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The Digitalisation of Future Work and Employment

Possible impact and policy responses

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The Digitalisation of Future Work and Employment

Possible impact and policy responses

Chris Warhurst and Wil Hunt (Warwick Institute for Employment Research, University of Warwick)

Abstract

This Working Paper outlines claims about the 'future of work' (as the shorthand for work and employment) and the policy responses to those claims. It is based on a review of the academic and grey literatures on digitalisation and the future of work. The paper first explains the two main developments by which the new digital technologies are shaping work and employment – Industrie 4.0 and Uberisation, and the claims of the death of work and the death of employment arising respectively from these developments. It then examines the policy responses to each development, finding responses to the first to be centred on welfare rights and the second to be centred on labour rights. It also examines past and newly emerging empirical evidence about the future of work, including other trends that are impacting this future. The review suggests that digital technology will not deterministically shape the future of work but that options and choices exist over what and how technology is implemented and with what effects. It concludes by offering a number of policy pointers about how the future of work and its understanding can be better developed.

Keywords: digitalisation, future of work, labour rights, technological determinism, welfare rights

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Introduction

According to the OECD (2017), technological progress is one of the mega-trends that has the potential to transform work. Indeed a 'Digital Revolution' is said to be underway, defined as 'a general acceleration in the pace of technical change in the economy' (Eurofound 2018a: 1). Although the language used to describe the new digital technologies-as-practice varies (e.g. computerisation, robotisation, artificial intelligence, advanced automation, Uberisation, gig work), three 'vectors' of change have been suggested: digitally-enabled machines with artificial intelligence (AI); the digitalisation of processes enabling enhanced possibilities of processing, storage and communication of information; and the use of digital networks to coordinate economic transactions with algorithms through platforms (Eurofound 2018a; World Economic Forum [WEF] 2017). In practice it can be difficult to disentangle these three vectors. All rely on new digital technology and often overlap to create or enable specific work practices. For example, in terms of the foci of this paper, the use of AI to carry out routine cognitive tasks such as Chat-bot telephone cold calling or automated online support relies on digital processing, storage and communication and the ability to recognise external stimuli such as spoken or written responses or commands. Likewise, platform working, such as that provided by Uber, often not only makes use of digital communication technologies to enable work to be assigned and carried out remotely but also involves automated algorithms and uses this data to help sort and match clients to workers and may involve remote sensing and monitoring technology as well as data storage and processing to check that work is being carried out in real time and how it is carried out for future use. In both cases, the physical production process of a service or good is translated into digital information and digital information can be used to support that production. Cumulatively, their impact is potentially profound and claimed to be imminent – by 2020, according to the World Economic Forum (2016; see also Manyika et al. 2017). It might even be that we stand at the dawn of a new 'Digital Age', suggests Eurofound (2018a).

This new age is one of a plethora of 'futures' that are now being promoted but which have in common claims of impending 'catastrophe', according to Urry (2016). Indeed, a wave of pessimism about the future of work has spread amongst policymakers and business commentators. This pessimism might be summarised thus: in the digital age, future work might be more efficient but there will be much less of it around and mass unemployment will follow. The unwitting trigger for this wave of pessimism was the report produced by Frey and Osborne (2013) which claimed that up to 47 per cent of jobs in the US were at risk of eradication, with humans substituted by the coming of the clever robots. A raft of popular and often influential publications followed, all with the same message: whilst new digital technologies might have impacted jobs in the past, the scale of change is different this time – significant job losses really will occur (see Wajcman 2017).

There are more optimistic counter claims that the new digital technologies can be beneficial. The OECD (2017, 2018a, 2018b), for example, argues that the new technologies offer unparalleled opportunities such as the creation of more productive jobs, new earnings opportunities, the alleviation of skill shortages and greater control and flexibility for workers as to when, where, how much and for whom they work. Others argue that the platforms offer opportunity to create a genuine collaborative economy that displaces the current emphasis on economic activity based on profit maximisation (e.g. Font-Mas 2018). In this respect, more broadly, the new digital technologies might enable us to rediscover what makes us human, according to Walsh (2017; also Mason 2016).

Whether positive or negative, that there will be digital disruption has become a policy orthodoxy. In this respect, it should be noted that much of the analysis that currently informs the debate about

digitalisation's impact on the future of work is technocratic and, from it, predictive. In other words, econometric models are made about what jobs or what parts of jobs could be replaced by the digital technologies and then assumptions made that these jobs *will* then be affected in this way (Fleming 2018). Occasionally, the same modelling and assumptions are used to be prescriptive, arguing that those jobs *should* be affected, usually in the hope of creating a post-work future (e.g. Dunlop 2016). There is little input into current debate about what actually happens to jobs and recognition of the socio-political processes that create options and choices about the introduction and implementation of digital technology. In part this absence has arisen because of the paucity of good datasets, as the OECD admits (2018a) and a double time lag – first, in the implementation of the new digital technologies and, second, in the reporting of new empirical research on that implementation (Hunt et al. 2019). However some evidence is now emerging. Moreover it is not the first time that claims have been made that new technology heralds a new industrial revolution that will eradicate and/or change jobs – claims which failed to materialise, but which seem to have been forgotten.

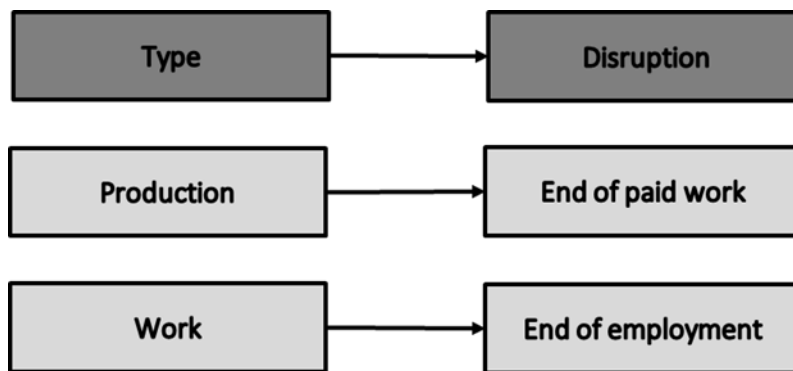
If better understanding is to occur, clarity is needed on what is meant by 'work' in the debates about its future. Work is often used as a catch-all term (e.g. Halford et al. 2016). However it envelops unpaid and paid work, the latter including but not exclusive to 'jobs', and stretches from how people get jobs to how they do those jobs. Narrowing and naming the scope of analysis is therefore important. Jobs comprise both work and employment. Work is defined as an activity performed by persons to produce goods and services for own or others' use (International Conference of Labour Statisticians 1993 [ICSE-93]). It has use and exchange value. Paid work tends to generate the latter; or, more prosaically and typically, it is intended to create profit for whoever is paying the person working. It comprises a bundle of tasks requiring skill and knowledge put together for an employee by an employer and applied to some form of technology. Employment covers the terms and condition under which that work is undertaken for the employer, and typically made explicit in a contract. Such contracts stipulate employment status and payment for example. Employment that is permanent, full-time and involves a single employer is often articulated as 'standard', preferable and a 'good job' (Wright 2015). The new digital technologies can impact both work and employment, and policy measures need to address both.

This paper identifies and disentangles the predictions and prescriptions, preferences and positions and the policy measures that follow. It is based on a review of the academic and grey literatures on digitalisation and the future of work. It examines current claims about the 'future of work' (as the shorthand for work and employment) and the responses to those claims. It first frames and outlines the two main developments by which the new digital technologies are shaping both work and employment. It then examines the policy responses to each, both current and anticipated measures. It then examines past and current evidence about the future of work, including other trends that are impacting this future. It concludes by offering a number of policy pointers from these debates and the prescribed policy responses. The review suggests that digital technology will not deterministically shape the future of work but that options and choices exist over what and how technology is implemented and with what effects. As such we would argue that the EU is not locked into a single *future of work* but has a number of possible *futures of work*.

Digitalisation’s impact on work and employment

Although there is no consensus on which number industrial revolution is occurring currently (cf. the ‘second machine age’ of Brynjolfsson and McAfee 2014), the more usual claim settles on it being the 4th Industrial Revolution, as Industrie 4.0 epitomises (WEF 2017). Whichever industrial revolution is occurring, one theme is common to all claims: that a new digital technology has arrived and will reshape the social organisation of economic activity. Drawing on the three vectors listed above and accepting that digitally-enabled machines with AI and the digital coordination of economic transactions through platforms both involve the digitalisation of processes with enhanced possibilities for processing, storing and communicating information, we suggest that the new digital technologies are said in current debate to have two main impacts. The first relates to what we refer to as the ‘digitalisation of production’, that is the production system for goods and services, and, the second relates to what we refer to as the ‘digitalisation of work’, drawing on the definition of it as an activity provided by ICSE 93. Each type gives rise to different disruptions: the first the end of paid work; the second the end of employment. The types and disruptions are illustrated in Figure 1 below and then outlined in this section.

Figure 1: Types of digitalisation and their disruption on work and employment



Source Authors' own elaboration.

These two types have generated most debate – and concern – amongst policymakers and business commentators. The two types are not exclusive, as Uber’s ultimate goal of using driverless cars illustrates (Topham 2017). Nevertheless, analytically, it is useful to discuss each separately for the distinct concerns that they raise.

The digitalisation of production

The first type is the digitalisation of production and the way that the new digital technologies dramatically reconfigure how goods and services are produced. Put prosaically, AI combined with the emergence of big data, the internet of things and ever-increasing computer power has the potential to unleash clever robots to increasingly undertake both physical (manual) tasks and, increasingly, some cognitive (mental) tasks hitherto undertaken by humans (Manyika et al. 2017; OECD 2018b). There are even claims that the robots can perform social tasks involving empathy for example. Moreover, these robots do not just work continuously, they are able to learn, including from machine-to-machine information exchange, and so adapt to be more efficient at these tasks. Digitalisation thus makes production of goods and services more efficient and more productive.

Although the gains will vary by sector, the World Economic Forum (2017) suggests that manufacturing firms will be able to make cost reductions of 17.6% and generate 22.6% additional revenues.

Although there are definitional problems (Davies 2015), the most popular articulation of the digitalisation of production is Industrie 4.0. Emerging in Germany, it was first applied to manufacturing. Positioned as manifesting the 4th Industrial Revolution, Industrie 4.0 is ‘the comprehensive transformation of the whole sphere of industrial production through the merging of digital technology and the internet with conventional industry’, according to German Chancellor Angela Merkel.¹ Also sometimes called the ‘smart factory’ or simply ‘advanced manufacturing’, Industrie 4.0 has a number of features:

- Application of information and communication technology (ICT) to digitise information and integrate systems across the whole production system within and outwith the host company;
- Cyber-physical systems that use ICTs to monitor and control physical processes and systems such as embedded sensors and intelligent robots that can configure themselves as product needs arise or additive manufacturing (ie 3D printing) devices;
- Use of network communications that link machines, products, systems and people both within the factory and outwith the factory amongst suppliers and distributors;
- Simulation, modelling and virtualisation in the design of products and the establishing of manufacturing processes;
- Collection, analysis and exploitation of vast quantities of data from within and outwith the factory
- ICT-based support for workers using augmented reality and intelligent tools (Davies 2015).

This digitalised production system offers increased production flexibility and product quality and customisation, reduced production times and enhanced productivity. It also provides customers opportunity to offer their own product modifications, which can then be quickly and cheaply produced, notes Davies. It is a significant extension of the self-contained ‘lights-out factory’ that emerged twenty years earlier. These lights-out factories were so-called because the robots doing the automated work do not need to see that work and so, unlike humans, can work in the dark, which adds another cost saving aspect to their use (see Clark 1995). Reporting testimony from the 2015 industrialAll conference of the European trade union for manufacturing workers, Degryse (2016: 38) describes how Bosch Rexroth integrates digitalisation the production process to create an ‘intelligent factory’, see Box 1 below.

