

Developments in Algorithmic
Management from an IR-perspective

Denmark

Trine P. Larsen

Anna Ilsøe

Henriette Krøll Tell

Christian Haldrup

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© Trine P. Larsen

© Anna Ilsøe

© Henriette Krøll Tell

© Christian Haldrup

General contact: quit@uab.cat

Centre d'Estudis Sociològics sobre la Vida Quotidiana i el Treball - QUIT

Universitat Autònoma de Barcelona

Campus UAB, Edifici B- C/ de la Fortuna s/n

08193 BELLATERRA, Spain

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Preface

This stock taking report is part of the Danish contribution to the EU funded project entitled: Democracy at work through transparent and inclusive algorithmic management (INCODING). The report briefly outlines the recent digitalization trends on the Danish labour market including the recent political and academic debates before reviewing contemporary Danish research on algorithmic management, AI-based technologies and digitalization and automation more broadly. Part of this report is also to briefly describe Danish regulation on Algorithmic management, AI-based technologies, digitalization and automation including employee involvement on these issues. The report comprises of 4 sections. In the introductory section, we briefly review the recent digital development and debates in Denmark with a specific focus on algorithmic management and AI-based technologies. In section 2, we review recent Danish studies and research on algorithmic management, AI-based technologies and digitalization more broadly, where we also include recent commissioned work by the Danish government and social partners, respectively. In section 3, we briefly outline the recent perspectives and initiatives by social partners and the Danish government before we in section four list Danish regulation on digitalization, algorithmic management and AI-based technologies including the rules and procedures regarding employee involvement in these processes.

Introduction

Digitalisation in Denmark has come a long way since its introduction to workplaces and everyday life in general. Denmark typically figures comparative high on different digitalisation scoreboards (European Commission, 2021; UN 2020). It was notably the general public's access to and usage of digital solutions for personal interaction with the public authorities such as changing address, reporting annual tax returns along with general communication that are often highlighted in these benchmark surveys (UN, 2020; European Commission, 2021). This accomplishment is largely down to the digital infrastructure in Denmark, where nearly 6 million citizens and 450.000 companies use the digital solution NemID¹, which is a secured personal access to the digital realm (Zeeberg 2021).

Many Danish companies have also increasingly digitised and automated their work processes and embraced algorithmic management and AI-based technologies understood here more broadly as AI systems, where individual tasks are handled by algorithms rather than humans (Danish statistics, 2021a; 2021b; Ilsøe and Madsen, 2017; Ministry of Commerce, 2017; Bevort and Thorsen, 2022). The AI-based technologies are in some instances exclusively software-based solutions (chatbots, translating software and virtual assistants) or AI solutions tied to various hardware such as robots, drones, self-driving cars etc. (Statistics Denmark, 2021a; Munkholm et al. 2022). A recent large-scale survey by Statistics Denmark (2021a) indicates that an increasing share of companies rely on AI-based technologies: One in four companies with 10 or more employees rely on these technologies in 2021 compared to 11 per cent of Danish companies in 2020 and 5 per cent in 2017

¹ In June 2022, MitID replaced NemID as a national digital identity solution for public authorities and private service providers.

(Statistics Denmark, 2021a; 2021b). The same study also indicates that one in five companies use automated and computerised machines in 2021 (Statistics Denmark, 2021b). However, the digitalisation process is highly fragmented with SME's being less likely to have digitised or automated their work processes, including applying AI-based technologies and algorithmic management compared to larger companies (Ministry of Commerce, 2017; Statistics Denmark 2021a; 2021b; Bevort and Thorsen, 2022). Around 66 per cent of large companies with 250 or more employees use AI-based technologies compared to 45 per cent of medium sized companies with 100 to 250 employees and 20 per cent of small companies with 10-49 employees (Statistics Denmark, 2021b).

There are also important sector variations, where Danish retail together with manufacturing, business services, information and communication are some of the most automated and digitised sectors on the Danish labour market (Ministry of Commerce, 2017; Ilsøe and Madsen, 2017; Statistics Denmark, 2021b). Around one in two companies within the information and communication sector rely on AI-based solutions compared to 30 per cent of Business service companies, 27 per cent of Danish manufacturing companies and 20 per cent of Danish retail companies (Statistics Denmark, 2021a). In most cases, AI based technologies are typically used to automate work processes (17%), and to support management in their various risk assessments as well as forecasting business development. AI-based technologies are also increasingly used for business intelligence purposes (Statistics Denmark, 2021a; 2021b). The Danish contribution to the international Cranet-survey also suggests that one in three companies with 100 or more employees rely on algorithmic management as part of HRM processes (Bevort and Thorsen, 2022). In this context, the platform economy and e-commerce are some of the areas of the Danish economy that are often debated due to such companies' usage of not only AI-based technologies, but also their reliance on algorithmic management in their day-to-day operations (Haldrup et al. forthcoming; Politiken, 2021). However, the Danish platform economy remains limited in size with one per cent of all employed selling their labour via a digital labour platform (Ilsøe et al. 2021). Similar figures regarding the share of people working with e-commerce are not yet publicly available, but recent figures suggest that nearly four in five Danes have purchased products or services online in 2020 compared to one in three in 2006 (Statistics Denmark, 2020). Most services facilitated via a digital labour platform tend to be concentrated in certain in sectors such as cleaning, transport, hotel and restaurants, while e-commerce is primarily associated with retail, logistics and transport, where the latter typically is responsible for product delivery (Ilsøe and Larsen, 2021; Politiken, 2021).

