The Amazonian Era
The gigification
of work

Contents

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Introduction

We are living through a new transformation of work. We are living in an Amazonian Era.[1] The ethos, practices and business models that emerged within the platform economy have been packaged up and made available for download to the furthest corners of our essential services, reshaping the lives of millions of workers across Britain.

The COVID-19 crisis has accelerated businesses' adoption of algorithmic systems that predict and control how, when and where people work. Well designed and deployed, algorithmic technologies have vast potential to augment human skills, improve work safety and create new, good work.[2] However, this study finds that this potential is not yet being materialised. Instead, these systems are being designed and deployed in ways that erode good work.

Just as the organisational design developed by Henry Ford came to characterise society more broadly,[3] our research indicates that the ethos, practices and business models of the platform economy[4] have spread far beyond gig work, resulting in widespread 'gigification' of jobs and the restructuring of workplace behaviours and relationships.

Our interviews with essential workers and managers in retail, logistics, manufacturing and food processing, and with the developers of algorithmic systems deployed to serve platform business logics, reveal that businesses are introducing algorithmic systems without understanding the significant impacts on the nature and quality of work. Often, this is driven by an appetite for innovation rather than an informed sense of returns, and evaluation of trade-offs.

The ways in which algorithmic systems are being deployed by businesses create an environment in which high levels of monitoring and automated decision-making about fundamental aspects of work is normalised. These systems are designed to drive the completion of more tasks in less time, intensifying work. Standards set by algorithms are then used to evaluate and manage performance, incentivise or penalise workers, and grant or deny access to work. In this way, 'work' is being redefined in narrow terms that

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can be quantified by an algorithm, and the use of human judgment and skill is incrementally reduced.

Fluctuating shifts, intense instruction and strain to reach automated targets harm people's health and wellbeing. Workers are rarely involved in or consulted about the implementation of data-driven technologies and feel anxious about their lack of agency, and how their data is being used.

Concerns about the impacts of automation have tended to focus on technological unemployment. The impacts of automation on the nature and quality work have received far less attention. However, we find that it is not the replacement of humans by machines but the treatment of humans as machines that defines the Amazonian Era.[5] Changing the way people feel valued, and are valued, has significant knock on impacts for the experience of work, and for communities.

Our study finds that we are at a critical juncture. To ensure digital innovation works for everyone, data-driven technologies must be designed and deployed to be human-centred, clearly aimed at making work better.

Key insights

→ The ethos, practices and tools of the gig economy are being embedded across the economy without understanding of profound impacts on the nature and quality of work.

→ Algorithmic systems are being used across the economy to control fundamental aspects of work, driving the 'gigification' of jobs. 'Work' is being redefined in narrow terms that can be quantified and measured by an algorithm.

→ This approach is segregating the workforce, intensifying work and can erode the value of human judgment, skill and agency.

→ Information about how to conduct work is collected and turned into work instructions by platform technologies. This can change the nature of firms, and has the potential to devalue labour.

→ Routes to enable understanding, involvement and redress are not working, or do not exist.

→ This short-term approach is eroding good work in many essential sectors. This is not sustainable and bears significant costs.

Key recommendations

To redirect technology to work for people and the public interest, Good Work must be at the centre of our new social contract. This means a sharp focus on creating and prioritising better work across government departments, regulators, industry and civil society. We recommend:

Protect Good Work

→ Introduce an Employment Bill with a dedicated Schedule of 'Day 1' Digital Rights.

→ The Government should initiate an Accountability for Algorithms Act in the public interest which will require early algorithmic impact assessment and adjustment when adverse impacts are identified. Further detail is outlined in IFOW's 'Mind the Gap' report.

→ New disclosure obligations should require regular reporting on the fact, purpose and outcomes of algorithmic systems shaping access, terms and quality of work.

→ A joint regulatory forum led by the Information Commissioner's Office should be established with new powers to create certification schemes, impose terms and issue statutory guidance on use of algorithmic systems at work.

Collaborate for Good Work

→ The Cabinet office should initiate a collaborative, cross-government Work 5.0 Strategy, underpinned by the human-centred design and use of technology. This forward looking Strategy should be developed with industry, unions and civil society.

→ Good Work standards should be embedded across local and national Government departments, recovery and levelling up packages, new infrastructure projects and procurement.

→ Collective bargaining covering use of algorithmic systems and new collective rights for involvement should be permitted. Anti-union laws must be repealed.

→ Employee contracts, collective agreements and technology agreements should include explicit agreement about use of data and algorithmic systems shaping access, terms and quality of work.

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Key recommendations *continued*

Innovate for Good Work

→ The UK's AI Strategy should be principles driven and human-centred, with human flourishing and wellbeing as the overarching goal. The role of Good Work to make this a success must be formally recognised and integrated.

→ New functions and funding streams for the AI Office Council, UK Research and Innovation and Centre for Data Ethics and Innovation should be introduced to ensure that the UK leads in the design and development of human-centred automation.

→ A new tech innovation Grand Challenge targeted at stimulating innovation in human-centred automation should be initiated to create better work.

→ The government should allocate funds and monitor progress in recovery and levelling up through the prism of Good Work, as outlined in IFOW's Good Work Monitor ('GWM'). Local compacts and pilots should be enabled for locally led innovation in human-centred automation, as proposed in the GWM.

Researching Good Work

→ Researching the of use and impact of automation technologies, and their impacts on work and welfare, should become a national priority.

→ The Equality and Human Rights Commission, Information Commissioner's Office and civil society, including the Bar Pro Bono Unit, should prioritise test cases to establish, enforce and highlight the remits of existing protection of rights for workers under the GPDR, Equality Act and Health and Safety laws.

→ The Health and Safety Executive should investigate incidents and publish research and guidance on health risks from the intensification of work under management by algorithmic systems.

→ ONS should add new measurements for the adoption of automation technologies by firms and their impacts on work and workers, initially in their Annual Business Survey.

This report

In Part 1 we describe what algorithmic systems are, how they relate to 'automation' and their impacts on human behaviour, through the 'human data cycle'. We look at how COVID-19 has created the conditions to accelerate their adoption.

In Part 2 we show how the Human Data Cycle affects the quality of work, using the 10 principles of IFOW's Good Work Charter (see Appendix 1) as a frame. We demonstrate how algorithmic systems incrementally but systematically erode the experience, value and role of work, counter to the Good Work Charter.

Part 3 explores the way in which the human data cycle is supported by organisational design choices. As we argue, these reflect platform business models, and result in the gigification of work in the wider economy, which we have found to be particularly acute in key work through the crisis.

Finally, in Part 4 we consider the aggregate impacts of the trends we have identified for communities and society as a whole – and offer recommendations to address this.

Evidence base

→   Worker interviews in retail, transport, manufacturing, maintenance sectors before and after the pandemic.

→   Focus groups with retail workers and SPIA workshop before the pandemic.

→   A site visit to an Amazon Fulfilment Centre.

→   A review of the Connected Worker Platform marketplace, a category of algorithmic system.

→   Interviews with web services, Connected Worker Platform and algorithmic system developers.

→   An USDAW survey conducted in September 2020; and a comparison of results with a comparable survey in 2017.

→   Case studies of three firms introducing algorithmic systems outside of the retail industry (in manufacturing, maintenance, and food processing).

1

Automation in the Amazonian Era

Part 1
Automation in the Amazonian Era

In this study we have looked at algorithmic systems operating in different workplace contexts. We also reviewed the marketplace of algorithmic systems packaged as 'Connected Worker Platforms'. The concept of a 'platform' has become increasingly popular in describing a business model which rests on the use of a powerful algorithmic system or systems.

Algorithmic systems

This research looks at the use of data-driven algorithmic systems to make decisions about work. In its most basic form, an 'algorithm' describes a process or a set of rules to be followed in calculations or other problem solving operations.

Algorithmic systems process information from an increasingly diverse set of information gathering technologies.[6] Such technologies allow for more granular, and invasive collection of personal information at work. Biometric analysis[7], fine-grained location tracking, face and image recognition have all increased in workplaces through COVID-19. Amazon, often pioneering these techniques, has gained media recognition for deploying four cameras inside the vehicle of each delivery driver, detecting when they yawn,[8] and wearables to detect which muscle groups warehouse workers are using when they work – with the intention that this could also shape worker 'regular day to day activities outside of work'.[9]

While algorithmic systems have long been used by managers, the shift to 'algorithmic management' – in which the workforce is managed by algorithms – is a qualitative shift, which has become increasingly prevalent in recent years.[10] Algorithmic systems can be used to make decisions, without human assistance (fully automated decision making), or to inform and shape human decision making (semi-automated decision making).[11]

Even when acting 'autonomously' these systems are responding to a set of design parameters,[12] reflecting human choices and value judgements. Key human decisions made throughout the design and deployment of algorithmic systems are identified in IFOW's 'Mind the Gap' report.

Platforms

Platforms can be programmed to coordinate information from a range of sources, locating them at the centre of the 'Industrial Internet of Things'.[13]

Just as Microsoft is designed to adapt to the different needs of desk-based workers, Connected Worker Platforms are adaptable software, designed to service *'the 80% of the worlds workforce who don't sit behind a desk'*.[14] These are also often the workers who have endured work through the pandemic. Of the 30 Connected Worker Platforms we reviewed, 60% service the manufacturing sector, with key infrastructure (mining, telecoms, energy, and logistics) the second most dominant industries (56%) (see Appendix 2). 56% were created in the US.

Connected Worker Platforms vary in complexity from offering traditional management functions, to new advisory and predictive functions, to using machine learning to identify possible transformations of the business model. Almost all offer workforce management and monitoring through a range of data gathering technologies which feed information to the platform:

a) instructing what and how tasks should be undertaken, to ensure compliance with standards and procedure;

b) scheduling and sequencing of tasks for workers;

c) monitoring, recording and evaluating worker activity, which may be through the worker directly inputting the information or through surveillance hardware.

d) providing reports on task completion, which may include predictions and proposed actions.

Several developer interviewees directly acknowledged that the added value of this software is being defined by businesses in real time: it is experimental. The subjects of this experiment are workers. Connected Worker Platforms are at what the tech industry refers to as at 'the beginning of their hype cycle'.[15]

Even when acting 'autonomously' these systems are responding to a set of design parameters, reflecting human choices and value judgements.

The Human Data Cycle

Algorithmic systems change human behaviour through what IFOW calls the 'human data cycle'.[16]

There are three stages to the human data cycle. In the first, information is gathered and analysed in real time to create representations of work. Work becomes defined by what can be represented, measured and recorded.
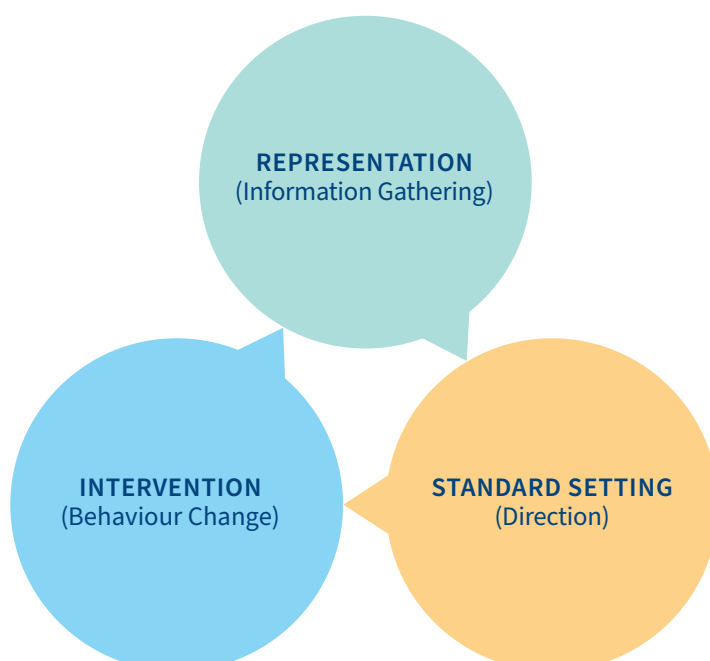
In the second stage, this information is assessed in accordance with a set of programmed objectives, aligned to standards of performance, set by an algorithm. These standards are adjusted or 'improved' over time. Work, as represented in the first stage, is increasingly defined, planned and scheduled by the system.

