



AUTOMATION AND DIGITALISATION TOOLKIT



**EUROPEAN
TRANSPORT
WORKERS'
FEDERATION**

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AUTOMATION AND DIGITALISATION TOOLKIT

EUROPEAN TRANSPORT WORKERS' FEDERATION

LIONEL FULTON
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Key points

Definitions: automation means that work previously done by people is undertaken by machines, while digitalisation is the widespread use of digital (computer) technology. This has allowed: wider automation, greater control over processes, customers and workers and the emergence of the platform economy.

Some studies looking at the overall impact of automation and digitalisation indicate that its effect on employment will be profound and suggest that employment in transport will be particularly hard hit. Women may be more affected by automation and digitalisation than men, at least in the short term. However, it is clear that occupations will be affected in very different ways.

Digitalisation, if unregulated, is also likely to lead to increased income inequality, to strengthen existing trends for employees to obtain a smaller share of economic output and to accelerate a shift to more flexible forms of work, as well as intensifying the monitoring and surveillance of workers.

However, the introduction of automation and digitalisation does not solely depend on technology. There are many other aspects to consider which may slow or limit its take-up, including the economic costs and benefits of its introduction, and the need to protect against cyber-attacks. There are also examples where the introduction of automated processes has not led to the promised higher productivity.

It is also important to recognise that the move towards greater automation and digitalisation is not an automatic process. Regulations can have a major influence on the way automation and digitalisation are introduced.

The Covid-19 pandemic, which has had an enormous impact on transport patterns, has also affected moves to automation and digitalisation. In most cases, it has increased the pressure for more digitalisation. However, in some sectors, the loss of passengers and, to a lesser extent the fall in goods traffic caused, has made it more difficult to finance the necessary investment, although the need to move to net zero counteracts this to some degree. Each transport sector is examined in turn.

Looking more specifically at automation and digitalisation, 10 separate transport areas are examined:

- civil aviation;
 - flight crew and cabin crew;

- air traffic management;
- ground handling and maintenance;
- water transport;
 - maritime transport;
 - inland waterways;
 - docks;
- land transport;
 - railways
 - road transport; and
 - urban public transport; and
- logistics (freight forwarding, document and package delivery, contract logistics and ecommerce)

In each the impact of automation and digitalisation is analysed in terms of:

- key potential changes;
- progress so far;
- the obstacles; and
- the impact

In looking at automation and digitalisation, unions need to ask a series of questions and not simply accept that the automation and digitalisation projects will inevitably work in the way that they promoters promise. Unions are not against automation and digitalisation. However, they want its benefits to be shared and not be captured by a small group.

Unions have three main instruments they can use to achieve their objectives:

- collective bargaining;
- campaigning and lobbying; and
- ensuring that their structures match the changed situation.

1. Collective bargaining is the main way unions can shape the introduction of automation and digitalisation and a 21-clause model agreement, based in part on already negotiated texts, sets out the demands to aim for, including:

- job security;
- the quality of work;
- a share in the benefits of automation and digitalisation;
- health and safety; and

- safeguards against inappropriate monitoring and surveillance.
2. Unions also need to be involved in public campaigns and lobbying on automation and digitalisation, and there is a framework showing:
 - the main union objectives;
 - the arguments unions can use;
 - the targets for union campaigning; and
 - some campaigning pointers.
 3. Unions may need to adapt their organisational structures and methods if they are to be able to recruit and organise new workers in transport. There are suggestions for action to ensure that:
 - as a starting point, unions know how their composition compares with that of the workforce they represent;
 - there are specific structures/committees for specific groups of members;
 - the leadership reflects the membership;
 - union training takes account of the challenges posed by automation and digitalisation;
 - union policies reflect the needs of new groups of members;
 - union processes and procedures are appropriate for current circumstances; and
 - new members are made aware of what the union is for and has achieved.

Finally, there is background information on:

- information and consultation legislation; and
- European works councils.

The challenge of automation and digitalisation

Definitions

Automation is where a process is performed with minimal human intervention and tasks previously undertaken by people are now carried out by machines. It has brought benefits, with the elimination of many physically arduous tasks and increased productivity, but it has also been a concern to workers since at least the industrial revolution,¹ although the word “automation” only started to be used widely at the end of the 1940s. **Robotisation**, where robots perform tasks without the help of humans, has a narrower meaning than automation.

Digitalisation refers to the widespread use of digital technology – in which information is converted into a digital format. It is a much more recent phenomenon. This digital format allows the information to be read, stored and processed by an electronic device, and the falling cost and increasing performance of these devices has resulted in their introduction on a very wide scale – from smart phones to facial recognition software and the internet of things. This potentially changes the quantity and quality of work required for any task, with a possible impact on the numbers employed and the skills and training needed.

Digitalisation allows:

- a wider range of processes to be automated than in the past – wider automation;
- greater control over processes, customers and workers – increased surveillance and a potential loss of privacy; and
- the development new relationships between end customers and workers – the platform economy.

Artificial intelligence describes the ability of machines to respond and react to changing situations in a similar way to humans. Through **machine learning**, they automatically learn and improve from experience without being explicitly programmed on how to respond. It has the potential to allow tasks involving decision-making and problem solving, previously seen as requiring human involvement, to be done automatically.

¹ In 1811 skilled textile workers in Nottingham, England, known as Luddites, attacked and broke automated looms they feared were replacing them. There were riots and 25 Luddites were executed, and others transported to Australia.

The potential impact of automation and digitalisation on jobs and employment in the transport industry

The potential impact of automation and digitalisation on employment levels

The overall picture

There can be no certainty on how employment, in terms of the number of jobs, will be affected by automation and digitalisation, and, in reality, the outcome will depend on a much wider range of factors than automation and digitalisation alone. However, a number of studies have tried to calculate the impact.

The 2013 Oxford University study, by Frey and Osborne,² used US job descriptions, to develop a method of estimating the “probability of computerisation” for specific occupations. Their calculations indicated that 47% of jobs in the US were at high risk of being automated within 10 to 20 years.

A second study, carried for the OECD by Arntz, Gregory and Zierahn,³ argued that looking at whole occupations rather than individual tasks produced a distorted and exaggerated picture of the number of jobs at risk, because “many workers in occupations that have been classified as vulnerable to automation ... may in fact be less exposed to automation than previously thought. The reason is that workers often perform a substantial share of non-routine interactive tasks, which are known to be less automatable.” The variety of the tasks involved in almost all occupations means not just that there are fewer occupations at very high risk from automation, but also that there are fewer at very low risk as almost all occupations have some tasks within them that can be automated. Their estimates, using the OECD’s Survey of Adults Skills (PIAAC), produced a much lower number than the Frey and Osborne study, suggesting that only 9% of jobs were at high risk of automation in 21 OECD countries.

A third study produced by the McKinsey Global Institute, the research arm of management consultants McKinsey & Company, in 2017, also focussed on work activities rather than

² The future of employment: how susceptible are jobs to computerisation? by Carl Benedikt Frey and Michael A. Osborn, University of Oxford 2013
https://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf

³ The Risk of Automation for Jobs in OECD Countries: a comparative analysis by Melanie Arntz, Terry Gregory and Ulrich Zierahn, OECD, 2016 <http://www.ifuturo.org/sites/default/files/docs/automation.pdf>

whole occupations.⁴ But it still suggested that, using “currently demonstrated automation technology”, 47% of employment in the main European economies (France, Germany, Italy, Spain, and the United Kingdom) could technically be automated. (The figure for the US is 46%).

A fourth study, by the international consultancy PwC in 2018,⁵ took account of both the Frey and Osborne, and OECD studies but suggested that the OECD had overestimated the impact of a task-based approach. It suggested the proportion of jobs at “potential high risk of automation” was much closer to the Frey and Osborne estimates than those of the OECD, ranging from 44% in Slovakia to 22% in South Korea and including 38% in the USA, 37% in both France and Germany, 30% in the UK and 39% in Italy.

The PwC study also identified three waves of digitally driven automation:

- the algorithmic wave (up to early 2020s), involving the automation of simple computational tasks and analysis of structured data;
- the augmentation wave (to late 2020s), involving dynamic interaction with technology for clerical support and decision making, including robotic tasks in semi-controlled environments; and
- the autonomous wave (to mid-2030s), involving the automation of physical labour and manual dexterity and problem solving in real-world situations requiring responsive action.

Individual countries would, in the view of the report, be affected in different ways at different stages, depending on their economic structure.

There have also been studies looking at individual European countries.

An examination by the German Institute of Employment Research (IAB), based on the German labour market, looked at the extent to which, in 2016, tasks could be undertaken by computers rather than people and therefore the degree to which jobs could be substituted.⁶ It found that 25% of all employees in Germany were in occupation where there was a high

⁴ Harnessing automation for a future that works by James Manyika, Michael Chui, Mehdi Mirejadi, Jacques Bughin, Katy George, Paul Willmott, and Martin Dewhurst, McKinsey Global Institute, January 2017

⁵ Will robots really steal our jobs? An international analysis of the potential long term impact of automation, by John Hawksworth, Richard Berriman and Saloni Goel, PwC Economics, February 2018
<https://www.pwc.co.uk/economic-services/assets/international-impact-of-automation-feb-2018.pdf>

⁶ Wenige Berufsbilder halten mit der Digitalisierung Schritt by Katharina Dengler and Britta Matthes, IAB Kurzbericht, 4/2018 <http://doku.iab.de/kurzber/2018/kb0418.pdf>

risk of substitution (above 70%). This is 10 percentage points higher than in a similar study by the IAB in 2013, which found that 15% of employees faced a high risk of substitution.

Another study by the UK Office for National Statistics (ONS) produced significantly lower figures for England (figures for the whole of the UK could not be calculated).⁷ The study estimated that, in 2017, 1.5 million people (7.4% of the total) were employed in jobs at high risk of automation (above 70%). This is a slightly lower percentage than the 7.6% estimated in a similar ONS study to be in high-risk jobs in 2014.

For all these studies it is important to emphasise that they are looking at the impact on individual jobs rather than overall levels of employment and that workers who lose their jobs because of automation and digitalisation may be employed elsewhere. In a second study in 2017, the McKinsey Global Institute specifically looked at this and concluded that existing trends meant that “job growth (jobs gained) could more than offset the jobs lost to automation” but that it would require action to achieve this and that as much as 14% of the global workforce “will likely need to transition to new occupational categories and learn new skills”.⁸

The impact on women

The two earlier studies by Frey and Osborne and the OECD team, and the initial study by the McKinsey Global Institute did not look at whether automation and digitalisation might affect women in a different way to men. The German IAB study similarly did not look at differences between women and men. However, this issue was considered in the PwC study, which concluded that, “female workers could be more affected by automation over the next decade, but male jobs could be more at risk in the longer term”. It explained this difference primarily in terms of where men and women work.

“Males may face a higher automation risk (34%) than females (26%) in the long run because they are more likely to be employed in manual-task-focused sectors such as manufacturing (13%) and transportation and storage (6%). In comparison, female employment in these sectors is relatively lower as women tend to be more concentrated in sectors such as education and health requiring more personal and social skills that tend to be less automatable.”

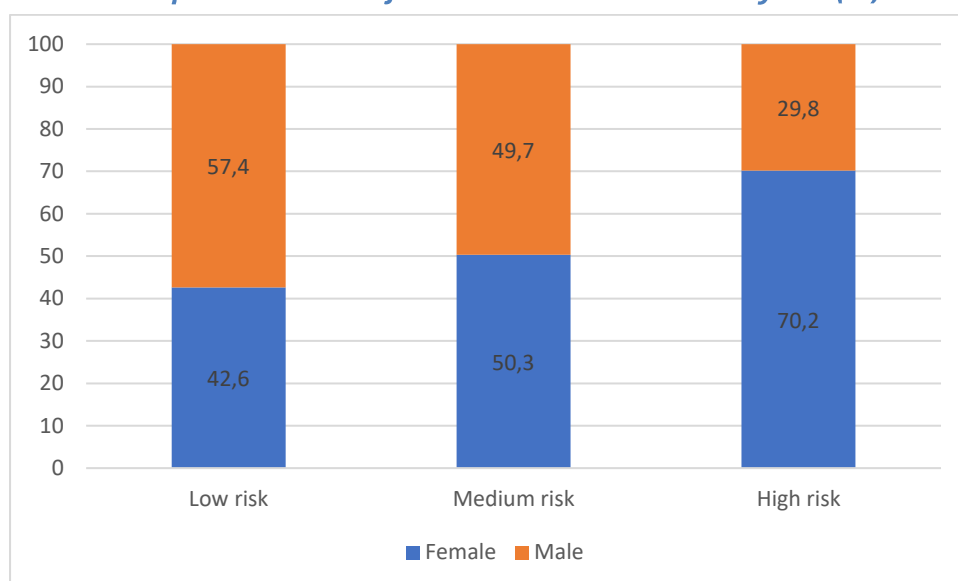
⁷ The probability of automation in England: 2011 and 2017, Office for National Statistics (ONS), March 2019 <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/theprobabilityofautomationinengland/2011and2017>

⁸ Jobs lost, jobs gained: workforce transitions in a time of automation, by James Manyika, Susan Lund, Michael Chui, Jacques Bughin, Jonathan Woetzel, Parul Batra, Ryan Ko, and Saurabh Sanghvi, McKinsey Global Institute, November 2017

The varying timing of the impact on men and women is explained in the view of the PwC study by the fact that women performing clerical tasks could be vulnerable to automation in the short term, while in the longer term “less educated men may face the highest risks as autonomous machines are deployed that are capable of independently performing manual tasks such as driving, as well as many factory and warehouse jobs”.

The ONS study for England, which examined the situation in 2017, confirmed the PwC conclusion that in the short-term women were likely to be at greater risk, with 70.2% of jobs at high-risk of being automated being performed by women (see Chart 1)

Chart 1: Proportion of main jobs at risk of automation by sex (%)



Source: The probability of automation in England: 2011 and 2017, Office for National Statistics (ONS), March 2019

The difference in the impact of automation and digitalisation on women and men was examined in greater details in a study by the Institute for Women’s Policy Research in 2019.⁹ Although based on a study of the US situation, its conclusions are relevant to the situation in Europe. Looking at the risk of automation across occupations, it found that women were more likely than men to be both in the high-risk occupations and the low-risk occupations. In 2014-16, 29% of all women were in occupations with a high risk of automation (90% or above) compared with 19% of all men. Similarly, 30% of all women were in low-risk occupations (10% or below), compared with 25% of all men. This is because the occupations in which the largest numbers of women are employed include both those at

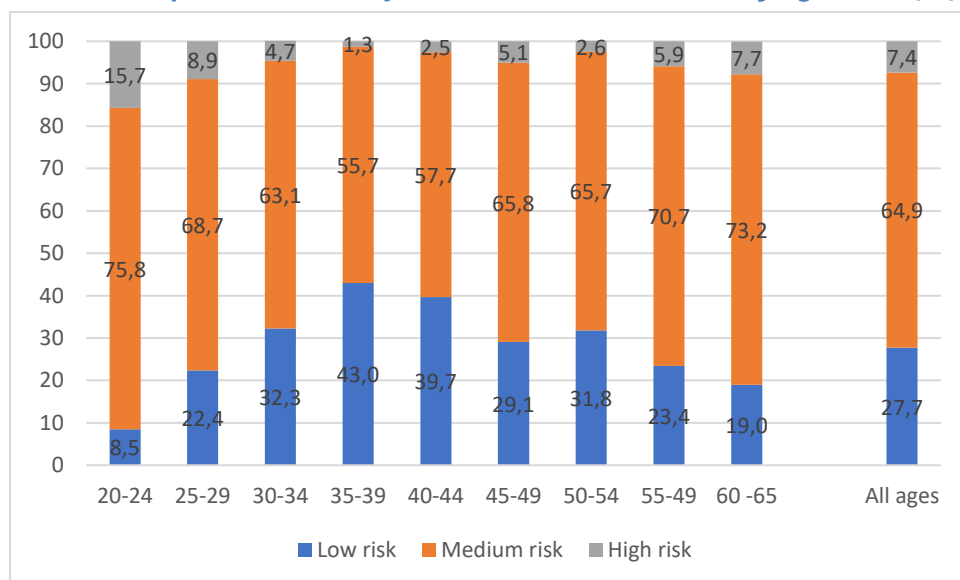
⁹ Women, Automation, and the Future of Work, by Ariane Hegewisch, Chandra Childers, and Heidi Hartmann, Institute for Women’s Policy Research, 2019 https://iwpr.org/wp-content/uploads/2019/03/C476_Automation-and-Future-of-Work_ADA-Compliant.pdf

“highest risk of automation—such as secretaries and administrative assistants, cashiers, and receptionists and information clerks— as well as some of the lowest risk occupations, such as elementary and middle school teachers and registered nurses”.

The impact on young workers

Age differences were not examined in the Frey and Osborne the OECD studies or in the analyses undertaken by the McKinsey Global Institute and the German IAB. The PwC study, which did look at it, concluded that, “there is not much difference in the potential rate of automation between age groups”. However, this was not the view of the ONS study of the risk of automation in England. It found that, because of the typical patterns of employment, young people were twice as likely to work in occupations at high risk of automation than the population as a whole – 15.7% of those aged 20-24 were in high-risk occupations, compared with 7.4% overall. Nevertheless, it also pointed out that, “younger workers are often in high-risk roles temporarily, moving to roles at a lower risk of automation as their careers develop”.

Chart 2: Proportion of main jobs at risk of automation by age band (%)



Source: The probability of automation in England: 2011 and 2017, Office for National Statistics (ONS), March 2019

The position in transport

Several surveys have suggested that jobs in transport may be at particularly risk of automation.

A survey produced by the European Trade Union Institute listed transport and logistics as one of seven areas where “jobs [are] at greatest risk of automation/digitalisation”. As an example, it pointed out that digitalisation had enabled the ride-hailing service Uber to

“become one of the largest ... transport services in the world without owning a ... fleet of vehicles, without exercising the least contractual, legal or penal liability in its mediation service, and with a minimum of salaried staff”.¹⁰ The situation has changed since this was written in 2016, with union pressure and a series of court cases in several European states forcing Uber to change its contractual relationship with the drivers who work for it.¹¹ However, it remains a powerful example of the ability of digitalisation to change existing industries and patterns of employment.

The McKinsey study ranks industries in the US in terms of their “technical potential for automation” and places transportation and warehousing, with manufacturing, in joint second place, with a 60% automation potential, behind only accommodation and food services, on 73%.

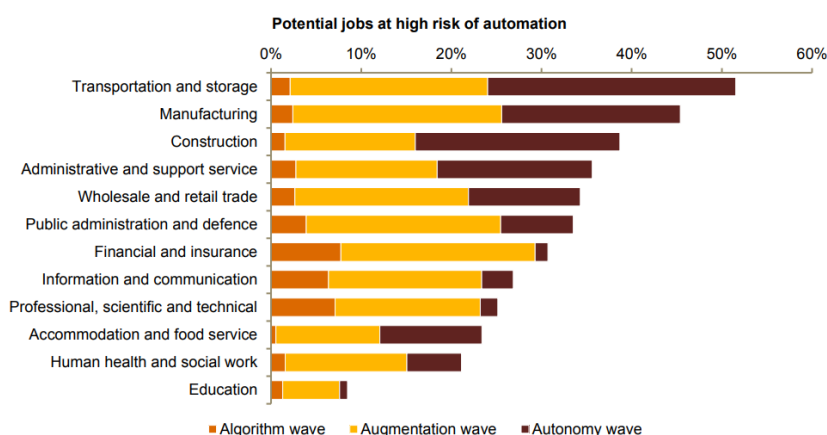
The PwC study also found that, “transport stands out as a sector with particularly high potential for automation in the longer run as driverless vehicles roll out at scale across economies”. It estimated that transport would be most affected by the third wave of autonomous automation (which may only come to maturity in the 2030s), but that overall, it had “the highest share of existing jobs that could potentially be automated by the 2030s at around 52%”.

However, in the initial period, up to the early 2020s, the study suggests that the impact of digitalisation on employment is likely to be much less in transportation and storage than in other areas such as financial services (see Chart 3).

¹⁰ Digitalisation of the economy and its impact on labour markets by Christophe Degryse, ETUI, 2016

¹¹ For example, in the Netherlands, where a court in Amsterdam found in favour of the union FNV and against the ride hailing company Uber in a dispute over the employment status of Uber drivers. The court judgement, delivered on 13 September 2021, concluded that the legal relationship between the drivers and Uber had “all the characteristics of an employment contract” and that, therefore, Uber drivers should be considered to be employees.