Although Danish companies increasingly rely on AI-based technologies and algorithmic management, these forms of digital solutions appear less used than other forms of digitalisation and automation. A recent large-scale survey tied to the Danish Labour Force Survey by Ilsøe and Madsen (2017) suggests that 82 percent of all employed on the Danish labour market use computers, tablets or smart phones at work with one in two using such devices for more than 50 per cent of their working day. The same study also indicates that 22 per cent of all employed rely on automated and computerised machines in their day-to-day manual work and 50 per cent of office staff rely to a high or very high degree on computerised devices for administrative, communicative and analytical purposes – numbers that differ across sectors (Ilsøe and Madsen, 2017).

Recent digitalisation debates –Algorithmic management and AI-based technologies

AI-based technologies, algorithmic management, digitalisation and automation more broadly have attracted increased political and academic attention in Denmark. Some of the key issues recently debated in relation to industrial relations concern the risks of job loss, data security and ethics, health and safety issues, further

training opportunities, along with wage and working conditions more generally, when companies introduce technological solutions and subsequently organise work in novel ways.

Risks of job loss due to increased digitalisation and automation dominated the media and political debates a few years back, notably against the backdrop of Osborne and Frey's (2013) famous study that projected a 47% per cent job loss due to technological advancements (Ilsøe, 2017). However, since then the job loss debate has shifted with the publication of more moderate projections. For example, OECD (2019) estimates that 11 per cent of all Danish jobs/job functions are to be lost due to digitalisation and automation. Other studies conclude that thus far the digital transformation has not led to substantial job losses per se, but may even have led to job growth as well as served as an important tool to deal with the labour shortage characterising, especially parts of the public health and social care sectors (KL, 2022; Ronaldson et al. 2020).

Data security and ethics is another, but more recent topic of heightened interest, partially due to the directives and initiatives at the European Union (EU) level. The Danish debates were initially comparatively few (Ilsøe, 2017), but have since then gained political prominence with the appointment of different government led advisory bodies and a recent series of commissioned work by the Danish government to address the various data security and ethical aspects associated with AI-based technologies, algorithmic management and digitalisation more broadly. The Disruption Council (2017), the Data Ethics Council (2019), the Sharing Economy Council (2019) and the Digitalisation Partnership (2021) are examples of such government led advisory bodies. Various pieces of legislation and regulations on data security and ethics have also been proposed by government and then passed by Parliament within the past decade (see also section II & III).

Further training, Health and safety, along with the regulation of *wage and working conditions*, are also aspects often debated in relation to digitalisation and automation more broadly, but especially with regard to algorithmic management, the platform economy and e-commerce (Munkholm et al. 2022; Ilsøe, 2017). There have been several media stories about low wages and poor working conditions among platform workers and subcontracted workers working for different labour platforms and e-commerce companies such as nemlig.com, Uber, Wolt etc. in recent years (Thelen 2018; Berlingske tidende, 2022; Politiken, 2021; Altinget 2021; Ilsøe and Madsen, 2017). Danish unions as well as some companies and employers' associations have also actively campaigned for lifting and regulating wage and working conditions within the platform economy and e-commerce sector with some success, leading to various company based and sector collective agreements covering platform workers (Ilsøe and Larsen, 2021; Larsen et al. 2022; Nemlig.com, 2021). The employment status of platform workers has also been widely debated and disagreements continue to exist as they typically operate in the greyzones between traditional employment and self-employment (Munkholm et al. 2022). The challenges regarding further training, health and safety also tend to be raised in relation to platform work and e-commerce, but more so when it comes to digitalisation and automation more broadly. The needs for upskilling the workforce exposed to digitalisation as well as the rights to disconnect and the potential health and safety risks of working side by side with co-bots, self-driving cars etc. have been high on the political agenda (Ronaldsson et al. 2020; Larsen and Ilsøe, 2020; Munkholm et al., 2022; ANE et al. 2021).