In the third stage, interventions are made which seek to change human behaviour, to ensure standards are met. This might be incentivisation, such as being rewarded with Amazon vouchers for conducting more than your scheduled tasks, or penalisation, such as being prohibited from accessing more hours, or securing a better contract (see Figure 1).

The types and number of information sources feeding the Human Data Cycle, and extent to which decision making at each of these stages is automated or semi-automated varies by system and business approach to deployment.

The following examples illustrate how the human data cycle works in practice. These case studies are pseudonymised, drawing on real stories of workers we spoke to. Experience of this cycle spans industries and applies to workers from across skills categories.

Figure 1: Stages of the human data cycle

REPRESENTATION
(Information Gathering)

INTERVENTION
(Behaviour Change)

STANDARD SETTING
(Direction)

Case study

Virginia, Supermarket Worker

Information gathering for representation

Information taken from heat sensors at the end of each till monitor the number of customers standing at the checkout Virginia works on. Sensors record the total speed of Virginia's scanning of items through the till. These inform 'queue length reports'.

Standard setting for direction

When Virginia fails a queue length report, she is called into a meeting with her manager about her performance.

Intervention for behaviour change

Her manager explains that to keep 'the system' happy, Virginia needs to swipe items more quickly. Virginia explains that there are not enough staff working on the tills to meet the targets. Her manager explains that the system allocates staffing budgets. This leads Virginia to have a growing sense of resentment about work, and she stops talking to customers to focus on her scan rate.

Case study

Sarah, Engineer

Information gathering for representation

Sarah hits 'record' in the Connected Worker app on her mobile phone, to log when she starts and completes a task. This information represents Sarah's overall level of work. The more tasks she logs, the more of her time is accounted for as 'work'. Her goal is to reach 95% optimisation. To mitigate the possible inaccuracy of this data, for instance time Sarah spends talking to a colleague while cleaning a machine rather than looking at and conducting the work, the algorithmic system also processes information from wearable headsets which monitor Sarah's eye movements to note when she is talking to colleagues, rather than conducting the tasks she is recording.

Standard setting for direction

The platform records the duration of all tasks completed by Sarah, and her colleagues. Over time, the fastest time taken to complete each maintenance task is calculated, and work is scheduled for all workers according to 95% work optimisation of all staff at all times.

Intervention for behaviour change

Sarah is incentivised to work harder by the promise of Amazon vouchers for team members with the highest optimisation rate. Sarah recognises that she is not working fast enough to meet her 95% optimisation target and begins to work at a pace which is above her comfort level. Over time, she becomes fatigued. She fails to meet her semi-automated performance review and is let go. The workforce becomes increasingly young, and male.

Case study

Adam, Food Processing Delivery Driver

Information gathering for representation

Data is collected from the app in Adam's phone, which also sets his route and tracks his speed. Sensors on his brakes detect the quality of his driving and a camera in the vehicle observes his behaviour, triggered whenever he diverges from set route, increases speed or if he brakes too sharply.

Standard setting for direction

The algorithmic system allocates Adam a number of delivery drops to achieve each day. These are created based on strict compliance to set routes, at optimal speeds. Time delays must be recovered throughout the shift.

Intervention for behaviour change

Adam is anxious about making his set number of drops. If he does not, he will not secure the future shifts required to support his family. Noting that the camera is triggered whenever he stops the vehicle at a non-designated spot, he has begun taking toilet breaks in the car and eating while driving.

Figure 2: How do you feel that the following aspects of your job have changed in the last five years?

Feeling valued by employer   **2020** (n = 1459)

Don't know	7%
Got worse	48%
Improved a little	13%
Improved a lot	5%
No effect	27%
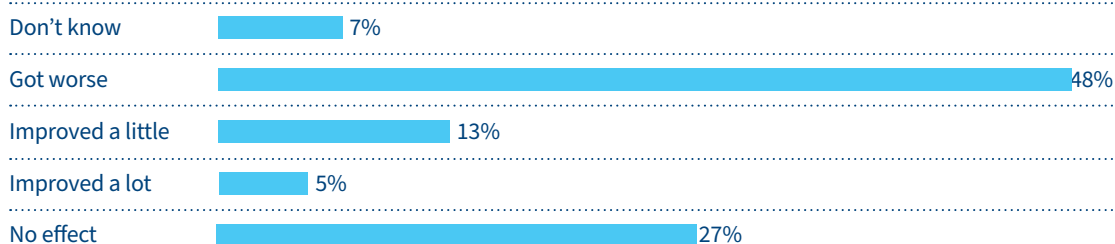
Feeling valued by society   **2020** (n = 1462)

Don't know	10%
Got worse	27%
Improved a little	12%
Improved a lot	4%
No effect	47%
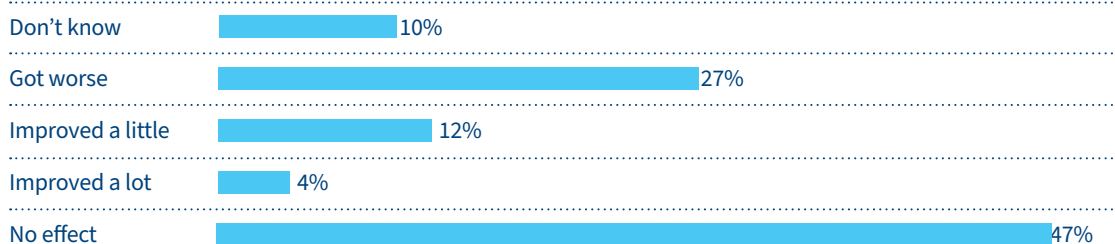
Establishing the Human Data Cycle

The Human Data Cycle can be established in different ways, with different actors and individuals responsible for designing components of the algorithmic system over time, or 'installing' the system via adoption of an app. Large organisations, such as supermarkets, may already have in-house data teams.

Connected Worker Platforms can be downloaded from the App Store and adapted to work within any business context.

In-house design of the Human Data Cycle

A fragmented process in which human impacts are often disregarded

One developer working as a contractor to the in-house team at a major supermarket explained how fragmented the design process was for creating a new component of the organisations overarching algorithmic system and how many designers were engaged:

'There's a team handling the data streaming, the surveillance, then there's me – the middle-man who gets the data and turns it into the right format – and then the key part of this is the 'data team' which is part of [Supermarket group], who do something with it.'

In discussions with others in the team building this tool, the humans these systems would affect were never mentioned. Instead, discussions focussed on 'perfecting systems.'

'The fact it's a human being doing it, wasn't really raised, and I think that's just the professional way of putting things. You wouldn't pitch the business plan as "we want to see where people are messing up", you'd do it in an anonymised way where it's not really people, it's a system and we want to build the system better.'

He noted that as a contractor he was rarely given oversight of problem definition and would not meet the workers who would be monitored by the tool he was creating.

Downloading the Human Data Cycle from the app store

Experimentation built in

There is a range of connected worker software and free trials available on the App Store for businesses interested in these solutions to encourage experimentation. As one maintenance manager at a school site told us:

'There were loads of apps I tried from the app store, I contacted them, got a zoom meeting and it went from there. I didn't read much into them, I was more interested in just getting stuck in, then they gave us the free trial and that's when I started finding out about their goals.'

As new businesses, seeking to gain market share, these firms were willing to adapt and test their products responsively, often managed remotely from the US:

'They kept adding additional features to make it easier to use, they were very responsive, it was awesome. They even gave me a beta testing log in at one point, so I could use things that hadn't been released yet and they were benefitting from me testing it for them… I've really invested in it personally, because they listened to me - they're American they aren't afraid to pay compliments – we've pinned you as the muse on this project, it's great to have someone so enthusiastic about this, you're helping us grow our global market and that.'

Impacts of the systems

Conventionally automation is solely understood as the use of technology to replace human labour and so displace workers – a fear which has seen some resurgence through the COVID-19 crisis. However, our research suggests that the impacts of automation through algorithmic management are more varied and fall into six categories (see Figure 3). A system can potentially cause each of these effects to varying degrees on different parts of the workforce.

Substitution of human work

By scheduling shifts, algorithmic systems directly replace the work of supervisors. By monitoring stock levels, they directly displace the work of stock room managers.

Transference of human work

Consumers replace the work of workers. For instance, customers are invited to self-checkout. Our study shows this category now extends to 'refractive surveillance' in which customer ratings replace the role of managers in performance review.

Telepresence of human work

Algorithmic systems have been introduced through COVID-19 to allow managers to oversee activity remotely. They also push notifications about work to workers when not 'on site' and can enable instant messaging between workers not in the same location.

Creation of human or non-human work

Algorithmic systems allow for the creation of new roles in data analytics, or additional warehouse delivery roles through recording and processing data about aspects of work which were not previously recorded.

Augmentation of human work

Algorithmic systems can hold real time training information and instructions about how to conduct work. While augmentation is conventionally seen to increase the capabilities of workers, we have found that this can delimit their capabilities.

Intensification of human work

This is a significant impact of algorithmic systems. Intensification involves workers who are not displaced or augmented being required, and policed through the platform, to conduct a greater density of tasks within working hours.

These impacts are not mutually exclusive and may overlap. Our survey of USDAW Union members found that worker understanding and concern about new technology in the workplace does not always correlate with actual exposure to new technologies. Concern often outstrips exposure for the less visible, more invasive surveillance technologies (see Figure 4) such as facial recognition, image recognition, speech recognition and location tracking.

Figure 3: The impacts of automation

SUBSTITUTION
TRANSFERENCE
TELEPRESENCE
CREATION
AUGMENTATION
INTENSIFICATION
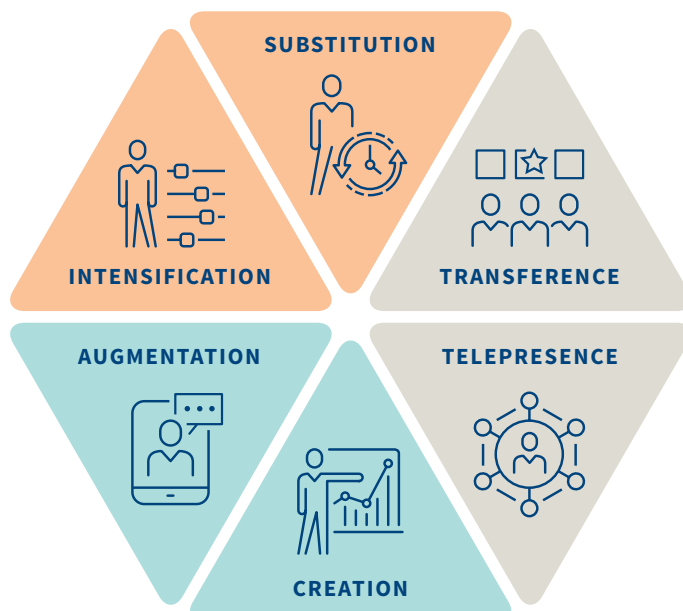
Figure 4: Worker exposure vs concern about new technologies in the workplace

	Which of these technologies are you most concerned about?	**What technologies have you seen being implemented in your workplace?**
Facial recognition technology	16%	2%
Image recognition technology	12%	6%
Social media and workplace platforms	25%	37%
Click and collect	7%	46%
Customer self scanning 'as you shop'	19%	35%
Customer self-service machines	27%	52%
Internet enabled devices	11%	48%
Recording and measuring software and databases	15%	23%
CCTV	22%	68%
Speech recognition technology	9%	5%
Barcodes and other sensors	9%	59%
Electronic scheduling of shifts	27%	52%
Location tracking	19%	10%
Wearable devices	18%	19%
Mobile computing including mobile phones	30%	53%

Acceleration through COVID-19

*'We've been growing like wildfire. Why?
Very clear reasons. If anyone was thinking about
digital transformation as something they were
going to do five years from now, Coronavirus did
an update on that mentality and we're now in
a world where digital transformation needs to
happen now.'*
Connected Worker Platform Developer USA1

COVID-19 has accelerated automation by
introducing new incentives and imperatives,
restrictions and demands.[17] A third (33%) of
USDAW union members we surveyed reported
that their role had been 'extremely' changed by
new technology since COVID-19.