Chart 3: PwC forecasts on risks of automation



Source: Will robots really steal our jobs? An international analysis of the potential long-term impact of automation, by John Hawksworth, Richard Berriman and Saloni Goel, PwC Economics, February 2018

However, other studies indicate that the impact of digitalisation may hit transportation and storage much sooner. The examination by the German Institute of Employment Research (IAB) referred to above, divided occupations into 14 segments. It found that occupations related to manufacturing had the highest potential for digital substitution, at 83% for production jobs and 70% for production-technical jobs. However, the potential for substitution in transport and logistic occupations was in fifth position at 56%, 20 percentage points higher than a similar study by the IAB looking at the position in 2013.¹² This was the largest increase over three years, because as the study points out “tasks in logistics and intra-logistics, which previously could only be undertaken by people can now be done by technologies that have recently become available on the market”.

The study went on to explain the situation in transport in greater detail:

“Almost all activities involving the flow of materials and goods in a production line, or an entire value chain can be completed and optimised fully automatically by robots. In contrast, driving buses, cars or HGVs – though not driving rail-based vehicles – is still classified as non-substitutable, because the appropriate technologies are still being tested and therefore cannot be said to be market ready.”

¹² Folgen der Digitalisierung für die Arbeitswelt: In kaum einem Beruf ist der Mensch vollständig ersetzbar, by Katharina Dengler and Britta Matthes, IAB Kurzbericht, 24/2015
<http://doku.iab.de/kurzber/2015/kb2415.pdf>

The IAB report emphasises the fact, which is clear in all the studies, that the impact of automation and digitalisation on employment will vary substantially with the job being done. Not all jobs will be affected equally.

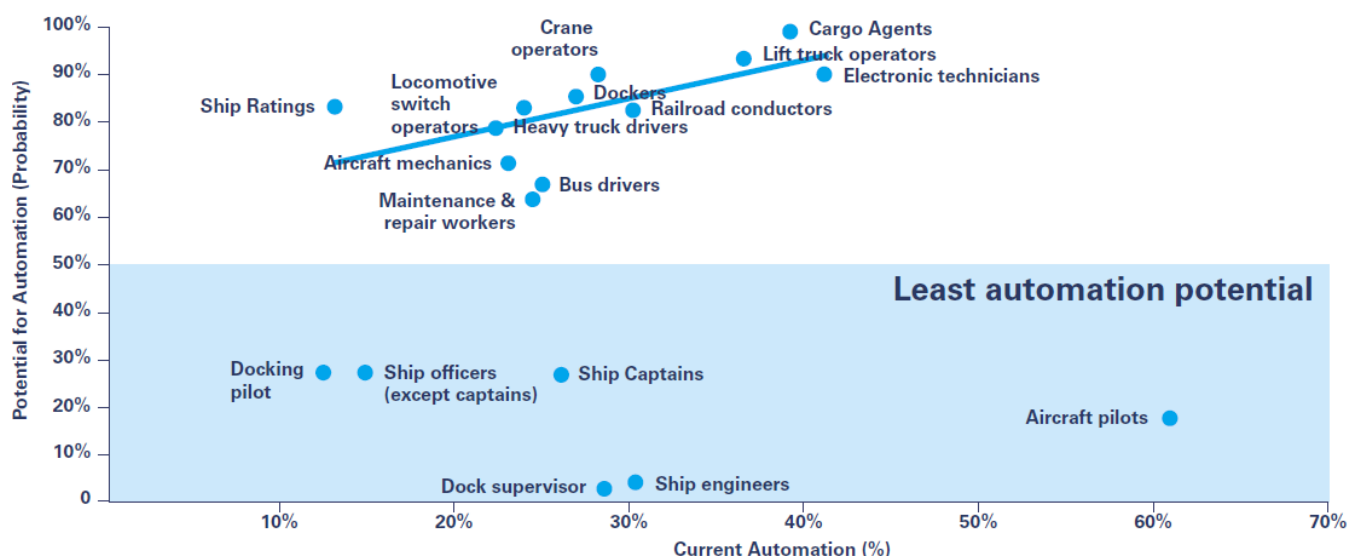
A major report for the International Transport Workers Federation (ITF) by the World Maritime University used the 2013 Frey and Osborne study to identify the automation potential for job profiles in transport.¹³ Based on the situation in the US, it found that those at highest risk – with 90% plus risk of automation – were cargo agents, fork-lift truck operators, crane operators and electronic technicians. Those occupations at a slightly lower level of risk (with between 70% and 90% risk) were dockers, ships ratings, railway signal staff, railway guards, drivers of heavy goods vehicles, and aircraft mechanics. Bus drivers and maintenance and repair workers were at less risk, at between 60% and 70% (see Chart 4).

The study also identified those occupations with the lowest potential for automation. These were docking pilots and ships' officers, including captains (between 20% and 30%), aircraft pilots (around 20%) and dock supervisors and ship engineers (less than 10%).

The report suggested that low and middle-skilled occupations had the most potential for automation and that automation was less likely to affect highly skilled occupations. The report noted that for those in highly skilled occupations, "automation and technology are often introduced to assist them, so that individuals can concentrate more on their core tasks. The objective is to complement their work rather than replace them, whereas for the other groups [those with medium and low skills] a significant proportion of core tasks can be automated by 2040.

¹³ Transport 2040: Automation, Technology, Employment - The Future of Work, World Maritime University, 2019 https://commons.wmu.se/lib_reports/58/

Chart 4: Automation potential for job profiles in transport



Source: Transport 2040: Automation, Technology, Employment - The Future of Work, World Maritime University, 2019

The UK ONS study for England estimated the probability of automation for 369 occupations in 2017, ranging 73% for waiters and waitresses at the top to 18% for medical practitioners at the bottom. Table 1 set out the position for the transport occupations identified in the survey. It places drivers in road transport as having the highest probability of automation – above 60%, while aircraft pilots and flight engineers have the lowest possibility. However, many transport occupations are not identified separately in the study.

It is also worth pointing out that high scores for the driving occupations at the top of the table all depend on the introduction of technology – autonomous vehicles operating in traffic – which, despite extensive trials, has not been successfully introduced anywhere.

Table 1: Probability of automation in England: 2017

Occupation	Probability of automation
Van drivers	66%
Taxi and cab drivers and chauffeurs	63%
Large goods vehicle drivers	62%
Crane drivers	61%
Bus and coach drivers	61%
Train and tram drivers	57%
Air transport operatives	57%
Rail construction and maintenance operatives	57%
Other drivers and transport operatives	56%

Marine and waterways transport operatives	56%
Transport and distribution clerks and assistants	54%
Rail transport operatives	54%
Travel agents	52%
Driving instructors	52%
Air travel assistants	49%
Rail travel assistants	46%
Managers and directors in storage and warehousing	35%
Ship and hovercraft officers	33%
Travel agency managers and proprietors	32%
Air traffic controllers	32%
Managers and directors in transport and distribution	31%
Aircraft pilots and flight engineers	28%

Source: The probability of automation in England: 2011 and 2017, Office for National Statistics (ONS), March 2019

As well as having an impact on the numbers employed, there are some cases where digitalisation may not change this, but, instead, allow a change in their geographical distribution. This has already been seen with call centres, which are often located in low-cost locations, while providing services to high-cost countries. The ability to transmit data at low cost and high speed now makes it possible to offshore screen-based jobs to low-cost locations.

The potential impact of automation and digitalisation on pay and working conditions

The overall picture

As well as the studies on the number of jobs at risk of being lost to automation there have also been reports on the way automation and digitalisation is likely to change the jobs that remain.

The 2019 European Commission report on the Impact of the Digital Transformation on EU Labour Markets, presented by the High-Level Expert Group, identified four key elements of the impact on labour markets, other than simply on the number of jobs.¹⁴ These are:

- **Job polarisation** – because “skilled jobs are automated by computers, while digitalisation augments the productivity of the most skilled jobs, and the least-skilled

¹⁴ Report of the High-Level Expert Group on the Impact of the Digital Transformation on EU Labour Markets, April 2019 <https://ec.europa.eu/digital-single-market/en/high-level-expert-group-impact-digital-transformation-eu-labour-markets>

jobs survive because they cannot be automated nor greatly benefit from new technologies” (a view that has been questioned in some recent research – see section below on the position of women);

- **Rising diversity in working arrangements**, with an increase in new and non-standard forms of employment – partially a result of the growth of work through platforms, but also because “digitalisation allows firms to outsource jobs more easily”. While some workers may welcome this increased flexibility, others “turn to atypical work to cope with precarity and dismissal from standard employment ... New forms of work opened up by digitalisation could therefore generate both winners and losers, leading to a deepening of the polarisation of the labour market unless suitable policy responses are adopted.”
- **An impact on worker well-being and work-life balance** – for some, digitalisation can create increased change and pressure, reflected in mental health conditions. “Conditions related to stress, due to employment uncertainty and changes related to technology, are likely to have an increased impact on already disadvantaged or less flexible groups”.
- **Rising wage and income inequality** – “As the rising demand for high-skilled workers is not accompanied by a rapid expansion in the supply of worker skills, the wage premium of high-skilled relative to low-skilled workers and, therefore, wage inequality increases.” At the same time, the share of economic output going to labour has fallen, although specific institutions and policies can address this problem: “Powerful unions, heavy payroll taxes, high minimum wages and generous unemployment benefits compress the wage structure and may hamper the creation of a low-wage sector.”

A separate report by Eurofound, the EU agency charged with investigating living and working conditions, published in 2018, looked at the implications for work and employment from a slightly different perspective.¹⁵ It identified what it called “three vectors of change”:

- **Automation of work**: the replacement of human input by digitally enabled machine input, which, together with artificial intelligence, allows a much wider range of tasks to be potentially automated;
- **Digitisation of processes**: using sensors and other devices to translate the production process into digital information, which can then be processed stored and communicated; and

¹⁵ Automation, digitisation and platforms: Implications for work and employment, Eurofound, 2018

- **Coordination by platforms:** the use of digital networks to coordinate economic transactions in an algorithmic way.

The Eurofound report argues that each of these vectors has a different impact in the area of work and employment.

The **automation of work** is seen primarily in terms of its impact on levels of employment, although Eurofound takes a different view on the question of job polarisation. It accepts that physical routine tasks had already largely been automated before the arrival of digitalisation and that automation of intellectual routine tasks is “inevitable”, although “it still has some way to go”. But it also argues that technological advances mean that it will soon be possible to automate both physical non-routine tasks, such as cleaning, serving and driving, and intellectual non-routine tasks “involving creativity, problem-solving and pattern recognition”. With non-routine tasks being automated both at the top and at the bottom of the skills distribution, the Eurofound report suggests that, rather than hollowing out the centre (medium-skilled jobs), automation may move “employment towards the middle of the skills spectrum”.

The impact of the **digitisation of processes** on working conditions is seen in terms of the extent to which constant monitoring – a simple option with digital technology – can lead workers to feel that “their autonomy and privacy are being compromised”. On the other hand, the report suggests that constant monitoring of work processes might reduce accidents.

The digitisation of processes may also affect employment conditions and industrial relations by making it easier to subcontract an increasing number of tasks. This, the Eurofound report suggests, “can result in less favourable conditions of employment for workers in terms of stability, income and working hours” In addition, “by blurring company boundaries and disrupting union solidarity, such forms of work can also make collective representation more difficult”, although the report says that “alternative methods of collaborative decentralised production” are also possible, and cites the development of open-source software as an example.

The problems for employees caused by the digitisation of processes are even more evident in **coordination by platform**, which, the Eurofound report indicates are “as much a form of institutional innovation as a form of productive innovation”. The report states that at least part of the success of some well-known platforms can “probably be attributed to their success in circumventing regulation in the markets in which they operate, hence profiting from unfair competition”. However, Eurofound points out that another reason is “the

weakened position of workers in such platforms compared with traditional firms". One reason for this is that platform workers are classed as independent contractors and so do not have the same rights as employees and "are not entitled to collective bargaining".¹⁶

Overall, the report states that, although platform work can provide autonomy and flexibility for some workers, the fact that it "allows for the division of labour into very small tasks ... can result in those tasks being tedious and repetitive (on top of their often being carried out in isolation). These are not ideal psychosocial conditions for work and can often be associated with feelings of alienation."

The position of women

The Eurofound report does not, unfortunately, examine the ways in which the impact of automation and digitalisation on pay and working conditions may be different for women and men. The report by the High-Level Expert Group also does not look in detail at the differing ways women and men may be affected, but it points to the fact that, with women already more likely to be in "non-standard employment" than men, a further shift in this direction may leave them even more disadvantaged.

Unsurprisingly, the 2019 report by the US Institute for Women's Policy Research concentrates on the impact on women, although in the light of developments in US labour markets. It notes that automation is likely to have a greater impact on women's earnings overall than men's, because, while the occupations most at risk for men are generally low paid, this is not the case for women.

The report looks in detail at two sectors of particular importance to women in the US labour market – office work and retail. In the office, the report finds that "technological and sectoral restructuring of office work has led to a shift from better to less well-paid office and clerical occupations" and "the potential erosion of good middle-skilled jobs for women". In retail, it points to growing levels of part-time work, although it is not clear how far this is linked to automation.

The reference to "the potential erosion of good middle-skilled jobs" is in line with the job polarisation referred to in the report from the High-Level Expert Group, but there has been some recent research that suggests that while this may be happening in the US, job polarisation is not taking place in Europe (other than the UK). One study uses figures from

¹⁶ This may be a slight simplification – see Trade unions protecting self-employed workers, by Lionel Fulton, ETUC 2018

the European Labour Force Survey, looking at changes between 1992 and 2015.¹⁷ These show that in Germany, Spain and Sweden, while there has been an increase over time of between nine and 12 percentage points in the proportion of employees in the top quintile (fifth) in terms of earnings, the proportion of employees in the bottom has not increased, as the job polarisation theory would suggest. Instead, it has declined everywhere by three to five percentage points. Only in the UK, was there an increase in both the top and bottom quintile – job polarisation in other words.

If changes in employment are analysed by level of education rather than by earnings, the job polarisation effect also disappears in the UK. In all four European countries (Germany, Spain, Sweden and the UK), the proportion employed in the highest quintile rose between 1992 and 2015, but the proportion employed in the lowest two quintiles fell.

More detailed work on Sweden, points to a possible reason why the job polarisation theory appears plausible, at least if the analysis is based on earnings. This is that, in the middle to lower section of the skills structure, “the number of people working in production and distribution has decreased, while the number of people working in care and services has increased”.¹⁸ However, these care and services are typically done by (lower paid) women, while the production and distribution jobs are typically done by (better paid) men.

The position of young workers

Neither the Eurofound report nor the report from the High-Level Expert Group looked at whether the impact of automation and digitalisation on pay and working conditions varied according to age. However, a study looking at the situation in Austria, Germany, the Netherlands, Sweden and the UK, found that “young people were more likely than their older counterparts to participate in crowd work.”¹⁹

The study, published in December 2016 noted that “People under the age of 24 have a higher propensity to say they have done some crowd work in all countries, with a difference [between the share of the age group reporting crowd and the share of the age group in the population] ranging from four percentage points in the UK to nine in Sweden”. There was a similar pattern in the 25-34 age range. The study suggested that crowd workers “are choosing it from a desperation to find any source of income, rather than as an active career

¹⁷ The polarisation myth: Europe’s job structure is upgrading by Daniel Oesch, Giorgio Piccitto, January 2020, VOX, CEPR Policy Portal, <https://voxeu.org/print/64933>

¹⁸ Polariseringsmyten: Försvinner verkligen de medelkvalificerade jobben? by Michael Tåhlin, Arena Idé, 2019

¹⁹ Crowd work in Europe: Preliminary results from a survey in the UK, Sweden, Germany, Austria and the Netherlands, by Ursula Huws, Neil H. Spencer and Simon Joyce, FEPS Studies, December 2016 https://uhra.herts.ac.uk/bitstream/handle/2299/21934/crowd_work_in_europe_draft_report_last_version.pdf?sequence=1

choice”, but the study stated that there is still the need of “qualitative research to explore the motivations of crowd workers”.

Irrespective of the reasons, the fact that young workers are more likely to do crowd work leaves them particularly open to the problems linked to platform work identified in the Eurofound report.

The position in transport

There is less research on the impact of digitalisation on pay and working conditions specifically in the transport industry. However, many of the points identified in the High-Level Expert Group and Eurofound reports are also referred to in the ITF report. This points to the possibility that digitalisation can lead to increased income inequality, strengthen existing trends for employees to obtain a smaller share of economic output and facilitate a shift to more flexible forms of work.

“The emergence of technology in the workplace facilitates a shift toward more flexible forms of work, with no physical workplace and consequently fewer relations between co-workers. Although appealing for some, the flexible nature of work associated with the gig economy can weaken the bargaining power of workers and reduce their voice.”²⁰

²⁰ Transport 2040: Automation, Technology, Employment - The Future of Work, World Maritime University, 2019

Obstacles to automation and digitalisation

These reports, showing the potential impact of automation and digitalisation, may seem alarming, particularly in terms of job losses (at least considering the individual jobs rather than overall levels of employment). However, it is important to emphasise that the figures on the number of jobs at risk reflect the technological possibility of automating a specific occupation and ignore other elements such as the economic costs and benefits of introducing the necessary technology, as well as potential regulatory issues.

As the OECD report points out “the utilisation of new technologies is a slow process, due to economic, legal and societal hurdles, so that technological substitution often does not take place as expected”.²¹

The January 2017 study from McKinsey Global Institute identified five factors “that can influence the pace and extent of automation”.²² These are:

- technical feasibility: as the report notes much of the innovation is “still in development – and often imperfect”;
- the cost of developing and deploying solutions: this is not just the cost of physical equipment, like robots or self-driving trucks, but also the cost of developing new software and deploying it, including the expenditure of customising it and training workers to use it;
- labour market dynamics: in particular the relative cost of labour versus automation; if labour is to undertake a specific task is cheap, this makes it less likely that that task will be automated;
- economic benefits: reducing labour costs are not the only potential benefit to the employer of automation, there may also be other benefits such as improved quality or greater safety; and
- regulatory and social acceptance: these include safety and liability issues, as well as privacy concerns, worries about job security and a reluctance in some areas, like social care, where human relationships are important, to see people replaced by machines.

In practice, these factors are likely to slow the introduction of automation and digitalisation and a later McKinsey study estimates three possible outcomes in terms of the impact on

²¹ The Risk of Automation for Jobs in OECD Countries: a comparative analysis by Melanie Arntz, Terry Gregory and Ulrich Zierahn, OECD, 2016

²² Harnessing automation for a future that works by James Manyika, Michael Chui, Mehdi Miremadi, Jacques Bughin, Katy George, Paul Willmott, and Martin Dewhurst, McKinsey Global Institute, January 2017

total employment.²³ Under the earliest adoption scenario, automation would replace 47% of all hours worked in the economy in Germany by 2020. (The figure for the US is 44% and there are no estimates for other European countries.) But when automation is delayed, only 2% of employment in Germany is replaced by automation by 2030 (3% in the US).

Based on a midpoint scenario, 24% of employment is automated in Germany by 2030 (23% in the US). Estimates are also provided for developing economies and they are much lower – 16% in China, 13% in Mexico and 9% in India, on the basis of the midpoint scenario. As the study notes, “In general, wage rates are the biggest determinant of the difference in automation scenarios among countries; higher wage rates make automation more economically attractive”.

The PwC report also notes that “a variety of ... constraints” will need to be overcome before what it describes as the “benefits for business” can be fully realised.²⁴ Like the McKinsey study PwC identifies five key constraints, although they are grouped slightly differently. They are:

- technological: difficulties in adopting the technology in practice, perhaps because some key infrastructure elements are missing or because legacy systems are well developed and “do not mesh easily with new techniques”;
- economic: the high upfront cost of the investment required may make automation a riskier option than continuing with existing practices – in other words, workers may continue to be cheaper than machines;
- legal and regulatory: data is crucial to new digital developments and the protection of individual rights and privacy is an increasingly complex and controversial issue; there are also specific regulatory issues relating to safety and liability where automation directly interacts with the outside world – as in the liability for driverless vehicles; and
- social: individuals may not accept humans being replaced by machines for some tasks, like health care; there may also be concern “with regards to the potential rise in inequality as a result of automation as tech companies and highly educated workers gain at the expense of other workers”.

