, Zoom

INT8	Female	NA	Danish Nurses Unions/DSR	Health and hospitals	Nurses	Vice-chair	30.6. 2022	Online, Zoom
INT9	Female	NA	Danish Nurses Unions/DSR	Health and hospitals	Nurses	Joint shop steward	7.7. 2022	Online, Zoom
INT10	Male	NA	Dansk El-forbund, Danish Electricians' union	Electricity	Electricians	Joint shop steward	5.10. 2022	Online, Zoom

FG2	Male	Unknown	Dansk El-forbund, Danish Electricians' union / or 3F	Electricity production and distribution	Electrician/technician
FG2	Male	Unknown	Dansk El-forbund, Danish Electricians' union / or 3F	Electricity production and distribution	Electrician/technician
FG2	Male	Unknown	Dansk El-forbund, Danish Electricians' union / or 3F	Electricity production and distribution	Electrician/technician
FG2	Male	Unknown	Dansk El-forbund, Danish Electricians' union / or 3F	Electricity production and distribution	Electrician/technician
FG2	Male	Unknown	Dansk El-forbund, Danish Electricians' union / or 3F	Electricity production and distribution	Electrician/technician
FG2	Male	Unknown	Dansk El-forbund, Danish Electricians' union / or 3F	Electricity production and distribution	Electrician/technician
FG2	Male	Unknown	Dansk El-forbund, Danish Electricians' union / or 3F	Electricity production and distribution	Electrician/technician
FG2	Male	Unknown	Dansk El-forbund, Danish Electricians' union / or 3F	Electricity production and distribution	Electrician/technician
FG2	Male	Unknown	Dansk El-forbund, Danish Electricians' union / or 3F	Electricity production and distribution	Electrician/technician
FG2	Male	Unknown	Dansk El-forbund, Danish Electricians' union / or 3F	Electricity production and distribution	Electrician/technician
FG2	Male	Unknown	Dansk El-forbund, Danish Electricians' union	Electricity production and distribution	Unionist
FG2	Male	Unknown	Dansk El-forbund, Danish Electricians' union	Electricity production and distribution	Unionist
FG3	Male	31	HK/Stat, union for salaried employees, section for state employees	Public administration	Shop steward in the police force
FG3	Female	59	HK/Stat, union for salaried employees, section for state employees	Public administration	Laboratory technician and former shop steward
FG3	Female	53	HK/Stat, union for salaried employees, section for state employees	Public administration	Public administration in prison service
FG3	Female	58	HK/Stat, union for salaried employees, section for state employees	Public administration	Public administration in prison service
FG3	Female	Unknown	HK/Stat, union for salaried employees, section for state employees	Public administration	Vice Chairperson in HK/Stat, union for salaried employees, section for state employees
FG3	Male	Unknown	HK/Stat, union for salaried employees, section for state employees	Public administration	Analytical chief officer in HK/Stat, union for salaried employees, section for state employees