The primary driver of widespread adoption of
workforce management platforms through the
pandemic has been the need to reduce staff on
site, leave a skeleton crew to complete tasks
and increase 'telepresence'[18] – in this case, the
ability to manage remotely. This has enabled
a drive for "full visibility" of what is happening
on the ground.[19] For instance, the use of
algorithmic systems to ensure compliance to
health and safety procedures by submission
of body temperature checks or photographic
evidence of handwashing.[20]

*'The worst medium to spread a virus is a
clipboard that everyone coughs on all day.
Four five six sets of hands. The only way to
prevent the spread of the virus in that context is
for us all to just touch the pain of glass that's in
our pockets.'*
Connected Worker Platform Developer USA4

This allows for a more uniform, centralised
control of activity, which is a common business
strategy at times of crisis.[21] On top of this, there
has been increasing economic pressure, driving
businesses to deliver more with less. As we
discuss in this report, intensification is a key
outcome of algorithmic systems deployed in
work.

*'The fact that the guys are entering everything
that happens into a tablet means I can still see the
information from home, I don't have to be there.'*
Food Processing Industry Worker

*'We created a standard procedure [to monitor
workforce] temperature, and check have they
cleaned their hands – and you build in the ability
to verify this remotely – so ask a colleague to take
a picture of you cleaning your hands.'*
Connected Worker Platform Developer USA6

COVID-19 has also introduced new health and
hygiene justifications for monitoring
hardware and data sharing in the workplace.
Our interviews with workers find increased
location tracking through wearables,
heat sensors, CCTV, and greater sharing of
biometric data.[22] These data are pooled and
cross-referenced with wider data sets used
to track performance to train the algorithmic
technologies.

In consumer-facing sectors such as retail,
greater surveillance of customers also
comes to inform performance assessment of
workers. Supermarkets have long had heat
sensors to detect bodies at the tills, informing
'queue length reports' which may lead to the
disciplining of staff if more than one person is in
a queue. Through COVID-19 this trend, termed
'refractive surveillance'[23] has accelerated with
new sensors introduced to manage customer
levels throughout stores.[24]

In addition, the crisis has driven a general
transition to online commerce. Businesses
that have not had online sales systems have
fared badly through the pandemic. Amazon
has had significant, direct success through the
pandemic doubling its quarterly profits[25] and
increasing its UK workforce by a third.[26] It has
also signalled through the pandemic that it
will seek to position itself within the UK's mass
grocery retail market,[27] with Amazon Fresh
offering free delivery of groceries and Amazon
Go, competing with players like Deliveroo and
Uber Eats in the ready meal delivery market.

In addition, Amazon profits from the growth of Connected Worker Platforms as many are cloud-based products. Amazon Web Services currently holds 45% market share.[28]

'We've been able to deploy to customers 100% remotely through the crisis, so that's the benefit of these tools being in the cloud – you can go to the cloud and download our app now. This needed cloud and mobile to really accelerate and the acceleration is huge.'
Connected Worker Platform Developer USA6

As noted by Forbes, Connected Worker platforms have been a success story in the pandemic. These firms are each seeking to win the market share that Microsoft has for desk-based workers, for frontline workers. Their success owes not only to their displacement of supervisory, and managerial work – but also to their recognition that workers are at the heart of businesses, even in those sectors widely perceived to be fully automated:

'Humans have always been 'essential workers' in manufacturing. But the present crisis has shown us just how important humans are. No humans, no manufacturing.'[29]

Our interviews with platform developers confirm this. In this sense, COVID-19 has exposed the centrality of workers to even the most technologically advanced sectors. Technologists developing platforms at the heart of the Amazonian Era recognise this, and their investors are also betting on this trend of people, rather than machines, persisting.

'This is the future of work, it's not about replacing people, it is about augmenting people so they know what to do and then capture what they've done to make the next person more efficient.'
Connected Worker Platform Developer USA3

'We believe we've reached a peak in how much you can make out of machines so the last big nut to crack is around people in the human environment, how can you optimise them?'
Connected Worker Platform Developer USA1

In turn, to build a fairer future, we must focus on making work better through technological change.

Figure 5: I am confident that my employer will invest in new technologies over the next five years

Legend: 2020 (n = 1457), 2017 (n = 965)

	2020	2017
Agree	44%	39%
Disagree	12%	10%
Don't know	18%	17%
Strongly agree	20%	27%
Strongly disagree	5%	6%

2
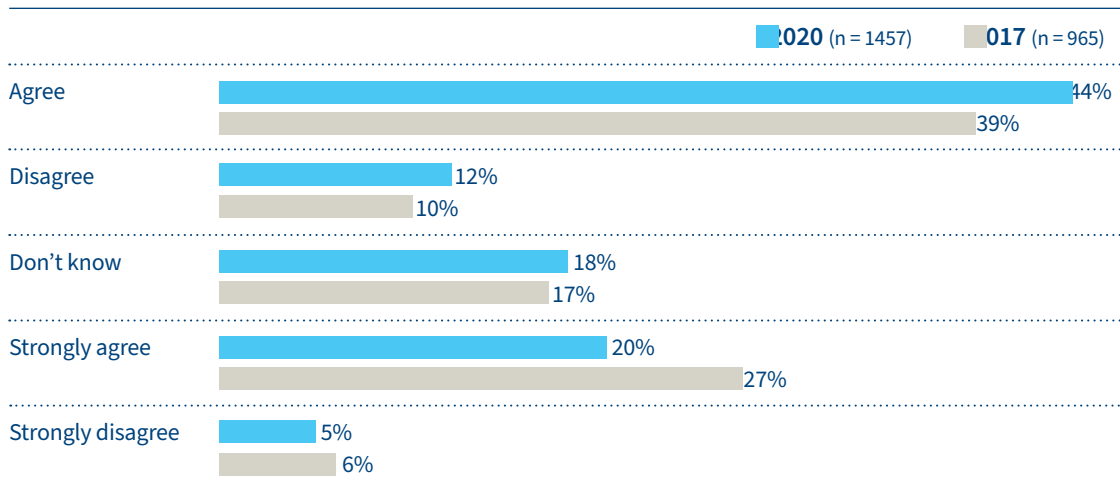
Algorithmic systems and good work

Part 2

Algorithmic systems and good work

In this part we explore the impacts of algorithmic systems on good work, as defined by the 10 principles of IFOW's Good Work Charter and find that the current deployment of these technologies is undermining the foundations of good work.

Good work is more than employment. It is work that promotes dignity, autonomy, equality; work that has fair pay and conditions; work where people are properly supported to develop their talents and have a sense of community. IFOW research has shown that good work builds resilience, smooths transition and protects against health and economic shocks.[30]

We find a yawning gap between what algorithmic technologies could accomplish if they were designed and deployed to advance Good Work, and the current experience of the Human Data Cycle.

Access, fair pay and conditions

Our research has found that workforce management platforms are used not only to manage performance, but to allocate tasks and shifts; determine pay and working time; and set terms and conditions. Access to better terms, including security and benefits, is also determined by algorithmically predicted performance. Taken together, these are diminishing fair, open and consistent standards in these core aspects of Good Work.

Transparency is central to fair terms and conditions of work. However, often workers are not aware of the different forms of data being collected about them, or how this is being used to assess their performance. Of USDAW union members we surveyed 67% of respondents were not at all confident that they know how data collected about them is used to assess or make predictions about their performance.
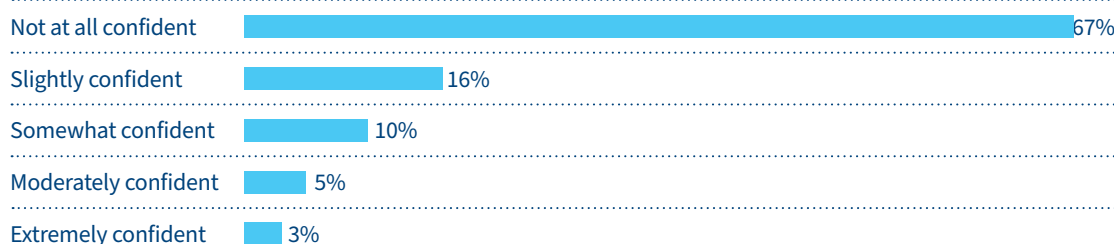
Workers have also felt less able to question or challenge the introduction of these technologies through COVID-19.

Figure 6: If my data is used to assess or make predictions about my performance, I know how it is used to do so

Total n = 974. Fieldwork completed between August and October, 2020. By USDAW in partnership with IFOW.

Not at all confident	67%
Slightly confident	16%
Somewhat confident	10%
Moderately confident	5%
Extremely confident	3%

The standards set and policed within platforms, drawing on these expanding datasets, have the common outcome of reducing many aspects of work valued by frontline workers, such as speaking to each other or to customers. This reflects an intensification of work in which performance is observed, measured and predictively scheduled. This condenses and narrows the definition of 'work' to that which can be represented by information gathered for and processed by algorithmic systems.

'I currently have colleagues in my workplace who are being 'performance managed' for their reluctance to use company technologies which are completely irrelevant to their job role.'
USDAW Survey Respondent

'My job cannot be rated on the amount of transactions I make on a till.'
USDAW Survey Respondent

These standards can be used to restrict access to work, and performance manage or discipline staff:

'A colleague was coming in everyday crying, because she was being pulled up by the Replen app… this monitored her timing and she was missing her targets, taking too long between her first and last scan. She was told she was going too slow, and was disciplined… The Replen app set a higher speed than she could manage.'
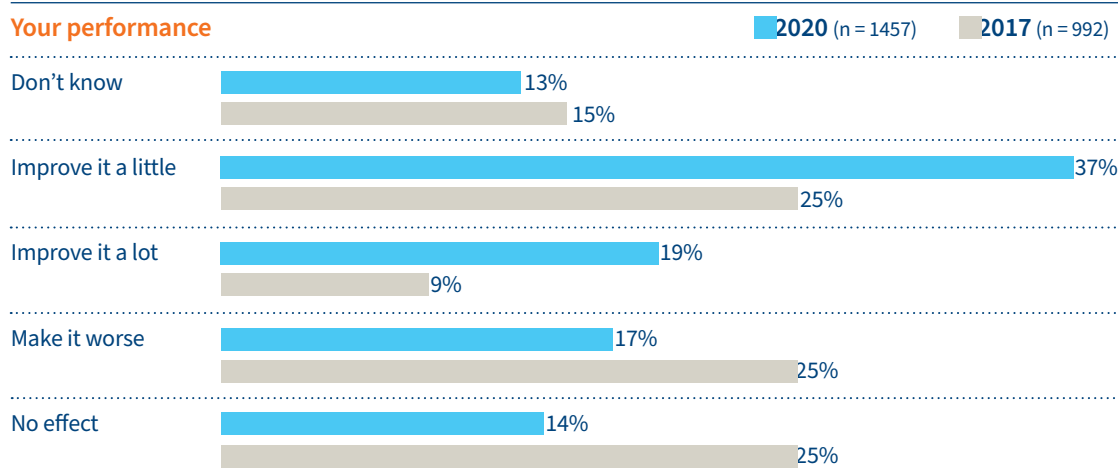Supermarket Worker

We found the line between contract type and performance monitoring to be especially fine at Amazon, as temporary staff are offered permanent contracts based on their KPI data. On a site visit, we heard that temporary staff must meet key performance indicators for packing items at 120%. When asked what that meant in terms of exertion, IFOW were told that 100% was a speed of work where it is impossible to hold a conversation. Workers needed to be hitting 100% on average in order to stay in their jobs, and rates of 80% or below triggered a serious 'warning' conversation about the early termination of their contract.

An Amazon worker explained to us that at peak time (the months in the run up to Christmas), Amazon temporary staff had the opportunity to convert to permanent 'blue badge' status. While pay remains the same across temporary and permanent positions, blue badge workers have greater job security, access to staff benefits and opportunities for progression. The possibility of a permanent contract was, therefore, sold as motivation for workers to compete against their peers, working harder and faster in temporary positions.

This setting and policing of standards to an extent which may prohibit human interaction was found across our research in supermarket and delivery work. A supermarket worker told us that if staff were spotted talking to colleagues on the shop floor the assumption would be that they were not working, and they would receive a disciplinary warning for time wasting.

Figure 7: How do you think increased use of new technology will affect you at work over the next five years?