²³ Jobs lost, jobs gained: workforce transitions in a time of automation, by James Manyika, Susan Lund, Michael Chui, Jacques Bughin, Jonathan Woetzel, Parul Batra, Ryan Ko, and Saurabh Sanghvi, , McKinsey Global Institute, November 2017

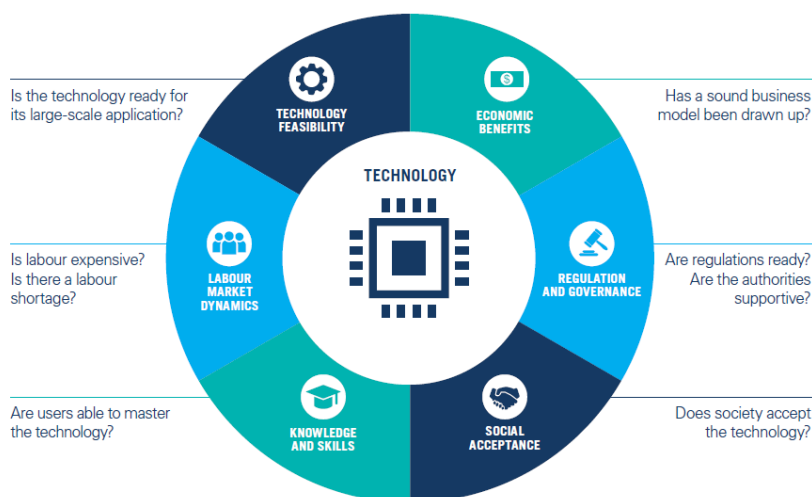
²⁴ Will robots really steal our jobs? An international analysis of the potential long term impact of automation, by John Hawksworth, Richard Berriman and Saloni Goel, PwC Economics, February 2018

These constraints may, the report accepts, delay the move to automation and in some areas halt it altogether.

The ITF report, in turn, identifies six factors which can delay or accelerate the adoption of technology (See Chart 6).²⁵ These cover:

- economic benefits;
- regulation and governance;
- social acceptance;
- knowledge and skills;
- labour market dynamics; and
- technological feasibility.

WMU RESEARCH HAS IDENTIFIED SIX MAIN FACTORS THAT CAN ACCELERATE OR DELAY THE ADOPTION OF TECHNOLOGY



Cyber-attacks

The costs of introducing automation and digitalisation are also likely to rise as a result of the increasing need to protect against cyber-attacks on highly integrated digital systems. The impact of such attacks can be very substantial. For example, the NotPetya cyber-attack in 2017 led to massive disruption at the international shipping company Maersk, which it

²⁵ Transport 2040: Automation, Technology, Employment - The Future of Work, World Maritime University, 2019

estimated at €250 to €300 million.²⁶ Another transport company, TNT Express, part of FedEx, lost \$300 million as a result of the attack.²⁷

Automation and digitalisation do not always pay

It is also important to remember that automation and digitalisation do not always deliver the economic benefits that their promoters promise. There are many individual projects that have gone over budget and overrun to the extent that the financial benefits they promised were never delivered. An example from transport and logistics, dealing with automated container ports, makes this clear. A recent major report on this issue concluded:

“Automated ports are generally not more productive than their conventional counterparts. ... Comparatively, high handling costs also make the case for automation not entirely convincing.”²⁸

The reality of these obstacles to automation and digitalisation becomes very clear in the reports on the situation in individual transport sectors which follow.

²⁶ 2017 Annual Report of A.P. Møller - Mærsk A/S

²⁷ NotPetya cyber-attack cost TNT at least \$300m, BBC, 20 September 2017
<https://www.bbc.co.uk/news/technology-41336086>

²⁸ Container Port Automation: Impacts and Implications, International Transport Forum, 8 October 2021
<https://www.itf-oecd.org/container-port-automation>

The impact and consequences of Covid-19

Transport was one of the sectors most severely affected by the initial outbreak of Covid-19. As the pandemic took hold in Europe in February and March 2020, passenger numbers across all modes of transport collapsed, as travel was restricted, and the flow of goods was disrupted, as economic output stalled. Deliveries linked to e-commerce were one of the few areas of growth, as lockdowns kept many physical retail outlets closed.

The situation improved, in the summer of 2020, but worsened dramatically as a second wave of the virus, starting in the autumn of 2020, led to even higher rates of illness and death. Large-scale vaccination has substantially improved the situation in relation to health in 2021, but passenger transport remains severely affected, although goods transport has largely recovered, and e-commerce has continued to grow.

This section looks at the impact of Covid-19 in each of the transport sectors covered in the toolkit and attempts to answer three questions:

- What has happened?
- How far are the changes that Covid-19 has brought permanent, or will they be rapidly reversed?
- What consequences with this have on automation and digitalisation?

Civil aviation

The impact

Civil aviation is the transport sector that has been perhaps most severely affected by Covid-19, and which, by autumn 2021, was still far from full recovery.

Figures from EUROCONTROL, the body which provides support to European aviation, show that, at the lowest point in mid-April 2020, flights were 87.7% down on the equivalent period in 2019. Since then, the situation has improved but, at the start of October 2021, flights were still 27% lower than in the same period in 2019 (average figures for seven days up to 13 October 2021).²⁹ In line with the situation in other transport sectors, passenger flows have been more affected than the transport of good, with flights by low-cost airlines 29% down on 2019 and those by traditional airlines down by 41% on 12 October compared with 2019. Cargo flights, on the other hand are up by 9%, while non-scheduled charter flights, which

²⁹ EUROCONTROL Comprehensive Assessment of COVID-19's Impact on European Air Traffic, 13 October 2021 <https://www.eurocontrol.int/publication/eurocontrol-comprehensive-assessment-covid-19s-impact-european-air-traffic>

are subject to greater fluctuation, are up by 13% in and business aviation flights are 31% higher than in 2019.

This fall has hit all parts of the aviation industry. Among airlines, the Lufthansa Group, Europe's largest traditional carrier, reported a €5.5 billion loss for 2020, with revenue 63% down over the year, dropping from €36.4 billion in 2020 to €13.6 billion in 2021. The Ryanair Group, Europe's largest low-cost airline, reported an 81% decline in revenue, even larger than Lufthansa, down from €8,495 million to €1,636 million, producing a pre-tax loss of €1,109 million. However, Ryanair's financial years runs until the end of March 2021, meaning that the whole period on which it was reporting was affected by Covid-19.

Among airports, Aena, Europe's largest airport operator, with airports across Spain, as well as Luton airport in the UK and airports in Latin America, reported a €454.3 million loss in the first six months of 2021, compared with a €795.9 million profits in 2019. Groupe ADP, which runs the Charles-de-Gaulle and Orly airports in Paris reported in July 2021 that Paris Aéroport passenger traffic in the first six months of 2021 was 80% lower than traffic in the same period in 2019.

The prospects

These falls in activity and the losses they have produced would be unsustainable if they continued, but activity is expected to recover, although there are differences in the expected timing, which, in part, reflect the sections of the market in which they operate.

Ryanair, a low-cost operator, is bullish. In its latest annual report, published in July 2021, it stated: "we expect a substantial return to pre-Covid traffic volumes through the second half of 2021, and we look forward to returning to pre-Covid growth in Summer 2022". In fact, EUROCONTROL's figures show that in October 2021, it was operating 12% fewer flights than in the same period in 2019.

Groupe ADP, with many intercontinental flights operating from its Charles-de-Gaulle airport, is less optimistic. It only expects a return to 2019 levels from 2024 to 2027, and that, as late as 2023, traffic through its airports will only be between 75% and 85% of the 2019 level. In October 2021, traffic through Charles-de-Gaulle was still 42% below 2019 levels.

EUROCONTROL's own central forecast for the whole industry, lies between the two. It expects recovery to 2019 levels to occur at the end of 2023, with growth continuing after

that to reach 6% above 2019 levels by mid-2027.³⁰ However, this is EUROCONTROL's baseline scenario, assuming an effective vaccine roll-out in Europe, fewer international travel restrictions, good passenger confidence, high pent-up demand and business travel returning to pre-Covid levels in 2023.

A more positive view, based on an efficient global vaccination programme, a more rapid return to intercontinental travel and a faster bounce-back of business travel beings a return to 2019 levels forward to mid-2023, and, on these assumptions, by 2027, traffic in Europe is 17% higher than in 2019.

Less positive assumptions, including an uneven uptake of the vaccine, continued travel restrictions, and a situation where demand is bouncing back for 60% to 70% of travellers but there is a reluctance to fly among the rest, delay the recovery to 2019 levels beyond 2027.

It is impossible to know, which, if any of these three scenarios will be close to the reality that emerges, but there are reasons for think that air travel will not return to the patterns of the past. While the reasons for travelling for holidays or visiting friends and relatives may be as strong as ever, this may not be the same for business travel. The pandemic has indicated that it is possible to organise meetings and conferences remotely, through Zoom and similar platforms, and that face-to-face contact and in-person attendance are not always essential.

Replacing business travel with electronic contacts has disadvantages, making it more difficult to network, make personal links or understand conditions at the destination. But it has benefits, offering lower costs, time saving and easier meeting arrangements, as individuals only need to find time for a meeting, not to travel there and back. A 2021 analysis of corporate travel by the consultancy company McKinsey, although primarily based on the US, estimated that there would be a 20% reduction in corporate travel spending by 2023 and another McKinsey report estimated business travel would only be at 80% of pre-pandemic levels by 2024.³¹

A reduction of this sort could have a significant impact on civil aviation, as business travellers generally pay more for flight, not necessarily because they buy business class

³⁰ Forecast Update 2021-2027: European Flight Movements and Service Units – Three Scenarios for Recovery from COVID-19, EUROCONTROL October 2021 <https://www.eurocontrol.int/sites/default/files/2021-10/eurocontrol-7-year-forecast-2021-2027.pdf>

³¹ The comeback of corporate travel: How should companies be planning? by Jenna Benefield, Vik Krishnan, Esteban Ramirez, and Matthew R. Straus, McKinsey & Company, July 2021 and Back to the future? Airline sector poised for change post-COVID-19 by Jaap Bouwer, Steve Saxon, and Nina Wittkamp, McKinsey & Company, April 2021

rather than economy tickets, but also because they book closer to the time of departure, when seats are more expensive, or purchase more flexible (and more expensive) tickets.

The consequences for automation and digitalisation

The pandemic has already accelerated some aspects of automation and digitalisation as airlines and airports have sought to minimise physical contacts and maintain social distancing.

The 2020 report from the digital technology group SITA notes that, in 2020, minimising physical contacts was a key goal for both airlines and airports. It states that airlines “are now prioritising a completely touchless check-in process to help improve passenger experience and safeguard passengers and staff. Most airlines want mobile touchless payment options for all services provided from booking to arrival, and essential customer services will become contactless such as automated lounge access and mobile delayed baggage reporting.” The situation is similar in airports, where “the pandemic ... accelerated planned investment in key areas, including the automation of passenger processing”.³²

With Covid-19 set to continue as a threat to health, the industry will remain under pressure to complete and extend these developments. The existence of online alternatives to business travel will also increase the existing need to invest in measures which make the travel experience pleasanter and time spent travelling more useful.

However, while Covid-19 is pushing the industry to increase its digital investment and introduce greater automation, at the same time it is making it more difficult to do so by reducing the industry’s financial resources.

This is clear from the 2020 SITA report which points out that 91% of airlines spent less on IT than they had planned in 2020, and that 40% of airlines plan to cut their IT spending again in 2021 and only 31% are expecting to increase IT spending. The situation was similar at airports in 2020, with 85% cutting their IT expenditure, and is set to be worse in 2021. In that year, 45% of airports are planning to cut their IT expenditure again, and only 14% are expecting to increase it.

Many companies in the industry have benefited from public support over the period of the pandemic, but in the longer-term their ability to pay for digitalisation and automation will

³² 2020 SITA Air transport insights SITA, 2021 <https://www.sita.aero/globalassets/docs/surveys--reports/2020-air-transport-it-insights.pdf>

depend on a recovery in traffic and higher revenues. This is likely to be uncertain for some time to come.

Maritime

The impact

The shipping industry and seaborne trade was initially substantially affected by the downturn in economic activity and global trade caused by Covid-19. In its 2020 review of maritime transport, UNCTAD estimated the downturn in global maritime trade at 4.1% the first fall since 2008, although later estimates suggest that the decline may have been limited to 3.6%.³³ In terms of passengers, the cruise industry was halted completely early in the pandemic, while ferries were also affected by restrictions on travel. Figures from Eurostat show a 45% fall in the number of passengers embarking and disembarking in the ports of the EU 27 between 2019 and 2020.

In addition to these economic impacts, Covid-19 produced a humanitarian crisis for seafarers with 250,000 still stranded on ships worldwide, beyond the end of their contracts in July 2021.³⁴

Overall, as a report from the European Maritime Safety Agency (EMSA) shows, “the cruises sector and in general the transport of passengers are the sectors most heavily impacted by the Covid-19. Other sectors were also impacted, but in general the trade didn’t stop. Despite the difficulties, commercial ship operations, ports and other maritime transport sectors continued to operate ensuring the movement of goods and proving the strategic importance of maritime for our livelihoods.”³⁵

The prospects

In general, shipping has recovered rapidly from the initial impact of the pandemic, and global container traffic in the first few months of 2021 was higher than in the equivalent period before the pandemic. By summer 2021 calls to European ports of all types of shipping were higher than in the same period in 2019.³⁶ However, surges in demand for

³³ Review of Maritime Transport 2020, UNCTAD, 2021 https://unctad.org/system/files/official-document/rmt2020_en.pdf and Safety and Shipping Review 2021, AGCS, 2021 <https://www.agcs.allianz.com/content/dam/onemarketing/agcs/agcs/reports/AGCS-Safety-Shipping-Review-2021.pdf>

³⁴ Frequently asked questions about how COVID-19 is impacting seafarers, IMO 2021 <https://www.imo.org/en/MediaCentre/HotTopics/Pages/FAQ-on-crew-changes-and-repatriation-of-seafarers.aspx>

³⁵ COVID-19 – impact on shipping, EMSA, September 2021 <http://emsa.europa.eu/newsroom/latest-news/item/4525-september-2021-covid-19-impact-on-shipping-report.html>

³⁶ Ibid

goods, and bottlenecks at various stages in the supply chain, including those caused by the grounding of the Ever Given in the Suez Canal in March 2021 and Covid infections among port workers, have led to problems. By mid-October 2021 there were 584 container ships waiting to dock worldwide, according to figures compiled by the freight forwarders Kuehne + Nagel.³⁷

The situation for cruise ships is much worse. The EMSA report shows that calls by cruise ships in EU27 ports were still 49% down on 2019 level in August 2021.

The consequences for automation and digitalisation

As in other sectors, the Covid-19 pandemic has accelerated the push towards digitalisation. The UNCTAD report expects that one of the consequences of the pandemic will be “a swifter uptake of technology and digitalisation, with technology increasingly permeating supply chains and their distribution networks, including transport and logistics.” The pandemic has already led to increasing use of electronic trade documentation, which reduces possibilities of contagion, as well as accelerating the interest in data-driven services to help decision-making.

Inland waterways

The impact

As the 2020 report from the European Inland Waterway Transport Platform points out, inland waterway transport has been seriously affected by the Covid-19 pandemic and estimates that there was a 90% reduction in passenger transport and a 25-30% reduction in freight transport in the first part of 2020.³⁸

The Central Commission for the Navigation of the Rhine (CCNR) publishes figures for the whole of 2020, and these are more positive for cargo. They show that transport performance in terms of tonne-kilometres on the traditional Rhine (from Basel to the German-Dutch border) fell by 10.0% compared to 2019, while transport performance on the Danube (EU Danube countries plus Serbia) was only 1.4% below the 2019 figures.³⁹ However, they show an equally negative outcome for passenger traffic, which was down by 93% compared to 2019.

³⁷ The waiting game: where are the world's worst port delays? Financial Times 15 October 2021

³⁸ European Inland Waterway Transport Platform: Annual Report 2020

<https://www.inlandwaterwaytransport.eu/wp-content/uploads/IWT-Platform-2020-Annual-Report.pdf>

³⁹ European Inland Navigation Market Observation: 2021, CCNR, 2021 https://www.ccr-zkr.org/files/documents/om/om21_II_en.pdf

Prospects

In the short-term the performance of the sector in relation to cargo will be affected by the overall economic recovery but in the longer-term inland waterways could benefit substantially from the EU's Strategy on Sustainable & Smart Mobility which seeks to increase transport by inland waterways and short sea shipping by 25% compared with 2015 by 2030 and by 50% by 2050.⁴⁰

The consequences for automation and digitalisation

The European Commission sees the renewal of the current barge fleet as part of this process of shifting freight away from roads, and this renewal will provide an opportunity to introduce greater automation and digitalisation. However, as the Commission points out in a 2021 report on the future, "renewing barge fleets and improving access to renewable and alternative low-carbon fuels will require substantial investments that will only happen if the right supportive EU frameworks are in place".⁴¹

Docks

The impact

The impact of the Covid-19 pandemic on Europe's ports mirrors the impact on the maritime sector, with a sharp drop in tonnage transported through the main ports at the start of the crisis followed by an improvement in the second half of the year and a return to pre-pandemic levels in 2021.

Eurostat figures for the four quarters of 2020 as compared with the same quarters in 2019, show a 4.7% decline in the first quarter, a 12.6% decline in the second, an 8.2% decline in the third and a 3.9% fall in the last quarter.⁴²

More up-to-date figures are available for Rotterdam, Europe's largest port, and they show that the ground lost in 2020 had been largely made up by 2021. The figures in Table 2 are for the first nine months of the year over the period 2019 to 2021. Overall traffic was down by 0.9% in 2021 compared with the same period in 2019, but container traffic was up by 1.8% compared with 2019 in terms of tonnage and 2.8% in terms of units.

⁴⁰Sustainable and Smart Mobility Strategy – putting European transport on track for the future, European Commission December 2020

⁴¹ NAIADES III: Boosting future-proof European inland waterway transport, European Commission

⁴² Gross weight of goods transported to/from main ports by direction and type of traffic (national and international) - quarterly data Eurostat

Table 2: Rotterdam throughput (January to September) - 1,000 metric tons

	2019	2020	2020 Change on 2019	2021	2021 Change on 2019
Dry bulk	55,892	45,482	-18.6%	58,160	4.1%
Liquid bulk	159,486	142,962	-10.4%	152,085	-4.6%
Containers	114,759	112,383	-2.1%	116,864	1.8%
Break bulk	23,343	21,493	-7.9%	23,020	-1.4%
Total	353,480	322,321	-8.8%	350,130	-0.9%
Containers (TEU) 1,000	11,193	10,669	-4.7%	11,506	2.8%

Source: Port of Rotterdam News releases⁴³

Prospects

The rapid recovery in traffic in the second half of 2021 has caused its own problems for ports, with ships unable to dock. This is likely to increase pressure on ports to invest in new facilities, and it may lead shipping companies to increase their own investment in ports to secure priority treatment for their own vessels. In September 2021 two shipping companies acquired stakes in German ports, COSCO in Hamburg and Hapag-Lloyd in Wilhelmshaven, although Hapag-Lloyd bought the stake from another shipping company Maersk. At the same time, there is pressure to meet net zero carbon targets, which will also require new investment.⁴⁴

The consequences for automation and digitalisation

As in other sectors, the disruption to normal arrangements produced by Covid-19 gave advantage to those companies which had already introduced more digitalisation into their operations. They were better able to deal with the disruptions caused by the pandemic, and they continue to be better placed to deal with the disruptions caused by the rapid recovery in trade.

⁴³ <https://www.portofrotterdam.com/en/news-and-press-releases/port-of-rotterdam-throughput-rises-substantially-again-in-q3> and <https://www.portofrotterdam.com/en/news-and-press-releases/continued-growth-container-handling-third-quarter>

⁴⁴ Ports face biggest crisis since start of container shipping, Financial Times, 11 August 2021

Rail

The impact

Quarterly figures from Eurostat on rail passenger transport in 2020 and 2021 compared with the same quarters 2019 – before the pandemic – show the dramatic impact the pandemic has had on the number of people travelling (see Table 3). The decline is greatest in the second quarter of 2020 at the start of the pandemic, but the generally worsening situation in the second wave in the first quarter of 2021 is also clear. The situation is better in the second quarter of 2021, but the declines are still substantial compared to the pre-pandemic period. In Ireland, 73% fewer passengers travelled by train in the April to June 2021, compared with the same period in 2019; in the Netherlands there was a 55% fall; in Sweden the drop was 47%; in France it was 43%; and in Spain 37%.