Section I – Research and data sources in relation to the use of algorithms, artificial intelligence and algorithmic management

Different strands of literature and disciplines have examined the implications of digitalization and automation, algorithmic management, AI-based technologies in Denmark, but often from different perspectives such as business, legal, sociological, technological, welfare, health and safety etc. (Staykova and Damsgaard, 2021; Ajslev et al. 2019 Plesner et al. 2018; Hotvedt et al. 2020; Ilsøe and Madsen, 2017; Bevort and Thorsen, 2022). There has also been a series of commissioned work on digitalization by the Danish government and social partners, which explores the pros and cons associated with increased digitalization and automation, but often focus on the utilization of digital data as well as the economic growth-, investment- and technology potentials. Data ethics and data security and development of digital partnerships have also formed part of several of these commissioned studies with the set-up of for example the Danish Ethics Council and Digital partnerships that annually report on progress and different relevant topics (Danish digital partnership, 2021; Data Ethics Council, 2021). These reports tend to be the products of the various government led advisory bodies, where the mandate has been to discuss various aspects related to digitalization and deliver policy recommendations that subsequently have inspired various national strategies and regulations on AI, digital growth, data security and ethics, the digital green transition. etc. (Danish digital partnerships, 2021; The Disruption Council, 2017; The Sharing economy council, 2019; Data Ethics Council, 2019; 2021; SIRI-Commission, 2019; 2022; Munkholm et al. 2022; KL 2018).

Recent commissioned work by the Danish government & social partners on digitalization & employment aspects

Aspects related to the regulation of wage and working conditions as well as employee involvement, except for further training and skill development, rarely form part of these aforementioned reports. However, there seems to be a slight shift with recent commissioned work, notably by the Danish government increasingly exploring the implications of algorithmic management and AI-based solutions for the affected workers' wage and working conditions and different business models. For example, the government led Sharing Economy Council presented in their final report and policy recommendations two avenues or models to ensure decent wage and working conditions within the platform economy (Sharing Economy Council, 2021). The proposed models were the *collective agreement model* that builds on the Danish voluntarist IR-traditions for regulating wage and working conditions as well as the *entrepreneur model*, where individual platform workers operate in the platform economy as independent contractors registered as small business that enter a partnership with the different digital platforms (The Sharing Economy Council, 2021). Another example is recent work by Kristiansen and colleagues (2018-2022), who in a series of reports on platform work commissioned by the Danish government explore health and safety, platform workers' legal employment status and distinct models for regulating wage and working conditions in the platform economy (Jacqueson et al. 2021, Ilsøe et al. 2020, Ilsøe 2020). Likewise, Munkholm and colleagues (2022) analyse in their recent reports, also commissioned by the Danish government, the different legal aspects associated with the introduction and usage of algorithmic management, where they among others examine the different rules and regulations related to employee involvement when companies introduce new technologies (Munkholm et al. 2022).

Ample digitalization studies commissioned by Danish social partners have also addressed various themes related to increased digitalization such as the implications of AI-based technologies and algorithmic management for individual's working lives, career opportunities and employee involvement with differing implications for the affected workers and managers (Shapiro et al, 2016; Shapiro and Finansforbundet, 2019; Ernst and Young, 2019; KL, 2018). For example, most engineers foresee increased usage of these technologies, but subsequently expect limited changes to their current work situation (50 per cent) or improvement in their job and career opportunities (35 per cent) following their implementation (Shapiro et al. 2016). Other occupational groups such as middle managers foresee that digitalization, notably algorithmic management, entails changes to their management style to embrace not only an increasingly diverse workforce with different digital skill levels, but also the expected shift from face-to-face to increasingly virtual reality meetings, along with greater emphasis on social skills in the digital realm (Ernst and Young, 2019). Other commissioned studies by social partners stress that AI-based technologies offer ways to reduce heavy workloads and ease work processes among administrative staff and care staff in the public sector as well as through various digital devices ease communication between users, staff and management in the local government sector (KL, 2018; Høyby-Mortensen, 2012). However, other studies, not necessarily commissioned by social partners stress that technological advancement, notably increased domination and registration of work processes have negatively impacted the autonomy and employee involvement among Danish care workers (Kamp et al. 2013; Justesen and Plesner, 2018). Data ethics and data security, notably the implementation of recent GDPR regulations and data handling together with employee involvement, upskilling and health and safety also form part of many of these studies commissioned by social partners (IDA, 2020a; 2020b; Rambøl-management, 2017; FA et al. 2019-2022; Shapiro and Finansforbundet, 2019; SIRI-Commisison, 2022). In fact, various social partner projects, research labs, think thanks, and consultancy firms often stress in their analyses and policy recommendations the importance of employee involvement and further training. They also tend to varying degrees to advance awareness of workers' collective rights and voice in the digital era (The Why Not Lab, 2022; Rambøl-Management, 2017; Shapiro and Finansforbundet, 2019; ABB, 2022).