Your performance   **2020** (n = 1457)   **2017** (n = 992)

Don't know	13% / 15%
Improve it a little	37% / 25%
Improve it a lot	19% / 9%
Make it worse	17% / 25%
No effect	14% / 25%

'If they trigger the camera, they will be seriously sanctioned. We've had drivers sacked because of it, but drivers do it because they are under time pressures.'
USDAW Survey Respondent

For essential workers who find the greatest value of their work to be the care they can show to clients or customers, changes to their working day that delimit their ability to take time with people were seen as an unfair narrowing of their role and assessment of their performance:

'The human interaction I have to make because of my job (customer service) is not taken into account when technology is used to determine what hours we are to work and what shift patterns to follow and how many staff are needed in my department.'
USDAW Survey Respondent

This same pattern was found in firms we spoke to across maintenance, manufacturing and food processing sectors. While workers are not customer facing, the requirement to conduct tasks deemed of value by the platform at all times – achieving 95% of working time on 'work' as it can be represented in the system – damaged morale and relationships.

'It's just impossible to get 95% of your time logged, it's really damaging morale.'
Worker, Manufacturing Maintenance

'With [Connected Worker platform] I can go to my guys and say look guys, you can't tell me you haven't got enough time to do a job, if I ask you to do work you can't say you can't do it, because I can see out of the 7 hour a day – we've clearly got scope for more work. They can't hide.'
Manufacturing Maintenance Manager

This intensification is defined as 'continuous improvement'. As we have noted previously[31] predictive analytics present risks as workers are evaluated, and treated differently, on the basis of shared characteristics rather than their own performance or capabilities.

Managers in larger firms must also play the 'game'[32] ensuring compliance with the algorithmic standards. As a supermarket supervisor explained, while staffing budgets are determined by the workforce management platform, supervisors are held accountable for cashiers failing 'queue length reports', determined by heat sensors which identify how many people are in a queue at any time. If cashiers fail these reports, supervisors are flagged for underperformance and workers are brought in for a training session, or disciplined with warnings.

In this system, the role of managers in setting standards, and using their discretion to vary these between workers of different capabilities, is eroded by the introduction of workforce management platforms.

Dignity, autonomy and equality

Alongside the intensification of work, algorithmic systems mean work is increasingly digitally micro-managed. This systematically undermines the dignity and autonomy of frontline key workers. Throughout our research we found a diminishing of human judgment in work.

Overall, we observed a marked shift from managerial trust and dialogue towards the intense monitoring and surveillance of activity. As some managers we spoke to confessed, as technology enables them to monitor work in more granular and invasive ways it also encourages them to do so. More and more personal information is sought from workers while companies divulge little about what is stored and how it is used, reflecting the steady erosion of choice, consent and privacy.

'Drivers are all equipped with black boxes under their bums which track exactly what route they are taking, how fast, whether they brake too harshly, whether they take too long between drops. The team unloading cages do 8–10 in a night – and they know the weight of everything that's on them and what that should mean for timing, down to the minute.'
Retail Worker

'You're constantly looked at and watched. You think, have I done something wrong? You're scared to have a conversation and a giggle with your colleagues in case you get reprimanded. It's horrible. Your privacy is gone.'
Workshop Participant

Being trusted to act with integrity is a key source of dignity.[33] As we move towards systems in which integrity must be proven continually, this can undermine some of the fundamental tenets of Good Work.

Increased use of mobile phones and cameras in each worker's pocket allows for real time tracing of activity and information capture. It also enables frequent push notifications and instructions outside working time, and beyond the workplace.

'I don't like that I have to use my own device and data, I don't like that I have to download apps on my own device.'
USDAW Survey Respondent

The shift from managerial trust to surveillance of activity, and from team to individual performance monitoring, was a shock to older workers in manufacturing and maintenance sectors whom we spoke to. Younger workers were more receptive to the digital documentation of working reality, and the intensification of work, partly reflecting the normalisation of these tools in their non-work life.

'I am 60 years old. I am certain that the company will use my lack of technical knowledge to try and get rid of me. They are already demanding that tasks are completed much more quickly, thus causing stress with older staff.'
Retail Worker, Female

A hike in consumer use of platforms has made uptake of their products much more palatable:

'The reality is in our market, because of the way we build our solution, we've been really helped by the consumerisation of how people run their life – the barrier to entry a few years ago was much harder but now, people are so familiar with using these tools.'
Connected Worker Platform Developer

This reflects broader social trends towards the acceptance of surveillance and digital documentation of lived experience.[34] The move from being trusted as having a reliable character, to being accountable for proving one's worth and activity on an ongoing basis through digital documentation, reflects values inherent to platforms.[35]

**Part 2
Algorithmic Systems
and Good Work**

Several expressed concerns about 'automated' disability discrimination:

'Disabled employees are never given enough help to use and understand the new systems'; 'scheduling never takes into account people's physical disabilities'; 'Not all pickers can achieve the increased picking speeds due to health problems.'
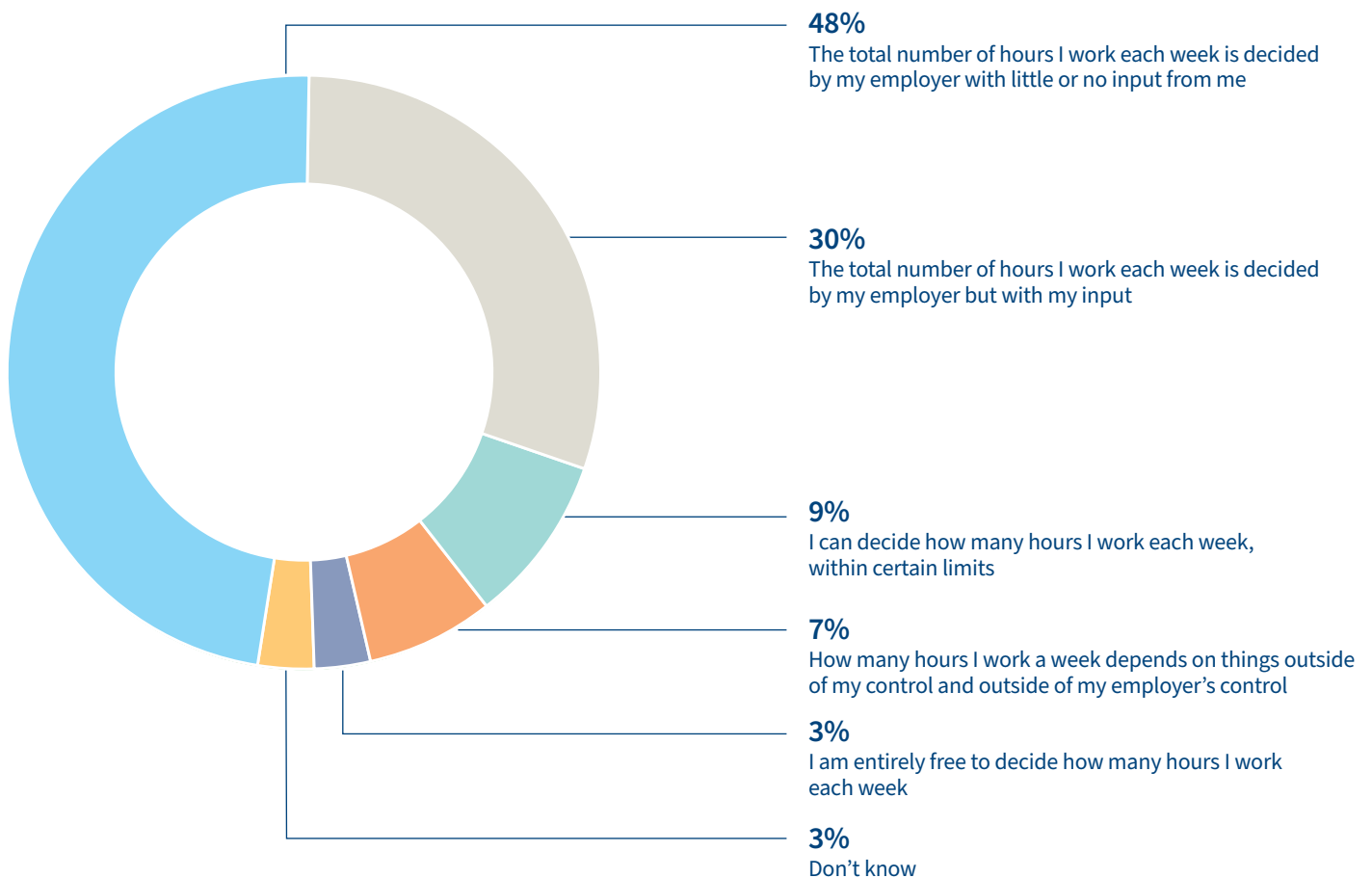(all USDAW Union Survey Respondents)

Inequities faced by carers, most frequently reported by female workers, was also a recurring theme. This is a particular problem when assumptions about 'ideal' behaviour are projected into the future, reinforcing existing inequalities, as we have explored elsewhere.[36]

'It makes a decent home life impossible as now demands 24hr availability.'
USDAW Union Member

Of USDAW union members who work in the retail sector we surveyed, for 95% of respondents this job was their only job. For 39% of households, respondents were the only earner. Despite this, 48% of respondents felt their hours were decided by their employer with little or no input from them (see Figure 8).

Figure 8: Which of the following statements best describes how your working hours are decided?
(n = 990)

48%
The total number of hours I work each week is decided by my employer with little or no input from me

30%
The total number of hours I work each week is decided by my employer but with my input

9%
I can decide how many hours I work each week, within certain limits

7%
How many hours I work a week depends on things outside of my control and outside of my employer's control

3%
I am entirely free to decide how many hours I work each week

3%
Don't know

Research from the Joseph Rowntree Foundation finds[37] just over half of retail workers think they are less likely to secure promotion if they are on part time contracts. In turn, flexibilisation can create a trap which workers struggle to get out of.

In retail, a predominantly female workforce, this creates significant knock-on impacts for family life and caring responsibilities. 62% of USDAW members we surveyed who reported that technology allocates their shifts said they 'had experienced problems as a result'. Of these, 23% suggested it was difficult to discuss this with a human, and 13.5% suggested it was very difficult to discuss this further with a human.
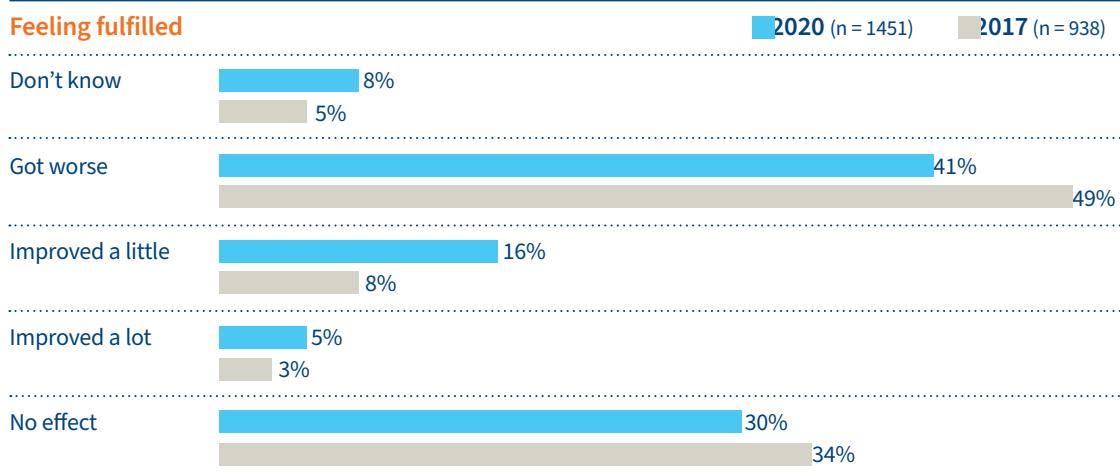
'I'm concerned with receiving my shifts online and worried if I don't have a choice of what days will be suitable for me as I have a few responsibilities outside of the workplace – I am my mums carer, plus I mind my grandchildren.'
USDAW Survey Respondent

As noted in recent research,[38] 37% of UK working adults receive less than a week's notice of their working hours, with 7% receiving less than 24hours notice.

While autonomy is a multidimensional construct, researchers have emphasised the importance of three facets: autonomy with regard to work scheduling, work criteria and work methods.[39] Algorithmic systems remove all three dimensions from work, as we see here and below with regards to training.

Figure 9: How do you feel that the following aspects of your job have changed in the last five years?