Box 1: Intelligent production

All elements of the production line are placed in a network, everything is communicated intelligently through the various infrastructures. This environment ensures the interface between worker and machine. Quality and performance are evaluated in real time. Each assembly station has separate operations, enabling any one of them to be stopped at any time and production to be carried out on another line. The products are transported and arranged by artificial intelligence and a worker is informed of the process and of what s/he has to do via a tag that identifies that worker.

Source: From Degryse (296:38)

¹ Quoted in the EPRS briefing (Davies 2015: 2).

This example shows how remote digital sensing and monitoring devices and systems can be combined with AI to perform aspects of the production process previously carried out by humans, and not just tasks that are routine and repetitive, such as the organisation, coordination and timing of tasks. This other development, what might be termed the ‘digitalisation of workers’ (Warhurst et al. 2019f) also distinguishes Industrie 4.0 from previous putative ‘factories of the future’ such as the light-out factory described by Clark (1995). At Bosch Rexroth workers wear devices that integrates them into the production system. Such devices can relay information to workers. As the WEF (2017: 7) notes, ‘Enterprise wearables are permanently switched-on, interconnected computing displays that are worn on the human body, for example, for easy, hands-free access to contextually relevant information.’ However they can also collect information on workers. This data then enables the monitoring and evaluating of workers’ behaviour, creating a surveillance workplace, though ostensibly argued as a response to company security needs, as Box 2 below illustrates.

Box 2: Microchipping employees

Microchips are being developed to be implanted in employees. These implants are positioned as helping improve intra-firm security by restricting some employee access to sensitive areas. It is reported that UK firm Bio Tech has already fitted 150 microchip implants into workers in engineering and financial services companies. In other reports, a Swedish company is in talks with other UK legal and financial services companies to provide more human microchip implants for their employees.

Source: Gilfillan (2018).

However the harvesting of data on the behaviour of workers can also be used for performance management, for example through the use of a ‘smart glove’ that guides and monitors workers movements (Davies 2015). One UK company even uses fingerprint data to identify workers who express discontent (Davies 2017). This data can be used to provide feedback and the allocation of tasks to workers without human interference – algorithmic human resource management (Lee et al. 2015). More broadly, people analytics offers employers opportunity for real-time workforce planning and assessment of costs and productivity (Ivanov et al. 2018). Although a less sophisticated use of company-boundary-crossing digital technology, companies can also use it for the recruitment and selection of workers using a mixture of social media and algorithms. There is however considerable scope for opacity and bias in both process with the use of such methods (e.g. Van Iddekinge et al. 2016).

Nevertheless, Industrie 4.0 is now being rolled out beyond Germany and it is recognised that services too can adopt the same digital technology, for example, in banking (Perez and Martin 2018). Here, digital technology enables remote banking and automation of banking processes. For example, a virtual assistant saved customer advisor’s time by automatically searching for information in archived documents by identifying the intention in customers’ requests. While this technology did not improve the recognition rate of intentions compared to a human worker (both were around 75%) the project manager at the bank reported that the application reduced the ‘drop-out rate’ by half and increasing the correct response by 50 per cent. Other new research from the

same project² by Green et al. (2018) shows how organisations in the care sector are also employing digitalisation to streamline the organisation and delivery of care, see Box 3 below.

Box 3: Digitising the delivery of care

In the care home, the company used an integrated computerised system to organise schedules, log care being delivered, organise invoicing, keep a tab on workers and keep a record of everything. Care workers call into the system using the client's landline when they arrive at a care job. If they fail to 'log in' supervisors receive an alert on their mobile phones from the system, prompting them to call the clients home to see what is going on. They can even use the system to check the camera feed to the client's home to see if the carer has arrived. The system also flags up when the client's care plan or even the worker's passport or visa is due to expire and flags up when a quality assurance visit is needed. Respondents in the study noted that the system had many benefits for the company as it streamlined planning and had a positive impact on the job quality of care managers and co-ordinators, though it was reported to have had little impact on the day-to-day work of carers. This digitalisation represents a major improvement when compared to the paper-based system that was in place at another UK home care provider covered in the research.

Source: Green et al. (2018).

Despite this possibility and claims, for example, that robots can care for elderly people (see Levy and Witherow 2017), according to the International Federation of Robotics, most robot use still occurs in countries with a strong manufacturing base or sector such South Korea and Singapore and, in Europe, Germany (McCarthy 2018). Although it should be noted that even in Germany only around 20 per cent of manufacturing companies have interconnected IT systems to control their production process (Davies 2015).

This digitalisation of production has sparked intense debate and there are malign and benign accounts of its impact on the future of work. In the malign account, the clever robots are coming to take away the jobs of humans. Improved computing power, AI and robotics will replace the paid work of humans on a scale not previously seen, not least because that the purpose of this technology, claims Autor (2015). Whilst Frey and Osborne predicted that clever robots will put up to 47 per cent all US jobs at risk, there is wide variation in subsequent studies about the extent of technological unemployment. Whilst the McKinsey report (Manyika et al. 2017) generally concurred with Frey and Osborne's ballpark figure (51%), other predictions are lower, 35 per cent of jobs (Deloitte, 2014) and yet others much higher – 90 per cent (see Lever, 2017). There will be country, regional and sectoral variations and the impact will likewise vary by type of worker. In the developing countries, the situation could be worse for example. According to the World Bank President Jim Yong Kim 69 per cent of jobs in India, 77 per cent of jobs in China and 85 per cent of jobs in Ethiopia are threatened by automation (Yong Kim 2016). Within the developed countries there will be sectoral variations. In the UK, for example, the sectors most at risk of job automation are transport, manufacturing and wholesale and retail. Education and health will be least at risk (Wilson 2017). There will also be regional variations related to sector. The OECD (2018c) has developed a regional typology based on employment trends and risk of jobs automation. It then identifies regions most at risk. For Spain, for example, it identified Castilla-La Mancha as having

² See QulnnE.eu

jobs at lowest risk of automation and Murcia at highest risk. Muro et al. (2019) argue that it will be those regions currently more dependent upon manufacturing that will be hit hardest. The policy imperative will be to help regions at most risk encourage lower risk job creation. However there can be variations by country in terms of sectoral impact. In France, for example, only 50 percent of non-managerial, professional and technical occupations in the textile and leather sector will be automated, Cambridge Econometrics with Cedefop (2018) estimates, whilst in Poland the figure will be 78 per cent. In the auto sector, 30 per cent of jobs in France will be automated but 84 per cent in Poland. In terms of type of worker, in the US at least, male workers are more vulnerable to technological unemployment because they are employed more in manufacturing and transport, whilst women are safer because of their clustering in the health and education sectors. Hispanic and black workers are more vulnerable than white or Asian workers due to Hispanic workers' over-representation in the construction and agricultural sectors and black workers in transport (Muro et al. 2019).

Whilst it is routine jobs that can easily be defined by a mathematical equation that are most at risk (Pugliano 2017), no occupation will be unaffected, according to Muro et al. (2019). The result will be the substitution of human paid work by AI and advanced robotic automation, the outcome of which will be mass unemployment. Providing lists of the specific occupations at risk has become vogue. Drawing on Pugliano and other research, one such list is provided by Copeland (2018) see Box 4 below.

Box 4: The types of jobs that the robots are predicted to take

travel agents	IT support
postal workers	photo processors
telephone switchboard operators	jewellery workers
mortgage brokers	bookkeepers
broadcasters	middle managers

Source: Copeland (2018).

Whilst Dunlop (2016) contends that such claims can be overplayed and are often mere speculation, as Warhurst et al (2019f) note, there are genuine ballot-box implications for politicians in the developed countries if the most vulnerable workers with least capacity for job-hopping to other opportunities are those most likely to be replaced by the clever robots. And it is this malign account and the apocryphal reports of mass unemployment that most concerns policymakers – and business commentators.

However a closer reading of these claims, such as the jobs collated by Copeland (2018), reveals that these jobs' demise is sometimes more apparent than real. No doubt some of the occupations are at technological risk of replacement, travel agents and photo processors for example. Some postal occupations are also at risk – sorters most obviously. However delivery jobs, whilst they might disappear from the old companies, are often simply displaced through outsourcing to new platform-based companies which use 'gig workers' (see below). Other occupations, IT support and jewellery making, for example, are disappearing in the developed countries because they are being offshored to the developing countries – admittedly made easier by the new digital technology. With this development, although they are lost in the developed countries, jobs can be created in the developing countries, at least until the price of labour in those countries rises.

In the benign account, digitalisation is less destructive. First, not all physical or cognitive tasks can be yet, if ever, automated, even when supported by AI and machine learning, Levy and Murnane point out. For example, baby diaper changing cannot be automated, even with AI and machine learning. At best, some tasks within jobs are more prone to technological replacement than others. More nuanced assessments of jobs' vulnerability to technological situation note that the percentage of jobs that can be fully substituted by digitalisation is low. Across 21 OECD countries only about nine per cent of jobs face a high risk of 'automatibility' – that is, with at least 70 per cent of tasks that could be fully automated. Another 25 per cent of jobs have 50-70 percent of tasks that could change significantly because of automation (Arntz et al. 2016). OECD estimates suggest that 14 per cent of jobs in OECD countries are at high risk of automation and an additional 32 per cent face substantial change (OECD, 2018b).

It might also be that digitalisation complements and even enhances rather than substitutes human work (Autor 2015; WEF 2017). In this respect, it needs to be appreciated that the balance of different tasks (physical, cognitive etc.) varies in each job. Moreover some tasks are routine, others complex. With digitalisation, it is suggested that occupational composition and the skill profiles of these occupations will change as humans work alongside the new technologies. Three closely related versions of what might happen then follow. First, robotics and AI have the potential to reconfigure jobs. In this respect, some skills will become obsolete but others will be added, a process termed 'enskillment' by Penn (1994) in relation to the changes to jobs wrought by the introduction of microchip technology in the 1980s. In this compensatory theory of skills, whilst new technology tends to deskill direct productive tasks, ancillary tasks rise in prominence, such as the installation, maintenance and programming of the new technology. Such tasks cross a spectrum of high to low skill, with maintenance involving repair and cleaning for example (see Wilson and Buchanan 1988). A version of the same argument was made later by Levy and Murnane (2004), who claimed that computerisation might not lead to the eradication of jobs but lead to changes within jobs. Second, and extending this point, the OECD (2018b), states that digitalisation can free up workers' time to do more productive, less routine tasks and to provide consumers with better products. Again the QuinnE research is instructive here. The use of Watson, the virtual assistant in the French bank, freed up workers' time to carry out more complex tasks and make response to customer requests more efficient. While this could theoretically have reduced the aggregate time needed for workers responding to customer requests there was no job destruction reported. The bank had an explicit strategy to use AI to alleviate employee workloads and to help customer advisors to improve services. Thus, despite initial fears, workers and union officials were satisfied that Watson's limitations meant that it was not going to be a serious threat to their jobs and could, moreover, enhance job quality by removing the need to carry out repetitive tasks and free up time for more interesting work (Perez and Martín, 2018). Third, Levy and Murnane state, all human work involves some cognitive skill – and social skill (Warhurst et al. 2017), it might be added; if digitalisation removes routine tasks, then cognitive and social tasks can expand. Or, as Levy and Murnane put it: 'increasing the importance of expert thinking and complex communication' (p.6). Jobs that are imbued with these types of skills tend to be 'good jobs' they point out. The implication is that there will be more workers in better jobs in the future – a possibility signalled in other research for QuinnE undertaken by Muñoz-de-Bustillo et al. (2016) applying Frey and Osborne's methodology to occupations of different job quality.

Finally, as Osbourne (2015) subsequently admitted, his original 2013 analysis with Frey omitted consideration of the new jobs that might be created by digitalisation. Each time that techno-anxiety has been stoked, for example in the 1960s when companies first started installing computers, more jobs have been created than destroyed (Economist, 2016). The problem is that it is difficult, if not impossible to predict what new jobs will emerge in the future. However hindsight allows

identification of jobs that were not predicted. The World Economic Forum, for example, lists a number of jobs that did not exist ten years ago, most of which are digital-related, including: app developer, social media manager and drone operator (WEF 2016).