Table 3: Passengers transported 2020 and 2021 compared with same period in 2019

	2020-Q2	2020-Q3	2020-Q4	2021-Q1	2021-Q2
Bulgaria	-37%	-18%	-22%	-25%	
Croatia	-67%	-25%	-35%	-40%	-33%
Czech Republic	-48%	-21%	-47%	-52%	
Denmark	-55%	-27%	-41%	-61%	-37%
Estonia	-55%	-21%	-29%	-39%	-29%
Finland	-52%	-35%	-40%	-53%	
France	-78%	-33%	-34%	-43%	-43%
Germany	-59%	-34%	-45%	-55%	
Greece	-69%	-38%	-66%	-71%	
Hungary	-59%	-19%	-41%	-47%	-36%
Ireland	-90%	-73%	-74%	-88%	-73%
Italy	-78%	-50%	-61%	-61%	
Latvia	-52%	-22%	-40%	-53%	-44%
Lithuania	-57%	-21%	-44%	-57%	-21%
Luxembourg	-78%	-42%	-35%	-41%	
Netherlands	-79%	-55%	-61%	-67%	-55%
Poland	-64%	-30%	-51%	-47%	
Portugal	-71%	-40%	-42%	-49%	-35%
Romania	-47%	-22%	-32%	-27%	
Slovakia	-61%	-27%	-54%	-67%	-44%
Slovenia	-57%	-35%	-53%	-25%	-13%
Spain	-78%	-44%	-49%	-49%	-37%
Sweden	-54%	-39%	-46%	-53%	-47%
Norway	-66%	-48%	-60%	-68%	
Switzerland	-57%	-25%	-37%	-42%	-38%

UK	-92%	-70%			
The figures are not available for Austria and Belgium due to confidentiality and Cyprus and Malta do not have railways. There are no figures for the UK after 2020 Q3.					

Source: Eurostat Passengers transported (detailed reporting only) - (quarterly data)

[RAIL_PA_QUARTAL]

Figures for Germany, which breakdown passenger number between short distance (commuter) services and long distance, show that long-distance services have been more affected.

Table 4: Passengers travelling by rail in Germany 2020 and 2021 compared with same period in 2019

	2020-Q2	2020-Q3	2020-Q4	2021-Q1	2021-Q2
Short distance	-60%	-35%	-45%	-55%	-46%
Long-distance	-71%	-39%	-59%	-67%	-56%

Source: Statistisches Bundesamt (Destatis), 2021 Personenverkehr mit Bussen und Bahnen 46181-0005

Since the end of the second quarter, it is likely that passenger numbers have recovered further, but the detailed figures are not yet available, and it seems that the impact of the pandemic has not yet disappeared. In September 2021, the Community of European Railway & Infrastructure Companies (CER) reported that passenger-km in August were still down by a third (33%) on the same month in 2019, while revenue was 29% lower.⁴⁵

The pattern is generally similar for rail freight with a sharp dip at the start, followed by some recovery in the second half of 2020, and another decline in the first quarter of 2021, but the falls compared with 2019 are generally less for goods than for passengers, and the picture is more mixed (see Table 5).

Table 5: Goods transported 2020 and 2021 compared with same period in 2019

	2020-Q2	2020-Q3	2020-Q4	2021-Q1	2021-Q2
Austria	-19%	-7%	4%	-4%	
Bulgaria	19%	21%	22%	19%	
Croatia	4%	-1%	5%	3%	4%
Czech Republic	-17%	-8%	3%	-5%	
Denmark	8%	-4%	-3%	-24%	-19%
Estonia	-26%	-11%	-14%	-7%	22%

⁴⁵ Latest CER COVID Impact Tracker: partial improvement over summer months, CER 28 September 2021
<https://www.cer.be/media/press-releases/latest-cer-covid-impact-tracker-partial-improvement-over-summer-months>

Finland	5%	2%	8%	4%	
France	-29%	-12%	22%	-4%	2%
Germany	-16%	-8%	4%	-1%	7%
Greece	-12%	-3%	1%	10%	
Hungary	-3%	2%	5%	-10%	-5%
Ireland	32%	98%	35%	-5%	17%
Italy	-19%	-5%	5%	-11%	
Latvia	-46%	-40%	-34%	-48%	-59%
Lithuania	-8%	1%	5%	-13%	-8%
Luxembourg	-22%	-19%	-18%	-26%	
Netherlands	-20%	-8%	10%	-7%	3%
Poland	-15%	-5%	4%	-7%	
Portugal	-14%	-5%	-3%	-9%	6%
Romania	-27%	-16%	-12%	10%	
Slovakia	-20%	-3%	8%	-7%	9%
Slovenia	-16%	-13%	0%	-16%	-10%
Spain	-32%	-17%	0%	-18%	-11%
Sweden	-2%	4%	3%	2%	6%
Norway	-6%	1%	1%	-2%	
Switzerland	-16%	-7%	-1%	-7%	0%
United Kingdom	-21%	-8%			
The figures are not available for Belgium due to confidentiality and Cyprus and Malta do not have railways. There are no figures for the UK after 2020 Q3.					

Source: Eurostat: Goods transported (detailed reporting only) - Quarterly data

[RAIL_GO_QUARTAL]

As with passenger numbers, the volume of goods transported by rail is likely to have increased in the second half of 2021. However, detailed figures are not yet available and the CER estimated in September 2021 that in August 2021 freight revenues were still 9% down on the figures for the same month in 2019/2019.

Prospects

After the experience of the pandemic, the prospects for rail transport of passenger and goods are likely to be different but still broadly positive.

Short distance (commuter) transport by rail, is likely to be affected by the forces affecting urban public transport more generally – the move to remote rather than workplace-based working for many office staff – which are discussed in greater detail in the urban public transport section. Long distance rail transport faces some of the same challenges as air

transport, in the sense that some business travellers may prefer teleconferencing and remote meetings to physically travelling.

However, both types of rail transport are likely to benefit for the pressure to make transport more sustainable and in the push to meet net zero targets.

On passengers, for long-distance travel, the European Commission is aiming to offer carbon-neutral choices for all travel below 500km by 2030 and will produce an action plan to boost long-distance and cross border rail services. Commuter rail services will benefit from the switch to more sustainable forms of transport (see section on urban public transport). On goods, the target of the Commission is that rail freight traffic will increase by 50% by 2030 and double by 2050, while freight traffic on high-speed rail will double by 2030 and triple by 2050.⁴⁶

The consequences for automation and digitalisation

As in other transport sectors, companies that had previously invested more heavily in digital technologies appear to have survived the pandemic better than those who were less able to identify the location of their assets or reorganise their routes.

The pandemic has also intensified the move away from paper. This is the case in customer-facing areas such as ticketing and timetables, but also in internal procedures, with mobile apps being used for reporting, inspections, and communicating between workers.⁴⁷

Despite the pressures pushing greater automation and digitalisation, the losses sustained by rail companies during the pandemic may slow future investment. As CER Executive Director Alberto Mazzola pointed out in September 2021, “With more than €40bn total losses since the beginning of the crisis, railway undertakings are recording operational losses that will have an impact on their capacity to invest, for instance in rolling stock”. While he expressed the industry’s gratitude “for the important investments in rail infrastructure supported by Next GenerationEU, the European and national budgets”, he called for further operational support.⁴⁸

⁴⁶ Sustainable and Smart Mobility Strategy – putting European transport on track for the future, European Commission December 2020

⁴⁷ The impact of COVID-19 on the UK rail industry, by Amy Gallagher, 22 April 2021, ONTRAC <https://on-trac.co.uk/covid-19-uk-rail-industry/>

⁴⁸ Latest CER COVID Impact Tracker: partial improvement over summer months, 28 September 2021 <https://www.cer.be/media/press-releases/latest-cer-covid-impact-tracker-partial-improvement-over-summer-months>

Road transport

The impact

Road transport, both moving passengers and goods, has been one of the sectors most severely affected by the Covid-19 pandemic. Writing in June 2021, the International Road Transport Union (IRU) stated that, “commercial road transport operators, in both mobility and logistics, continue to be severely impacted by Covid-19. This is primarily due to social, sanitary and mobility restrictions put in place by governments to help control the pandemic, coupled with the consequent overall economic downturn in some sectors”.⁴⁹ The IRU pointed out that losses were continuing and that while losses in goods transport were expected to be half 2020 levels, “passenger transport losses are forecast to be even higher than last year”.

This is the global picture. Detailed European-wide statistics on the impact of the pandemic are not yet available, but some figures are available for the EU's largest economy, Germany, and the reduction in activity after the pandemic started is clear.

In goods transport, in the hire and reward sector (excluding the own account sector – good moved by companies ancillary to their main activity) total goods moved, compared to 2019, fell in every month but September between April and October 2020. In international haulage, the fall was sharper at the start – down by 27% in April and 23% in May 2020 – but the figures recovered more strongly towards the end of the year (see Table 6).

Table 6: Goods transported in Germany in 2020 compared with same month in 2019 – Hire and reward

Month	Quantity (000t) carried in hire and reward sector as compared with same month in 2019		
	Total	National	International
January	4%	5%	-7%
February	-2%	-1%	-9%
March	1%	1%	1%
April	-8%	-7%	-27%
May	-14%	-14%	-23%
June	-2%	-2%	-7%
July	-5%	-5%	-17%
August	-9%	-9%	11%
September	2%	2%	5%
October	-3%	-3%	-4%

⁴⁹ COVID-19 Impact on the Road Transport Industry Update: June 2021, IRU

November	2%	1%	12%
December	5%	5%	10%

Source: Statistisches Bundesamt (Destatis), 2021 Quantity of goods carried, transport performance (freight transport by road) 46321-0004

However, it seems likely that the recovery at the end of the year was reversed in the first few months of 2021, as a result of the second wave of Covid infections.

This was certainly the case for long-distance passenger transport by road in Germany. The figures in Table 7 show that after staging a partial recovery in the third quarter of 2020, bus passenger numbers, compared with 2019, fell in the fourth quarter of the year to 88% of their previous total and collapsed completely (down 99%) in the first quarter of 2021. In the second quarter they were still only 5% of their pre-pandemic level. (The position in short-distance bus transport is covered in the section on urban public transport.)

Table 7: Passengers travelling by long-distance bus and coach in Germany 2020 and 2021 compared with same period in 2019

	2020- Q2	2020- Q3	2020- Q4	2021- Q1	2021- Q2
Change compares with same period in 2019	-96%	-65%	-88%	-99%	-95%

Source: Statistisches Bundesamt (Destatis), 2021 Personenverkehr mit Bussen und Bahnen 46181-0005

Prospects

With the economy recovering after Covid in most European states, goods transport by road now faces a different problem – a shortage of qualified drivers. A study in August 2021 suggested that Europe was short of 400,000 heavy goods vehicle drivers, with Poland, the UK and Germany facing the largest shortfall.⁵⁰

However, it is less clear whether the recovery in traffic that this represents will continue in the same way. Road transport for goods offers substantial advantages over other modes of transport in terms of flexibility, but it is, at least currently, less environmentally sustainable than other forms of freight transport. The European Green Deal aims to shift a substantial part of the 75% of inland freight currently moved by road to rail and inland waterways, so less freight may be moved by rail in future.

⁵⁰⁵⁰ European driver shortages by Violeta Keckarovska, Senior Research Analyst Transport Intelligence, August 2021

The consequences for automation and digitalisation

The pandemic's impact on moves towards greater automation and digitalisation is difficult to estimate. It has highlighted the dangers presented by long supply chains and, as a result, encouraged the use of greater digitalisation to track assets and goods more precisely.

Companies making greater use of digital technologies have probably been able to adapt more rapidly to the rapid changes produced by the pandemic. At the same time concerns about physical contact and the fact that so many people have been working remotely has accelerated the move away from paper-based to electronic processes.

However, the losses sustained by some companies during the pandemic, as identified by the IRU, have reduced companies' capacity to invest in automation and digitalisation, and road freight transport does not have the sort of public financial support potentially available to rail or inland waterways to make up the difference.

Urban public transport

The impact

Urban public transport, made up of a network of buses, trams, metros and local trains, has been heavily hit by the pandemic. This was particular the case at the height of the first and second waves in Europe, as many businesses closed, and people were instructed either to stay at home or to work from home where possible.

A study by the banking group ING, using Google mobility data found that, at the lowest point, at the start of the pandemic, public transport volume, as compared with the pre-pandemic average, fell by 86% in Spain, 84% in France, 83% in Spain, 73% in the UK, 71% in Belgium, 65% in the Netherlands, 60% in Switzerland and 57% in Germany. The situation improved in the summer of 2020, before deteriorating again at the end of 2020 and the start of 2021 and then recovering again as 2021 progressed.⁵¹

Looking at 2020 as a whole, figures from RATP, the group responsible for public transport in the Paris region, which describes itself as “the fourth-largest urban transport operator in the world” show a 43% drop in passenger traffic in the Île-de-France region (the area around Paris) in 2020 (although this includes the impact of industrial action in January 2020.) The light-rail service to the airport was most heavily affected – down by 72% on the 2019 figures,

⁵¹ European public transport shows signs of sustained recovery, ING 1 September 2021
<https://think.ing.com/articles/european-public-transport-shows-signs-of-sustained-recovery/>

but traffic on RATP's other services also fell sharply: metro – down by 50%; the RER urban rail service – down by 47%; tram – down by 35%; and bus down 33%.⁵²

As the Google mobility data shows, things improved in the second quarter of 2021, and this is also indicated by the official German statistics for short-distance travel which show the number of passengers on trains, trams and buses. The figures (Table 8) show that the largest falls were in short distance rail travel and the smallest in travel by buses.

Table 8: Passengers travelling short distances by public transport in Germany 2020 and 2021 compared with same period in 2019

Type of transport	2020-Q2	2020-Q3	2020-Q4	2021-Q1	2021-Q2
Train	-60%	-35%	-45%	-55%	-46%
Trams	-48%	-30%	-40%	-49%	-41%
Buses	-41%	-21%	-29%	-34%	-28%
Total short distance travel	-48%	-27%	-36%	-43%	-36%

Source: Statistisches Bundesamt (Destatis), 2021 Personenverkehr mit Bussen und Bahnen 46181-0005

Official figures are not available for the period after the second quarter of 2021, but ING's analysis of the Google mobility data shows a rise in the number travelling over the next few months until by 25 August 2021, public transport volume was only 4% below pre-pandemic levels in France and Switzerland, 10% lower in Germany, 11% lower in Italy, 16% lower in Belgium and 17% lower in Spain, but it was still 25% lower in the Netherlands and 28% lower in the UK.

Prospects

It is still unclear whether this gap between current and pre-pandemic numbers travelling – still present in August 2021 – will be closed in the future; whether the remote working that many workers were compelled to adopt during the pandemic will become a permanent feature of working life. The ING study, quoted above, suggest that “travel behaviour has changed, and a full return of volumes will take time in several countries”.⁵³ It also argues that the lower travel volumes found in the Netherlands (25% below pre-pandemic levels) and the UK (28% below), reflect the higher proportion of services in the two economies, as a relatively large share of workers employed in financial services, information and

⁵² RATP Group Activity and Sustainable Development Report, June 2021 <https://www.ratp.fr/en/groupe-ratp/group-presentation/our-essential-documents>

⁵³ ⁵³ European public transport shows signs of sustained recovery, ING 1 September 2021 <https://think.ing.com/articles/european-public-transport-shows-signs-of-sustained-recovery/>

communications, and consultancy worked from home during the pandemic and will continue to do so.

Analysis by the EU social and employment research agency Eurofound concluded that, based on surveys conducted in October 2020 and March 2021, “60% of workers would like to work from home (daily or several times a week) after the pandemic”. It also suggested that while many workers would prefer a hybrid model, combining remote working with time in an office, “exclusive telework will also continue to be significant: around one in three employees in the EU who worked only from home in February and March 2021 would continue to do so if they could decide their own work arrangement.”⁵⁴

Employees do not decide their own work arrangements, but the Eurofound analysis also notes that “in general, companies that have implemented telework during the pandemic have a positive attitude towards this arrangement”. It therefore seems likely that a much higher level of remote working than before the pandemic will continue, and this will have an impact on the numbers using public transport to travel to work.

This is certainly the view of some major public transport groups. Catherine Guillouard, head of the RATP in Paris said on 19 June 2021 that although the requirement to work from home had ended on 9 June, “telework is still very present” and for the future “there will be an impact of telework, that's for sure”. She said that the group had modelled an average of two days of remote working for everyone, which would amount to decline in traffic of between 5% and 7%.⁵⁵

A study for the transport body for the Rhine-Ruhr region (Verkehrsverbund Rhein-Ruhr) came to similar conclusions. It estimated that in future 20% of the workforce in the region would work from home, twice as many as before the pandemic and that, on average, they would work two days a week from home rather than the previous 1.4 days. As a result, traffic was likely to be between 5.5% and 8.0% lower than before the pandemic. There might also be greater use of private cars, which would result the number travelling on public transport falling even further.⁵⁶

⁵⁴ Workers want to telework but long working hours, isolation and inadequate equipment must be tackled, Eurofound, September 2021 <https://www.eurofound.europa.eu/publications/article/2021/workers-want-to-telework-but-long-working-hours-isolation-and-inadequate-equipment-must-be-tackled>

⁵⁵ Transports : la RATP s'attend à un impact durable du télétravail sur la fréquentation, Le Figaro, 9 June 2021 <https://www.lefigaro.fr/societes/transports-la-ratp-s-attend-a-un-impact-durable-du-teletravail-20210619>

⁵⁶ Langfristige Auswirkungen der Corona-Pandemie auf das Mobilitätsverhalten, VRR und IHK, 29 June 2021 <https://www.vrr.de/de/presse/veraendertes-mobilitaetsverhalten-von-berufspendlern/>

Although the pandemic means that urban public transport faces new challenges, it continues to have support from policy makers at European and national level as a key element in the move to net zero. As the Commission states in its strategy document “increasing the modal shares of collective transport, walking and cycling, as well as automated, connected and multimodal mobility will significantly lower pollution and congestion from transport, especially in cities and improve the health and well-being of people. Cities are and should therefore remain at the forefront of the transition towards greater sustainability.”⁵⁷

The consequences for automation and digitalisation

Falls in the number of passengers and the consequent decline in income for the bodies running urban public transport may slow investment, including investment and digitalisation. Even though investment decisions may depend more on considerations of public benefit rather than financial return, it is more difficult to argue for higher investment, if the number using the service is falling.

The pandemic itself has accelerated the use of technologies intended to make urban public transport safer. These include the greater use of contactless payments, new passenger information on topics like the numbers travelling and information about less congested and/or more activity alternative means of travel. The shift to more remote working will also accelerate the development of new ticketing arrangements which take account of the fact that passengers may travel regularly, but no longer go to work five days a week. The move away from standardised travel routines also places a premium on collecting data on passenger numbers and patterns and the ability to analyse and act on this information, potentially using artificial intelligence to help decision-making.

Logistics

The impact

Logistics companies provide a wide range of services – freight forwarding, document and package delivery, contract logistics and e-commerce – and, as a result, the impact of the pandemic has varied across the sector.

For freight forwarding companies, the disruption to supply changed caused by the pandemic, with ports closed, border controls reintroduced, quarantine restrictions imposed on drivers and many passenger flights cancelled, presented major challenges. However,

⁵⁷ Sustainable and Smart Mobility Strategy – putting European transport on track for the future, European Commission December 2020

although this led to initial losses in many companies, by April 2021 Frank Huster, the director of the German logistics association DSLV was able to say that the situation had substantially improved.⁵⁸

Document and package delivery was initially similarly negatively affected by the disruption resulting from the pandemic, with guaranteed delivery times being suspended and new arrangements having to be introduced for contactless deliveries. However, as the pandemic continued, they were able to benefit from the growth in e-commerce as consumers switched to on-line shopping (see below). By March 2021, the two largest express delivery companies, UPS and FedEx were reporting significant growth in revenues and profits.⁵⁹

Contract logistics also faced difficulties because of the pandemic. Deutsche Post DHL, the market leader in the sector, said in its 2020 annual report that “local lockdown measures in conjunction with global economic restrictions in certain sectors have had a significant impact on the contract logistics market in the year under review”, going on to refer to reduced volumes and temporary site closures. However, the situation has subsequently recovered.