Feeling fulfilled   **2020** (n = 1451)   **2017** (n = 938)

Don't know	8%
	5%
Got worse	41%
	49%
Improved a little	16%
	8%
Improved a lot	5%
	3%
No effect	30%
	34%

Learning and development

The use of skill in work is a key job resource, offering workers a sense of identity and pride.[40] It is a resource which enables progression, and is part of what gives workers negotiating power. However, our research has highlighted deskilling of work through the Human Data Cycle. Algorithmic systems capture tacit and tribal knowledge, seeking to create a 'GPS' style manual of work so that 'anyone' can do the job.

In workplace deployment of Connected Worker Platforms we studied for this project, skilled workers record and input their activity, with pictures and descriptions of their process, to create both a record of what has been done and create a template for future digital instruction.

'Photographs are added to the app to give details on how a task was completed, and this gives historical data if the same fault arises. There is also a function in which procedures can be added, for example, instructions on how to perform a preventative task. These can be changed by managers and challenged by anyone using them'.
Manufacturing Maintenance Worker

This design feature was seen as one of the most potentially transformational aspects of these platforms by their developers, many of whom were keen to see this empower workers on the frontline to establish their own working means and methods. However, the deployment of these features by businesses can impede learning and development.

Rather than creating space for ongoing dialogue about alternative approaches, these systems can be used to enforce compliance to the 'one way' of doing things. Beyond limiting innovation, this also undermines prospects for learning:

'Staff are no longer allowed to think or work on initiative, it is what a computer system tells them that matters, every aspect of performance is measured and monitored using the systems. If more profit is needed the wick in the system is turned up and KPI's are modified, people either step up or break!'
USDAW Union Member

'It's really standard operating procedure. How do you do work. I'm sure if you buy something you don't look at the instructions, you go to Youtube. This is the same concept, digitise at scale standard operating procedures, but also the ability to capture the data to make sure you've done it properly'.
Connected Worker Platform Developer USA2

'It takes away the requirement for experience because we are logging them, people's experiences'.
Manager Manufacturing Maintenance Firm

Our interviews with technology developers suggest that reduction in skills required for work is seen as a core advantage of worker management platforms.

'[By creating] an experience that's like a consumer user app – they're tapping and swiping – so the barrier to entry in terms of the skills to use this, we've brought down really low.'
Connected Worker Platform Developer USA1

'The need to be an advanced engineer can be significantly reduced because you can train people how to do the work digitally, on the job. So, it lowers the barrier to entry… the benefits of digital work instructions is you don't need to be as expert and train to do something.'
Connected Worker Platform Developer USA3

This has become important during the pandemic, as many businesses have seen their supply of experienced and skilled labour threatened. In 'high skill' work, where qualifications or experience are required, this has presented a significant challenge.

'The skills gap has been a huge issue in the industrial sector forever, and now with the pandemic the skills gap has turned into skills variability'.
Connected Worker Platform Developer USA1

'With increased absenteeism there can be a less skilled workforce [on site].'
Connected Worker Platform Developer UK1

Worker Management Platforms claim to respond to this. By engaging users in active documentation of their working practices, workers effectively create a 'how to' manual for any given activity.

As IFOW fellows have explored elsewhere, expenditure on training has diminished at exactly the time it is needed most, and for

workers who need it most.[41] Where training was identified, it was on-the-job training via platforms. Our interviewees expressed scepticism about the value of this virtual instruction or 'training':
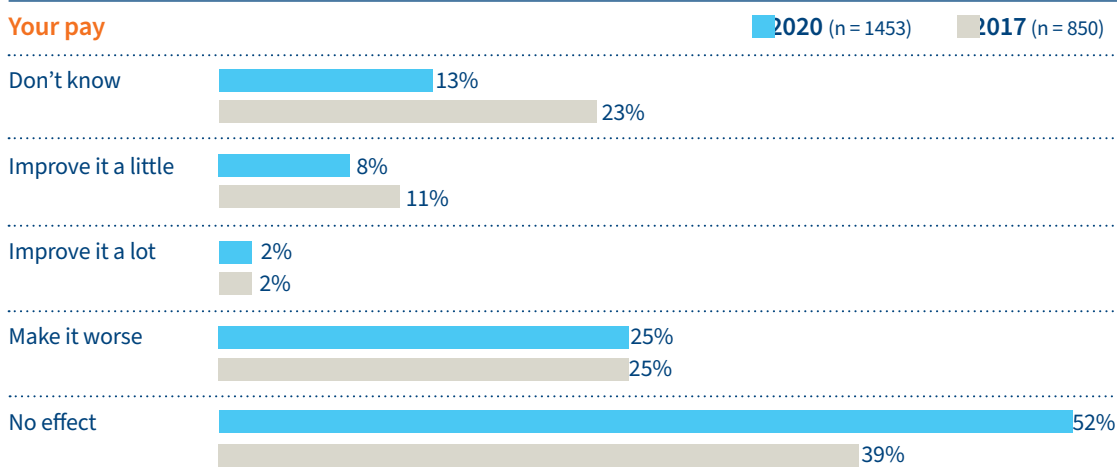
'A lot of teaching is done by e-learning with little or no interaction with people. It does not work for a lot of staff which results in mistakes and wasted time which in turn costs money.'
USDAW Survey Respondent

Just 4.6% of USDAW members who responded to our survey felt confident that their employer would invest in staff over the next five years. This reflects a trend across the economy, in which workers who enter work with fewer formal qualifications are also subsequently given less on the job training.[42] As a result, work is further polarised and those in society whom are offered the least material rewards from work remain locked into poverty.

At the same time, opportunities for progression are limited as these technologies 'hollow out' middle-range supervisory jobs.

Figure 10: How do you think increased use of new technology will affect you at work over the next five years?

Your pay	■ 2020 (n = 1453)	■ 2017 (n = 850)

	2020	2017
Don't know	13%	23%
Improve it a little	8%	11%
Improve it a lot	2%	2%
Make it worse	25%	25%
No effect	52%	39%

'We've been automated, we lost three levels of management… the overall store manager is still there, but the customer service manager is no more, the stock manager is no more and the operations manager is no more. All those jobs are being done by the technology.'
Workshop Participant, Retail

In interviews with Connected Worker Platform Developers, these functionalities were suggested to increase innovation, as new processes are created and continually evaluated dynamically by the team, and increase autonomy: workers can resolve problems alone, or support each other to solve problems without needing management.[43] Such framings often increase worker support for more invasive forms of monitoring technology.[44]

Yet, many tools do not emphasise their use for 'bottom up' innovation.[45] As Connected Worker Platform NovaTech promise[46] their system allows for *'error-proof execution of manual tasks… closing the gap between… personnel, the control system and standard operating procedure… ensuring accurate execution, information capture and validation of manual tasks.'*

Even where systems are advertised as enabling frontline-led transformation, we found that in implementation, this is highly dependent on managerial style. Rather than being a channel for worker voice, these tools are deployed in ways which centralise control, and enforce compliance and standardisation.[47] Regardless, the platforms which serve these businesses gain by winning access to more and more raw information about operations and business processes.

Support and participation

Dialogue, trust and dispute resolution are being replaced by automated processes. These undermine access to support to represent workers' interests and workers' ability to determine and improve their working conditions in three ways.

First, there is a reduction in peer support. Individuals are increasingly atomised as a result of having different shifts, the intensification of work, and individual level performance tracking, driving competition and harming morale. Our interviews and survey suggest a growing sense of isolation, as workers are trapped in perpetual competition with their colleagues and opportunities for human communication are diminished: 29% of USDAW members report that over the last five years, communication with colleagues has been made worse.

Secondly, the pastoral aspects of human management have been diminished. The transition to remote management physically removes managerial support, and a reduction in roles in some cases. This can make accessing management difficult. The one-way mirror of surveillance led a third (34%) of workers who responded to our survey to feel that the increased use of technology would make communication at work worse while 44% thought that increased use of technology will make management practices worse over the coming five years.
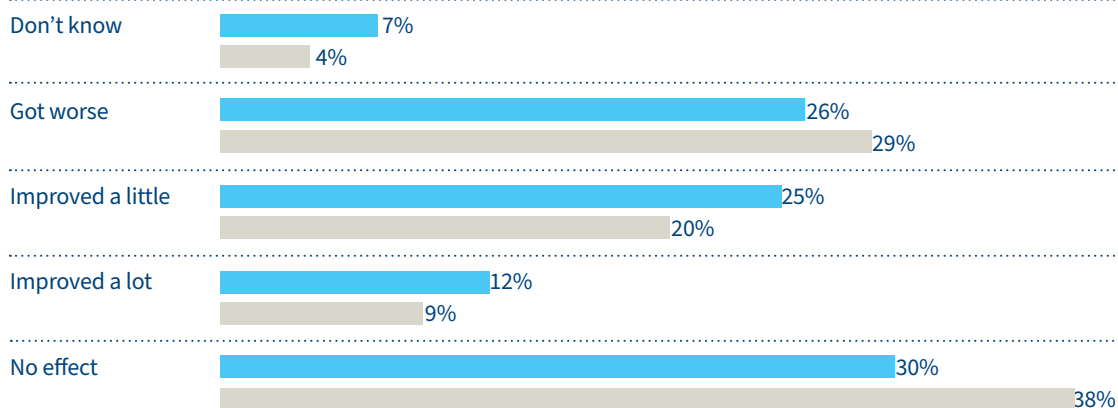
While some managers recognised the limitations of these systems, they told us they felt compelled to use them and their full functionality. This was seen as a necessarily progressive activity, because it is 'innovative', allowing for 'precision' in management. Yet, the way managers deploy these systems can degrade relationships with staff, and the willingness of workers to approach them in their pastoral role.

Figure 11: How do you feel that the following aspects of your job have changed in the last five years?

Communication with colleagues

2020 (n = 1460)   **2017** (n = 954)

	2020	2017
Don't know	7%	4%
Got worse	26%	29%
Improved a little	25%	20%
Improved a lot	12%	9%
No effect	30%	38%

'I keep telling them to just log it. Then once they're comfortable…I'll start to tighten the noose a bit more…'The older blokes felt they were being spied upon. But my argument was if they see you've only done 30% of 7 hours they will come to you and say why have you only done 30%… you have to argue it.'
Maintenance Manager, Manufacturing

In our survey of USDAW union members, 60% of those who said their work is managed by technology or an app said they had experienced problems as a result. Of respondents who reported that they had experienced problems with technology managing their work, 27% suggested it was difficult to report or discuss issues which arose with a human.

Thirdly, just as support is most needed, and a sense of community at work is reduced, access to unions is made more challenging. While parts of the gig economy, and Amazon in particular, have been found to use algorithmic tactics to block and prohibit unionisation[48] in established firms the introduction of platforms often comes alongside contract transformations and increased outsourcing (see Part 3), which can mean new collective agreements have to be negotiated.[49]

Further, as the workforce is recruited and trained individually, online, on a rolling basis, union representatives have fewer opportunities to meet and recruit workers. This makes the right to access representation, digitally and with privacy increasingly important.[50]

There is a marked lack of meaningful consultation about deployment of algorithmic systems in work, and the collection of growing reservoirs of personal data. When asked whether their employer consults with staff on the introduction of new technology and its impact, 65% of our survey respondents disagreed. 49% feel better consultation would make technology more effective; and 49% felt better consultation would help workers to adjust to changes. Our research and others' suggests that widespread lack of knowledge about use of data driven technologies and personal data multiply the asymmetries of power between employer and employees.

'We were not informed until we had all been signed up using the personal emails we had given employers for our payslips. Now it is impossible to perform our jobs without access to this site as all work communication is through it.'
USDAW Survey Respondent

Employees we spoke to were concerned about their data use, as highlighted further in our survey. 48% of USDAW union members we surveyed were not at all confident they knew what data their employer collects about them; 52% were not at all confident they knew why and for what purposes their employer uses data collected about them; and 67% of respondents were not at all confident that they know how data collected about them is used to assess or make predictions about their performance. This closely mirrors the findings of a Prospect Union Survey in February 2020, finding that 48% of respondents were not confident they knew what data their employer collected about them and 34% were not confident that this data would be used in an appropriate way.[51]

Employers deploying these systems in firms we spoke to did not see this as an issue. One frontline engineer in the manufacturing sector we spoke with explained the difficulties of progressing a dialogue about this without a recognised union.
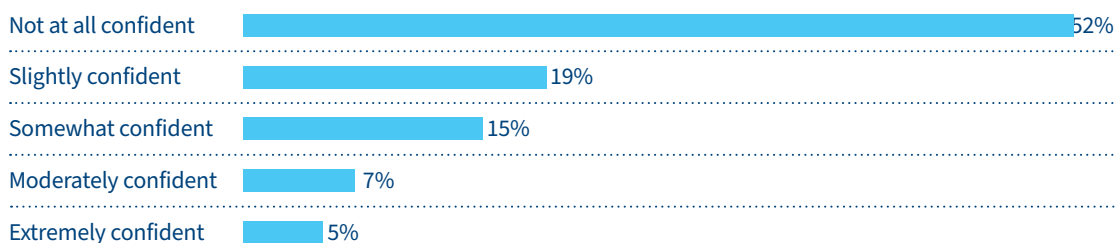
When USDAW union members were asked whether they were confident that the new technology used by their employer has been designed with their best interests in mind, 66% disagreed, with 60% feeling the job they do is controlled by the machines they work with. The 'problems' advanced technology is deployed to solve – such as a machine learning system being deployed to check whether staff are scanning items through the tills correctly – are not the priorities for workers on the frontline.