The technology that enables the digitalisation of production thus has the capacity to substitute paid work and there will be some jobs lost. Nonetheless, there is some realisation that the future will not be one of simple mass unemployment: it is equally likely that some jobs will be saved, others reconfigured and new jobs created.

The digitalisation of work

Put prosaically, the digitalisation of work rests on the emergence of platform companies and the migration of work to these platforms. Platforms are digital networks that coordinate economic transactions – usually matching the demand for and supply of resources through algorithms. The use of platforms for the delivery of an increasing range of goods and services is one of the most pervasive and visible forms of digitalisation and has significant implications for the way work is organised, managed and regulated. Uber has become the posterchild (Walker Smith, 2016) of the putative ‘platform economy’ and ‘Uberisation’ suggested as the model for the future of work (cf. Bernhardt, 2016).

However different types of platforms exist: those for the exchange of goods; and those for the exchange of services; those driven by ‘requesters’ that can be companies or individuals; and those driven by workers offering goods and services. However, as Howcroft and Bergvall-Kåreborn (2018) note, most platforms are open to all workers to generate network effects, drive platform expansion and reduce competition. Workers can register their services on the platform and then ‘requesters’ post tasks on the platform that they want completed and an algorithm is used to match workers to tasks based on parameters such as location, availability, skills/features and, perhaps most importantly, user ratings. Brokering supply and demand, platforms provide the possibility for work to be carried out anywhere around the world at any time in a ‘truly global, digital assembly line’ (OECD, 2017). While communications technologies have presented this possibility for a number of years it is the integration of digitalisation that enable better matching of clients to workers and the possibility of remote monitoring of work that has led to the explosion of this form of working. In this sense online digital platforms represent a new business model and also enable the delivery of services in a new way, even if some of the services provided through the platforms are not new.

Within this platform economy, ‘gig work’, ‘crowdwork’ or ‘on-demand’ work (OECD 2017) covers low- and medium-skilled services such as babysitting, flatpack assembly, cleaning and home repairs, to more highly-skilled services such as photography, language tuition and web design. As such work can be routine and non-routine, local or global. Tasks can be physical (e.g. TaskRabbit), intellectual (e.g. Upwork) and social (e.g. Bubble). Work in these platforms could be done online or mediated by the platform and executed offline (Meil and Kirov, 2017). Remote gig work comprises both ‘microwork’ – jobs broken down into small tasks that can be distributed to large numbers of people to perform via platforms such as MTurk and Crowdflower, which tends to be low-wage with low worker control, and online freelancing which is more akin to traditional freelance work and is generally high-wage, high worker control (Wood et al., 2018a). Platforms used for the latter type of work include UpWork, Freelancer.com and Fiverr. This platform services provision can be collapsed into two forms, with the second having two variants, as the OECD summarises, see Box 5 below.

Box 5: Types of platform services provision

... work can either be carried out *offline* and locally (which include ride-hailing, delivery and domestic services) or entirely *online* and hence globally (which included *low-skilled* ‘click work’ as well as *high-skilled* freelancing).

Source: OECD (2018a: 1; emphasis added).

Analysis by Kuek et al (2015) shows that in 2013 there were 48 million registered workers using online labour platforms worldwide, although only 10 per cent were ‘active’. Online freelance work was estimated to be much larger than microwork accounting for around \$1.9bn of the total \$2bn gross revenue, with microwork only accounted for around \$120 million. In the case of both microwork and online freelancing, the markets were found to be dominated by a few large platforms with Amazon Mechanical Turk (MTurk) and Crowdfunder representing around 80 per cent of the market in microwork and Upwork, Freelancer.com and Zhabajie/Witmart representing about 50 per cent of freelancing. The Online Labour Index (OLI), and index of English-language labour platforms (again excluding local-gig work), developed by Kassi and Lehdonvirta (2018a, 2018b) shows that such work has grown by 21 per cent between May 2016 and January 2018 with software development and technology skills most in demand (representing around one third of vacancies, followed by creative and multimedia work, then clerical and data entry work. In the studies presented by Ojanperä et al. (2018), the global nature of these transactions is revealed, with the majority of work using these platforms posted in the developed countries and the work being carried out in lower-income countries. Around half of requests for work were posted by clients in the US, UK, India, Australia and Canada, while the majority of workers were in India (25%), Bangladesh (16%) and the US (12%). In this respect, the use of online platform work can be viewed as a ‘new wave’ of globalised outsourcing, particularly to low- and middle-income countries (Graham et al. 2017; Wood et al. 2018b).

The potential outcome of this digitalisation of work is not the end of human paid work but the death of employment as jobs are replaced by contracts to undertake micro-work tasks by gig workers and freelancers. As Piasna and Drahokoupil (2017: 315) argue ‘digital technologies allow better coordination of workers across space and time, enabling increasing reliance on flexible and non-standard work’. In short, platforms allow work that would previously have been done by an employee to be outsourced to an on-demand worker (Ojanperä et al. 2018) and, with it, the standard employment relationship and good jobs could disappear. It should be noted however that the extent of this type of work is low still. Analysing data from the COLLEEM survey³ of internet users from 14 EU member states, Pesole et al. (2018) found that only ten per cent of adults reported having ‘ever’ used an online labour platform, less than eight per cent reported having done so frequently, less than six per cent had spent at least ten hours per week doing platform work or earning a substantial proportion of their overall earnings (at least 25% of income) from it. These figures confirm that there are still only a few ‘platform dependent workers’ who derived a larger share of their income from micro-tasking (see D-G for Internal Policies 2017). Nevertheless, concern about the potential for the digitalisation of work to eradicate the standard employment

³ The COLLABORATIVE Economy and Employment (COLLEEM) survey of 32,409 internet users undertaken in 2017 covered: Germany, Netherlands, Spain, Finland, Slovakia, Hungary, Sweden, UK, Croatia, France, Romania, Lithuania, Italy, and Portugal.

relationship perhaps explains the larger volume of research now emerging on the digitalisation of work, though, again, there are both positive and negative accounts.

On the positive side, on-demand consumption is offered as a key benefit of the platform economy. It provides more transparency and availability whilst also lowering transaction costs (De Groen et al. 2016). Platforms help match clients and workers more quickly and efficiently leading to efficiency gains. Irani (2015) notes, for example, that, drawing on a global workforce, MTurk enables large numbers of tasks to be carried out much more quickly than would be possible using traditional freelancing. These service providers are simply 'everyday entrepreneurs ... seeking to shake up the market by solving other people's problems' according to the UK Government (HM Government 2015). Moreover with costs lowered and ease of access, usually through an app, services are democratised, meaning that even low income consumers can use them so that, overall, a conflation occurs between service users and providers. In addition, on-demand and gig work is argued to offer both clients as service users and workers as providers flexibility about when work is carried out.

This flexibility is frequently cited as a key advantage for workers, who can choose not just when to work but how. Using the COLEEM survey, Pesole et al. (2018) found that motivations to engage in platform work (delivered locally or remotely) revolved around flexibility and autonomy, and that self-reported conditions of work tended to reflect this motivation. Among the ten per cent of adults who reported having ever used an online labour platform for 'location independent, web-based' services or for 'work delivered on-location' the motivations for choosing platform work that tended to be rated as more important were: preferring flexibility over where to work, preferring flexibility over when to work, the offer of work that was compatible with family commitments, and a desire to be 'my own boss'. However, many platform workers rated 'difficulties in finding standard employment' as an important motivation for choosing platform work. The self-reported conditions of platform workers tended to support the idea of flexibility with the majority agreeing that they could decide when and how many hours to work.

Analysing administrative data from Uber, Hall and Krueger (2018) found that, when compared to taxi drivers, Uber drivers work fewer hours but tend to earn at least as much per hour – between \$16.23 and \$23.87 per hour depending upon US city. They also found that Uber drivers seem to make use of the flexibility, often working significantly different hours from week to week. This relative benefit they attribute at least in part to the way in which the taxi medallion system works in the US, whereby taxi drivers must pay lease a medallion on a daily or weekly basis which incentivises drivers to work long hours during the lease period. Hall and Krueger also highlight the importance of ratings in the system. Drivers' reputation is an important factor using the platform with drivers with good reputations tending to be rewarded with more fares. As customers rate driver performance, it incentivises drivers to perform well and maintain a good reputation, whereas taxi drivers are generally anonymous and need not concern themselves with reputation. In their survey of Uber drivers, Hall and Krueger found the vast majority of 'driver partners' had registered with the platform to earn money and make up for a lack of stable income, to be their own boss and to have more flexibility to set their own schedule. Indeed there was evidence that drivers valued this flexibility, with many saying that the flexibility driving for Uber offered had improved their lives and nearly four in five said they would prefer to be independent workers rather than employees.

In the two forms of on-demand working outlined above, platform companies claim to simply provide a way for workers to offer their services more or less directly to clients or customers, in theory making them 'independent contractors' (in US legal parlance), taking out an intermediary employer from the equation and providing greater autonomy for workers.

Self-identification by gig workers as ‘entrepreneurs’ or ‘aspiring entrepreneurs’ is an important narrative, with this type of working offering them ‘considerable discretion’ and ‘perceived flexibility’ and opportunity to save money to start a business and develop the ‘dispositional attitudes’ needed to succeed as an entrepreneur (Wood et al, 2018a). Indeed, the narrative of entrepreneurship and workers being their own bosses, which is promulgated by proponents of the platform economy, is important in attempts to gain acceptance amongst policymakers and the public for on-demand service provision (Wood et al. 2018a).

However, nearly one third of respondents in Hall and Krueger’s study said that they were working for Uber in order to earn money while looking for a steadier, full-time job. Hall and Krueger suggest that Uber may then provide a helpful ‘bridge’ (or ‘stepping stone’, Lane 2018) to better work for some drivers, whilst acknowledging that Uber might not be their preferred option for work. Other studies provide some evidence that flexible forms of working can enable people with weaker attachments to the workplace enter employment (Piasna and Drahokoupil 2017). Barnes et al. (2015), for example, point out that over the life-cycle workers’ personal circumstances and needs change and that on-demand work can benefit workers not able to be employees, helping overcome their barriers to labour market participation.

Negative accounts question this flexibility and autonomy, emphasising instead platform companies’ control of workers and the ambiguity over these workers’ employment status. Indeed the techno-anxiety with the digitalisation of work centres on this status. In the UK Government’s 2017 Taylor Review of Modern Working Practices it is framed in terms of the rights of service providers and responsibilities of platform companies. As the trade union journal Labour Research (2016) explained: ‘Those working through these platforms do so outside of traditional employment relationships and without the rights and protections that come with normal employment contracts.’ These rights and protections disappear if providers are labelled as independent contractors. The issue has become whether this labeling is wrong: the platform companies say not; some research suggests otherwise.

Rosenblat and Stark’s (2016) research suggests that while Uber drivers do exercise some forms of autonomy, generally, this autonomy is limited. Despite invoking the imagery of autonomy and partners status as independent entrepreneurs, Uber exercises ‘soft control’ over its driver partners. For example, blind passenger acceptance means that drivers must accept or reject a passenger within 15 seconds without seeing where the clients want to go. This practice results in drivers not having an informed right to accept or refuse work and minimum fares mean some rides may earn very little, and, in some cases, drivers may make a loss on some rides. Uber monitors driver productivity, keeping comprehensive data on its drivers’ trips, fares and time and uses this data to measure their waiting location and time, time-to-task and working time. It is performance management, and Uber deactivates drivers (i.e. switches off access to the app) for poor productivity. This action is significant: unlike independent contractors, drivers do not build their own client base; the client base comes through the app. Moreover, and significantly, unlike independent contractors, Uber drivers are subject to standardized price-setting – drivers cannot set their own rates nor negotiate them collectively. Uber not only sets the price of rides, it unilaterally alters and varies ride pricing. Such controls indicate the control Uber has control over drivers, Rosenblat and Stark argue.