For e-commerce, in contrast, the pandemic resulted in substantial growth as many traditional shops were compelled to close and consumers were often required to stay at home. Eurostat figures show that, between the first and second quarters of 2020, the volume of retail sales through the internet and mail order catalogues in the EU27 increased by 22% from an index figure of 161.3 to 196.6.⁶⁰

Compared with the equivalent quarter a year earlier, sales through the internet and mail order catalogues were more than 20% higher in each of the last three quarters of 2020 and the first quarter of 2021. Even in the second quarter of 2021, when the comparison is with a quarter already affected by the pandemic, sales through the internet and mail order catalogues, still show a 14% growth on the previous year (see Table 9).

Table 9: Retail sales in EU27 via mail order houses or via internet

Period	2020-Q2	2020-Q3	2020-Q4	2021-Q1	2021-Q2
Index (2015 =100)	196.6	187.3	207.7	224.3	224.8
Change compared to same quarter in previous year	32%	22%	34%	39%	14%

⁵⁸Logistikfirmen trotzen der Krise Tagesschau 14.04.2021

<https://www.tagesschau.de/wirtschaft/unternehmen/logistikbranche-corona-101.html>

⁵⁹ FedEx predicts lasting surge in e-commerce shipments, Financial Times 18 March 2021

⁶⁰ Eurostat Turnover and volume of sales in wholesale and retail trade - quarterly data, Retail sale via mail order houses or via internet

Source: Eurostat Turnover and volume of sales in wholesale and retail trade - quarterly data

Prospects

There seems little reason to think that the trends which developed as the pandemic progressed will not continue, as economies recover from the pandemic. The recovery in world trade means that, for freight forwarders, the current situation of strong demand and tight capacity will continue throughout 2021 and potentially 2022, providing opportunities for further growth. Document and package delivery will also continue to benefit from the growth in e-commerce, while, in contract logistics, Deutsche Post DHL notes in its 2020 annual report that, “the trend towards outsourcing warehousing and distribution is set to continue, given the increased demand for flexibility, agility and speed”.

In e-commerce, the main beneficiary from the lockdowns introduced because of the pandemic, growth seems likely to continue. A report by the OECD, produced in October 2020, drew attention to the rapid growth of e-commerce when Covid-19 first emerged and suggested that, “some of these changes in the e-commerce landscape will likely be of a long-term nature, in light of the possibility of new waves of the epidemic, the convenience of the new purchasing habits, learning costs and the incentive for firms to capitalise on investments in new sales channels”.⁶¹ The available figures, including the fact that growth continued in the second quarter of 2021, suggests that this is indeed the case and that the pandemic has produced a permanent increase in the share of the market taken by e-commerce.

The consequences for automation and digitalisation

In all areas of logistics, it seems that the pandemic has accelerated the move toward greater digitalisation.

In freight forwarding, as the German logistics company DB Cargo notes, “most experts ... agree that the pandemic will boost digitalisation in the logistics sector”, and it points to three areas where it is likely that will be introduced, tracking supply chains, inventory forecasting and comprehensive capacity planning.⁶²

In document and package delivery, the pandemic accelerated and deepened digitalisation efforts overnight. As Rob Carter, FedEx’s chief information officer said in October 2020, “We

⁶¹ E-commerce in the time of COVID-19, 7 October 2020 <https://www.oecd.org/coronavirus/policy-responses/e-commerce-in-the-time-of-covid-19-3a2b78e8/#figure-d1e153>

⁶² How the coronavirus has changed logistics, DB Cargo, <https://www.dbcargo.com/rail-de-en/logistics-news/how-the-coronavirus-has-changed-logistics-coronavirus-pandemic-6341844>

had been building a critical set of capabilities for a long time. What really happened [because of the pandemic] is we got sling-shotted into 2023.”⁶³

In contract logistics, the pandemic has meant, in the view of the operations director of the logistics company GXO in Italy that, “the industry is four to five years ahead of where it had planned to be when it comes to digitalisation of the supply chain”.⁶⁴

Finally, in e-commerce, the key impact of the pandemic has been to expand the size of the sector. As well providing the resources to invest in new technology, the growth has led to an increase in the number of workers, employed on a self-employed basis, using a mobile app to be allocated work.

⁶³FedEx CIO Attests to Data-Driven Strategies in Pandemic Times, IoT World Today, 15 October 2020 <https://www.iotworldtoday.com/2020/10/15/fedex-cio-attests-to-data-driven-strategies-in-pandemic-times/>

⁶⁴ Technology’s changing role in the supply chain by Alessandro Renzo, GXO Operations Director, Supply Chain – Italy, 8 April 2021 https://www.gxo.com/pl/news_archive/technology-changing-role-in-the-supply-chain/

Automation and digitalisation in civil aviation

Flight crew and cabin crew

Key potential changes: a push for single pilot operation and more automatic flight

The work of pilots has already been heavily affected by automation, as the shift from three people in the cockpit of a wide-bodies jet (pilot, co-pilot and engineer), to just two (pilot and co-pilot) indicates.

This process could be taken even further if the aviation authorities were to allow single-pilot operation across a wider range of aircraft. The German Aerospace Centre (DLR) sets out what this would involve and also who would benefit:

“It is expected that with further increase in automation in the cockpit, the role of co-pilot could become redundant provided the reliability of necessary and assistance cockpit systems is sufficient. This concept of “single pilot” could lead to the economic benefits for airline industry as the cockpit crew cost would be reduced.”⁶⁵

This is not a plan for the far distant future. In September 2019 Daniela Lohwasser, head of research and technology at Airbus, confirmed at a conference in Berlin that Airbus was working on technology to make single-pilot operations a reality. She said: “We can already see that there is a shortage of pilots... and that will not get better in the coming years”. The move to “green flying will make aircraft more expensive to produce, and to operate because fuel costs would be higher ... so we have to see how we can get operating costs down, and single-pilot operation could be such a way.”⁶⁶

Lohwasser saw single-pilot cargo aircraft as a step towards single-pilot airliners and conceded that, “it will not be a one-step approach [to single-pilot passenger operations].” In the longer term, as Airbus says on its own website, “Airbus is working towards a world of self-piloting urban air mobility vehicles and cargo drones, and more autonomous commercial aircraft.”⁶⁷ Boeing and avionics companies are also working on comparable projects. The European Union Aviation Safety Agency (EASA) has already indicated that it is considering the potential for some relaxation of the rules which currently prevent single-

⁶⁵ Single Pilot Operations, DLR

https://www.dlr.de/ik/en/Portaldaten/57/Resources//Single_Pilot_Operations_en.pdf

⁶⁶ Airbus: Single-pilot freighters a step to airliner operations, Flight Global 27 September 2019 reporting in the ISTAT-EMEA conference in Berlin 25 September 2019 <https://www.flightglobal.com/systems-and-interiors/airbus-single-pilot-freighters-a-step-to-airliner-operations/134505.article>

⁶⁷ Airbus website <https://www.airbus.com/innovation/future-technology/autonomy.html>

pilot operations in commercial aviation.⁶⁸ It aims to be prepared for the introduction of single-pilot operations, which it expects to be sometime over the period 2025 to 2030.

Digitalisation has also had a significant impact on flight through its ability to measure, aggregate and present data on aircraft systems and aircraft performance in an understandable and frequently visual format. However, these systems essentially help the pilot make decisions, or take over some routine tasks, while the pilot concentrates on others. Typically, a commercial flight is flown for the 90% of the time with the autopilot engaged, and the two pilots have a supervisory role. In addition, when visibility at the airport is poor, most commercial aircrafts can undertake automatic landing procedures. There are now suggestions that this could go further using “Automatic/Autonomous Flight Rules”, which would allow the plane to be flown automatically in a wider range of circumstances than currently apply. Supporters of this change argue that it could make flying safer, by making dangerous actions by pilots impossible.⁶⁹

Other potential changes in the cockpit include:

- using so-called cognitive computing to respond to unstructured questions from pilots, and to draw lessons from past experiences, as humans do; and
- the use of wearable digital devices, which would monitor pilots' performance and well-being.

Cabin crew may be less affected by digitalisation than others working in civil aviation, as theirs is primarily a personal service and therefore more difficult to automate, leading to a loss of jobs. However, digitalisation is having an impact on their work. This includes greater use of tablets by cabin crew, using digital technology to capture individual passengers' personal preferences and inflight wi-fi connections.

Cabin crew may in future be expected digitally to capture customer feedback and collect operational passenger and aircraft information in real time. This will increase the pressure on them to respond to this newly available information.

Progress so far

There are some indications that some of these changes are happening.

It is not clear what progress has been made on single-pilot operations, as airlines may be reluctant to discuss this because of the negative impact on customer sentiment. This is one

⁶⁸ EASA open to relaxation of single-pilot rules for commercial aviation, Flight Global

⁶⁹ Aviation 4.0: More Safety through Automation and Digitization by Rosa Arnaldo Valdes and Victor Fernando Gómez Comendador, Safety and Security Engineering VII, 2018

reason why, if it is introduced at all, it will first be on cargo rather than passenger flights. A report in 2018 suggested that a US company, M2C Aerospace, planned simulator tests in 2019, followed by later test flights.⁷⁰

In other developments extending the capability of technology, in July 2019, the Technical University in Munich reported that it had been able to extend automatic landing, which is already possible at larger airports with the necessary infrastructure using the Instrument Landing System (ILS) to smaller airports. This possible because a vision assisted navigation on the plane allows it to land in poor visibility without the need for ground-based systems.⁷¹ Airbus has used IBM's cognitive computer system technology "Watson" in some development work, and EasyJet began trials with wearable devices built into uniforms in 2015, although it is not clear that this has continued.

The obstacles

However, there are obstacles to a more rapid move to the more widespread introduction of digitalisation on the flight deck, particularly the move to single –pilot operation. This would not just remove a second source of advice and experience on the flight deck, but would also, in the case of the incapacity of the pilot mean that there would be no-one there to fly the plane. Even if the only cargo was freight, a plane crash can cause widespread destruction and loss of life.

There is also greater public concern over the safety implications of an enhanced role for digital equipment in making decisions, following the two tragic accidents involving the Boeing 737 Max . The fact that the pilots of the two planes involved seemed unable to take control back from the computer highlighted the risks involved in reducing human involvement. Issues of cyber security are also potentially linked to passenger safety.

A further obstacle may be the cost, not just in terms of the planes themselves but also ground-based infrastructure. This may now be a greater problem, following the decline in air travel over the pandemic and the uncertain prospects for full recovery.

The impact

A move to single-pilot operation would have a significant impact on the numbers of pilots employed, although the minimum ICAO standards on crew numbers limit airlines' ability to make changes in crew numbers unilaterally. In the medium term, the changes may be less

⁷⁰ Single Pilot Operations for Air Cargo a Test for Autonomous Flying, Insurance Journal, 11 October 2018 <https://www.insurancejournal.com/news/national/2018/10/11/504089.htm>

⁷¹ „Augen“ für den Autopiloten, 04.07.19 <https://www.tum.de/nc/die-tum/aktuelles/pressemitteilungen/details/35553/>

likely to involve a move to a single pilot on short-haul flights, but rather a reduction in the number of pilots needed on long-haul flights.

Other than a possible shift to single-pilot operation, in the short term, the impact of increased digitalisation is likely to be in changing jobs rather than reducing them. This is already happening for both flight and cabin crew, as the shift to digital methods of recording and receiving information is increasing workloads. For example, preparatory material for upcoming flights is now provided electronically and crews are effectively expected to read and deal with it in their own time rather than during works time. The pressure to work outside paid hours is growing.

Air traffic management (ATM)

Key potential changes: the Single European Sky and remote towers

Air traffic management (ATM) is an area where fundamental change is underway in the EU, with the European Commission's intention to move to a Single European Sky, involving much greater sharing of data. It may also result in a shift away from national Air Traffic Service Providers providing an integrated service to a situation where they buy data from other providers.

A 2017 report by SESAR, the Single European Sky ATM Research programme, a public-private cross-industry initiative, looked at the implications of digitalisation on ATM.⁷² It identified seven major challenges facing the industry in the period up to 2050, many of which were linked to digitalisation. These were:

- continuing growth with air traffic forecast to be four times higher than currently by 2050;
- new urban services partially provided by drones;
- growing digital transformation driven by big tech companies;
- higher customer expectations, particularly for on-demand services;
- an ongoing requirement to provide safety and security, particularly against cyber-attacks;
- moves towards pilotless aircraft; and
- increased global competition threatening Europe's leading role in the aviation industry.

The response of SESAR to these challenges is set out in its 2020 Masterplan.⁷³ This involves:

- improved communication, navigation and surveillance (CNS);
- interconnected and standardised air traffic management (ATM) network;
- digital information and meteorological services;
- U-space (drone) services;
- virtualisation of services – no longer close to point of use;
- improvements at airports and airspace round airports;
- dynamic and optimised airspace;

⁷² Digitalising Europe's aviation infrastructure: a discussion paper, November 2017
<https://publications.europa.eu/en/publication-detail/-/publication/85dbfe24-024b-11e8-b8f5-01aa75ed71a1/language-en>

⁷³ European ATM Masterplan 2020, SESAR, 2020 <https://www.sesarju.eu/masterplan>

- operations based on whole trajectory of flight (TBO); and
- multi-modal mobility.

The ATM sector has long been accustomed to continuous technological innovations and to the introduction of new tools researched within the SESAR project that allow air traffic controllers manage higher traffic volumes. However, the development within the SESAR Masterplan with the clearest impact on jobs and employment is probably the virtualisation of services, which allows flights to and from several airports to be controlled from a single remote tower which can be hundreds of kilometres away. This moves jobs to new locations and potentially allows the numbers employed to be reduced through consolidation.

Progress so far

Progress has been made on many of the issues in the Masterplan, and it lists a large number of technical improvements which have been deployed. These include:

- air traffic service datalinks;
- collaborative network operations plans; and
- e-registration and identification service for drones.

In the area of remote tower control, the first installations were in Sweden, at Örnköldsvik and Sundsvall.⁷⁴ Subsequently other countries have started, or are planning, to use this new technology, including in Germany, in Saarbrücken and Erfurt, and a project of the remote tower centre in Norway. In another new development in Sweden, for the first time in the world an airport, the Scandinavian Mountains Airport in Sälen, was designed and built without a conventional tower but with a remote tower. It came into operation in December 2019.⁷⁵

London City, in the UK, is the first major international airport in the world to be fully controlled by a remote digital air traffic control tower. This is in Swanwick, Hampshire, 115 km away, and it became operational in December 2020.⁷⁶

⁷⁴SDATS Takes Over Remotely Operated Air Traffic Control in Sweden Saab press release, 26 November 2018 <https://saabgroup.com/media/news-press/news/2018-11/sdats-takes-over-remotely-operated-air-traffic-control-in-sweden/> and

⁷⁵ Saab Providing Digital Air Traffic Services for Scandinavian Mountains Airport in Sälen, Saab press release 21 December 2019 <https://www.saab.com/newsroom/press-releases/2019/saab-providing-digital-air-traffic-services-for-scandinavian-mountains-airport-in-salen>

⁷⁶ London City is first major airport controlled by remote digital tower, NATS press release, 30 April 2021 <https://www.nats.aero/news/london-city-is-first-major-airport-controlled-by-remote-digital-tower/>

In all these projects, there is a single operator dealing with one airport at a time. Trials to verify the feasibility of simultaneous control of multiple airports have been undertaken, but the results have been unsatisfactory.

The obstacles

Many of the measures being implemented under the SESAR Masterplan require substantial investment, and the recent growth of the airline industry in the past made this easier to justify and finance. However, the proposals could be at risk as a result in the fall in passenger numbers because of the pandemic.

Moving to remote operations also raises safety issues around both cyber security and terrorism, in particular questions over the security of communications. However, with air traffic control generally remaining an unseen service, these concerns are less obvious to the public than questions such as single-pilot operations.

The impact

The 2017 SESAR report quoted above expected that there would “a net displacement of current jobs in the industry, which is expected to be partially offset by the creation of next-generation skilled jobs inside and outside the travel ecosystem”.

The difficulties become greater if there is a substantial shift to the creation of control centres which manage several towers simultaneously. This would allow one operator for each tower and multiple working positions in a single centre. In these circumstances, jobs will be relocated and potentially lost.

A complete switch to a market in air traffic management services could also have a major impact on employment and working conditions. However, this currently seems unlikely. There is a structure for social partner involvement in the Single European Sky project and in September 2019 the Director General of DG MOVE at the European Commission stated that future regulations would need to be socially acceptable.

Ground handling and maintenance

Key potential changes: automated operations, self-driving equipment and predictive maintenance

Ground handling has been substantially affected by digitalisation, primarily in a drive to improve efficiency and reduce costs, but also to open new sources of revenue. As well as digital changes in areas common to most employers, such as human resources planning, web-based trained and integrated invoicing, a recent paper identified 16 digitally based process within the airport, which were specifically aimed at the core processes of ground handling agents.⁷⁷ These were:

- passenger handling:
 - self-service check-in kiosks;
 - self-boarding;
 - indoor-navigation for passengers with reduced mobility and transit passengers;
 - smart wheelchairs;
 - digital processing of “irregularity” vouchers (vouchers for meals and accommodation in case of delay);
 - smart wearables (glasses and watches), for example to allow staff to greet passengers by name;
 - biometric services, to improve identification;
- baggage handling;
 - radio frequency identification (RFID) baggage tags, which unlike barcodes do not need line-of-sight identification;
 - self-tagging;
 - digital bag tags, which can be changed remotely;
 - real-time luggage tracking;
 - automated baggage drop-off;
 - self-service lost luggage kiosks;
 - improved analytics in baggage handling;
- lounge services;
 - automated access gates; and
 - new types of lounge tickets.

⁷⁷ Digital Transformation in Airport Ground Operations by Ivan Kovynyov and and Ralf Mikut, May 2018
<https://arxiv.org/pdf/1805.09142.pdf>

Other changes on the airport apron and runways include;

- the use of drones to inspect runways, fences and other installations at the airport,
- self-driving shuttle-buses;
- self-driving aircraft stairs;
- automatic de-icing and cleaning of aircraft; and
- pushback tugs, which, if not fully automatic, require fewer people to operate.

Ensuring operational availability is one of the most important issues that the aviation industry needs to address, and unplanned maintenance is one of the key reasons why aircraft become unavailable. Artificial intelligence is seen as a crucial element in developing predictive maintenance to avoid aircraft being taken out of service, using a combination of big data and sensors on crucial parts (the internet of things).

Progress so far

Within the airport, most of these technologies are at a high level of readiness for implementation, with some, like self-service check in and bag drop-off, already being used widely. The exceptions are digital processing of irregularity vouchers, smart wheelchairs, real-time luggage tracking by customers and new types of lounge tickets,

A 2020 survey by SITA, a company specialising in air transport communications and information technology, found that many of these technologies are already in use or planned. Almost all airlines (95%) now provide web check-in, and more than a third (36%) provide assisted self-boarding. Airlines are moving away from using staff to check and scan ID documentation, with the proportion operating self-boarding gates using biometric and ID documentation expected to rise from 5% of airlines in 2018 to 82% in 2023. In baggage handling 50% of airlines use unassisted bag-drop, while 45% provide real-time baggage tracking information for staff.⁷⁸

The 2019 SITA survey also suggested that digitalisation is having a substantial impact on maintenance. In 2019, 75% of airlines were using AI for predictive analytics and 44% for automatic scheduling of tasks such as maintenance and repair.⁷⁹

The obstacles

Potential obstacles are the cost of the technology and passenger resistance. The cost may be an issue in some smaller airports, where it continues to be cheaper to employ staff rather

⁷⁸ Air Transport IT Insights 2020 SITA <https://www.sita.aero/resources/surveys-reports/air-transport-it-insights-2020/>

⁷⁹ Air Transport IT Insights 2019 SITA <https://www.sita.aero/globalassets/docs/surveys--reports/it-insights-2019.pdf>

than machines. However, this is less likely to be the case at larger sites, although the SITA 2020 report shows that the decline in passenger numbers as a result of the pandemic has led to large falls in IT investment. There is no evidence of passenger resistance, at least when the system is working smoothly. However, frustration can mount rapidly when it breaks down and there are no staff to ask.

Impact

The impact of these technologies on employment in ground handling is clearly significant, although there appear to be no precise figures. A survey for the European Commission published in 2012 found that the number of ground handling hours per “turn” (an aircraft arriving and then taking off) had decreased by 19% between 2005 and 2010. This was the result of “productivity measures and changes in the operating environment, in particular the increase in the market share of low-cost carriers; reductions in volumes of checked baggage following the introduction of baggage fees; and other market changes such as the introduction of online check-in”.⁸⁰ It seems likely that these trends will have strengthened since then. It is certainly the case that many passenger handling staff have been redeployed to other duties.