'All this technology is there to monitor me, but they can't get the bloody doors to shut properly.'
USDAW Survey Respondent

Figure 12: I know why and for what purposes my employer uses data collected about me

Total n = 977. Fieldwork completed between August and October, 2020. By USDAW in partnership with IFOW.

Not at all confident	52%
Slightly confident	19%
Somewhat confident	15%
Moderately confident	7%
Extremely confident	5%

Health and wellbeing

Of respondents to our USDAW union member survey 55% thought the increased use of technology would make staff wellbeing worse over the coming five years. An increased physical and mental burden is driven by the intensification of work, and a demise of social opportunities, in particular. More research is needed on the interface between health and surveillance technology, but interviewees identified intense monitoring and a loss of control over working hours, rate and nature of work, and a loss of basic privacy, as drivers of a range of health concerns.

'I used to enjoy the job but technology watches over us and management by telematics reports too much; it has affected my mental health.'
USDAW Union member

The systems of control being used add significant stress to workers, who are human beings in human situations being monitored and analysed as if machines.'
USDAW Survey Respondent

The boundaries between work and non-working life are often blurred, with workers informed of updates to gruelling schedules when resting at home – suggesting that issues of 'switching off' also extend to the key workforce who continue to travel to a workplace:

'The supermarket app set out all my hours for me before I'd even said what times I was available, as well as finishing at 10pm at night and starting at 6am it used to kill me…It's hard because you're starting a day with no full energy, you've not slept well, you've just left work then you're back again, to achieve a good day and be energised to carry on it's hard…you can't book time off and you can't say what days you need for other things.'
Retail Worker Interview

Several interviewees pointed to adverse impacts on their performance as a result, suggesting that algorithmic management decisions may well not improve efficiency, as professed and widely assumed:

'Inward facing cameras are being used to discipline so many drivers from every aspect of what you do. I have found in my case it makes you very nervous and jittery about doing your job… of late I find myself overthinking things that normally come naturally, my performance is not as good.'
USDAW Survey Respondent

When asked whether they felt increased use of technology would improve performance at work over the next five years, 25% of USDAW survey respondents thought it would have no effect, and 25% thought it would make it worse (see Figure 7). We heard that the intensification of work under algorithmic systems was actually increasing the risk of harm. This is contra to popular theories of automation that suggest it will remove 'dirty, dull and dangerous'[52] jobs from the labour market, leaving only the more engaging and fulfilling work which requires 'essentially human' skills.

'A lot of professional drivers will sometimes jump a red light or brake too hard because they are under time constraints and often they have to use their mobile while driving.'
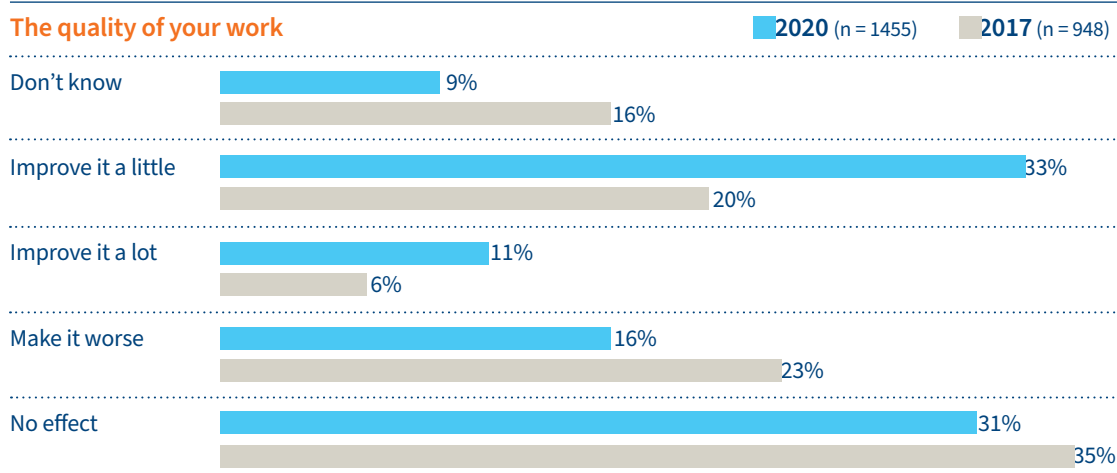Supermarket Delivery Driver

Lightfoot installed into vans means drivers are pulling onto A roads and motorways at around 40mph: company training wasn't provided to all, meaning some aren't aware you don't have to be 'Elite' every single trip. This is putting drivers at risk of causing accidents. Lightfoot present a league table and it is seen as a competition meaning drivers are focusing on their score over their safety because some have been sacked due to low scores.'
USDAW Survey Respondent

Figure 13: **How do you think increased use of new technology will affect you at work over the next five years?**

The quality of your work

■ **2020** (n = 1455)   ■ **2017** (n = 948)

Response	2020	2017
Don't know	9%	16%
Improve it a little	33%	20%
Improve it a lot	11%	6%
Make it worse	16%	23%
No effect	31%	35%

It is perhaps for the range of reasons above that when asked how the increased use of technology will affect the quality of work over the coming five years, just 11% of respondents said they thought it would improve it a lot, with the majority suggesting it would either have no effect (31%) or make it worse (16%). Previous research has found that wearables and monitoring increase workplace stress, with potentially detrimental effects on productivity.[53] We did not hear from any of our research respondents that they had been consulted on the health and safety implications of these tools.[54]

Overall, we have seen that the introduction of algorithmic systems leads to the systematic erosion of all 10 principles in the Good Work Charter. In the following section we demonstrate that this is linked to their design, in accordance with the values which are intrinsic to platform businesses.

3

How firms are restructured

Part 3
How firms are restructured

'They just don't have that idea that you're a human being…'

Retail Worker

As we have seen, the Human Data Cycle can erode good work. In this chapter, we explain in greater detail how firms restructure the workforce around algorithmic systems and the extent to which this drives trends akin to the 'gigification' of work. This sees the use of gig economy management techniques spread to conventional employment.

Data as value

In the Amazonian Era, data is conceived not as infrastructure, so much as 'oil' or 'gold'.[55] This has been described as a 'data imperative',[56] a wide-reaching assumption that data is the key source of value, driving a form of 'enchanted determinism'[57] whereby algorithmic inference defines innovation.[58] Under the data imperative, data created by and collected about the workforce can be seen as more valuable than the person, or labour actually undertaken.

While Connected Worker Platforms stand to benefit from ever greater data flow through their software, several of those we spoke to, as well as worker interviewees, expressed concern about how businesses were deploying these systems and questioned whether the levels of data capture were necessary, or guaranteed to be valuable.

'Wearable devices and gesture control devices can detect movement in the hands and movement in the eyes. A lot of companies we've spoken to are taking it to extremes. Looking at whether people are moving their hands, where they are looking with their eyes. There are companies that do video surveillance of workers, and use AI to analyse the video… hand and gesture controls, tracking eyes – that's a lot of monitoring and you start to wonder how valuable that is…'
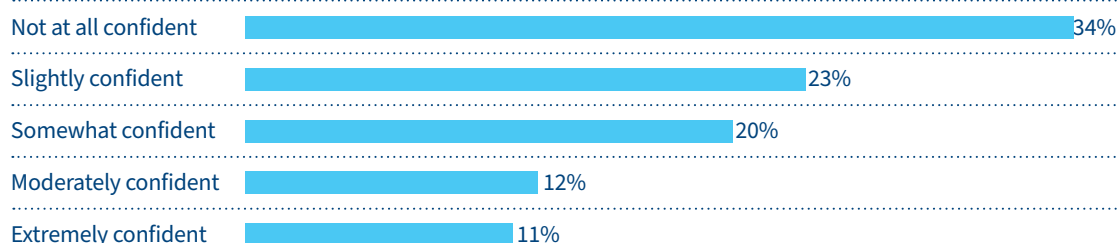Connected Worker Platform Developer, USA1

Platform developers speculated that data was being gathered by employers, without a known business benefit, or purely to the ends of control.[59] 51% of USDAW union members we surveyed were not at all confident they knew why and for what purposes their employer uses the data collected about them. This suggests an experimental rather than proportional approach.[60]

This unquestioning drive towards data acquisition may lead employers adopting these tools to overlook human impacts, and in some instances regulatory commitments. Several developers of Connected Worker Platforms we spoke to suggested they were rarely asked about compliance to data protection law. From employers we spoke to there was confusion regarding who is the data controller when systems are downloaded rather than built in house.

Figure 14: I trust my employer knows how to protect my rights when using my data

Total n = 940. Fieldwork completed between August and October, 2020. By USDAW in partnership with IFOW.

Not at all confident	34%
Slightly confident	23%
Somewhat confident	20%
Moderately confident	12%
Extremely confident	11%

The majority of Connected Worker products are created in the US.[61] As some developers noted, younger procurers of technology did not want to go through the standard procurement procedures of their organisations, and were keen to 'disrupt' the firms they work in by introducing these within their teams. Managers we spoke with who had downloaded tools, and asked their staff to do so, did not list data protection standards as an issue of concern.

'Now millennials are the purchasing managers, they don't want that level of hassle. You want to download it, and use it. You don't want to sit there, in 12 months you're not even in that job any more.'
Connected Worker Platform Developer USA4

'It concerns me to be honest…what you end up with is people wanting to solve problems, but they have almost no expectations around workers rights, whether our technology is compliant with employment law, or GDPR.'
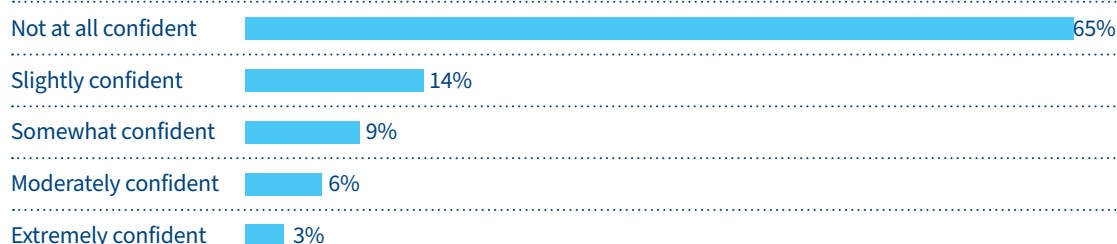Connected Worker Platform Developer UK1

'A lot of the guys have grown up in a digital age with instant messaging so they're very used to it, so there hasn't been any concerns [about privacy] and to be honest I haven't given [privacy] a great deal of consideration.'
Manager, Manufacturing Maintenance

This is concerning, given the risks of third party software.[62] As markets in the prediction of individual behaviour cross public and private realms, sharing of data collected at work could impede individual progress in a range of domains – be that receipt of welfare, credit or more.[63] In this sense, Amazonian Era deployments of technology demonstrate the importance of our right to privacy[64] for the preservation of other fundamental rights.

Figure 15: I know whether my data is being shared with 3rd parties

Total n = 963. Fieldwork completed between August and October, 2020. By USDAW in partnership with IFOW.