Even the earnings figures cited by Hall and Krueger (2018) have been challenged. Once driver costs such as fuel, maintenance, vehicle depreciation and insurance are included, driver income can be

less than that suggested by Hall and Kreuger. Research by Mishel (2018) shows that the effective wages of Uber drivers after deducting fees, drivers costs and social security are much lower at around \$10.87 per hour. Factoring in the equivalent health and retirement benefits or social insurance that most employees receive, Mishel's analysis calculated the effective wages of Uber drivers to be lower still at \$9.21 per hour. This figure places them at roughly in the 10th percentile of the wage distribution and below the minimum wage in nine out of twenty driver markets in the US. Uber drivers might value their flexibility to work but once in work appear highly controlled and relatively poorly paid.

Beyond Uber, Wood et al. (2018b) similarly highlight how algorithmic management effectively structures the work process and provide examples of how platform companies monitor the work of freelancers (although they also highlight worker circumvention strategies). As with other forms of platform work, online freelancers were attracted by the perceived autonomy and flexibility that it offered. While platform working afforded some autonomy, workers reported work intensity. Pesole et al. (2018) too noted that a significant proportion of platform workers indicated that their platform-derived work was stressful. Because of the large number of workers using the platform there was considerable competition for work, which gave workers little control over the price of their labour, Wood et al. noted. The only way for workers to increase their income was to undertake more work. Workers needed to complete the work as quickly as possible so that they could take on more work. Wood et al. note that this work intensity reflected workers' relative lack of information and power compared to that of the platform company using its algorithmic management. Similarly in his study of on-demand delivery workers Shapiro (2018) found workers had insufficient information from the platform to be able to make choices about accepting or rejecting work constrained their ability to make independent, informed decisions.

Again, as with Industries 4.0, it should be noted that the platform not only retains information about the requester and worker, some platforms harvest data about how workers do the task, for example the routes that Uber drivers take. This data could then be used digitally by Uber to programme any future driverless cars. As such, the tacit knowledge of the worker becomes the commercialised asset of the platform.

The issue is whether these asymmetries of information and power undermine invocations of autonomy and worker status as 'independent contractors'. The employment status tests rest on issues such as remuneration by time or task, freedom to work for others, the right to delegate or sub-contract work to others, control over work schedule and the right to accept or reject work (Shapiro 2018; Stewart 2019). Uber claims not to be an employer but merely a broker, through an app, of service provision and use. This brokerage role absolves the company of employer responsibilities. In the US the use of independent workers is attractive to employers as it frees them from a number of costly obligations such as minimum wage, overtime, contributions to social security, medicare, equipment costs, workers compensation, unemployment and health insurance, see Uber example below in Box 6.

Box 6: Uber and the delivery of transport services

Uber has become 'shorthand' for business models in the new digital economy. Founded in 2009, Uber now operates in 633 cities worldwide with an annual revenue of \$20bn. It styles itself as a digital platform that matches users (ride-seekers) with providers (drivers). Uber insists that it is only a technology provider – an app – with drivers paying to access the app to connect them to users. Users pay Uber, which charges a service fee, most of which is then passed on to drivers. Drivers are not employed by Uber. Consequentially they receive no health insurance, holiday pay, (paid) sickness leave or minimum wage. The premise is that drivers have the flexibility and freedom to work whatever hours they please: 'self-management' by 'independent entrepreneurs'. As Uber tells its drivers, 'you're in charge'.

Source: Warhurst et al. (2019f: n.p., drawing on Rogers (2015) and www.uber.com).

Similarly, Amazon seeks to dispel any suggestion that it is an employer by specifying that when workers register, they (the worker) will be supplying their services as 'work made for hire' for the requester and that the copyright for any works sits with the requester. Amazon further specifies that the worker is in no way eligible for holiday pay, sick pay, health insurance, retirement or accident compensation, and that workers are personally responsible for any tax they may need to pay.

Bergvall-Kåreborn and Howcroft (2014) note that, with service providers being labelled independent contractors, platform companies offload risks and costs by accessing a flexible, scalable workforce, simultaneously bypassing the traditional boundaries of labour laws and regulations. However they question this status, arguing that Amazon, for example, does not merely act as a broker for work but also shapes the terms of employment:

Amazon's MTurk is more than a mere facilitator of digital outsourcing services or a passive broker ('payment processor') in a long supply chain ... it plays an active and fundamental role in establishing the conditions for crowd labour. The platform makes possible the exercise of control over employment relationships. (p.220)

Unless this role is recognised, they continue, such companies will continue to bypass regulatory procedures when procuring labour, and workers' rights will be lost, with delirious consequences for the quality of working life.

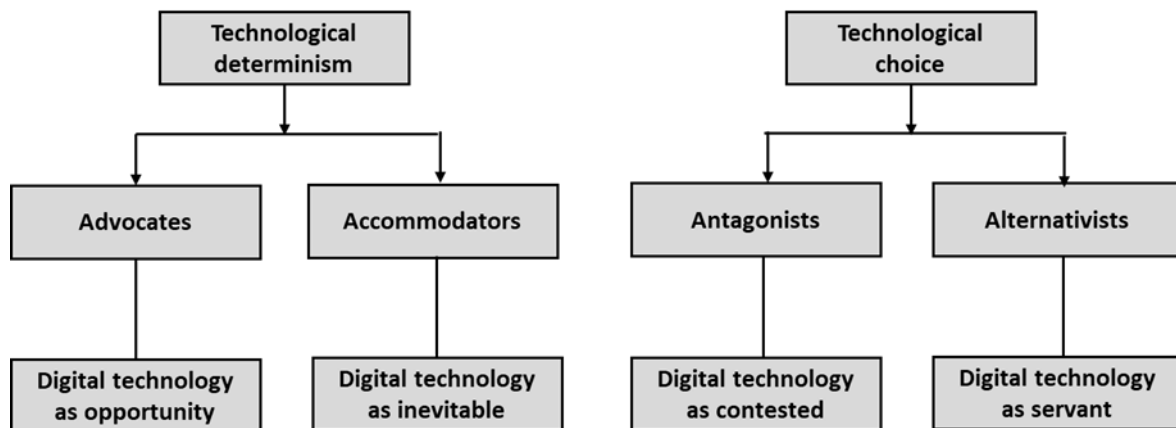
Thus, whilst offering benefits to consumers and some flexibility for workers, the digitalisation of work raises concerns about the employment status of these workers. If the position of platform companies holds, and the extent of micro-working and freelancing continues through the use of these companies, the future might be the end of employment and the loss of worker rights.

Perceptions, positions and policy responses to the digitalisation of work and employment

Policy responses are implicitly or explicitly underpinned by two different perceptions about new digital technologies – one that it is deterministic, the other that choices exist about its adoption and use. Technological determinism sees technology as shaping the social organisation of economic activity. As one variant of contingency theory, Woodward (1965) was early in arguing that organisational structures and practices should follow the type of technology being used by those organisations. Now, as Fleming (2018) notes, there is a similar fetishisation of the new digital technologies. In part a contemporary critique of Woodward’s thesis, Child (1972) contended that ‘strategic choice’ exists in the introduction and implementation of technology. Child saw this choice as exercised by powerful actors within companies, for example management and trade unions. This choice could be extended to actors outwith organisations to include governments, social partners, users and providers, as well as the public (Clark et al. 1988). It suggests not working within the constraints imposed by technology, as determinists would argue, but choosing what constraints to impose upon technology.

Drawing on these two perceptions – technological determinism or technological choice – Warhurst et al. (2019f) identify four positions that inform thinking about policy responses to digital technologies, as Figure 2 below illustrates. Identifying these different positions and disentangling their suggested policy measures is important because each position has a different goal in terms of the social organisation of economic activity with digital technology.

Figure 2: *Perceptions and positions about digital technology*



Adapted from: Warhurst et al. (2019f).

Advocates

The first position is wholly positive. Advocates argue that digital technology should be actively embraced as an opportunity. Both the political far Right and far Left laud the coming of advanced automation and the platform economy.

For those on the Right the hope is *liberalisation* through technology. The platform economy enables innovative individuals to be able to cut through red-tape imposed by big government that hampers

entrepreneurialism. Platform companies create a direct relationship between users and providers that is ‘an unregulated, voluntary, mutual benefit market exchange ... part of a new liberated economy that is slowly but surely transcending government shackles’, according to the libertarian Massimino.⁴ Automation offers opportunity to reduce the size of government. Rightwing think-tank Reform argued that 250,000 jobs in the UK public sector could be cut through automation, for example (Hitchcock et al. 2017). Fleming (2018) even suggests policy thinking exists around robotizing policing.

For those on the Left it offers *liberation* through technology. If the employment relationship is fraught with structural antagonism, asymmetrical power relations favoring employers and is materially exploitative, as Pollert and Charlwood (2009) state, then platform working offers self-management and self-determination. At the very least it offers workers opportunity to supplement their incomes or pursue non-exploitative work for pleasure, whether through the manufacture and sale of own-produced artisanal goods or as a ‘side-hustle’ asset or activity for the benefit of the producer not employers or clients (Guillebeau 2017).

Although with variations, there is cross-position consensus that the employment relationship should end. It is an anachronism of the industrial age, being, on the one hand, constraining, and on the other hand, unjust, and better replaced with workers as free agents.

Accommodators

The second position adopted by accommodators is held by the center Right and centre Left and accepts the new digital technology as inevitable but recognises that there will be a number of socio-economic challenges that need to be addressed. In other words, some adjustments are needed to soften the worst impacts of digital technology on work and employment. Most current policy thinking and development adopts this position. Accommodators can be *conservative* or *radical*.

- In terms of the platform economy, the conservative approach accepts that many gig workers and freelancers are not genuinely self-employed. Policy measures then centre on changes to classifications, with the options being: confirm and enforce existing employment status laws; clarify and expand definitions of employment; create rights for workers, not just employees; and reconsider the concept of employee (Stewart and Stanford 2017). Another option flagged by Stewart and Stanford is to create a new legal third category status between self-employment and employment – they suggest ‘independent worker’, others in the EU and US advocate ‘dependent contractor’ (Taylor 2017; Harris and Krueger 2015; Eisenbrey and Mishel 2016; Stewart and Stanford 2017; Lewis Silkin 2017). Two accompanying policy suggestions made, first in the UK Government’s 2017 Taylor Review, are to compensate gig-workers and freelancers for their precarity with a wage supplement, in the UK case with a fixed supplementary payment above the level of the National Living Wage⁵ or second, from the OECD (2017), to extend minimum wage regulations to independent contractors. At the very least there will be a need to update social protection policies in relation to growing non-standard employment. (OECD 2018a, 2018b; EPSC 2016; ILO 2017). With respect to advanced

⁴ Quoted in Dunlop (2016: 129).

⁵ Formerly what was called in the UK the National Minimum Wage.

automation, the conservative approach recognises the potential for mass unemployment and seeks to develop policies that will, in effect, ensure the employability of workers in what will then become a competitive labour market and regionally-focused adjustment plans to increase demand for less risk-prone jobs. Options include: active labour market policies that support workers displaced by digital technology to find new jobs; social protection such as income support and re-employment assistance; enhancing skill policies focused on both digital literacy and soft skills such as problem-solving; and ensuring lifelong learning opportunities to enable the updating of skills over the course of working life. This latter measure could be supported by the introduction of a skills endowment fund and a revamp of higher education to emphasis employability and entrepreneurship skills. In addition, Big Data could be used to monitor skills demands and changing occupational compositions to enable better careers advice and guidance. Finally, regional entrepreneurship needs to be encouraged (OECD 2017, 2018c; ILO 2017; EPSC 2016).