On maintenance, one survey suggests that predictive maintenance could reduce maintenance labour costs by between 5% and 10%.⁸¹

As well as potentially leading to a loss of jobs, digitalisation is also changing the jobs that remain. The allocation of tasks through apps potentially means a higher workload as gaps between tasks are eliminated. Workers are subjected to higher levels of surveillance and monitoring. Staff increasingly need new skills to operate their digital equipment.

⁸⁰ Study on the effects of the implementation of the EU aviation common market on employment and working conditions in the Air Transport Sector over the period 1997/2010, Steer Davies Gleave, 2012

⁸¹ Forestalling the future with predictive maintenance by Lucia Zhang, 2016
<https://www.oliverwyman.com/content/dam/oliver-wyman/global/en/2016/may/owtl/08-Forestalling-the-Future-With-Predictive-Maintenance.pdf>

Automation and digitalisation in the water transport sector

Maritime transport

Key potential changes: autonomous ships

As in other forms of transport, the ultimate challenge of automation and digitalisation in the shipping industry appears to be the fully autonomous ship, which operates without supervision and where all decisions are made and implemented by a digitally-based system without human involvement. However, there are other levels of automation below that of the fully autonomous ship and Lloyds Registry in 2016 proposed a six-level classification system (see chart). There are, however, also other systems of classification.



Source: Chart taken from Seafarers and digital disruption: The effect of autonomous ships on the work at sea, the role of seafarers and the shipping industry, Hamburg School of Business Administration (HSBA), October 2018

The key advantages, of autonomous ships, at least from the shipowner's point of view are that they:

- reduce or eliminate crew costs;
- increase safety, as fewer/no crew members are being exposed to danger at sea;

- make the design of the ship more efficient, as there is no need to provide for living quarters for the crew; and
- reduce fuel costs, because of the more efficient design and the lack of living quarters.

It is also suggested that they reduce human error, although human error has not been the only cause of losses in the past and human intervention has certainly been a factor in saving ships.

The HSBA report, from which the chart was taken, and which was written for the employers, the International Chamber of Shipping, sees the levels of autonomy, together with the type of ship concerned and the route it is sailing, as being crucial in determining key aspects on the industry in future⁸². These are:

- the number of crew who will still be needed on board;
- the circumstance in which a crew may be needed, for example the differences between coastal and deep water journeys;
- the parts of current crews with which STCW (Standards of Training and Certification of Watchkeepers) qualifications who will be required in the future;
- the possibility that bridge and machine functions will develop separately and that new functions will be created; and
- the extent to which crew functions will move in part or entirely to shore-based facilities.

As with other transport industries, digitalisation will have an impact on aspects of the industry other than through the move towards autonomous ships. Human resources, marketing, cargo documentation, maintenance and purchasing will all be affected. In those parts of the industry dealing with passengers – ferries and cruise liners – there will be an impact on ticketing, check-in and luggage (RFID tags), and on cruise ships there will be an impact on the entertainment that passengers expect (such as video streaming or social media access), potentially requiring new skills from the crew.

Progress so far

The HSBA report notes that there are already examples of some aspects of autonomous ships, particularly in relation to remote operation, pointing to the Remote Operating Centres

⁸²Seafarers and digital disruption: The effect of autonomous ships on the work at sea, the role of seafarers and the shipping industry, Hamburg School of Business Administration (HSBA), October 2018 <https://www.ics-shipping.org/docs/default-source/resources/ics-study-on-seafarers-and-digital-disruption.pdf?sfvrsn=3&sfvrsn=3>

(ROCs) which liner shipping companies, like Maersk and CGM, and cruise operators have run for several years. These centres collect data in real time and assist with the operation of the vessel.

A number of small projects with unmanned vessels are underway, such as Patrol ship RPA3 in Rotterdam, and trials of fully autonomous ferry between Parainen and Nauvo in Finland in 2018. In addition, in the most ambitious project, the Yara Birkeland, an open-hatch container feeder with a capacity of 120 TEU, was launched in 2020. It is intended that it will move gradually from crewed operation to fully autonomous operation during its first two years after its completion.⁸³ The Yara Birkeland will be battery driven and will shuttle close to the shore within between Yara's fertiliser plant and two deep water ports in Norway. It will carry cargo currently moved by road.

As part of the EU-backed Munin project (Maritime Unmanned Navigation through Intelligence in Networks) a survey published in 2015 found that 16% of the maritime professionals questioned expected autonomous ships to be “commonly deployed” in the next 10 years, 29% in the next 11 to 15 years and 27% in the next 16 to 20 years, (although these answers are based on only 63 responses).⁸⁴

The obstacles

However, despite the apparent benefits, the early trials and partial use of the technology, it is clear that there are still significant obstacles in the way of the widespread introduction of autonomous ships.

These include:

- the cost not just of new ships but also the digital infrastructure;
- the technological problems, in terms of sensors and instrumentation accuracy that have still to be resolved;
- the reliability of on-board machinery and equipment, as on ships without crews there is no-one to repair the machinery if it breaks down; and
- the lack of a legal framework for the use of autonomous vessels, which, because of the nature of the shipping industry, will have to be agreed at international level.

⁸³World's first crewless, zero emissions cargo ship will set sail in Norway, CNN August 2021 <https://edition.cnn.com/2021/08/25/world/yara-birkeland-norway-crewless-container-ship-spc-intl/index.html> and Yara Birkeland press kit, 2019 <https://www.yara.com/news-and-media/press-kits/yara-birkeland-press-kit/>

⁸⁴ See <http://www.unmanned-ship.org/munin/wp-content/uploads/2015/10/MUNIN-D9-2-Qualitative-assessment-CML-final.pdf>

(Interim guidelines on trials of autonomous ships were approved by the Maritime Safety Committee in June 2019.)

In addition, in many ships, crew costs are a relatively small element of overall costs.

In the view of many observers⁸⁵ autonomous ships are likely to be introduced primarily in small coastal and inland craft, and in other vessels, digital technology will be introduced but will be used as an aid to the crews.

The impact

Despite this there is deep concern among existing seafarers on the impact of autonomous ships, and a survey by the Nautilus Federation, bringing together 19 seafaring unions across the world, found that 84% considered that automation was a threat to jobs. The Nautilus survey, based on almost 900 responses from 12 countries, also expected the introduction of autonomous shipping to take much longer than the MUNIN survey suggested. Fewer than 40% of the Nautilus respondents expected autonomous ships to be in widespread use in the next 20 years, and a very high proportion (85%) thought that unmanned remote-controlled ships would be a threat to safety at sea.⁸⁶

The HSBA report suggests that, with the volume of shipping expected to grow, there is no need to fear job losses, at least not among officers, where it quotes a report suggesting that there will be a shortage of 147,500 officers worldwide in 2025.⁸⁷ For ratings, its projections are less optimistic. Indeed, even if there are no job losses, the report makes it clear that both the introduction of autonomous ships and the digitally based changes, like more remote operations, will potentially change the job that seafarers do. The boundary between onshore and on-board work may blur and skill requirements will change. These two elements together may lead shipowners to seek employees with the right skills who are new to the industry rather than retraining existing employees. However, it is important to remember that shipowners do not have a free hand in this area, as remote operations would require changes to the STCW Convention (part of the regulations of the International Maritime Organisation – IMO).

⁸⁵ See for example Unmanned ships on the horizon by the Norwegian risk management group DNV GL <https://www.dnvgl.com/article/unmanned-ships-on-the-horizon-94273#> and Key advantages and disadvantages of ship autonomy by Callum O'Brien <https://safety4sea.com/key-advantages-and-disadvantages-of-ship-autonomy/>

⁸⁶ Future proofed? What maritime professionals think about autonomous shipping, Nautilus Federation 2018 https://nautilusfederation.org/wp-content/uploads/2018/02/report_auto_8.2.18.compressed.pdf

⁸⁷ ICS/BIMCO. "BIMCO/ICS Manpower Report." www.bimco.org. 05 17, 2016.

The ETF is addressing new skills requirements through its SkillSea project, where it is working with the employers, the European Community Shipowners' Associations (ECSA) to develop a strategy for future proof education and training for maritime professionals (both seafarers and on-shore workers working in the maritime industry).⁸⁸ The aim is to:

- increase the number of European maritime professionals;
- map out technological developments in ship operation and their effect on the industry's skills requirements;
- overcome barriers to the mobility of seafaring labour; and
- improve co-operation between education providers, competent authorities and industry.

In some areas, automation and digitalisation may have a positive impact for seafarers. Fatigue, caused by long hours is a major problem, both in terms of the health of individual crew members and the safety implications of exhausted crew members. Digitalisation and automation could have help to address this issue if introduced in an appropriate way. Automation could also remove some dangerous tasks.

Using automation to improve safety at sea and the health of seafarers is one of the five elements set out in the ETF's policy document on automation in shipping, "An ETF plea to the industry and regulators for a human-centred approach to automation in shipping".⁸⁹ This includes five guiding principles:

- no 'one-size-fits-all' approach – indicating the variations of usage in different shipping sectors;
- safety first – emphasising the need to use technology to assist seafarers and improve safety and to ensure that liability remains with the shipowner or the shipping company;
- high standards – to ensure that new technologies are not implemented in vessels flagged to states with lower safety, security and environmental standards;
- life-long learning – allowing seafarers to be upskilled to cope with technological developments; and
- digital shipping = green shipping – moving towards technologies which remove or reduce the dependence on fossil fuel.



















⁸⁸ ETF and partners launch EU-funded project for futureproof skills in maritime transport , November 2018
<https://www.etf-europe.org/3729-2/>

⁸⁹ <https://www.etf-europe.org/resource/etf-plea-for-a-human-centred-approach-to-automation-in-shipping/>

Inland waterways

Key potential changes: full automation and a wider use of digital technology

In inland waterways, as in other transport sectors, there is the potential for completely automated operation, and as elsewhere, there is a chart which shows progress towards this. The definitions developed by the Central Commission for the Navigation of the Rhine (CCNR) and adopted in December 2018, indicate a hierarchy of automation, ranging from 0 (no automation) at the bottom to 5 (full automation) at the top (see chart).

			Navigation	Situational awareness	Fall-back
Human execution	0	No automation			
	1	Navigational support Human execution required			
	2	Partial automation Human response required			
Automated execution	3	Conditional automation With human response			
	4	High automation Context dependent			
	5	Full automation No constraints			

Source: Central Commission for the Navigation of the Rhine (CCNR) <https://www.ccr-zkr.org/files/documents/cpresse/cp20181219en.pdf>

The potential benefits of a shift towards automation in inland waterways – primarily for the employers but not exclusively – are seen as including the following:

- lower costs, as vessels will be able to be operated with fewer crew;
- greater safety, with the elimination of human error as a cause of accidents and collisions (although human error is by no means the only reason for such incidents);
- larger payload as there will be no need to provide living accommodation and
- more sustainable operations as fuel consumption per tonne transported will be reduced because of the higher payload.

It is also suggested that lower costs might lead to inland waterways winning a greater share of goods transport, with wider social and economic benefits, as inland waterway transport has a smaller carbon footprint than road transport.

A move to fully automated vessels seems unlikely. It seems more probable that there will be a push to go as far as level 4 (High automation), or that vessels would be remote controlled, but with at least one person, the captain, on board. This is because the captain is the only crew member who must be able to exercise and be competent in all onboard functions. There are also active discussions on ongoing on shore-basing crew members. As a result, the first phase in the move to automation will be a division between the purely on-board functions such as navigating on the one hand, and onshore functions such as loading/unloading, mooring/unmooring and maintenance, on the other.

These are by no means the only changes that can be expected because of digital developments in inland waterways. These include moves to electronic documentation and potentially an electronic market for inland waterways transport “e-Bargebooking”.

River cruises will be affected by some of the same changes being introduced on sea cruises: e-ticketing, remote check-in, RFID tags on luggage and new entertainment and passenger communication demands. Like other industries, inland waterways are also likely to see the introduction of remote sensors to improve maintenance, and digital technologies employed in areas like marketing, human resources and purchasing.

There may also be moves towards automation in smaller vessels providing short trips for tourists, in cities such as Bruges in Belgium or Amsterdam in the Netherlands.

Progress so far

As well as some pilot projects, particularly in the Netherlands and Belgium, there are already various aspects of the industry where automated systems control aspects of the vessel's operations.⁹⁰

These include:

- rotational speed controllers, which regulate the vessel's rate of turn;
- automatic track control systems, which ensure that the vessel follows a pre-determined route; and
- more integrated digital assistance systems such as LAESSI, with bridge warnings systems, berthing assistance and improved control displays, able to take over important parts of the navigation of the vessel.

⁹⁰ Much of the information in this section comes from the papers presented at ETF Inland Waterways Seminar in St Petersburg, in September 2018: Smart Shipping: means to an end or end to a means? By Bart van Gent, Automation & Inland Waterways, Present and Future by Edwin Verbergh and Technical options for automation in inland navigation and the role of the human factor by Benjamin Boyer

Another possibility which has been trialled is the vessel train (similar to truck platooning on roads) where vessels are in convoy and remote control ensures that the following vessels track the lead vessel without human involvement. However, the trial took place on an isolated section of waterway, and it seems very unlikely that it can be implemented under normal conditions.

The obstacles

However, there are clearly barriers preventing moves towards automated vessels, and these are set out in a report written by Edwin Verberghat at the Department of Transport and Regional Economics in Antwerp for the CCNR. He points to the following problems:

- insufficient funding (private and public);
- lack of auxiliary innovation (automated docking, solutions for loading and unloading);
- lack of legal definitions and other regulatory aspects such as liability and responsibility of ship and cargo;
- risk of different legal regimes;
- cultural: social resistance and general disbelief;
- an inefficient sector lobby on all policy levels (too fragmented, not professional);
- lack of mass consumer availability;
- insufficient machine learning and data-gathering/sharing;
- too strong unimodal focus and not from a multimodal perspective upon developments in other modes.

Overall, it seems that there is unlikely to be enough investment, at least in the freight sector to produce rapid movement towards automated vessels. Around two-thirds of the sector (65% to 70%) consists of owner operators: one family – one vessel. In times of crisis, they lowered their tariffs or even sailed below cost. These micro- enterprises do not have the financial resources to invest properly in innovation and automation.

In river cruises, it seems unlikely that moves to more automated vessels will follow the same path as in freight transport. The onboard hospitality functions (cleaning, catering, cooking and entertainment) will always be required as well as a minimum nautical crew. Most passengers are elderly, and the psychological impact of not having crew on board, in case of a disaster or an emergency, would be too great.

Financial pressures limiting investment are also present in passenger transport, where passenger numbers declined by 93% compared with 2019, as a result of the Covid-19 pandemic.⁹¹

The impact

The consequences on employment and job quality in the industry of these changes remain unclear. If there were to be widespread introduction of more automated vessels this would lead to job losses. However, this seems very unlikely, at least in the short term, and currently with an ageing workforce there is a shortage of qualified crew. A more likely outcome is a change in skills and competency requirements. Overall, provided it is dealt with correctly automation and digitalisation can be seen more as an opportunity than a threat.

To move towards this, the ETF has developed its own policy in relation to automation in inland waterways.⁹² It recognises that “automation is unstoppable”, but states that it “has to be looked at from a workers’ perspective and properly accompanied by social dialogue”. It sets out six points covering:

- safety – which must be paramount and which may be threatened by the introduction of automated systems, potentially be open to cyber-attack;
- life-long learning, a long-term demand of the ETF, which becomes more essential with the introduction of new digital technologies;
- one size fits all – regulating bodies should have real-time access to a single integrated record of individual crew members’ working and resting times;
- standards – CESNI QP (Comité Européen pour l’Élaboration de Standards dans le Domaine de Navigation Intérieure – QP) CCNR’s committee for professional standards should draw up IT standards for different levels of automation, and these standards should be common across Europe;
- ecological benefits of automation – although inland waterways transport is a more sustainable transport mode than others, lack of innovation in the sector and lack of financial resources mean that these benefits are not realised;
- pro-active action – there should be a mechanism for monitoring new projects and pilots with social dialogue involvement; and
- good examples of automation – such as e-learning should be developed more intensely.

⁹¹ Annual Reports 2020 and 2021: Inland Navigation in Europe Market Observation, CCNR

⁹² Making the future together - Automation in European IWT, ETF, October 2018 https://www.etf-europe.org/wp-content/uploads/2018/12/ETF-IWT-Position-on-Automation_EN.pdf

Docks

Key potential changes: fully automated operations and the wider use of digitalisation

Automation in the docks is not measured by a type of multi-stage classification found in other areas of transport. However, it is certainly present and developing rapidly. Currently developments started with containerisation in the 1960s, which involved goods being packed into containers at a factory or other starting point, rather being individually loaded onto a ship. These containers are then sent to the port, where they are loaded onto specially designed container ships. At the destination port this process operates in reverse, until the container reaches its final destination where it is unloaded.⁹³

Initially most of these processes were undertaken by dockers and other ports staff. However, they have increasingly been automated.

In a fully automated container operation, OCR (optical character recognition) readers identify the containers as they arrive, and automated stacking cranes (ASCs) and automated guided vehicles (AGVs) move them to the storage areas, as well as noting their precise position. When they are ready to be shipped, the cranes move the containers onto AGVs which takes them to an automated ship to shore (STS) crane, which loads them onto the ship. This crane is one part of the process still operated by human being, although the crane driver may now be in an office sitting in front of a screen, rather than in the crane. The process is controlled by the terminal operating system (TOS), which knows at all times where the containers are, works out when they need to be taken out of storage stacks, and, combined with computer systems on the ships themselves, decides how they will be loaded into the hold. At the end of the exercise the TOS produce a list of containers being shipped (the ship's manifest). The process works in reverse for cargo arriving in the port. The other main area of human involvement that remains is lashing, securing the containers on the deck, although dockers also intervene in areas, where, for whatever reason, the automated system fails.

As with other transport industries, digitalisation will have an impact on aspects of the industry other than through the move to fully automated operations. Human resources, marketing, cargo documentation, maintenance and purchasing will all be affected. The growing use of sensors on equipment will potentially enable maintenance to be targeted

⁹³ For a history of containerisation see *The Box: How the Shipping Container Made the World Smaller and the World Economy Bigger* by Marc Levinson, 2010

more effectively (predictive maintenance), allowing better use of assets, with GPS providing more precise information on their location.

Progress so far

The first generation of automation was installed at the ECT Delta Terminal in the Port of Rotterdam in the Netherlands in 1989, with the introduction ASCs in the stacking area. These ASCs replaced the straddle carriers used up to that point and, together with an automated container store system, made it possible to stack more containers at the terminal with less handling involved in moving the containers from the stack to road, rail or ship. Since then, automation has been extended to many other ports. A 2018 report from the consultants McKinsey, stated that there were almost 40 ports in the world which had at least partly automated some of their terminals.⁹⁴ And a later report on container port automation by the International Transport Forum in 2021 increased that number to 53.⁹⁵ However, both reports point out that automation is not total, with some elements, particularly STS cranes, also known as quay cranes, being operated manually. The International Transport Forum report makes the reason for this clear when it states: “The automation of quay crane movements is possible in theory, but due to high operational complexity, quay crane automation is least developed and seldom implemented. Only selected sub-processes are automated.” It points out that a few container terminals have remote crane operators, but this only means they no longer operate the crane in a suspended cabin on top of the crane, but in a separate operations centre elsewhere in the port area.

The McKinsey report suggests port automation will continue to progress, with 80% of the industry respondent to its survey expecting at least half of all greenfield projects to be partly or fully automated, and more than half expecting at least 50% of the existing top 50 ports to introduce more automated equipment.

In contrast to containers, the introduction of automation and digitalisation into terminals handling bulk cargoes has been much slower. However, this is starting to change with digitalisation being used to cut maintenance and other costs like electricity and fuel.⁹⁶

⁹⁴ The future of automated ports by Fox Chu, Sven Gailus, Lisa Liu, and Liumin Ni, McKinsey December 2018

⁹⁵ Container Port Automation: Impacts and Implications, International Transport Forum, 8 October 2021 <https://www.itf-oecd.org/container-port-automation>

⁹⁶ Driving bulk ports and terminals toward digitalisation, automation, operational resilience and safety, Port News, May 2019 <https://www.hellenicshippingnews.com/driving-bulk-ports-and-terminals-toward-digitalisation-automation-operational-resilience-and-safety/>

Digitalisation has also been implemented in roll-on roll-off terminals to improve the handling of vehicles.