Not at all confident	65%
Slightly confident	14%
Somewhat confident	9%
Moderately confident	6%
Extremely confident	3%

Matching of 'supply' and 'demand'

'Wherever work can be broken down into shifts, it will go gig.'
Amazon Web Services Director

As set out in Part 1, when algorithmic systems are introduced into established firms, work becomes defined, measured, monitored, and scheduled by the algorithmic system. This 'digital thread' allows for closer matching of 'supply' of labour with 'demand' for tasks as defined within the system. Work becomes a variable input, like any other factor in the process of production, to respond to 'demand' from the market.[65] This use of 'immediate' sales data to dictate the availability of work represents one aspect of the complex relationship between workers, consumers and the platform.[66]

'The worker can now be part of the digital thread of the business… scheduling of frontline worker activity can be [triggered] from the point of sale.'
Connected Worker Platform Developer USA1

While many platform businesses establish themselves as marketplaces for self-employed or freelance contractors to win work, firms which adopt algorithmic systems simultaneously restructure the workforce and contract type to allow for closer 'matching' efficiency.

'The vast majority of staff at the supermarket are on flexi-contracts, anything from 16 hours a week, sometimes 20, 22 – about the max you'd get as a cashier is 22 hours. You wouldn't get any more permanent hours or core hours as they call it. Then the rest of the week you're what they call flex up and flex down.'
Retail Worker

'We've gone through a restructure… it's all changing and affecting contracts, so you'll have more flexibility… the way I see things over the next 5–10 years there's going to be more of a company that's the core group with lots of subcontracted employees.'
Retail Worker

While in retail work, restructures still saw work done by employees on zero hours contracts, we also heard of increased use of agencies – with these workers also scheduled by the app – for delivery services. A future aim of Connected Worker Platforms, as suggested to us by a UK based developer, is partnership with 'liquid workforce providers' (agencies). In essence, the platform would both manage what work was to be done in an organisation, and provide the labour to meet this demand for work, significantly changing the nature of the firm[67] and presenting new issues in terms of accountability.

Employees on temporary contracts are required to deliver more intensified labour, in order to compete for and secure a contract with better hours, as discussed in Part 2. Many contractors in the gig-economy similarly accept less than the minimum wage for work on platforms.[68] This 'choice' to self-exploit reflects wider systemic features. As the ILO report, over the past few decades in both industrialised and developing countries there has been a shift away from standardised employment as a result of such 'just in time' production models[69] (leading some to question how innovative the gig model really is).[70] A weak demand for labour[71] exacerbates workers ability to 'opt out' of bad work. The UK has the 5th highest share of workers in part-time work on an involuntary basis across EU-28 countries.[72]

Place can amplify this issue.[73] A supermarket supervisor in London reported huge turnover in colleagues, with many staff seeing work in her store as a temporary stopgap and undesirable career. In contrast, speaking to a young woman in Grimsby, any guaranteed hours contract with this same supermarket was seen as a highly competitive job. When working as a temp for the organisation at Christmas, she felt unable to say no to any shifts, offered at 24 hours notice, for fear of missing the chance to win a secure contract thereafter.

'People who are left have to work twice as hard to compensate for the loss in hours also this then affects their emotional and mental state because of the extra workload.'
USDAW Survey Respondent

'They run a minimum level of staff and have an over-reliance on agency to back them up, but in recent years with de-manning exercises we've seen a transition to more and more agency. They've introduced second and third generation contracts in recent years… meaning workers on site have really diversified terms and conditions.'
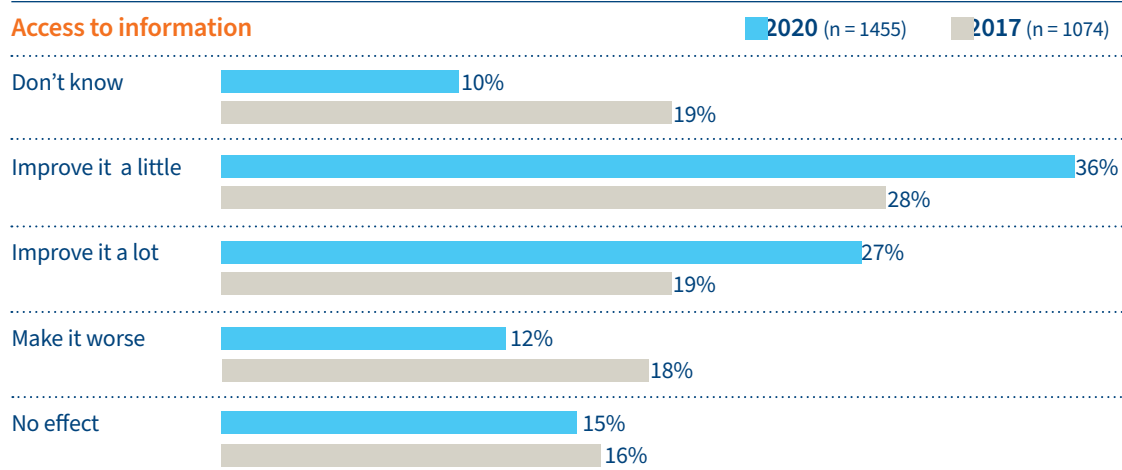Food Processing Worker

In addition to a lack of good exit options, algorithmic systems can deploy 'nudge' based techniques to incentivise action, as is common in gig-work contexts.[74] This imbues the 'user' with a sense of choice, while playing on known aspects of psychology to promote competition and drive performance.[75] As a connected worker platform developer told us, workers completing 'extra' tasks above and beyond those already scheduled could win points which translate to Amazon vouchers:

'Most of the time it's not been extra pay, it's been recognising heroes, creating healthy competition… either at a site, or crew or individual level – giving them kudos… then there's a points system which you can spend on gifts… so it's an indirect monetary reward, you get digital bonuses which you can spend on Amazon…'
Connected Worker Platform Developer USA3

While research suggests that some freelancers offering professional services can experience greater feelings of agency when working on platforms,[76] outcomes for freelancers are often stratified.[77] We have found that when introduced to established firms, platforms also create a segmented workforce, on different terms and conditions, to maintain consent to the balance of power.[78]

Figure 16: **How do you think increased use of technology will affect the organisation you work for over the next five years?**

Access to information   ■ **2020** (n = 1455) ■ **2017** (n = 1074)

	2020	2017
Don't know	10%	19%
Improve it a little	36%	28%
Improve it a lot	27%	19%
Make it worse	12%	18%
No effect	15%	16%

Interchangeable and expendable workers

A widely acclaimed and positive attribute of the gig economy is the alleged ease with which workers can secure work. Taking the example of taxis, Uber removed the requirement for detailed place knowledge by incorporating direction into the app. In this process, value held within humans (human capital) transfers to technology (capital). This can devalue labour within the overall production process. 25% of USDAW union members when asked how increased use of technology will affect work over the next five years felt that the increased use of technology would 'make their pay worse'.

Fungibility is the ability of a good or asset (in this case, worker) to be interchanged with any other individual good or asset of the same type. Fungibility implies equal value, meaning workers are more replaceable and interchangeable. This marks a further move away from the 'personal relationship' characteristics of employer/employee and has been recognised as at the heart of Amazon's workforce management strategy:

'At the end of the day, the big problem isn't the specifics of COVID-19 response. It's that Amazon treats the humans in the warehouses as fungible units of pick-and-pack potential.' [79]

While realisation of these capabilities largely remains to be seen, the implications for labour are clear, as recognised by the creators of this technology:

'This is one of the deepest problems that will affect the workforce over the coming years. It is deeply worrying that individual skills won't be relevant. One of the firms that are investing in us can see this problem and they want us to solve it. We need a digital union system.'
Connected Worker Platform Developer USA5

'For your average worker, yep you could be replaced by a gig worker, you could lose all predictability in your earnings, which is definitely a problem, be replaced by someone with less experience, particularly as [worker management] platforms that can effectively make it possible for anyone to do it. It's a massive problem and I don't know what the solution is.'
Connected Worker Platform Developer UK1

In addition to becoming more interchangeable, through the pandemic, new attention was drawn to how expendable gig workers are, as they experienced unfair termination of contracts.[80] In a similarly troubling trajectory, some developers of some cloud-based workforce management platforms suggested that interested stakeholders, such as investors in this software and cloud hosts of the data (such as Amazon) were seeking to advance 'blacklisting' capabilities within the platform, reducing an individual's ability to transfer between jobs:

'There are pushes towards hey, I want to see this guys baseball card and their personal statistics and how they did in their prior job for me to hire them in this new job, and the answer has to be absolutely not.'
Connected Worker Platform Developer UK1

At present, the reasoning behind such decisions could remain inaccessible to workers.[81] Gig economy platforms can 'deactivate' workers without warning, taking away their livelihoods and undermining the fairness of work.[82]

Reduced human management and obscured accountability…

A legal employment relationship is defined as a 'personal relationship' and confers responsibilities and duties of care. Arguably, one predominant 'innovation' of the gig economy was its re-framing of relationships with frontline workers as non-employment relationships.[83] This is a core source of the profitability of these businesses, as is increasingly recognised by investors.[84] When platforms are introduced to established businesses, and the conditions of work change, similar battles to redefine responsibility arise.

The erosion of the personal relationship changes the role and dynamics between the worker and the corporation. This signals a deeper shift away from a sense of care and responsibility, and towards the idea of the 'entrepreneurial self'.[85] Our research suggests that the way workers see their responsibility, and the responsibility of the platform, is a major contributor to the upholding or standards and spread of the platform business model.

While workers in established firms are not self-employed 'entrepreneurs', algorithmic systems prompt workers to internalise the logic that they are responsible for completing algorithmically set workloads, diminishing employer responsibilities to set fair work terms.[86] As a manager who had newly procured a Connected Worker Platform to manage their team told us:
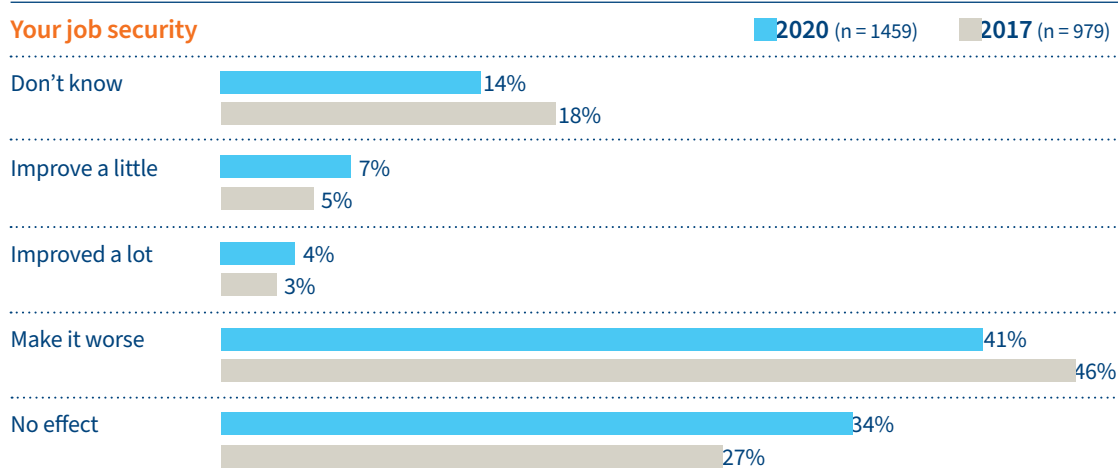
'If it's in your inbox, you have to deal with it, you know – if it's not moving it's the user at fault for not moving those jobs around.'
Maintenance Worker, Schools

This reflects the sentiment of riders we spoke to from Deliveroo and Uber, where the narrative of 'the platform' was well accepted, the role of humans in setting these standards is less recognised. Workers spoke to us of *'keeping the app happy'* and, as a result of its design, being driven to be *'their own worst manager'*. This drive takes place within the context of institutional obstacles to accountability, as explored in IFOW's report Mind The Gap.

Behaviour change is deemed most effective when it leaves the person being managed with the feeling that they own their choices. However, in reality, choices presented to workers are strongly pre-determined by the design of the human data cycle and wider opportunities for good work.

Figure 17: How do you think increased use of new technology will affect you at work over the next five years?

Your job security

2020 (n = 1459)   2017 (n = 979)

	2020	2017
Don't know	14%	18%
Improve a little	7%	5%
Improved a lot	4%	3%
Make it worse	41%	46%
No effect	34%	27%

4

The social costs of an Amazonian Era

Part 4
The social costs of an Amazonian Era

In the Amazonian Era, work is not working.