- The radical approach accepts that the job losses will occur as paid labour is substituted or that employment opportunities might shrink if the platform economy expands. At best, income opportunities for citizens will be reduced, at worst, there will be growing poverty and social inequalities. At a minimum, welfare might need to be redesigned with entitlement aligning within individuals rather than jobs or unemployment. Going further, residual work could be distributed across the workforce, with workers equipped with digital and soft skills to boost their capacity to participate in this residual work. For periods between work, welfare support will be needed as a safety net. Based on explicit redistribution policies, this welfare support would deliver a guaranteed minimum level financed through robot (including algorithm) taxes. It will also be necessary to ensure that all types of non-standard employment workers are captured in both welfare and tax systems, with digital technology used to this end (Berg et al. 2018; OECD 2017; Ojanpera et al. 2018). In addition, it is proposed that a minimum level of employment protection be introduced for all workers accompanied by adaptations of existing regulations such as health and safety to again cover all workers (OECD 2017; see also the call for job quality standards made by the ETUC, Davies 2015). The ETUC goes further, arguing that Industrie 4.0 requires a new social contract with improved workers consultation and participating (Davies 2015). Such calls resonate with a recommendation subsequent to the UK's Taylor Review to develop minimum standards of job quality to cover pay, terms of employment, the nature of work, social support and cohesion, voice and representation, health and safety, and work-life balance (Irvine et al. 2018). Ojanpera et al. (2018) suggest that such regulation should extend along global value chains using international certification schemes.

Although having two approaches and a raft of policy proposals, the basic underlying principle is that workers and regions need to be prepared for the changes that are coming, whether that preparation centres on ensuring the employability of and safety nets for workers through to regional economic development policies. The difference between the two approaches rests on the degree to which regulation is thought to be needed.

Antagonists

The third position is adopted by antagonists. Antagonists contest the current use of digital technology, directing their ire at platforms in particular. However suggested policy measures take two forms. The first are aimed at platform companies, the second aimed at the platform economy, though the second extends beyond platforms.

- Organising workers against platform companies is recognised to be challenging but possible. It is difficult because companies such as Uber seemingly lack a single site/physical presence i.e. a 'workplace'. Workers, not just clients, interact with the company through the app, and they are spatially dispersed and disaggregated, and individualized in their relationship with the platform company. Moreover, union membership fees can be relatively costly for low-income workers (Labour Research 2017). Despite such structural barriers, there are instances of Uber drivers organising collectively. The capacity for organisation is enhanced by Uber drivers being tech-savvy and able to mobilize social media campaigns (Rogers 2015). For example, the International Association of Machinists and Aerospace Workers has formed the Independent Drivers' Guild, an association for New York City's drivers. The guild represents drivers in meetings with Uber, including when drivers appeal against Uber decisions to deactivate them. It aims to secure better terms and conditions for workers. In the UK a similar Independent Workers Union exists. It attempts to organise workers into co-operatives or help them develop their own apps for their services (Labour Research 2017). Trade union organising is supported by the OECD (2017). It wants to encourage social dialogue and worker voice. It recommends multi-level collective bargaining with a significant role for firm-level bargaining for on-demand workers. Ojanpera et al. (2018) note however that success in organising and bargaining for these workers will require unions to develop novel approaches. Echoing the accommodators – radical and conservative respectively – proponents of the new bargaining want rights to voice and representation to be legally binding as well as new classification of on-demand workers (e.g. Berg et al. 2018). Similarly echoing another recommendation of the Measuring Job Quality Working Group (Irvine et al. 2018), Berg et al. would also like to see platforms companies' terms and conditions clearly and concisely presented to workers. Moreover, if they are to be classified as independent, the logic, state Berg et al., is that these workers should know who their clients are, the nature of the task being requested and also be able to continue their service relationship with clients off-line.
- The second form takes issue with the platform economy and seeks to do more than soften its worst effects. Instead, it rails against the platform economy's structural undermining of the standard employment relationship. It wants active labour market policies from government, and jobs that pay decent wages, meaning, in practice, workplaces organised by trade unions. Such jobs deliver more than decent wages but directly or indirectly include opportunity for workers to have social insurance. These jobs thus provide dignity for individuals and security for families; in short pride and prosperity. As such, this position is also critical of neo-liberalism, wanting instead to replace it with something like social democratic corporatism. On the one hand, some antagonists want to establish a solid floor of social protection and extend social insurance provision to all types of workers, paying for it by capturing these workers in a technology-driven streamlined tax system (Berg et al. 2018). On the other hand, some antagonists' benchmark is the golden era of Fordism in the mid-twentieth century when male, manual workers in manufacturing dominated and the (male) bread-winner model of employment existed (Dunlop 2016). In this sense, this second form extends beyond critique of the platform economy to include a desire to prevent technological unemployment more broadly. The argument is that if having a job is the best protection against social exclusion and poverty, then the best form of social protection is having a job, preferably a good job (however defined, see Warhurst et al. 2017). Policy therefore should be based on ensuring full employment of the type purported to have existed before the rise of neoliberalism. 'The first – and most fundamental protection – is a job', Jenny Macklin, former minister in the Australian

Government explained, 'But not just any job', she continued, ones that 'ensur[e] that everyone can live a decent life.'⁶

Antagonists want to push back against platforms and the digital technology, not simply ameliorate their worst impacts. They would either like workers to be able to organise against platform companies and, presumably as a consequence, negotiate better terms and conditions or reimpose the standard employment relationship and full employment for its perceived benefits for workers and their families.

Alternativists

The fourth position rests on a fundamental alternative harnessing of digital technology to serve humans. Two possibilities are advanced by the alternativists: one centred on different use of platforms, the other on maximising the potential of the digitalisation of production.

- In terms of the first, an important distinction can be made between commercial and non-commercial platforms. An informal sharing economy has long existed between friends, family and neighbours. It is reciprocity not commerce that governs the exchange of resources. Using platforms, the new and formalised 'sharing economy' does not necessarily need to involve commercial transactions and the commodification of goods or services (Belk 2014; Font-Mas 2018). However few non-commercial platform companies exist. Using the term 'sharing economy' in relation to Uber or Airbnb is a distortion of its essential meaning. Despite the use of such language, Uber is not really a ride-share offer made by a driver already going in the direction of the client. Airbnb is no longer an opportunity for ordinary people to temporarily capitalise on an under-used bedroom in their homes but an opportunity for commercial landlords to access the travel market (Schneiderman 2014; Gladstone et al. 2019). There have been calls by the Left in the US and EU, see Olin Wright (2015) and Mason (2016) respectively, to establish a genuine non-commercialized sharing economy with a 'Do-It-Yourself' approach to exchange. This approach would undermine capitalism and the commodification of goods and services, including labour, they state. Thereafter the issue for Mason is not whether apps will eradicate human work, paid or otherwise. For Mason, apps should be used to eradicate human work, leaving humans more time to be human.
- This post-work thesis is extended to the digitalisation of production and championed by Dunlop (2016). As with Mason, Dunlop argues that work should be left to technology. This post-capitalist society is a choice, Dunlop states, based on wanting *liberation not from the employment relationship but from work itself* through technology: 'the postwork position calls for full unemployment to be adopted as policy ... the ability of humans to flourish lies in a world in which technology – robots, artificial intelligence and the rest of it – takes over most of the productive work of society' (p.193).⁷ This post-work world would eradicate the inequalities that are structural requirements of capitalism and which deny humanity, he states. Anti-work (in the broad sense meaning jobs), it is an anti-standard employment relationship position. Freeing the population from the drudgery of work and employment would require policies that aim not to distribute residual work and underpinned by targeted welfare support but which aim

⁶ Quoted in Dunlop (2016: 185).

⁷ Emphasis in the original.

to maximize the productive capacity of digital technology, capture the wealth created and deliver its radical redistribution through a universal basic income (UBI). This UBI would go beyond the provision of minimum needs and intended to lever the unemployed into work, as recent experiments in Finland have attempted (and failed, see Nagesh 2019). Instead this UBI would provide stability and support outside the wage system. To support his argument, Dunlop asserts that the crux of complaints about the future of work is not the lack of a guarantee of a decent job but having no guarantee of a decent life. However, it is a long-term political project that is unashamedly ambitious and utopian, Dunlop admits, and more prescription than prediction at this stage. Although, he states, 'if the jobs really are going to disappear then postwork loses its radical edge and simply becomes necessary' (p.195).

The position regards the digital technology as a welcome means for radically reconfiguring the social organisation of economic activity that will deliver system change in which technology becomes the servant of humans rather than its master.

Emergent policy themes

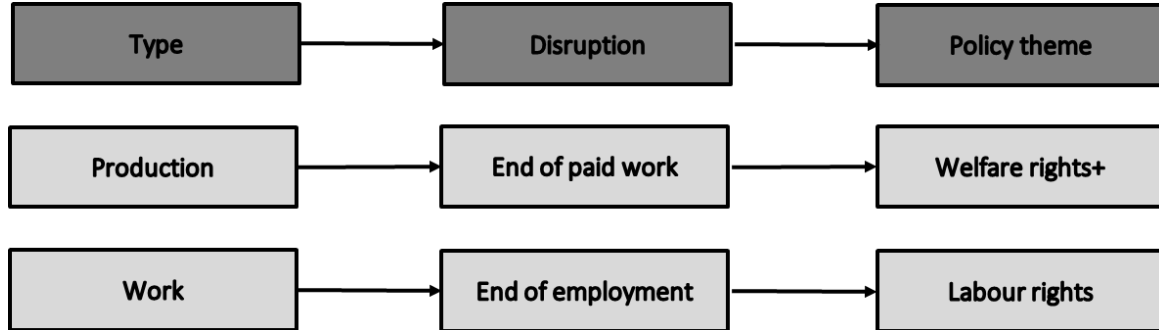
Although there exist different positions on technology, most explicit policy thinking centres on the accommodation and to a lesser extent, antagonism positions. Each though has different champions and themes.

The main policy theme to emerge from debates about the digitalisation of production, with Industries 4.0 as its emblem, is that, in order to soften and manage the anticipated mass unemployment, welfare support, broadly defined, needs to be redesigned, see Figure 3 below. Focusing mainly on measures that intervene in the supply side of the labour market, it suggests a kind version of Danish-style flexicurity approach for the digital age that presupposes flexibility in the labour market which then needs to be supported with enhanced social security provision for workers displaced and transitioning in that labour market plus active labour market policies underpinned by rights for the unemployed – and workers. It is centred to a large extent on boosting education and training for all workers to provide them with digital and other skills throughout their working lives. In many respects, in terms of policy approach and measures it is more of the same from the same top-down sources – the OECD, ILO and European Commission. Moreover it largely accepts the dominant narrative about digital technology being deterministic. However, cast as updated flexicurity, it has a policy coherence and clear purpose – to attain and maintain the employability of workers – and an aim – social protection.

Policy thinking around the digitalisation of work and platforms is much less technologically reductionist. It challenges the use of technology through bottom-up measures on the part of trade unions through the law courts and employment tribunals and individual workers collectivising into new trade unions or taking action against individual platform companies. In essence it seeks legally clarified, improved and enforced labour rights, see Figure 3 below. Not surprisingly support comes from the ILO and, when it comes to individual platforms companies, if not the platform economy, and better social dialogue at least, the OECD. In many respects it is the re-assertion of 'classic' industrial relations for the digital age and not surprisingly championed by trade unions, and, in some respects, if 'independent workers' can be organised successfully on any meaningful scale, it might herald trade union renewal within, or at least relevance for, the digital age. Its most obvious thinking is that concerns that employment might disappear to be replaced by micro-tasking might be allayed by reinforcing the employment status for workers currently 'misclassified'. More

expansive policy thinking around this position would like to see reaffirmation of full employment with decent jobs as a policy aim.

Figure 3: Types of digitalisation, their disruptions and policy theme



Source Authors' own elaboration.

It should also be noted that there are omissions currently in policy thinking across these two positions, both of which arise from the digitalisation of production but can extend to the digitalisation of work.

The first centres on the potential and actual workplace surveillance of workers through digital devices. This issue has attracted less policymaker and academic attention. Even amongst practitioners it has only 'medium' status (see WEF 2017). Even with the new EU GDPR, the managerial opacity and bias problems raise important privacy and human rights issues that need to be addressed. The issue is the legitimacy of companies digitally collecting data covertly or even overly on worker behaviour. At the moment the justification is security issues but the capacity to move beyond security to simple performance and evaluation. When this issue is raised currently, it tends to be in terms of part-defining whether a worker is a dependent or independent contractor for a platform company; that is, whether workers self-determine, for example, what they do, when they do it and how they do it, or whether they are managed and controlled by the platform company. However, data harvesting through digital technologies extends the possibility of a surveillance workplace to all companies that integrate IT with their production processes. It is not unlikely that the right of workers (as employees or otherwise) not to be surveilled without prior consent will emerge as an issue for EU policy deliberation in the future.