Recent academic research on digitalization and employment aspects

Recent academic research on the interlinkages between employment aspects and algorithmic management and AI-based technologies include among others a series of large-scale quantitative surveys that aim to map the size of the Danish platform economy and the share of companies relying on AI-based technologies, algorithmic management, automated and computerised machines. These surveys suggest that platform work is one of the fastest growing employment forms on the Danish labour market but remains limited in size (1% of all employed are platform workers), while companies' reliance of AI-based technologies have more than quadrupled between 2017-2021 (Statistics Denmark, 2021b; Bevont and Thorsen, 2022; Ilsøe and Madsen 2017; Ilsøe and Larsen, 2021). Moreover, these surveys have, similar to a range of other quantitative and qualitative digitalisation studies examined the wage and working conditions for workers and managers affected by digitalization and automation (Ronaldsson et al. 2020; Jesnes and Oppegaard, 2020; Nielsen et al. 2022; Bevont and Thorsen, 2022; Justesen and Plesner, 2018; 2022; Rasmussen et al. 2017, Greve 2017). For example, a recent comparative Nordic project entitled "Future of Work" explored among others the various challenges and opportunities associated with increased digitalization and the emerging platform economy for the Nordic model from a legal-, sociological- and health and safety perspective, respectively (Alsos and Dølvik 2021; Ronaldsson et al. 2020; Jesnes and Oppegaard, 2020; Hotvedt et al. 2020). Part of this project was also to research the implementation of novel digital solutions, including the role of collective bargaining and

employee involvement in these processes within Nordic manufacturing, Banking, Social care and the platform economy (Ronaldsson et al. 2020; Jesnes and Oppegaard, 2020; Hotvedt et al. 2020).

Other comparative and single Danish country digitalization studies have also explored the role of collective bargaining and employee involvement when regulating wage and working conditions within the emerging Fintech sector and platform economy (Larsson and Ronaldsson, 2022; Ilsøe and Larsen, 2021; Ilsøe and Larsen 2022b; Ilsøe and Söderqvist 2022). Likewise, a series of large-scale projects on digitizing the Danish public sector analyse the implications of digital welfare for citizens, management practices and individual workers, often with a specific focus on social work, elder care and health care sectors (Justesen and Plesner, 2018; 2022, ADD, 2022; Bjørnholt et al. 2020; Escherich and Jarlner, 2021; CDW, 2022). In these types of research projects employee involvement and other democratic processes tend to be considered important proxies for successful implementation of digital reforms and solutions at the shop floor (Justesen and Plesner 2018; 2022, ADD, 2022; Bjørnholt et al. 2020; Escherich and Jarlner, 2021). Also part of many of these studies on digitising the public sector involve aspects related to data-ethics and security, notably dealing with sensitive personal data management (Justesen and Plesner, 2018). Health and Safety in the realm of digitalization has also been subject to extensive research and these studies point to different aspects, where increased digitalization for some groups have led to intensified workloads and so-called techno-stress while digital solutions for others have replaced hard physical manual work (Ajslev et al. 2019; Nielsen et al. 2022; Laursen et al. 2021). Some of these studies also point to novel forms of interest representation and bargaining solutions when companies implement digital AI-based technologies and algorithmic management solutions (Ronaldsson et al. 2020; Jesnes and Oppegaard, 2020; Larsson and Ronaldsson, 2022; Ilsøe and Larsen, 2022b). They also often emphasise that digitalization facilitate increased team work and tends to blur occupational boundaries, leading to various forms of up-skilling for lower skilled, blue collar and white collar workers (Ronaldsson et al. 2020; Jesnes and Oppegaard, 2020; Larsson and Ronaldsson,2022; Larsen and Ilsøe, 2020; Ajslev, et al. 2019).

A number of studies has also explored digitalization from a management perspective. These studies points to distinct combinations of algorithmic management with more traditional management tools as well as identify various hybridities of virtual and traditional management styles where managing from a remote setting entail a series of challenges for many employers (Haldrup et al. forthcoming; Navrbjerg and Minbava, 2020; Andersen and Elmholdt, 2021). The latter has particularly accelerated during the Corona crisis, where a large share of the Danish workforce teleworked from home following the general lockdown of the society (Navrbjerg and Minbeava, 2020; Andersen and Elmholdt, 2021; Bevont and Thorsen, 2022). In fact, ample research indicates that the Corona crisis in many instances have accelerated many private companies and public authorities' digitalization processes, even if they had already initiated such prior to the Corona Crisis (Navrbjerg and Minbeva, 2020; Andersen and Elmholdt, 2021; Bevont and Thorsen, 2022; CDW, 2022).

An emerging strand of literature also focuses on social partners, notably trade unions, increased reliance on digitalization to mobilise workers. For example, Larsen and colleagues (2022) illustrate that Danish unions to varying degrees have digitized many of their union services and increasingly rely on chatbots, virtual reality courses, personalised user interfaces in their servicing of members besides their development of joint databases involving various AI-based technologies to assist with organising efforts. Danish unions have also increasingly embraced the various opportunities for online and virtual communities available through the different social media platforms like Facebook, LinkedIn etc. to reach new groups on the Danish labour market (Larsen et al. 2022; Hansen and Hau, 2021). There are also examples, where unions have launched different digital organising campaigns to engage with members and non-union members during various collective bargaining rounds as well as to mobilise workers to pressure employers for collective agreements (Hjorth and HK privat, 2021; Hau and Savage, 2021; Geelan, 2015).