The obstacles

Despite the expected further growth in automation and digitalisation, the economics of automation in container terminals “haven’t lived up to expectations”, in the words of the McKinsey report. It states that “these [partly and fully automated] ports, especially fully automated ones, are generally less productive than their conventional counterparts”, with the return on capital invested one percentage point below the 8% industry average. The McKinsey survey found that while operating expenses fell by between 15% and 35%, with an average drop of 26%, productivity also fell by between 7% and 15%, with an average drop of 11%. These figures are much worse than expected as port operators had forecast a fall in costs of between 55% and 25% and a rise (rather than a fall) in productivity of between 35% and 13%.

This judgement is shared by the International Transport Forum report, produced three years later. It found that, “automated ports are generally not more productive than their conventional counterparts”, and that “port organisation and specialisation, geographical location and port size are more important determinants of port performance than automation”. It went on to state that, “comparatively, high handling costs also make the case for automation not entirely convincing. Although automation of container terminals reduces labour costs, capital costs are higher as automated equipment is more expensive than manually operated equipment. Whether or not automation has led to lower overall handling costs is place specific. “

On the specific issue of remotely operated ship-to-shore (quay) cranes the International Transport Forum report said “One could wonder if remote operations actually improve productivity. The productivity of the APMT-Maasvlakte 2 terminal cranes [which has remote crane operations] has lagged the rates of those in other container terminals in Rotterdam. During 2019-21, the average number of moves per crane per hour amounts to 25 moves per hour; there was hardly any week in which the rate exceeded 30 moves per hour.”⁹⁷

The McKinsey reports made a similar point, stating:

“At fully automated terminals, average number of gross moves per hour for quay cranes—a key indicator of productivity—is in the low 20s. At many conventional

⁹⁷ The report also referred to much higher crane moves an hour at the Chinese port of Qingdao, where average crane productivity rates are stated to reached 43 moves per crane per hour in January 2020. However, conditions seem less comparable than between the Rotterdam terminals.

terminals, it is in the high 30s. With numbers like these, automation can't overcome the burden of the up-front capital expenditures."

The McKinsey study identifies a series of reasons for the poor performance of automated ports. These are:

- a shortage of people with the necessary technical expertise – 75% of port operators with experience in automation described the shortage of people with the necessary skills and expertise as a "challenge";
- poor data quality – making it difficult to monitor operations and diagnose problems; the poor quality of the data means that further developments, such as using machine learning to schedule maintenance, allocate staff and equipment and forecast demand, becomes very difficult;
- operations being divided into silos – making collaboration across the whole process more difficult; and
- exceptions – because the process continues to be complicated.

The McKinsey study suggested a range of ways to tackle the problems presented by automation, included simplifying the processes before automating them, and developing a collaborate project with early input from, among others, "labour representatives". However, it goes on to conclude that "the ports' traditional investment model, which requires terminal operators to front-load investments, doesn't align with the distribution of value" in fully automated ports. In other words, it says they won't get their money back, or, at least, not as much as they expected.

The impact

The impact on jobs and levels of employment as a result of move to full or part automation is clearly substantial, as people are replaced by machines. One estimate is that "a fully automated marine terminal can reduce headcount 45% or more".⁹⁸ There is also a change in the skills needed, with physical work potentially being replaced by screen-based work, and changes in job content. This could be positive, if it allowed for greater variation, but it could also be negative, if possibilities of job rotation were removed. Requiring a dock worker to do exactly the same job all day and every day would represent a worsening of working conditions, and the continued existence of less physically demanding tasks is important as a

⁹⁸ US ports in no rush to follow Shanghai on automation path by Bill Mongelluzzo, JOC.com 11 December 2017 https://www.joc.com/port-news/terminal-operators/shanghai-international-port-group/us-ports-no-rush-follow-shanghai-automation-path_20171211.html

way of safeguarding the employment of older workers no longer able to work in more physically demanding roles, such as lashers.

However, it is important to note that containers are not the only cargo loaded by dockers, and that there are big variations in the size and operation of ports across Europe. As a recent report on skills requirements in Denmark noted,

“The skills requirements vary depending on the form of cargo handling dock workers carry out. Different skills are therefore required of dock workers working on loading and unloading cargo containers and dock workers working on the loading and unloading of e.g. oil, bulk and wind turbines. Other skills are required of dock workers in passenger terminals.”⁹⁹

However, wherever they are working, dockers are likely to need much greater IT skills than in the past. As the Danish report on skills concluded, “One of the important general requirements is that dock workers should have IT skills that enable them to use the technological solutions and the new equipment that will be used in ports ... they may otherwise find it difficult to retain their jobs.”

Finally, it is important to consider the possible positive consequences of digitalisation and automation. Automated terminals are potentially safer as people are separated from machines and equipment (like tractors and containers) to a greater extent than in manual operations, although the International Transport Forum report stated that, “there is so far little robust empirical data to demonstrate significant overall improvement in outcomes in practice.

Automation also offers a greater opportunity to use disabled workers in dockers’ roles, if the physical demands are reduced, although this requires a willingness on the part of the employer to do so.

In response to these challenges, the ETF makes six clear points. These are:

- that port automation has many faces – there are various paths to automation and that there are major differences between existing (brownfield) sites and new (greenfield) sites;
- that the profile of port workers is changing, as manual labour is replaced by machines and work becomes safer but with new dangers linked to repetitive screen-based work; as many jobs as possible should be retained and with a change in the

⁹⁹ Skills requirements for the dock workers of the future: Analysis report March 2016, Mærsk Nielsen HR, 2016

workforce – more women and more people drawn from a non-traditional background
– unions will face challenges to recruit and organise them;





- that unions are not against automation, but that it needs a business case;
technological progress is an inevitable part of industrial development, but although automated ports can bring benefits, they are not perfect and are expensive to build; use of automated technologies must be justified by productivity gains which outweigh costs and should not be implemented to meet the demands of shipowners or to reduce the workforce or break their unions;
- that workers and unions must have a say through collective bargaining, with specific automation clauses in agreement, and that they must be involved from the preliminary stages, through dialogue with employers in brownfield sites and dialogue with port authorities in greenfield sites; without this, industrial action is likely;
- that workers must share in the benefits of automation – if automation leads to productivity gains – and recent experience indicates that this is by no means certain – not all of those gains have to result in job losses, higher profits or lower prices for shipping companies; one option is to offer dockers a share of the gains in the form of shorter hours; and existing dockers should also have first access to the new jobs created in automated facilities or new port sites, so that existing staff are retained in the transition to automated technologies;
- that society can and must choose a just transition – this means that the shift to new technologies must be managed, with the aim of keeping as many jobs as possible for as long as possible; there should be extensive funding for retraining, although ports often have ageing workforces where retraining is difficult; everyone who plays a role in driving automation must take their part of the responsibility; and new forms of taxation, like a robot tax should be investigated, so that automated facilities pay their fair share; finally there is a question over whether governments should be financially supporting infrastructure and other investment that allow automation which destroys jobs.

Automation and digitalisation in the land transport sector

Railways

Key potential changes: unattended train operation and the widespread introduction of digital technology

Unattended train operation, where trains are controlled entirely automatically and there is neither a driver nor another onboard member of the train crew (such as a guard, train manager or inspector), is the most dramatic and obvious form of automation in rail transport. The industry sets out four Grades of Automation (GoA). They start with GoA1 at the bottom, where there is only automatic train protection (ATP) to control the speed of the train automatically and to ensure that red signals are not crossed, and with GoA4 at the top, where the train is operated without onboard staff having any control over its operations, although staff members may be present to provide other services, such as catering (see Chart).

Grade of Automation	Type of train operation	Setting train in motion	Stopping train	Door closure	Operation in event of Disruption
GoA 1 	ATP with driver	Driver	Driver	Driver	Driver
GoA 2 	ATP and ATO with driver	Automatic	Automatic	Driver	Driver
GoA 3 	Driverless	Automatic	Automatic	Train attendant	Train attendant
GoA 4 	UTO	Automatic	Automatic	Automatic	Automatic

ATP - Automatic Train Protection ATO - Automatic Train Operation

Source: Metro automation facts, figures and trends UITP

<https://www.uitp.org/sites/default/files/Metro%20automation%20-%20facts%20and%20figures.pdf>

Unattended train operation, the GoA4 level, is made possible through a combination of a sufficiently reliable system to monitor and manage the environment in which the trains are travelling (the European Rail Traffic Management System (ERTMS) is the EU-wide version) and a system to operate the train itself automatically.

Automated train operation is not the only way that digitalisation is affecting rail transport, as a briefing for the European Parliament in February 2019 noted.¹⁰⁰ It pointed to its impact on:

- ticketing systems, where passengers can use a variety of means to book and pay for tickets (such as automatic vending machines, apps and websites) as well as being able to change tickets already bought or ask for refunds;
- links with other transport modes, where passengers are able, for example, to pre-book car or taxi hire;
- greater use of digital systems by on-board staff, particularly tablets;
- new on-board entertainment and business services available to passengers – many trains now offer free wi-fi connection and some their own entertainment channels;
- improved maintenance, through sensors offering remote monitoring on critical components (predictive maintenance);
- asset location and utilisation, where easier analysis of how rolling stock is used and where precisely it is located, makes it possible to employ these assets more effectively;
- work allocation and work-time planning, where the technology automatically compiles shifts, thus reducing need of shift work planner and the dispatcher; and
- the digitalisation of signalling, routing and safety systems on the track networks, making it less necessary to have station managers, and allowing the replacement of local control rooms by a small number of centralised control rooms.

Digitalisation can also lead to improved expected time of arrival (ETA) data for goods shipments – important for intermodal logistics chains.¹⁰¹ Digitalisation has also allowed the widespread introduction of cameras and monitoring on trains, including, in some cases, bodycams for onboard staff safety.

In addition, railway operators, like other employers, are able to use digital technology to change the way that more standard parts of the business, like human resources, marketing and purchasing are run. There is already growing pressure for mobile working and working outside normal working hours.

¹⁰⁰ Digitalisation in railway transport, European Parliamentary Research Service, Damiano Scordamaglia [http://www.europarl.europa.eu/RegData/etudes/BRIE/2019/635528/EPRS_BRI\(2019\)635528_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2019/635528/EPRS_BRI(2019)635528_EN.pdf)

¹⁰¹ Presentation by Ad Toet at digital Transport Days 8 October 2019 <https://events.idloom.com/files/events/5797/files/ad-toet.pdf>

Progress so far

Unattended trains (GoA4) have been introduced into service in metros and light rail transport in Europe but have had only very limited trials on the railways. Examples include a test by the rail company Govia Thameslink through London in March 2018, although this section of the track is underground, trials in the Czech Republic on normally unused lines and trials in the Netherlands on the route between Lelystad and Zwolle at the end of 2019. (The fact that, in some circumstances, unattended trains can operate successfully is shown by the AutoHaul project which has been implemented by Rio Tinto in Australia. This runs unattended iron ore trains in Western Australia over a 280km route.¹⁰²)

Extensive work is being done to have standardised European systems for the shift to GoA2, and rail operators and manufacturers (including SNCF, DB, NetworkRail, Siemens, Alstom, Thales and Bombardier) are working on common specifications on GoA3 and GoA4.¹⁰³

In addition, elements of the rail traffic management system – an automatic train protection system and a radio system for voice and data communication between the track and the train – that underpin the move towards unattended train operation are also being introduced on a wide scale. By September 2019 there were contracts for the installation of the European system (ERTMS) on around 54,000km of track and 9,100 vehicles in Europe.¹⁰⁴ Some countries already have their own national automatic train protection systems, but ERTMS is being introduced to common standards to allow interoperability across the EU.

In areas such as ticketing and passenger services there has been substantial progress, with increasing numbers of tickets being purchased online. There have also been advances in asset location and management. DB-Cargo has receivers linked to GPS tracking satellites on 30,000 wagons and the private wagon hire company VTG has installed them on 80,000.¹⁰⁵

The obstacles

However, it is important to recognise the problems that must be overcome before moving to GoA4 or even GoA3. These include:

¹⁰² Rio Tinto completes AutoHaul autonomous train project, Railway Gazette International, 4 January 2019 <https://www.railwaygazette.com/australasia/rio-tinto-completes-autohaul-autonomous-train-project/47822.article>

¹⁰³ Presentation by Benoit Bienfait at digital Transport Days 8 October 2019 <https://events.idloom.com/files/events/5797/files/benoit-bienfait.pdf>

¹⁰⁴ The European Rail Traffic Management System: deployment statistics September 2019, UNIFE http://www.ertms.net/?page_id=58

¹⁰⁵ Presentation by Daniel Lopour at digital Transport Days 8 October 2019 <https://events.idloom.com/files/events/5797/files/daniel-lopour.pdf>

- the variety of signalling systems, trains and operating systems within a national railway network, making automation more difficult than on a single closed network;
- varying weather conditions and physical environments on outside tracks (snow, leaves) – many automated metro lines are underground;
- the fact that most railways are using lines initially constructed many decades ago – automated light railways and metro services are generally new with automation designed in from the start;
- problems in making stations a “closed system” with automatic safety measures, such as track intrusion systems and automatic doors on platforms; and
- customer resistance to travelling long distances without a driver – a fear of cyber-attacks on the system could make passengers even more wary of completely automated operations.

There are also obstacles in making progress in other areas. Differing legal and regulatory standards make European-wide ticketing problematic, and digital asset management depends on knowing precisely what the assets are in the first place – knowledge that some operators lack.

Finally, it is important to recognise the cost of investing in digitalisation and automation, which may, at the very least, limit the speed at which new technology is implemented. This may be particularly the case after the fall in passenger numbers during the pandemic. It is important not to forget that progress may depend on political as well as economic considerations.

The impact

The implications on employment of the widespread introduction of unattended train operation (GoA4) on the whole rail network would clearly be substantial, and even moving to GoA3 would have a major impact.

The precise implications for employment of changes, other than unattended train operation, are unclear but it is likely that they will impact both employment numbers and job content. There is also concern in at least some unions representing train drivers that more automated systems will lead to deskilling, with drivers no longer being required to learn the routes and being unable to resolve mechanical problems. There is also a problem with greater surveillance at work if inward-facing video cameras are installed.

Several UK train operators are currently trying to eliminate or change the roles of guards on trains, arguing that new technology makes them unnecessary, and their safety responsibilities can be transferred to the driver.¹⁰⁶ Staff numbers in ticket offices have been reduced as tickets are bought online and from automated machines.

There are also examples where the need for station staff has been reduced through connecting smaller stations to a centralised management system, able to deal with queries remotely.

Moves to greater use of digital technology in train operation will also lead to changes in job content for other rail employees. As a railway worker, quoted by the German railway union EVG points out:

“Customers are booking more on the Internet, they are booking more mobile tickets, and soon you will be able to have tickets sent to your wristwatch. Only 20% of tickets are still sold over the desk. This changes our occupational profile as travel consultants - from selling more and more to providing advice. We have to take care of the customer across all sales channels, no matter which problem they come to us with.”¹⁰⁷

¹⁰⁶ Driver-only trains: does removing guards put passengers at risk? by Chris Lo, Railway Technology 3 June 2019 <https://www.railway-technology.com/features/driver-only-trains-safety/>

¹⁰⁷ Work 4.0 – Good working conditions in the digital world of work, EVG

Road transport

Key potential changes: driverless vehicles, platooning and digital ticketing

The introduction of “driverless” vehicles is the most obvious and eye-catching example of how digitalisation can potentially affect those working in road transport. To better understand better what is meant by this, the International Society of Automotive Engineers (SAE) has produced a table indicating how the task of driving is divided between humans and an automated system in different stages of automation. This ranges from 0 (no automation) where the human driver does everything to 5 (full automation) where the system carries out all driving tasks in all circumstances (see Table 2)

Table 10: SAE levels of automation

Level	Name	Description
Level 0	No automation	Automated system has no vehicle control but may issue warnings.
Level 1	Driver Assisted	Driver must be ready to take control at any time. Automated system may include features such as Adaptive Cruise Control (ACC), Parking Assistance with automated steering, and Lane Keeping Assistance (LKA).
Level 2	Partial Automation	The driver is obliged to detect objects and events and respond if the automated system fails to respond properly. The automated system executes accelerating, braking, and steering. The automated system can deactivate immediately upon takeover by the driver.
Level 3	Conditional Automation	Within known, limited environments (such as freeways), the driver can safely turn their attention away from driving tasks but must still be prepared to take control when needed.
Level 4	High Automation	The automated system can control the vehicle in all but a few environments such as severe weather. The driver must enable the automated system only when it is safe to do so. When enabled, driver attention is not required.
Level 5	Full Automation	Other than setting the destination and starting the system, no human intervention is required. The automatic system can drive to any location where it is legal to drive and make its own decisions.

Source: SAE International Standard J3016 (SAE, 2014) in Automation of Road Transport: Towards Automation with Drivers, ETF Arjen van Halem

As an interim stage before full automation, until recently, it had seemed more likely that the first of the digital-based driving technologies to be introduced on a commercial scale in

goods vehicles would be “platooning”, where two or more trucks are linked together electronically. In the distant future platooning has the potential benefit of eliminating the requirement for a driver in the second and subsequent trucks. However, in the short term there are some savings in fuel costs (and CO2 emissions), as the second and subsequent trucks benefit from being in the slipstream of the first.

Moving towards driverless trucks is only part of the way that digitalisation is changing jobs and employment in the road haulage industry. It is also having an impact on:

- trip planning and driver utilisation;
- tracking and tracing journeys and loads;
- monitoring data on both the journey and the driver.

Another recent development is electronic documentation and the changes that this brings in the driver’s tasks.¹⁰⁸

It is also possible that automation and digitalisation will lead to some changes in the operation of long-distance buses and coaches. Driverless operations seem a distant prospect, but coach and long-distance bus drivers can be tracked and monitored like their goods vehicle counterparts and ticketing can be digitalised, with customers able to book and pay using an app. Passengers also increasingly expect services like USB chargers, Wi-Fi and entertainment to be provided on longer journeys.

Finally, as in other areas of transport, digitalisation is likely to have an impact on maintenance work on both trucks and coaches, with connected sensors making it easier to carry out targeted predictive maintenance. It will also affect work in other areas of the industry, such as human resources, marketing and purchasing, which are common to all employers.

Progress so far

In terms of the move to driverless vehicles, currently most new goods vehicles are at Level 1 with the system providing assistance to the driver in some circumstances. However, there are trials underway where automated systems control the vehicle, although only in certain environments. And at least one company, Daimler Trucks, is pressing ahead with the development of highly automated (Level 4) goods vehicles.

Trials on platooning have also been conducted in both the US and Europe. In the EU six European truck producers (DAF, DAIMLER, IVECO, MAN, SCANIA and the VOLVO Group),

¹⁰⁸ Electronic documents for freight transport , European Parliament 2018
[http://www.europarl.europa.eu/RegData/etudes/BRIE/2018/615673/EPRS_BRI\(2018\)615673_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/BRIE/2018/615673/EPRS_BRI(2018)615673_EN.pdf)

together with automotive component suppliers and research partners are running multi-brand truck platooning trials, in a joint three-year project known as ENSEMBLE.¹⁰⁹

In other areas, a regulation on Electronic Freight Transport Information (EFTI) is coming into effect in 2020 and there is widespread use of GPS technology to track journeys and loads.

The impact of digitalisation on coaches and long-distances buses is less evident but there are some cases where it has been introduced. The German private sector operator FlixBus, which runs a network of international routes, has an e-ticketing system and an app.

The obstacles

However, moving towards automated vehicles presents problems at each stage. At Level 2 there is a danger that drivers find the situation particularly stressful, as they must be aware of the situation, while not being actively involved in dealing with it. At Level 3 there is ambiguity about who is in control of the vehicle. Daimler Trucks has therefore stated that it sees no benefit for customers in trucks at Level 3, where the driver must always be prepared to take control when needed. It is therefore trying to move straight from Level 2 to Level 4.¹¹⁰

The interim step of platooning also seems more problematic than those promoting this technology originally hoped. A report on a German pilot project involving two MAN convoys, indicates that technologically the trial worked, with relatively few occasions when the driver of the second truck had to take over from the system, which otherwise was driving the truck. However, the saving on fuel, were not the 10% hoped for, but around 3% to 4%.¹¹¹ The trial also looked at the impact on the driver and, although it found that the drivers were neither more tired nor more stressed than in normal driving, there were occasions when the drivers took a moment to react to sudden events where they had to take over the controls.