The second relates to the harvesting of information by companies (platform or otherwise) from individuals generated in the domains of both production and consumption, and which these companies then commercialise but without sharing the financial benefits with the individuals who generated the information and data. In other words, whilst surplus value is co-created, that value is singularly captured by the company. In terms of Industrie 4.0, Davies (2015) gives the example of a customer who requests an individualised product. The request and the effort and thought behind it are unpaid work. Once requested, however the question arises as to who owns the intellectual property rights to the design from which future value can be generated for the company. Similarly Uber can use the data that it collects on driver routes to then programme its future driverless cars. These two issues arise from the emergence of what Zuboff (2019) more expansively calls 'surveillance capitalism', within which, she says, there is a division between the watchers and the watched. At the moment the typical way to redistribute the surplus value is through governments taxing these companies. However the revenue gained remains disconnected from the co-creator, who accrues nothing directly. This situation might change as individuals seek to directly receive a share of the value they co-created.

Zuboff claims digitally-enhanced surveillance raises profound questions about the future of democracy. More prosaically, privacy and human rights, and intellectual property rights, are likely to become contested as organisations seek to collect data and then use it as a productive asset from which they generate commercial value whilst state-led surveillance systems seek to enforce privacy and ownership rights for those individuals who generate this data (Eurofound 2018a). These two issues need to be folded into policy thinking about the future of work and employment.

What likely impact will digital technology have on work and employment?

A key problem in trying to evaluate the necessity of these policies is that, as Fleming (2018) points out, the new digital technologies are 'fetishised': it is their potential that has become the focus of debate rather than their empirical realisation. In this respect, whichever of the four positions outlined above is adopted, development of policy responses to the expected impact of the digital technologies on the future of work is hampered by two evidential weaknesses. The first, and of its own making, is that debate tends to be a-historical and not incorporate past examples of similar claims and their empirical realisation or otherwise (cf. Perez et al. 2017). The second, over which policy development has little control, is the patchiness of the current empirical evidence base for both the digitalisation of production and work (e.g. see OECD 2018a), though the evidence base is beginning to improve (e.g. with the COLLEEM survey and the UK's CIPD survey – see below). Incorporating awareness of the historical precedents and the emerging new evidence can be instructive however.

Despite their dismissal currently as potential precedents, it is worth noting that there have been other claims in the recent past that new technology will result in massive job losses but which have failed to materialise. An obvious example of a specific such technology was the introduction of banking ATM (automated teller machine). With its widespread diffusion from the 1970s, there were fears that retail bank tellers, or counter staff as they might now be called, would be eradicated. After all, the ATM could undertake many of their core functions – dispense cash, receive payments and maintain accounts, and do so 24 hours a day, 365 days a year using integrated ICT networks within and across banks worldwide. However, rather than fall, the number of bank branches and banking employees rose. In the context of the deregulation of the financial services industry in some countries, the tasks of some existing bank jobs such as the tellers expanded to become sellers of financial products and 'back office' staff in call centres providing telebanking for example also emerged (Author 2015; Perez and Martin 2018).

The introduction of ATMs was enabled by what was, at the time, regarded as epoch-changing new technologies that, it was claimed, would eradicate most jobs – microelectronics. Various described as micro-processing using microchips, this 'general-purpose technology' enabled a steady reduction in production costs and an equally steady increase in capabilities (Eurofound 2018a: 1). For this reason, this, then new, technology was claimed to herald a 3rd Industrial Revolution and would result in the collapse of most jobs and reconfiguration of the work and employment of any residual jobs. Like now, this epochal transformation was said to be imminent – by the mid-1980s. The claim and reasons for this collapse echo those of the current 4th Industrial Revolution, as Box 7 illustrates with its extract from Jenkins and Sherman (1979).

Box 7: The 3rd Industrial Revolution's predicted collapse of work

We now stand on the threshold ... of a new industrial revolution ... It is impossible to over-dramatize the forthcoming crisis as it potentially strikes a blow at the very core of industrialised societies ... past experiences do not help. ... this new quantum leap in technology will be like no other ... Neither the recent technological changes nor the unemployment were similar. The pace of change, especially technological change, has been growing at an ever-increasing rate. ... replacing, in part, human labour ... exert[ing] an immensely destructive impact on both existing jobs and the future supply of work. ... [There will be] tidal waves of technological unemployment. ... People will be disemployed, and yet the goods and services will still be provided. ... Fewer jobs will be needed to produce the same level of goods and services, and there must be very radical changes in job content ... different systems could apply to different types of work and production or commercial methods.

Source: Jenkins and Sherman (1979: Preface, 1, 5, 9, 163, 165, 167, 182)

Because micro-chips can make production more efficient there will be little need for human paid work and in language that now seems intemperate, Jenkins and Sherman predicted a 'jobs holocaust' (p.182). Some jobs would still be needed they acknowledged: first, technologists and scientists to develop, install, maintain the new technology; second, irreplaceable jobs in people-oriented service industries such as doctors and dentists; third, university educators to train the first and second groups of workers; and, finally, jobs in the leisure industries such as playwrights and clowns to enlighten and entertain respectively the great mass of dis-employed people.

The perceptions of this development and the policy recommendations from it echo those of the current 4th Industrial Revolution. Micro-processing would undertake simple and complex tasks. If these tasks were assumed by the technology, then jobs would disappear, the 'industrialised societies will not, in the future, be able to provide work for all on a continuing basis', Jenkins and Sherman stated (p.10). As with Dunlop (2016) currently, Jenkins and Sherman claim though that the collapse of work was to be welcomed because jobs are unpleasant and people do not like doing them. Their dual concern was preparing policy responses to the imminent threat of mass unemployment and developing policies to pave the way for the 'ascent to leisure' (p.13) by which humans would reclaim and exercise their humanness and have a better life.

Jenkins and Sherman recognised that mass unemployment, particularly amongst youth, could be politically dangerous and lead to extremist policies of both the Right and Left becoming attractive. For technological change to have beneficial effect, therefore, it must offer maximum good for all, they argued. People clung to jobs because jobs provided income. The financial benefits from technological change were hitherto skewed to the few but allowed to be skewed by politics. The wealth created by the more efficient, they argued more productive micro-chip technology would need to be distributed throughout the population. The mechanism would be a version of the alternativists' UBI: a high 'unemployment benefit' that enabled people to stop worrying about job security and instead enjoy 'whole life security' (p.163). This welfare would be funded by micro-chip-driven high growth, high-profit manufacturing and services industries. Within these industries, residual jobs should be rationed, they stated, and for those workers unlucky enough to be in those jobs there would be job sharing and shorter working time with a 4-day week⁸, a 3-week month and at least four sabbaticals over a shorter working life. Moreover there should also be 'life-long

⁸ They estimated that by 2000 a standard working week would be 24 hours.

education' (p.169, or what is now termed 'lifelong learning') to enable continual retraining 'three or four times' over this shorter working life. They exhorted the EEC, as the EU was then known, to immediately start work on delivering these policies amongst its Member States and to be optimistic about the future, 'It is an occasion for hope, not despair', Jenkins and Sherman proclaimed (p.182).

Reference to Jenkins and Sherman is particularly useful because the microprocessor is regarded as 'the key technology' underpinning the current digital revolution (Eurofound 2018a: 9). It is equally useful therefore to note that the collapse of work did not happen as Jenkins and Sherman predicted. Contemporary research of the employment effects of the introduction of micro-processing shows that employer expectations of its capacity to be 'trouble-free' were unrealistic and intelligence in production remained split across both the technology and a workforce that was reduced but not eliminated (Wilson and Buchanan 1988). It also highlights that the expected rising unemployment was mitigated by a number of compensating factors, such as wages and, relatedly, consumer demand (Whitley and Wilson, 1982). Despite the widespread use of micro-chips in production, the EU workforce has not contracted but expanded since their introduction and widespread diffusion. The EU now has a larger workforce than it did in the 1980s and that workforce is projected to grow by a further 0.6 per cent to 2030 (Cedefop 2018). Indeed rather than the end of work, as Jenkins and Sherman predicted, what followed is a 'cult of work' (Bradley et al. 2001), particularly amongst policymakers who have a 'work first' policy approach to solving socio-economic challenges such as social exclusion and poverty. Illustratively, and for these reasons, increasing employment participation is one of the key goals of the Europe 2020 strategy (EC 2010).

However aggregate data on employment levels provides little insight to changes in the balance of occupations within organisations and changes to the work and employment within these jobs. New evidence from a survey of more than 750 UK business leaders in private, public and voluntary sector organisations of ten or more employees reveals a very mixed set of outcomes for both work and employment from the introduction of AI for cognitive and physical tasks within organisations. The 2018 Chartered Institute for Personnel and Development (CIPD) survey of more than 750 respondents in organisations with ten or more employees. The survey found that while around two-fifths (40%) of the organisations introducing AI reported job losses, nearly half (48%) reported no job losses. In terms of job creation, just over two-fifths (43%) of organisations reported that jobs had been created⁹. Of those organisations reporting job creation, two-fifths indicated that these jobs were mostly high-skilled and less than one in ten indicated that the jobs created were mostly low skilled. Of organisations reporting job elimination, more than two-fifths indicated that the jobs were mostly low skilled (Hunt et al. 2019; see Table 1 below.) On balance, it seems that AI may be more likely to eradicate lower-skill jobs and create higher-skilled jobs.

⁹ Note that in some cases organisations may have experienced both job creation and job destruction as a consequence of the introduction of AI.

Table 1: UK evidence of the impact of AI on jobs (%)

	AI for physical and/or cognitive tasks
Has the introduction of the technology created any jobs in your organisation?	
Yes	43.0
No	44.1
Don't know	13.0
Base, N (unweighted)	226
- What skill level were these new jobs created? *	
Mostly high skilled	38.9
Mostly intermediate skilled	23.9
Mostly lower skilled	9.8
A range of skills levels	27.4
Don't know	0.0
Base, N (unweighted)	98
Has the introduction of the technology eliminated or replaced jobs?	
Yes	39.9
No	48.1
Don't know	12.0
Base, N (unweighted)	226
What skill level were the jobs eliminated/replaced? *	
Mostly high skilled	29.0
Mostly intermediate skilled	17.3
Mostly lower skilled	44.2
A range of skills levels	9.5
Don't know	0.0
Total	100
Base, N (unweighted)	95

Source: Hunt et al (2019).

The findings also revealed that it is high-skilled workers (e.g. professional and higher technical staff) who are most likely to be most affected by the introduction of AI through jobs created, lost or changed. This last point is interesting. For this group of occupations, in terms of their work, job tasks were reported to have become more complex in two-fifths (39%) of organisations, less complex in around a third (28%) and to have stayed the same in around a third (30%). These workers were also reported to need more skills and knowledge in three-fifths (60%) of organisations and just over half (51%) organisations reported that these occupations had slightly or far more control over their job tasks. The introduction also led to more control over working hours for these workers in two-fifths (40%) of organisations. In terms of their employment, half (49%) of organisations reported no change to pay for these workers but two-fifths (41%) reported pay increases. Significantly, jobs were reported to have become more secure in just over two-fifths (44%) of organisations but less secure in just less than one-fifth (18%) of organisations for these occupations.

Beyond the economic modelling and bold predictions, it seems that work and employment outcomes in real organisations introducing AI is more mixed. There is both job loss and job creation and some improvements in some aspects of job quality for those occupations most affected by AI's introduction.