Besides the aforementioned studies, there are also a series of ongoing large-scale interdisciplinary research projects on digitalisation funded by the European Commission as well as Danish private and public research funds. These include among others the research project “Algorithmic Management and mental health in the Danish banking sector” (FA et al. 2019-2022) and the ADD project “Algorithms and Democratic processes for both citizens and workers” (ADD, 2022). Other interdisciplinary research projects include “Digital welfare” (Wintheriek et al. 2019-) “The Digital Economy at Work (Ilsøe et al. 2020-2024) and the RADAR Project on Health and safety in the platform economy (Lykke Nielsen and Dyreborg, 2021-2023).

Section II – Main policy issues and challenges in relation to the use of algorithms and algorithmic management by companies: views from Social Partners and the government

Social partners and the Danish government all seem to embrace the digital transformation, but also adopt differing critical approaches and have initiated a series of initiatives to address the possibilities and challenges often associated with increased digitalisation and automation, including Algorithmic management and AI-based technologies.

Trade union perspectives and recent initiatives

The Danish trade union movement has been vocal in the recent digitalization debates. Different unions typically emphasize the pros and cons associated with increased digitalization, notably its implications for work organisation, wages and working conditions as well as workers’ rights, data ethics and security (Akademikerne 2021; FH, 2021; Lederne, 2018; 2021; Fagbladet 3F 2021; HK 2021; Dansk Metal, 2019; IDA, 2021; Finansforbundet, 2021). In general, the Danish unions embrace the increased digitalization, but often retain a critical approach as well as underline the importance of further training and skill development across employee groups to match future digital needs. In addition, individual trade unions stress different aspects related to increased digitalization, including algorithmic management and AI-based technologies. Their recent initiatives involve successive attempts to regulate the platform economy and the emerging Fintech sector through collective agreements, but often with a novel twist (Ilsøe and Larsen, 2021; 2022). There are also recent examples where different Danish unions rely on digitalization and AI-based technologies in their servicing of members through the usage of chatbots, social media platforms etc. (Larsen et al. 2022; Hansen and Hau, 2021; Geelan, 2015). Moreover, the Financial Service Union Denmark, representing workers within Danish banking and insurances, has proposed the idea of data ethics codexes which outline a series of basic principles that both users and employees have to adhere to when working with algorithms. These include among others clear guidelines on how to run data from various places in the same process, transparent and documented decision making, training in data ethics, as well as responsible introduction of People Analytics tools in HR (Finansforbundet, 2021).

Employers' perspectives and recent initiatives

Danish employers associations have also embraced the digitalisation and developed a series of digitalisation strategies that specifically focus on the possibilities, but also challenges associated with AI-based technologies and algorithmic management (KL, 2018; DA, 2020; DI, 2021; Dansk Erhverv, 2020; Danish government et al. 2016). For example, the Danish public employers represented by central government authorities, regional public employers and Danish municipalities has since the turn of the Millennium collaborated and jointly funded the digital development of the public sector through various digitalisation strategies and projects (Danish government et al. 2016). Most recently, they have initiated and funded a series of pilot projects testing AI-based technologies in the hospital sector, central administration etc. to among others ease data-management, ensure safe discharge from hospital through home-based AI-monitoring as well as discuss joint principles for working with such data (KL; 2018; 2021; 2022). Also, the private employers have developed various digitalisation strategies and proposals. Some of the largest Danish employer associations such as the Danish Confederation of Employers, Danish Chamber of Commerce and Confederation of Danish Industries emphasise the need to invest in skill development as well as joint guidelines for secure data-security and ethics to utilise the full potential of recent digitalisation trends, including AI-based technologies (DA, 2020; DI, 2021; Dansk Erhverv, 2020). The Danish Confederation of Employers also call for unified approaches towards digitalisation that involves a conscious and fair digitalisation policy that in combination with continuous further training and international collaboration utilise the digital opportunities to expand and promote Danish businesses (DA, 2020). The Confederation of Danish industry and the Danish Chamber of Commerce further underpin the needs to explicitly support SMEs in their digital transformation by supporting them with additional resources and skill development to ensure that digitalisation benefit all (DI, 2021; Dansk Erhverv, 2020). Moreover, Danish employers together with the unions have negotiated and signed a series of collective agreements regulating not only emerging digital labour markets like the platform economy and the Fintech sector, but also employee involvement when new technologies are introduced at company level. The latter regulations compel among others public and private employers to involve workers in such processes (KL and FF, 2017; DA and LO, 1996; Dansk Erhverv and 3F, 2021; Hilfr and 3F, 2018; Voccali and HK, 2018).