Throughout this study, we have seen social impacts beyond the material and non-material consequences of restructuring terms, conditions and quality of work. In particular, human contact and communication become less significant; opportunities for human skill, judgment and recognition diminish; and a transition from cultures of trust, to cultures of proof sees workers driven to become 'their own worst manager'.

We have found that the breakdown of work into irregular shifts, and the competition introduced into firms, degrades the role of work as a source of community and connection. While many remote workers may have envied these aspects of key work through the crisis, workers who are in frontline, onsite jobs share their experience of alienation. Growing competition between staff for security, more centralised control and reduced access to representation degrade community.

The aggregate impacts of these trends reduce the value of key work, both materially and socially. This is in stark contrast to the contribution these roles have played through the pandemic. We often heard that these jobs are where 'value is actually created' and were indispensable to business operations. Ironically, this 'value' has translated into a promising opportunity for platform businesses rather than an improvement in the quality of work for the essential workers who have earned it.

The comparative analysis of our surveys demonstrate that this is acutely felt by working people across the country. 49% of those surveyed felt less fulfilled by their work following changes made in the last five years, 55.7% felt less valued by their employer, and 38% felt changes made to their job in the last five years had made them feel less valued by society. By comparing our 2017 and 2020 surveys, we find that workers are more pessimistic about both the value of their work and the impact of technology on it. This is particularly pronounced for those who perceive technology will worsen or have no impact on their performance (increasing by 20%), will worsen or have no impact on their communication with colleagues (rising by 12%), or will worsen or have no impact on feeling fulfilled (rising by 13%).

As we have explored elsewhere, threats and perceived threats to work are predictive of other social and political behaviours, including voting behaviour. [87]

When platform business models are downloaded into firms, work is severed from human flourishing and wellbeing at the individual, firm and community level. Our research shows how imperative it is to re-establish, **or establish**, this connection. For technology to drive recovery and prosperity, as intended and is much needed, technology must be redirected to work for people and the public interest. This demands a 'human-centred' approach to technology and a renewed focus on making work better.

Key recommendations

To redirect technology to work for people and the public interest, Good Work must be at the centre of our new social contract. This means a sharp focus on creating and prioritising better work across government departments, regulators, industry and civil society. We recommend:

Protect Good Work

→ Introduce an Employment Bill with a dedicated Schedule of 'Day 1' Digital Rights. The Schedule should synthesise existing protection across employment, data protection and equality law and add new, digital rights. New protection should include rights to security, knowledge, involvement, human contact and disconnect. These rights should be universal and not dependent on employment status.

→ The Government should initiate an Accountability for Algorithms Act in the public interest which will require early algorithmic impact assessment and adjustment when adverse impacts are identified. Algorithmic impact assessment should extend to equality impacts and the physical, mental and financial risks of labour intensification. Further detail is outlined in IFOW's 'Mind the Gap' report.

→ New mandatory disclosure obligations would require reporting on the fact, purpose and outcomes of algorithmic systems shaping access, terms and quality of work. Algorithmic impact assessments, and adjustments made, should be regularly disclosed as part of fulfilling this duty.

→ A joint regulatory forum led by the ICO should be established with new powers to create joint statutory guidance and impose terms on use of algorithmic systems to determine access, terms or quality of work.

→ The joint forum should have new powers to create or approve certification schemes involving a set involving set of standardised metrics before systems are put on the market.

→ The Department for International Trade must produce impact assessments of forthcoming trade deals to be presented to parliament on the risks to worker rights of import of unregulated digital products, including worker-technology which may not be compliant with UK standards.

Key recommendations *continued*

Collaborate for Good Work

→ The Cabinet Office should initiate a collaborative, cross-government Work 5.0 Strategy, underpinned by the human-centred design and use of technology. Business, unions and civil society should be engaged to develop and implement the Strategy which should extend to the social and economic conditions needed to create Good Work,[88] funding for it, and support for workers in transition to it.

→ Good Work standards should be embedded across local and national Government departments, recovery and levelling up packages, new infrastructure projects and procurement.

→ The remit and representation of the Build Back Better Council should be broadened to enable social partners, academia and civil society to contribute meaningfully.

→ The Trade Union Act and other anti-union legislation should be repealed to redress power imbalance for a fairer future of work. Collective bargaining covering use of algorithmic systems and new collective rights for involvement and review when algorithmic systems are introduced must be permitted.

→ Employee contracts, collective agreements, technology agreements and employee privacy notices should include explicit agreement and commitments about employers' collection and use of employee data and algorithmic systems shaping access, terms and quality of work.

→ Data access rights and requirements should extend to all union representatives; and new and existing digital rights under the Employment Bill would be exercisable by unions on members behalf.

→ The new regulator's forum should review existing, and establish new, formal mechanisms to involve workers and their official representatives wherever algorithmic systems are used to determine access, terms or quality of work.

→ S172 Companies Act should be amended to require consideration of the algorithmic impact assessment including impacts on Good Work to enable the embedding of Good Work through business models.

→ The Chartered Institute of Personal Development should lead in collaborative development of business guidance to promote human-centred automation aimed at creating better work.

Key recommendations *continued*

Innovate for Good Work

→ The overarching goal for the UK's AI Strategy should be human flourishing and wellbeing – and the role of Good Work to achieve this goal must be formally recognised and integrated.

→ New functions and funding streams for the AI Office Council, UK Research and Innovation and CDEI should be introduced to ensure that the UK leads in the design and development of human-centred automation.

→ A new tech innovation Grand Challenge targeted at stimulating innovation in human-centred automation should be initiated. Existing Challenges should also consider anticipated impacts on Good Work.

→ The Government should allocate funds and monitor progress in innovation for recovery and to level up through the prism of Good Work, as outlined in IFOW's Good Work Monitor: A Framework For Action.

→ National Government should enable compacts and pilots by local authorities to catalyse locally led innovation in human-centred automation, as proposed in the Good Work Monitor.

→ Centre for Data Ethics and Innovation should undertake a '1 Year Review' of the success of the voluntary approach to pre-emptive action proposed for corporates in the 2020 Bias Review. If a voluntary approach has not resulted in voluntary pre-emptive action, the CDEI should advise Government on the need for an Accountability for Algorithms Act.

Researching Good Work

→ Research of use and impact of automation technologies, and their impacts on work and welfare, should become a national priority.

→ ONS should add new measurements for the adoption of automation technologies by firms and their impacts on work and workers, initially in their Annual Business Survey. A dedicated annual technology survey should be developed based on a 'SOC-style' typology of different technologies.

→ Cross-disciplinary research should be undertaken on the design environment for automation technologies. This should include work with technology developers, civil society and unions and should aim to equip the design community with understanding of future impacts.

→ Legal research should be undertaken on existing review and disclosure obligations on corporates, employers and data processors. This should examine why these obligations are failing to surface the impacts of automation technologies, or change corporate behaviour.

→ The EHRC, ICO and civil society including the Bar Pro Bono Unit should prioritise test cases to establish, highlight and enforce existing protection for workers under the GPDR, Equality Act and Health and Safety laws.

→ The HSE should investigate incidents and risks to the mental and physical health of intensification of work under management by algorithmic systems. HSE should update guidance on health risks of AS at work and consideration by HSE Committees at Work under HSE law.

"

Technology has led to a lot of essential services being taken for granted. It's always assumed that when work is online, things take less time. That's not necessarily the case!

Community Union Workshop Participant

Appendix 1

The Good Work Charter

1 Access
Everyone should have access to good work

2 Fair pay
Everyone should be fairly paid

3 Fair conditions
Everyone should work on fair conditions set out on fair terms

4 Equality
Everyone should be treated equally and without discrimination

5 Dignity
Work should promote dignity

6 Autonomy
Work should promote autonomy

7 Wellbeing
Work should promote physical and mental wellbeing

8 Support
Everyone should have access to institutions and people who can represent their interests

9 Participation
Everyone should be able to take part in determining and improving working conditions

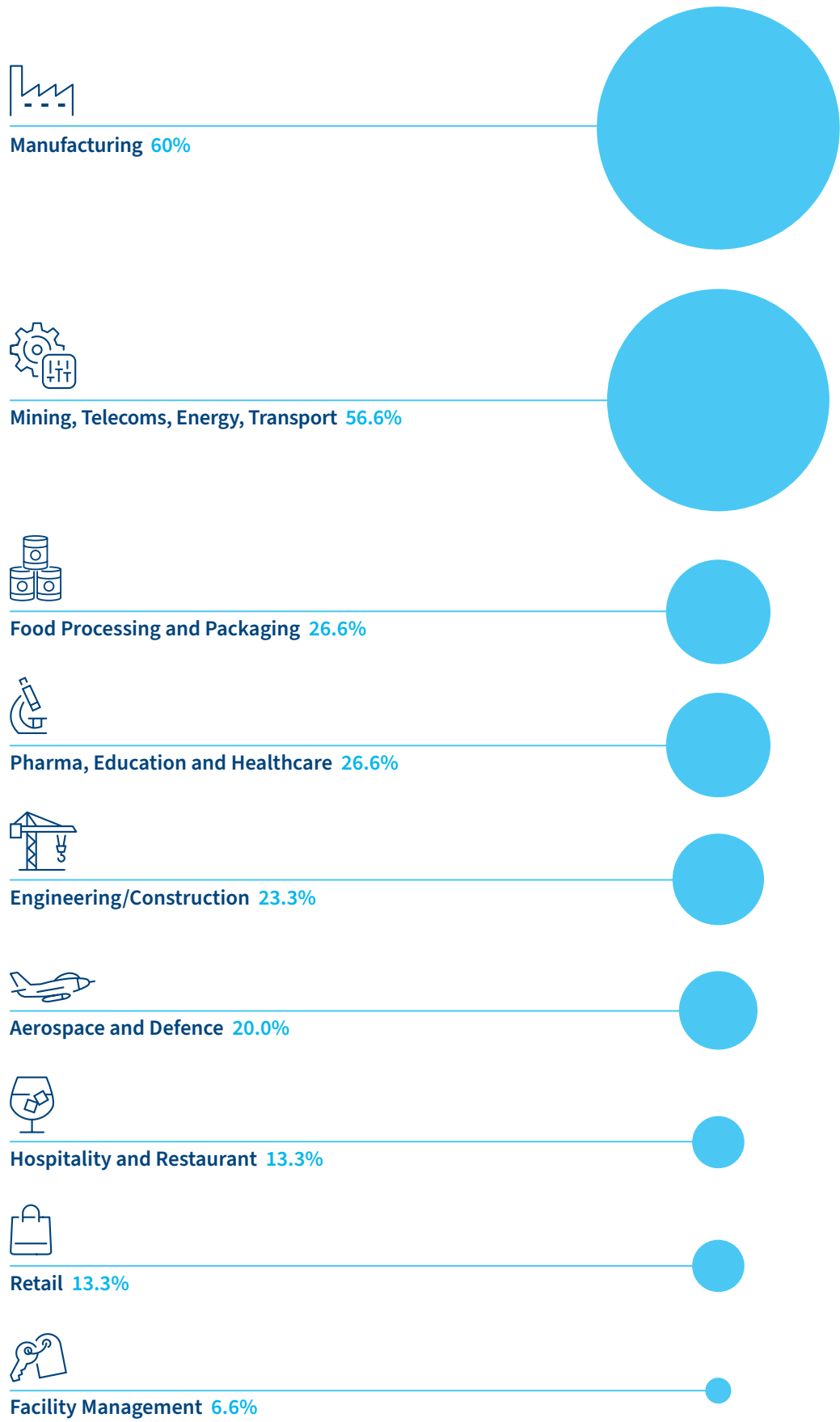**10 Learning**
Everyone should have access to lifelong learning and career guidance

Appendix 2   Industries serviced by Connected Worker Platforms

Manufacturing 60%

Mining, Telecoms, Energy, Transport 56.6%

Food Processing and Packaging 26.6%

Pharma, Education and Healthcare 26.6%

Engineering/Construction 23.3%

Aerospace and Defence 20.0%

Hospitality and Restaurant 13.3%

Retail 13.3%

Facility Management 6.6%

Endnotes

1   Scholars have previously coined the term 'uberisation' to describe changes to the economy resulting from Platform business model adoption. However, these papers conventionally refer only to the matching functions of algorithmic systems. We believe Amazon is a more pertinent metaphor, and driver of social transformation in the wider economy, as is justified throughout this report.

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6   Advances in hardware become advances in information technology in our current technological era.

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