Explanations as to why the new technology of the 3rd and now 4th Industrial Revolutions have not impacted on work and employment as expected are multi-level. The first explanation focuses on the micro level and the work involved. If jobs, in part, are comprised by work that involves bundles of tasks, these tasks are of different types – most obviously, as was noted earlier, physical, cognitive and social. The balance of these different tasks varies in each job. Not all of these tasks can be yet, if ever, automated, even when supported by AI and machine learning because they are either still too complex to be substituted by technology and/or are better undertaken by humans. This point was made by Levy and Murnane (2004) in their explanation for why computerisation (i.e. micro-processing) had not resulted in mass unemployment as predicted. What they said then is pertinent still. Routine, rule-based jobs whether blue or white-collar are more prone to technological substitution, which explains why semi-skilled manufacturing jobs are at high risk now (see Muro et al. 2019). Non-routine jobs have escaped computerisation. Those jobs for which the service is part of the product will also be safe. Even Jenkins and Sherman (1979) admitted that consumers like to interact with workers rather than machines, and hence their recognition that what Appelbaum (2012) now calls high-touch service jobs would remain. Even jobs whose tasks can be automated often are not because of customer/client preferences. Reiner (2016) gives the example of airline pilots: the technology is ready but the public is not for pilotless aircraft. The outcome of computerisation will not be mass unemployment but the continued decline of lower skilled jobs, and jobs growth in higher skilled jobs that require complex and/or communication skills, Levy and Murnane concluded. In short, some jobs are immune to technological substitution – then and now, though which jobs are immune may have changed over time.

The second explanation focuses on the meso level and organisational strategies and benefits. The McKinsey report is instructive here. It notes a number of organisational issues that affect the adoption of digital technology: technical feasibility, the cost of technology and performance benefits including and beyond labour cost savings (Manyika et al. 2017). For some organisations, beyond technical feasibility issues, it is too costly to replace human labour with digital technology (Fleming (2018) – to which it might be added that if technology-driven mass unemployment occurred with work-first government policies still prevailing, the costs of labour would become cheaper still and so incentives to replace it with technology diminish. The CIPD study confirmed these issues but added two others: market demand and competitor isomorphism. In this study, the

most commonly cited reasons cited by senior managers for introducing AI was: to improve the quality of goods and services; to deliver goods or services more cheaply or reduce overall costs; and to keep up with competitors and developments in the industry more widely. Conversely, even in organisations for which cost was not an issue, the most commonly cited reasons for not introducing AI and advanced automation was a lack of demand for it among customers/clients, the organisations were not aware of any technology that would be of benefit to their organisation; and simply that they were happy with the way things were at the organisation (Hunt et al. 2019). It might also be a lack of managerial interest, understanding and/or competence around new technology that can be a barrier, particularly in traditional small firms. Beyond AI and advanced automation, there can be transaction costs and a loss of control over product and process quality with the use of on-demand labour. In this regard, following quality assurance problems, some platform companies in the German cleaning industry have reverted to conventional employment (Schmidt 2017). Put simply, the findings suggest that in terms of organisational strategies, for some organisations there will be a market need to introduce digital technology with identifiable benefits, in other organisations there is no need, and some disincentives and no inclination to do so.

The third explanation focuses on the macro level and the business environment in which organisations operate. Again the McKinsey report is instructive. It cites the state of the labour market (skills supply and demand dynamics), and social and regulatory acceptance (Manyika et al. 2017). In terms of the first issue, there may be both labour and skill shortages that make the introduction of digital technology both necessary and feasible in terms of cost. Conversely there may be skill gaps within organisations that cannot be filled through external hire that would allow organisations to be able to both introduce and maintain digital technology. As Fernandez-Macias (2012) notes, for example, technology does not deterministically drive skill demand, instead a range of business environment institutions have an important role in shaping what happens within organisations. Relatedly, in the CIPD study, a small percentage of organisations (<3% in each case) cited legal concerns, and restrictive codes and standards as reasons for not introducing AI (Hunt et al. 2019). Such concerns may be more substantive for platform working. There have been a number of legal challenges to Uber, most obviously, across EU Member States (Adam et al. 2016). In 2017 Uber failed to have its license to operate renewed in London because it was judged to have failed to comply with necessary regulations (Doward 2017) Uber has lost its operations in Bulgaria, Denmark and Hungary for the same reason. Uber is not alone, other companies have come under legal scrutiny, for example food and postal delivery platform companies Deliveroo and Hermes, and there are suggestions across the EU and beyond that employment law needs to be reviewed with respect to on-demand working (see, for example, Stewart 2019). The outcomes of these reviews will likely affect the use of digital technology by platform companies.

A twist on this business environment explanation and which can extend into the organisational level, is the power relationship between capital and labour. This relationship is dynamic, with the balance varying over time. Fleming (2018) refers to it as 'bounded automation'. The introduction and implementation of digital technology, as with micro-processing technology before it, is 'delimited' (p.6) by this power relationship. When organised labour is strong, employer capacity to eradicate jobs or determine the work and employment of these jobs will be limited. It is perhaps for this reason that Uber resists recognising a trade union for bargaining purposes and why trade unions are now emerging in the platform economy (Roberts 2018) and Uber is investing significantly in the development of driverless cars (Topham 2017). This argument of course echoes that of Child (1972), who pointed out that technological transformation is not an autonomous development and technology is not deterministic. Company strategies and the balance of power within and outwith the workplace can be central drivers of change and happen in the context of labour market and welfare institutions, and public policy.

That history might repeat itself – grand claims of epochal changes to work and employment followed by little change, even counter-claim developments – might explain why, although people are aware of the current debates about the potential impact of new digital technologies on the future of work, they have little concern about the future of their own jobs. Data from the British Social Attitudes Survey is illustrative in this respect, as Table 2 below shows.

Table 2: Attitudes to automation and jobs over the next 10 years, by age group

	18-25	26-35	36-45	46-55	56-65	66+	All
Likelihood many of the jobs currently done by humans will be done by machines and computer programmes	%	%	%	%	%	%	%
Likely	72	73	74	69	77	82	75
Unlikely	21	21	21	26	19	9	19
Weighted base	271	420	379	411	370	527	2380
Unweighted base	148	365	390	423	419	662	2410
How worried are you that your job will be replaced by machines and computer programmes?							
Worried	12	11	16	7	10	9	11
Not Worried	88	89	84	93	90	91	89
Weighted base	183	367	312	347	199	75	1484
Unweighted base	105	309	317	352	220	86	1391

Source: Kelley et al (2018).

As the data in Table 2 shows, three-quarters of people think that automation will take jobs away from humans, though older people with more labour market experience are amongst those who think it less likely. This perception would align with current predictions. However, of those who currently have a job, an overwhelming majority think that their own job is safe. For ever one person in a job who thinks that his or her job will be taken, another eight thinks that their job is safe. Although the data is limited currently, the UK findings have support from elsewhere. Survey evidence from New Zealand similarly suggests that whilst most respondents (61%) were aware of debates in the media about automation and job loss, almost all (91%) did not perceive their own job to be at risk (Brougham and Harr 2018).

Historical evidence from the 1980s suggests that predictions of mass technological unemployment as a consequence of the putative 3rd Industrial Revolution led by micro-processing technology were unfounded. Emerging empirical evidence on the employment outcomes of the current 4th Industrial Revolution similarly suggest that fears of mass unemployment may be misplaced. It shows jobs

being created as well as lost and any residual jobs being reconfigured, and in some ways for the better, including a shift towards higher-skill jobs creation. The lessons from this historical precedent and which might help explain this less negative employment outcome now seem to lie with the automatibility of some tasks within jobs, the strategies and perceived benefits of automation at the organisational level and the regulatory and general business environment in which organisations are embedded. Certainly, fears of imminent job loss do not seem to overly concern workers. Whilst more empirical evidence is needed of current developments in work and employment in relation to the new digital technologies, that which has so far emerged suggests that a more considered policy approach might be appropriate; one less enamoured with technological possibilities and more tailored to the empirical probabilities.

Other trends and factors shaping the future of work?

If techno-anxiety is being over-played (see Autor 2015), changes to work and employment are still likely to occur and there may be a number of trends that might impact the future of work as much as technology. The OECD identifies two such trends – demographics and globalisation, to which we would add financialisation – and which highlight other factors that are and will likely impact work and employment, even if supported by new technology generally.

Demographics have two facets: declining birth rates and an aging population. The first means that, going forward, there will be fewer people of working age. Labour shortages and, consequently, rising labour costs might ensue unless alternatives are available. Technology, if it can substitute this missing labour, might be one option if the rising cost of labour exceeds the cost of technological introduction (Zhang and Xiong 2018). The second facet has two implications. One, that people might need or want to work longer and, even if relatively physically fit, might require jobs with less physical demands or that can be undertaken with technological support. Such workers might also need to maintain and/or update their skills base for a longer period, including digital literacy skills (OECD 2017). Second, increasing numbers of older people means that more care work will likely be needed, residential and health care for example. Further labour market polarisation might follow, with low and high skilled occupations' expansion (Cedefop 2018). There will also be a structural economic shift from the production of durable goods to high-touch services (OECD 2017; Appelbaum 2012). If high-touch services for an older population cannot be substituted with technology, and there has to be some doubt given Appelbaum's (and other's) point about high-touch services' automatibility, then jobs will likely be created, both low and high skill. The capacity for these low and high-skill, high-touch services to be automated is still debatable – though of course they could be provided through platforms.

Globalisation is manifest in changes in production, finance and trade. Although international trade and production has existed for centuries, it has been made easier and accelerated by ICT and new forms of transport. The most important 'force' or driver of globalisation is the firm; more specifically the transnational corporation (TNC) (Dicken 2014). These TNCs control economic activities in more than one country; takes advantage of spatial differences in factor endowments and have geographical flexibility. They are able to relocate resources and operations and can generate more revenue than some countries, even usurping the exercise of economic governance by nation-states (Dicken 2014; Ohmae 1990). The new digital technologies have both compounded globalisation by firstly enabling greater connectivity and, with it, a new disaggregation of work through global value chains and, secondly, complemented it with 'weightless' digital products that are more easily transported for production spatially – what might be called the 'trade in tasks' (OECD 2017). The pool of 'talent' available to companies becomes global and, furthermore, more flexibilised workers can be engaged to work by companies, if not employed by those companies,

through platforms. Globalisation then would suggest that work is likely to continue to be displaced rather than be eradicated (cf. Copeland 2018), though employment could be non-standard if delivered through platforms.

Financialisation focuses on increasing shareholder value, profits and flexibility, and is a form of value creation and capture based on squeezing labour costs and revenues. It has also shifted the balance of power to employers by reinforcing market discipline and market attitudes – neo-liberalism within companies. In terms of work, the standardisation of tasks (including increased measurement and monitoring) – that started with Taylorism and Fordism but accelerated by technology – has been exacerbated by financialisation. The result is work intensification. In terms of employment, the result is income and job insecurity for workers and, with pressures to turn around profits in a short timescale, the squeezing of costs through redundancies and outsourcing (Cushen and Thompson, 2016; see also Appelbaum 2012; Thompson 2013). Illustratively, Perez and Martín (2018) found evidence that, following the global financial crisis, digitalisation was used in the banking sector to accelerate and justify the restructuring of jobs in order to reduce costs and that, ultimately, adoption of digitalisation supported delivery of this existing market imperative. Financialisation itself has to be contextualised in the shift to services, the deregulation of financial markets, the rise of neo-liberal economic policies and the weakening of trade unions. Financialisation would suggest that, whilst work continues, employment will continue to become non-standard.

Whilst the uniqueness of the new digital technologies is often heralded – usually in the form of a ‘it’s different this time’ argument, others suggest instead continuous and context-bound technological development. In this respect, Piasna and Drahekoupil (2017) argue that digitalisation is just the most recent phase in the long running transformation of work and employment through technology, arguing that it ‘does not constitute a radical break with the past and can only be partially disentangled from other processes with which it interacts’ (p.314), citing population ageing, globalisation and liberalisation as examples of these other processes.

Whilst (digital) technological determinism dominates debate about the future of work, policy responses will need to be aware of these other trends and factors, both for how they will independently impact work and employment and for their interaction with technology. At the very least, these other trends and factors suggest that technology is not determinant but used as a means to particular ends, for example to substitute for labour shortages or enable organisations to have greater labour flexibility in the pursuit of profit. Again, whilst more empirical evidence is needed about the future of work in relation to the new digital technologies, analysis needs to factor in other trends and drivers and seek to understand the relationship between these other trends and factors.