Government perspectives, parliamentary debates and recent initiatives

Recent Danish parliamentary debates on digitalization have among others been tied to promoting digital growth as well as further training and education focusing on ensuring digital skill formation within the public school system (Danish Parliament, 2017; 2019a). Data privacy, notably the implementation of GDPR-regulations following EU' directive as well as the implementation of viable security measures with the introduction of the new digital signature (MY-ID that replaces the former NEM-ID system) also formed part of the recent series of Parliamentary debates (Danish Parliament, 2019b; Danish Parliament 2021). Besides these issues, the digital platform economy and the expanding e-commerce sector has also sparked much political debate, notably related to tax payment, taxi regulation, the employment status of platform workers and couriers along with social protection, working conditions, notably health and safety issues (Ilsøe and Larsen, 2021; Ilsøe, 2017; Danish Parliament, 2019a; 20221). While the Danish government, in line with the Danish IR-traditions has left much regulation of wage and working conditions to social partners, it has initiated a series of commissioned work, seminars along with the set-up of different tripartite councils, advisory bodies and joint committees on digitalization with representatives from unions, employers, academics and other key stakeholders. The purpose of the councils and advisory bodies is to give input to Danish politics on for example Data Ethics and implementation of digital solutions in both the private and public sector. The Danish government has also

developed a series of strategies on digitalization, including AI-based technologies and Algorithmic Management, often based on input from the various advisory bodies, councils and tripartite committees. For example, in 2019, the Danish government published its national strategy on Artificial Intelligence, listing the ambitions and goals for the usage of AI in Denmark. The strategy emphasises among others that AI is considered a supplement that help and assist, but do not replace people and their work as well as need to be implemented with respect to ethical principles and individuals 'right to privacy (The Danish Government 2019).

Another recent government led initiative is their Strategy for Denmark's Digital Growth from 2018, that built on the recommendations by the government led Digital Growth Panel (year) as well as the advice from the Disruption Council (2017). This strategy aims to help businesses with utilising the digital and technological opportunities by proposing a list of initiatives. These include granting free access to particular databases, assist SMEs with their digital transformation, develop regulation that support novel business models as well as develop a public-private partnership that advice business via Digital HUB and strengthen research on Big Data, AI and ICT (the Danish Government 2018b).

A third initiative is the Danish Cyber and Information Security Strategy (2018-2021), which builds on the work presented in the National Strategy for Cyber and Information Security 2015-2016 as well as consider the EU's NIS directive on cybersecurity. The strategy is a four-year plan and comprises of three strategic benchmarks: 1) security for citizens and companies, 2) heightening of competencies, as well as 3) a shared effort, where some initiatives concern the set-up of a national cyber situation centre, regulation in the cyber area, digital skill formation and strengthening ICT security (the Danish Government 2018a).

Besides the various broad strategies, the Danish government has also recently proposed new regulation to strengthen the rights of freelancers as well as platform workers by successfully extending social protection to workers with multiple incomes such as freelancers, solo self-employed and platform workers in 2018 (Mailand and Larsen, 2018). The Danish government has also recently proposed new regulation that aims to clarify the employment status of not only platform workers, but also the broader group of freelancers and solo self-employed that often work in the grey zones between traditional employment and self-employment (Munkholm et al. 2022). The proposed regulation is highly inspired by the ongoing debates at EU-level, but moves beyond the EU-proposed directive. However, it remains to be seen, which groups of workers the Danish regulation will cover once adopted by Parliament.

Section III – The governance of algorithmic management; the role of collective bargaining

Danish regulation on algorithmic management AI-based technologies along with digitalization and automation more broadly is a combination of statutory legislation and collective agreements where unions and employers associations play a vital role. Wage and working conditions are primarily regulated through collective agreements and there are extensive consultation rights that oblige employers to involve their workforce with the introduction of new digital technologies including algorithmic management and AI-based digital solutions (DA and LO, 1996; KL and FF, 2017; Samarbejdssekretariatet, 2021). For workers not covered by collective agreements there are statutory labour standards, but no minimum wage floor and the implementation of EU's directive on information and consultation ensures employee involvement in companies without collective agreements (Lov nr. 303 af 02/05/2005). Below, we first briefly describe different pieces of Danish legislation regulating various aspects related to Algorithmic management and AI-based technologies before examining

recent examples of joint regulation by Danish social partners negotiated and signed within the framework of the Danish collective bargaining model.

The Danish Data Protection Act – implementing GDPR regulations, 2018

The Danish Data Protection Act is one of the important pieces of legislation regulating various aspects tied to algorithmic management. The Act supplements and transposes EU's General Data Protection Regulation (GDPR) and regulates any data collection, automatic as well as non-automatic, which produces data to be filed in a filing database. The Act stipulates that data, which is gathered for a specific purpose, may not be used for other purposes than the initial purpose. When data is processed, the Act calls for proper encryption and pseudonymisation to ensure the person's privacy and safety. The collected data may not be shared with third parties without the person, whom the data regard, has given explicit consent (Lov nr. 502 af 23/05/2018).