Concluding comments and policy pointers

Debates about the future of work broadly defined are dominated by, firstly, fears of the coming of the clever robots to take away the jobs (or paid work) – what we term the digitalisation of production – and, secondly, fears that employment will disappear to be replaced by on-demand freelancing and gig work brokered by platform companies – what we term the digitalisation of work. Whilst articulated as being centred on distinct digital technology – automation and AI, and algorithms and platforms respectively – in practice that distinction can be blurred. Ultimately, both rest on the digitalised processing, storage and communication of information. However this distinction is important because work and employment, although sometimes used synonymously,

are, in fact, different aspects of jobs. With each type of digitalisation different outcomes are predicted – the end of paid human work and the end of employment.

Predications of the death of human paid work have been made before and found to be overly pessimistic. Past experience and emerging current evidence suggest that some jobs will disappear, others, as yet unknown, will be created and others that currently exist will be reconfigured. Though improving, evidence for the nature and extent of on-demand labour is currently patchy and analysis hampered by this problem. What is clear is that the experience of this type of work is, at best, mixed though that experience is likely related to the ambiguous employment status of workers in the platform economy.

Proposed policy responses to these two developments, the digitalisation of production and work, are influenced by perceptions of technology. Much of the current debate is dominated by a perception that technology is deterministic. However, past debates about new technology argued that its impact was shaped by the choices made by key actors most obviously within workplaces but also outwith workplaces. Interestingly, these perceptions cut across the political spectrum meaning that for some policies a consensus exists across this spectrum.

These positions need to be contextualised, not just in terms of the perceptions that underpin them but in terms of realising that most positions focus on the potential of digital technology rather than its realisation (Fleming 2018). In this respect past and current positions on new technology over-emphasise the determinacy of this technology and pay too little attention to a range of other trends and factors that also impact work and employment outcomes, whilst yet interacting with that technology. Historical and emerging new research highlights that predictions of a technologically-driven end of paid work resulting in mass unemployment have not occurred and that it is possible that increases the same will eventually be said about the fears for the end of employment, even as the incidence of at least some forms of non-standard employment currently in the EU (Eurofound 2018c). Technology is not determinant and what might seem inevitable as new technology is applied can seem fanciful in hindsight. Importantly, the possibility of emerging technologies should not be confused with the outcomes of matured technologies. Indeed some possibilities are never widely implemented (OECD 2018b).

In outlining the two main predictions – the end of paid work and the end of employment and then identifying and disentangling the predictions and prescriptions, preferences and positions and the policy measures that follow in debates about the future of work, a number of policy pointers can be made:

Policy pointer #1: whilst being cognisant of the possibilities of digital technology is important, it is not sufficient; longer term realisation of this potential can be very different

It seems that policymakers and business commentators can be easily seduced by the promise – or threat – of technological possibilities. Those who develop and are prime movers in technological implementation have a vested interest magnifying its newness and uniqueness (Naughton 2018). However over the longer term, initial possibilities can be both realised and unrealised. It might be, as happened with micro-processing technology, that human workers are not displaced by digital technology but work alongside it, albeit with changed job tasks, with those tasks being different, better and/or worse than existing task profiles for that job (e.g. Wilson and Buchanan 1988; Levy and Murnane 2004). In this sense a process of ‘normalisation’ occurs.

Whilst research is only just emerging on the work and employment outcomes of AI and advanced automation (e.g. Hunt et al. 2019), the early indications are that this normalisation might develop. Likewise, there is some evidence for it with regard to the platform economy. Uber, for example, is having to comply with existing laws and regulations such as the Disability Act in the US (Rogers 2015). In Denmark, trade unions and non-platform company employers call for platform companies to comply with existing law, including labour law (Eurofound 2016a). After its London license was revoked, Uber CEO accepted that the company had to start adhering to standard business regulations (Henley 2017). This process of normalization might be compounded depending upon the outcome of current legal and statistician deliberations about employment statuses. Clarifying whether gig workers and freelancers are employees or self-employed matters; to have some other status matters both in determining employer responsibilities and worker rights (Taylor 2017), and because the outcome so those deliberations might in themselves propel or slow their use.

Policy pointer #2: policy responses coalesce by type of digitalisation, with a relatively distinct theme emerging for each type

Most prescribed policy measures reflect an accommodating position to digital technology, regarding it as inevitable but likely to have negative disruptions that need to be addressed, most obviously mass unemployment. This position is common across the Centre Right and Left of politics. On the whole prescribed policy measures centre on welfare rights, broadly defined, and establishment of minimum employment standards. Accompanied by a possible updating of employment status classifications, this approach represents a revamp of flexicurity for the 4th Industrial Revolution – ensuring safety nets and employability through education and training. In this respect the focus is on adapting current welfare support, broadly defined, to help make the labour market work appropriately work for all, see Figure 3 above. Even Levy and Murnane fall back on education as ‘the best tool we have to prepare the population a rapidly changing job market’ (2004: 155). Where they would distinguish themselves from current and past supply-side policy thinking is that they caution against shifting towards vocational education. They argue that the higher-skilled jobs require a mixture of vocational and liberal education to develop different types of skills.

The other main focus of policy measure responses centres on the antagonistic position that wants to block the perceived the permissiveness currently amongst companies operating in the platform economy. Antagonists tend to approach the problem from the Left of politics and seek greater regulation of labour rights, which in practice means strengthening legal rights to collective organisation, representation and bargaining, see Figure 3 above. In this respect the focus is boosting the possibility and capacity for social partner negotiation. For some adopters of this position, the ultimate aim is to re-assert the value and efficacy of the standard employment relationship, though making this case requires broadening the scope of understanding about the value of jobs and social democratic forms of political governance.

Policy pointer #3: analyses and policy development around the future of work must envelop understanding of the range of inputs and influences on that work, including but extending beyond digital technology

Analysis of the future of work in relation to digital technology tends to focus on outcomes – typically the falling stock of jobs or changes within jobs (at the task level) or to jobs (the stripping out of particular employment status). The reason, we would suggest, is that a simple narrative is being offered – technology is deterministic and therefore other inputs, trends and factors shaping

those outcomes tend to be written out. However it is clear from both historical and emerging current research that outcomes are not determined solely by technology (e.g. Whitley and Wilson 1982; OECD 2018b, Hunt et al. 2019; Roberts 2018).

The likely effects of the new digital technology on the future of work are neither predictable nor inevitable and are instead likely to have a number of influences including institutional context, choices and adaptability, meaning that multiple possible futures exist (Ojanperä et al. 2018). The influences are both within and outwith the workplace. Inside the workplace there will be organisational strategies, more particularly product market strategies, the skills and competences of not just workers but also managers and other professionals who are involved in the introduction, implementation and use of any new technology. Traversing the firm and its business environment will be industrial relations as an influence as well as employment and social protections, the state of the labour market and business regulations – all before wider trends such as an aging population, globalisation and financialisation are factored in to shaping those outcomes. It is also worth noting that an instrumental approach to the future of work currently seems to prevail in which intended outcomes are driven by economic actors based upon self-interest and benefit, whether employers or workers. However as the Taylor Review (2017) makes clear, there are normative considerations that should come into play, primarily around what sort of work and employment the EU and its Member States want to promote and might even be necessary for its survival as a political project in the 21st Century (see, for example, debate around the need for upward convergence of working conditions in the EU, Mascherini et al. 2018). Here political choices outwith workplaces and the economy are important, as Clark et al. (1988) noted.

Policy pointer #4: the European Commission and EU member States need to extend policy measures to include the shaping of demand

The main policy responses to current predictions and fears about the future of work centre on interventions in the supply-side of the labour market, such as more and better education and training, often as a feature of welfare reform broadly defined. This approach is important but not sufficient. In part because it is policy focused on market failure; that is, the anticipated failure of the digitalisation of production and work to provide for stable and decent jobs. However governments can have a role in ‘market shaping’ not just a role in addressing ‘market failures’ (cf. Lazonick and Mazzucato 2013). The obvious way to shape demand is to clarify and, importantly, legally enforce the employment status of workers in the platform economy. Another way would be to encourage social dialogue at firm and sector levels both in this putative platform economy and regional economies, as well as generally as decisions to introduce and implement new digital technologies are made. This dialogue will help shape work and employment outcomes at these levels. The OECD (2017) is already supportive of encouraging this social dialogue but the status clarification requires international consensus amongst labour market statisticians and adoption of subsequent recommendations by government. For both to be successful would require a shift from market-based strategies to labour rights strategies underpinned by regulatory strategies to ensure the rights of workers (see Graham et al. 2017).

At present, market-based strategies have a strong role in shaping the extent and application of clever robots – ie what the public/consumers would and would not accept being automated (see, again, the airline pilots’ example of Reiner 2016). Similarly, platform companies, such as Uber, argue that consumer demand should be the test as to whether they should be allowed to operate (see, for example, Doward 2017) and lobby governments to try to persuade them against regulation. However labour rights strategies should also be considered – not to protect jobs per se – though following consultation government should intervene to ensure some jobs remain the

preserve of human labour – early years' care might be one suggestion. Rather the purpose of this shift would be to protect aspects of job quality that deliver wellbeing from and in work (Warhurst et al. 2017) and which can be as politically toxic for the EU as the lack of work (see, for example, in relation to the Brexit vote, Warhurst 2016).

Policy pointer #5: more data on the future of work, particularly at the firm-level, needs to be generated in order to better inform EU policy making and help develop and target particular policy measures

Shaping demand requires data about the stock and type of jobs available in the labour market at the aggregate level. This data exists in forecast form through Cedefop (e.g. Cedefop 2018). Better data is also now being collected about platform workers through the COLLEEM survey (Pesole et al. 2018). However data collection for both types of digitalisation – of production and of work – remains hampered by definitional problems (see, respectively, Davies 2015 and OECD 2017a; see also D-G for Internal Policies 2017). Firm level data in particular is a weakness. The irony is that, with respect to the digitalisation of work, because of platforms companies' digitalised processing and storage of often real-time information, good data exists on the nature of both work and employment – in is just held privately by these companies and, because it can be a commercialised asset, is unlikely to be made publicly available. If Industrie 4.0 becomes more pervasive, similar data is likely to come into being for the digitalisation of production but will again be a private rather than public good. In the meantime, the EU's Community Innovation Survey collects data at the firm level on technological innovations and is helpful though the question format and response options limit the scope and depth of analysis for both types of digitalisation. Trying to work through this dataset's limitations and make recommendations for improvement is a task that will be undertaken by a new Horizon 2020-funded project Beyond 4.0, though results are not imminent.¹⁰ To fill the gap, fledgling datasets such as that commissioned by the CIPD in the UK may prove useful (Hunt et al. 2019) This type of dataset opens a window on decision making at the organisational level and the work and employment outcomes of those decisions. Replicating it should be encouraged in other or, preferably across, EU Member States.

Having this organisational level data is important for two reasons. First if interventions in the supply-side of the labour market are to be pursued, then supply needs to meet demand if mismatches are to be avoided. Understanding, for example, how residual jobs are being reconfigured in terms of tasks and skills will help inform the provision of education and training as well as welfare supports needs as individual workers transition between available jobs and regions attempt economic (re)development. Secondly, this data will better help governments encourage firms to maximise the potential of the new digital technologies by, for example, identifying empirically rather than through modelling, the automatibility of particular jobs and likewise empirically how these technologies might complement rather than substitute human work or ensure that the quality of working life is maintained and improved rather than degraded, whether in organisations with Industrie 4.0 or for platform companies.

If the predictions are to be believed, the future of work will be characterised by two developments: one, the end of paid work for humans leading to mass unemployment, the other the end of employment with work provided by gig-workers and freelancers. However, as Dunlop (216) notes, the consequences of the current technological transformations are still hypothetical and/or

¹⁰ See <https://warwick.ac.uk/fac/soc/ier/research/beyond/>

speculative, and as likely to be wrong as right. A starting point for understating how the future of work unfolds is to recognise that technology is not deterministic. Once the technological determinism is jettisoned, a range of options become available. Those options mean that choices exist. The choice made will shape what policies will be pursued and to which future of work amongst the many possible futures the EU aspires.

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