Legal obligation on Danish companies for annual reporting on data ethics practices

Another important piece of legislation is the Annual reporting Act that compels all large companies to include a statement regarding their data ethics and data practices with their annual reporting. The law further stipulates that this statement needs to include information about how the company works with and implements its policies on data ethics. In case a company does not have such a data ethics statement, the law compels such companies to clarify and justify the reasons why they have not included such a statement in their annual reporting (Lov nr. 741 af 30/05/2020).

The Network and Information System Directive (NIS directive/Legislation))

The Danish legislation transposing of EU's NIS directive into national legislation in 2018 is also a relevant piece of legislation regarding algorithmic management and AI-based technologies. The Danish law ensures in line with the EU directive that the network and information systems that are essential for the cross-border movement of goods, services, and people are secure for companies and public institutions to withstands future cyberattacks (Lov nr. 436 af 08/05/2018). These regulations may thus implicitly affect companies' usage and implementation of digital solutions including reliance on algorithmic management and other digital services.

Employee involvement & technological advancements – dual regulation

Danish labour law and collective agreements regulate various aspects regarding employee involvement. Employee involvement regarding the introduction of new technologies are regulated by the different collaboration agreements within the public and private sector as well as Danish health and safety regulations. The collaboration agreements only apply to workplaces covered by collective agreements and compel management to inform and consult employees when new technologies, including Algorithmic Management and AI-based technologies, are introduced at the workplace in both the public and private sector (DA and LO, 1996; KL and FF, 2017; Samarbejdssekretariatet, 2021). Management is also obliged to involve employees and their workplace representatives in the assessment of the different implications of introducing new technologies for the financial situation, workforce, further training and health and safety at the workplace.

The collaboration agreements further request management to involve workers when developing joint guidelines for further training as well as data management of personal and sensitive data at the workplace (DA and LO, 1996; KL and FF, 2017; Samarbejdssekretariatet, 2021). These management-employee discussions typically takes place in the collaboration as well as the health and safety committees, where both sides of industry are represented through management representatives as well a union affiliated workplace representatives. In the private sector, companies with 35 or more employees and covered by collective agreements are requested to set up such collaboration agreement while the threshold is 25 employees among central government authorities while there is no minimum threshold in the local and regional government sector (DA and LO, 1996; KL and FF, 2017; Samarbejdssekretariatet, 2021). For companies without collective agreements, the statutory regulations regarding employee involvement apply and follow by and large the obligations outlined in EU's directive on information and consultation as well as the Danish health and safety regulations (Lov nr. 303 af 02/05/2005; BEK, nr. 1181 af 15/10/2010). While the information and consultation Act (2005) only applies to companies with 35 or more employees and without collective agreement coverage, the health and safety regulations apply to all companies – both those with and without collective agreement coverage and legally compel management to involve all employees when planning and introducing new technologies including AI-based technologies at the shop floor. Employers are also legally obliged to inform and consult all workers about any implications these technologies may have for individual's health and safety at work as well as work organisation (BEK, nr. 1181 af 15/10/2010; VEJ nor 11355 af 30/12/2015). However, a key question is how and if these rights for employee involvement are enforced across both highly organised and less organised settings on the Danish labour market when measured in terms of collective agreement coverage, union density and union affiliated workplace representation. In this context, our two in-depth case studies - Danish manufacturing and the platform economy- represent two extreme cases of the Danish IR-model. Danish manufacturing is often considered one of the strongholds of the Danish collective bargaining model, while the digital platform economy resembles an emerging and less regulated sector, where the union density and collective agreement coverage is rather patchy, if not nearly non-existent, in large part of the sector (Larsen et al. 2010; Ilsøe and Larsen, 2022a).

Recent examples of collective agreements regulating aspects related to Algorithmic management

Danish social partners have recently successfully negotiated and signed different sector and company based agreements regulating wage and working conditions within the platform economy and emerging e-commerce and Fintech sectors. Many local social partners have also utilited the opportunities for company based bargaining within different sector agreements to bargain and conclude local agreements related to digitalization. Examples of these agreements are listed below.

- ▶ *The collective company based agreement between 3F and the digital cleaning platform Hilfr (2018).* This agreement is one of the first collective agreements regulating wage and working conditions within the platform economy (3F & Hilfr 2018). The content of the agreement is also fairly novel, at least in a Danish context, as it offers platform workers to choose between the status as employee vis a vis working as freelancers after a certain period (Ilsøe and Larsen 2021). The agreement also includes digital worker rights where for example the deletion of profiles is considered a dismissal and requires a notice period. There are also rules and regulations dealing with bad ratings and customer language and how these can be erased from individual workers' profile (Ilsøe 2020).

- ▶ *Collective company agreement between the digital labour platform Voocali and HK: Voocali is a digital labour platform facilitating translation tasks and it signed an a company based collective agreement with the Danish union HK in 2018. This agreement regulates wages and some working conditions such as further training, pensions etc. for interpreters working as freelancers through the platform. It also included rules on data portability of ratings and deletion of profiles. The agreement was terminated in 2020 (Ilsøe and Larsen 2022; Voocali & HK Privat 2018).*
- ▶ *Sectoral Collective Agreement on Food Delivery Service 2021/2023 (Just Eat agreement).* This agreement is the first sector agreement regulating wage and working conditions for couriers in the Food delivery service sector. The Danish Chamber of Commerce (on behalf of Just Eat) and the Danish trade union 3F negotiated the agreement in 2021. The collective agreement secures a minimum wage, full pay during sickness for up to three months, the right to parental leave, and pension (Danish Chamber of Commerce & 3F 2021). The agreement also includes regulations regarding digital devices and tracking of couriers. For example, in the agreement, it is stated that the food delivery platform cannot track the courier when the courier is not working, thereby ensuring the privacy of the courier (Danish Chamber of Commerce & 3F 2021).
- ▶ *Collective sector agreement between the Employer's Association for FinTech (AF) and Financial Services Union Denmark (Finansforbundet) 2021/2023.* This sector agreement is the first framework agreement regulating wage and working conditions in the emerging Fintech sector. It is in many ways a novel collective agreement in that it compels local social partners to bargaining various issues at company level (Ilsøe and Larsen, 2022b). For example, the collective agreement states that the employees have the right to negotiate various aspects of their work life, e.g. working time, pension plan, health insurance coverage, and have the right to request holiday entitlements as long as it fits with the operation of the company and the individual's needs. Furthermore, the employees have the right to paid parental leave and full pay for up to five days when in need of taking care of their sick child. Finally, the salary is negotiable and should reflect the employees' skills, effort, and competencies, as it is to be renegotiated annually (Employer's Association for FinTech & Financial Services Union Denmark 2021). However, the agreement hardly touches on issues related to Algorithmic management, even if this is one of the sector where AI-based technologies is fairly widespread compared to other sectors on the Danish labour market (Ilsøe and Larsen, 2022b).

Conclusion

Danish companies are increasingly digitising their work processes with one in four companies relying on AI-based technologies often for HR purposes. The introduction of these novel technologies, including Algorithmic management has sparked much political and academic debate. The main issues related to industrial relations often concern the potential risks of job losses, data security and ethics, health and safety issues, further training opportunities, along with wage and working conditions more generally, when companies introduce technological solutions and subsequently organise work in novel ways. Social partners – trade unions as well as employers associations have been fairly vocal and although they tend to embrace technological advancements, they, notably trade unions, have also to varying degree been critical in their approach towards increased digitalisation and automation. Both sides of industry have commissioned work that deals with various aspects related to increased digitalisation, including Algorithmic management and AI-based based technologies. Also the Danish government has been active in developing various digitalisation

strategies as well as commissioned work on digitalisation, including the implications of Algorithmic Management and AI-based technologies for Danish workplaces and their employees. There is also a burgeoning Danish academic literature on digitalisation and its implications for work organisation, wages and working conditions more broadly. These studies also examine to varying degrees the implications for companies of increased reliance on algorithmic management and AI-based technologies for the day-to-day work activities in the public and private sector. These studies often stress the importance of employee involvement to ensure successful implementation of novel technologies at the shop floor.

When shifting our locus of analysis to employee involvement, the Danish regulatory setting for implementing digital technologies resemble an institutional context with strong traditions for collective and individual employee involvement that explicitly compel management to involve workers when introducing new technologies, including AI-based digital solutions and Algorithmic management at the shop floor. However, a key question remains as to whether workers are able to utilise and thus enforce these rights for employee involvement, especially in companies without collective agreement coverage, low union density and weak union affiliated workplace representation.

The strong traditions for collective and individual employee involvement are also reflected by the series of joint and often novel collective agreements social partners have successfully negotiated at sector and company level in order to regulate wage and working conditions in the emerging digital economies on the Danish labour market. However, it remains to be seen to what extent these novel agreements are genuinely enforced at company level as well as if local social partners utilise both the statutory and collective regulatory framework to involve workers in the emerging as well as more traditional sectors with differing traditions of workplace representation, collective bargaining and union density.

Also the government led initiatives resemble a close collaboration with social partners, which tend to be members on the various tripartite commissions and councils set up to advice the Danish government on how to deal with the various opportunities and challenges associated with the introduction of novel technologies. In this context, it appears central to both unions, employers and Danish politicians that they often embrace the digital transformation, but with a human-centric approach, whereby digital solutions and data usage are to happen with people in mind, and not for the sake of digital development in itself.

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