These results match those reported by Daimler Trucks, which has undertaken tests with platooning in the USA over several years. It reported that the fuel savings expected through platooning had proved to be less than expected, in part because where the following truck or trucks fell behind the leader they had to accelerate to catch up, leading to greater fuel

¹⁰⁹ See <https://platooningensemble.eu/project>

¹¹⁰ Daimler Trucks investiert eine halbe Milliarde Euro in hochautomatisierte Lkw, Las Vegas/ Stuttgart January 2019 <https://media.daimler.com/marsMediaSite/de/instance/ko/Daimler-Trucks-investiert-eine-halbe-Milliarde-Euro-in-hochautomatisierte-Lkw.xhtml?oid=42188247>

¹¹¹ LKW-Platooning: Sicher, aber nicht so sparsam wie erwartet, heise online 05.2015 <https://www.heise.de/newsticker/meldung/LKW-Platooning-Sicher-aber-nicht-so-sparsam-wie-erwartet-4419922.html>

consumption. Instead, Daimler is concentrating its investment on highly automated trucks (Level 4).¹¹²

As well as technical and economic problems which need to be resolved there are also questions which need to be tackled. These include:

- public acceptance – particularly in relation to road safety;
- regulations – including resolving liability questions – who is held responsible if a driverless truck kills or injures someone or causes damage;
- infrastructure requirements, both physical and electronic – which may need to be financed with public funds;
- the investment required to shift to the new technology; and
- fleet replacement rates.

This makes it very difficult to estimate, when, if ever, fully driverless trucks (Level 5) will be present on public roads. And there seems almost no prospect of public acceptance of driverless coaches and long-distances buses, where passengers rather than goods would be at risk.

Other areas of digitalisation seem to face fewer obstacles, although investment in the technology needed for tracking may be an obstacle for some, perhaps particularly in the fragmented coach and long-distance bus industry. Finally, the experience of TNT Express, where the NotPetya cyber-attack in 2017 led to significant disruption to its systems, is an indication of the risks of involved in digital operations.¹¹³

The impact

Whichever outcome finally emerges, it is likely to have a significant impact on the employment and job contents of truck and long-distance bus and coach drivers. A switch to highly automated (Level 4) vehicles potentially means that drivers are not needed in most circumstances, while, at lower levels of automation, drivers will face the potential stress of having to remain alert and ready to intervene, while at the same time not directly managing the vehicle. They may also be confronted with more intensive personal monitoring by sensors to ensure that the driver is alert and ready to intervene if necessary. Finally, the

¹¹² Daimler Trucks investiert eine halbe Milliarde Euro in hochautomatisierte Lkw, Las Vegas/ Stuttgart January 2019 <https://media.daimler.com/marsMediaSite/de/instance/ko/Daimler-Trucks-investiert-eine-halbe-Milliarde-Euro-in-hochautomatisierte-Lkw.xhtml?oid=42188247>

¹¹³ NotPetya cyber-attack cost TNT at least \$300m, BBC, 20 September 2017 <https://www.bbc.co.uk/news/technology-41336086>

driver may also be required to acquire new skills in order to manage the digital technology.¹¹⁴

Some of these concerns apply to the tracking and tracing technology already in place. For example, the online retailer Amazon uses an app called Mentor in the US to track delivery workers and score their driving behaviour on a scale of 0 to 850. Although the stated purpose of the monitoring is to improve safety, it also tracks other behaviour.¹¹⁵

Similar monitoring is in use in some European countries, although in others this would require the explicit agreement of employee representatives. In the UK, where such monitoring is common, the union Unite, which organises goods vehicle drivers, has produced guidance on the use of tracking systems. This states, among other things that “any introduction of a vehicle or other tracking device should only take place after a clear and detailed policy on its use has been agreed with Unite and clearly and simply communicated to the workforce.”¹¹⁶

¹¹⁴ For a detailed discussion of all these issues see Chapters 6 and 7 of Automation of Road Transport: Towards Automation with Drivers, ETF Arjen van Halem

¹¹⁵ Amazon is tracking delivery workers' every move with an app that assigns them scores based on their driving

by Hayley Peterson 18 December 2019, Business Insider <https://www.businessinsider.com/amazon-scores-delivery-workers-driving-skills-using-tracking-app-2019-12?r=US&IR=T>

¹¹⁶ Privacy at work: Unite guidance for members, 2013

<https://www.unitelegalservices.org/media/1584/privacy-at-work-unite-guide-for-members.pdf>

Urban public transport

Key potential changes: fully automated vehicles and new driverless shuttles

Urban public transport, consisting of light rail lines, metros, trams, buses and smaller road vehicles – shuttles and taxis, is affected by the same move to automated vehicles as road and rail transport. However, different parts for urban public transport use different scales for measuring progress. Light rail, trams and metro services use the GoA1 to GoA4 scales used in the railways. At level GoA4, also known as Unattended Train Operation (UTO), trains operate without any staff on board. For buses and driverless shuttles, the road transport levels set by the International Society of Automotive Engineers apply, and full automation is at Level 5.

As well as automating existing vehicles, the automation of a new form of vehicles, small shuttles, is, in the view of the International Association of Public Transport (UITP), a “potential game changer”. It argues that these small shuttles could replace the car for many local journeys, but the key to this is fully driverless operation as Autonomous Vehicles (AVs). “If fully automated operation cannot be accomplished, AVs will not be able to form a new mode of transport and thus could not enhance existing public transport”, the UITP believes.¹¹⁷

In the view of the UITP, “cities and countries must actively shape the introduction of AVs now to prepare the authorisation of driverless operation. An integrated effort of all authorities concerned (mobility, road safety, urban planning, traffic control, etc.) must be put in place. Otherwise, we will miss the chance for a fundamental change in urban mobility and end up in a scenario where vehicle automation will even further increase the amount of private car and vehicle miles travelled with all the associated negative externalities.”

Shuttles could also be used to provide transport services to people with mobility problems who are currently largely excluded from the transport system.

However, urban public transport is also substantially affected in other ways by the changes brought by digitalisation.¹¹⁸

¹¹⁷ UITP Policy Brief: Autonomous vehicles: a potential game changer for urban mobility, UITP, January 2017 https://www.uitp.org/sites/default/files/cck-focus-papers-files/PolicyBrief_Autonomous_Vehicles_LQ_20160116.pdf

¹¹⁸ These potential changes are examined in greater detail in a report produced jointly for the ETF and UITP, Digital Transformation and Social Dialogue in Urban Public Transport in Europe Final Report, by Eckhard Voss and Katrin Vitols, July 2020

One is the easier implementation of integrated ticketing, allowing passengers to use a single ticket to travel using different modes of transport provided by one or more operators, often associated with multimodal travel information and planning services. Integrated ticketing also links with the concept of Mobility as a Service (MaaS), where transport services are integrated and become more user-oriented, aiming to offer mobility to all citizens.

Another is the emergence of platforms allowing ride hiring and ride sharing, which has brought new players into public transport. The impact of this has already been substantial and could have wider implications.

In addition, human resources, marketing, maintenance and purchasing will all be affected. As in other sectors of the economy, the growing use of sensors on equipment will enable maintenance to be targeted more effectively, allowing better use of transport assets, with GPS providing more precise information on their location. Operators will also be able to collect and analyse more information on issues like the weather and traffic conditions.¹¹⁹ And digitalisation also allows monitoring of both drivers and passengers through CCTV systems and other forms of surveillance.

Progress so far

Automation and digitalisation have had a major impact on urban public transport, and metro services are the only areas of land transport with large numbers of fully automated vehicles in daily operation.

The latest statistics show that there were 64 fully automated metro lines in operation at the end of 2018.¹²⁰ In terms of length, half were in Asia Pacific, but Europe, with 33% of the total, is in second place. The European cities, with the longest length of GoA4 metro lines are Lille (France) – 47km, Barcelona (Spain) – 34km and Paris (France) – 33km. However, there are also automated metros in Italy, Germany, Denmark, Turkey, Hungary and Switzerland. The length of automated metro lines is also expected to more than double in Europe between 2018 and 2028, from 303km to 611 km. This growth includes seven conversion projects in Europe (see Table 11).

Table 11: Metro conversion projects in Europe

Country	City	Lines
Austria	Vienna	U2/U5

¹¹⁹ For a more detailed study of the impact of digitalisation in these areas see the UITP report Digitalisation in public transport, UITP, May 2017

https://www.uitp.org/sites/default/files/documents/News/UITP_Digitalisation_Report_2017.pdf

¹²⁰ UITP: World report on metro automation 2018, April 2019 https://www.uitp.org/sites/default/files/cck-focus-papers-files/Statistics%20Brief%20-%20Metro%20automation_final_web03.pdf

Belgium	Brussels	L1&5
France	Lyon	LA & LB
France	Marseille	L1 & L2
France	Paris	L4
UK	Glasgow	G. Subway
UK	London	Docklands

Source: UITP: World report on metro automation 2018, April 2019

However, the bulk of the growth worldwide is expected to come from new projects rather than conversion, although the fact that many of the lines installed in the 1970s and 1980s will need major investment shortly will, in the view of UITP, result in more conversions in the future.

The widespread use of **autonomous trams** is much further off than driverless metros. The world's first test of a driverless tram took place in September 2018 in Potsdam (Germany). The trial, undertaken by the German engineering company Siemens, lasted for four days and involved a tram running over six kilometres of track in real traffic. As the press release from Siemens stated, "Thanks to its artificial intelligence capability, the tram responds to trackside tram signals, stops at tram stops, and reacts autonomously to hazards such as crossing pedestrians and other vehicles."¹²¹ In 2021, the project took a further step forward with the demonstration of an autonomous tram depot (also in Potsdam).¹²²

The position on **autonomous buses** is similar, although possibly more advanced. There are trials of full-size autonomous buses, either underway or planned, in a number of countries, including both the UK¹²³ and France.¹²⁴ But so far most of these trials have only been at the level of conditional automation (Level 3 on the scale), where the driver can safely turn their attention away from driving tasks, but must still be prepared to take control when needed, or high automation (Level 4 on the scale) where the driver must take over in extreme circumstances. An autonomous full-size bus has been running in Málaga, Spain, since February 2021. However, a driver is still present – it remains a legal requirement – and the normal top speed is 18km an hour.¹²⁵

¹²¹ Siemens Mobility presents world's first autonomous tram, 3 September 2018

<https://press.siemens.com/global/en/pressrelease/siemens-mobility-presents-worlds-first-autonomous-tram>

¹²² Siemens' new autonomous tram project moves step forward, 1 September 2021, Rail Advent

<https://www.railadvent.co.uk/2021/09/siemens-new-autonomous-tram-project-moves-step-forward.html>

¹²³ Self-driving bus begins technical trials in Manchester, March 2019

<https://eandt.theiet.org/content/articles/2019/03/self-driving-bus-begins-technical-trials-in-manchester/>

¹²⁴ La RATP va mettre des autobus autonomes en circulation à Paris, May 2019

<https://www.phonandroid.com/la-ratp-va-mettre-des-autobus-autonomes-en-circulation-a-paris.html>

¹²⁵ El primer autobús sin conductor de Europa ya recorre las calles de Málaga, Expansión, 20 February 2021

<https://www.expansion.com/economia-digital/innovacion/2021/02/20/60313780468aeb021d8b463a.html>

Many more trials have been conducted with smaller mini-buses, so-called AVs or **driverless shuttles**. These are small capacity, slow moving vehicles which are intended linked to larger capacity public transport vehicles, like trams or metros. They are largely seen as providing an additional service rather than replacing existing services, although this could change over time. One of the largest providers of driverless shuttles in Europe is the French start-up company Navya. Its shuttles, which are 4.75 m long, have a capacity of 15 passengers and a top speed of 25 km/hr, are being tested in Finland (Helsinki), France (Dunkirk, Fontevraud, Lille, Lyons and Rennes), Germany (Berlin and Sylt), Luxembourg (Bascharage and Contern), the Netherlands (Groningen), Norway (Oslo), Sweden (Goteborg), Switzerland (Cossonay, Fribourg, Geneva, Neuhausen and Sion) and the UK (Salford University).¹²⁶ However, they operate in very limited and tightly defined circumstances. For example, the two services in Berlin both operate in the grounds of hospitals, with a top speed of 12 km/hr.¹²⁷

In other areas, there has been substantial progress. On integrated ticketing, a 2019 European Commission report concluded that “there are numerous examples of electronic and smart ticketing, developed as part of EU-funded research projects or provided by different transport operators, start-ups or public-private partnerships”, and listed national examples from Ireland in the west to Estonia in the east, although most were in the northern half of Europe.¹²⁸ In some cases these ticketing systems depend on the purchase of specific electronic cards, but in others passengers can use contactless debit and credit cards to open access gates, with automated billing on the basis of the cheapest available fare.

Ride hailing and ride sharing platforms, like Uber, Lyft and BlablaCar, which depend on digitalisation, in particular the high level of smart-phone ownership, have also emerged in many cities, although in some their activities have been blocked by the authorities, who consider that they are breaking existing regulations.

Other developments made possible through the widespread use of digital technology, like the provision of real-time transport information (such as the expected arrival time of buses and trams) and CCTV surveillance of routes, passengers and vehicles are found widely across Europe. Customers are increasingly able to use mobile apps to plan their journeys, with information on services available in real time.

¹²⁶ https://navya.tech/en/autonom-shuttle/?gclid=EAlaIqobChMlyZOXxOrA4wIVied3Ch1KrQvtEAAYAiAAEgJqWvD_BwE

¹²⁷ Die BVG macht's jetzt ohne, Tagesspiegel March 2018, <https://www.tagesspiegel.de/berlin/selbstfahrende-busse-in-berlin-die-bvg-machts-jetzt-ohne/21113726.html>

¹²⁸ Remaining challenges for EU-wide integrated ticketing and payment systems: Final Report, European commission, July 2019 <https://ec.europa.eu/transport/sites/transport/files/studies/2019-remaining-challenges-for-eu-wide-integrated-ticketing-and-payment-systems-final-report.pdf>

A study, conducted on behalf of the Italian transport union FILT CGIL in 2018, and based on the situation in the three Italian regions of Emilia Romagna, Umbria and Tuscany, identified five key developments in this area, as well as the problems associated with them.¹²⁹ These were that:

- automatic vehicle monitoring was proving to be a very useful tool in generating information which both allowed services to be better organised and improved relations with users;
- integrating public transport companies into the wider mobility system was a slow process;
- there were a wide range of ticketing and information products available, but that they were not always compatible
- progress had been made in using digitalisation to develop predictive maintenance, but the system was still in its infancy; and
- the move to digitalisation had demonstrated a significant skills gap in the workforce.

The obstacles

Although there are hundreds of kilometres of automated metro services in Europe, there are difficulties in converting existing metro networks. One reason for this, as an UITP report explains, of the “complexity of implementing full automation in an existing line while in operation”.¹³⁰

As well as the technical problems that have yet to be overcome, the use of autonomous trams and buses faces the same difficulties as other autonomous road vehicles. These include:

- public acceptance – particularly in relation to road safety;
- regulations – including resolving liability questions;
- infrastructure requirements, both physical and electronic – which are likely to be publicly financed;
- the investment required to shift to the new technology; and
- planned replacement rates for trams and buses.

¹²⁹ La digitalizzazione nel trasporto pubblico locale: ricadute su utenti e lavoratori: Risultati di una ricerca sul campo , Research teams: Luca Lanini (Università Cattolica del Sacro Cuore) Monica Patelli (Fondazione ITL Istituto sui Trasporti e la Logistica) Francesco Timpano (Università Cattolica del Sacro Cuore), FILT CGIL 2019

¹³⁰ UITP: World report on metro automation 2018, April 2019 https://www.uitp.org/sites/default/files/cck-focus-papers-files/Statistics%20Brief%20-%20Metro%20automation_final_web03.pdf

Driverless shuttles (AVs) face similar obstacles and there have been some setbacks. For example, the trial of driverless buses in Vienna was suspended in July 2019 after an accident in which a woman was slightly injured.¹³¹

There are fewer obstacles in the way of other aspects of digitalisation, although the need to finance it out of limited budgets may be a problem in some cases, particularly after the impact of the pandemic. However, the 2019 EU Commission Report on integrated ticketing found that lack of a common legal framework and the heterogeneity of national rules concerning road and rail transport services were both significant barriers to progress.¹³²

The impact

Taken together, the changes driven by digitalisation have already had an impact on jobs and employment, with more to come. New ticketing technologies have led to the reduction in the number of ticket office staff in many cities, with some staff being used to provide more passenger information. Jobs are potentially also threatened by the introduction of driverless metros, trams and buses. However, at least as far as trams and buses are concerned this seems some time off. There could also be new jobs linked to providing assistance to those with mobility difficulties.

More urgently the increased use of digital technology is likely to require staff with new digital skills, although there is a danger that at least some of the staff will be taken on for specific projects and may not have full employment rights.

Digitalisation means that urban public transport workers, including drivers, are more closely monitored than in the past, particularly through CCTV. However, this may have some benefits, as CCTV footage can be used to defend them against unfounded complaints from passengers and the presence of cameras may deter potential assaults.

In the area of platforms allowing ride hiring and ride sharing, it seems, as a 2018 Eurofound report pointed out, that “at least part of the success of some well-known platforms can probably be attributed to their success in circumventing regulation in the markets in which they operate, hence profiting from unfair competition”.¹³³

¹³¹ Nach Unfall mit fahrerlosem Bus: Wiener Linien halten an Projekt fest, Die Presse July 2019 https://diepresse.com/home/panorama/wien/5661924/Nach-Unfall-mit-fahrerlosem-Bus_Wiener-Linien-halten-an-Projekt-fest

¹³² Remaining challenges for EU-wide integrated ticketing and payment systems: Final Report, European commission, July 2019 <https://ec.europa.eu/transport/sites/transport/files/studies/2019-remaining-challenges-for-eu-wide-integrated-ticketing-and-payment-systems-final-report.pdf>

¹³³ Automation, digitisation and platforms: Implications for work and employment, Eurofound, 2018

Up to now the major victims of this unfair competition have been traditional taxi drivers and taxi firms, although there is evidence ride hiring vehicles have contributed to congestion¹³⁴ and there are also major problems with working conditions. However, with platforms aiming to increase their market share, there is a risk that they start to take passengers away from public transport. This already seems to be a pattern in at least some US cities, although the evidence is mixed.¹³⁵

¹³⁴Uber and Lyft finally admit they're making traffic congestion worse in cities, The Verge, August 2019
<https://www.theverge.com/2019/8/6/20756945/uber-lyft-tnc-vmt-traffic-congestion-study-fehr-peers>

¹³⁵How ride-hailing could improve public transportation instead of undercutting it, The Conversation, July 2018
<https://theconversation.com/how-ride-hailing-could-improve-public-transportation-instead-of-undercutting-it-96453>

Automation and digitalisation in logistics

Key potential changes: digital systems and automated warehouses

The range of services provided by logistics companies – freight forwarding, document and package delivery, contract logistics and ecommerce – mean that the role played by automation varies across the sector. However, digitalisation, in the sense of the effective collection and exchange of accurate information and the ability to act on it, is essential across all areas of logistics. It is also playing an increasingly important role.

Digital systems

Logistics companies need systems that:

- allow the customers (whether business or consumers) to say what they want (an order management system);
- ensure that it is taken from where it is stored, produced or presented to the system (in the case of couriered packets) to a point where it can be delivered (a warehouse management system or an equivalent system for freight forwarding and couriers); and
- deliver the item that has been ordered to the right place at the right time (a transport management system).¹³⁶

These systems, which in the past were paper based, are now largely digital. To be effective, these systems need to be integrated, with the information they hold being seamlessly exchanged, but the information that these systems provide can also be enhanced by information from other sources.

- Logistics companies can integrate their systems directly with their customers' systems through Application Programming Interfaces (API's) that enable the smooth and automated exchange of information between the customer and the logistics company.
- The Internet of Things (IoT) allows the use of monitoring sensors on goods being moved. As well as tracking where the goods' location, they can, where necessary, also monitor other data, such as temperature or humidity in real-time.
- Tracking and other devices on vehicles can perform similar functions for vehicles, as well as improving reliability through the regular monitoring of key components, allowing for predictive maintenance.

¹³⁶ See Unlocking the omnichannel opportunity in contract logistics, McKinsey & Company, March 2021 <https://www.mckinsey.com/industries/travel-logistics-and-infrastructure/our-insights/unlocking-the-omnichannel-opportunity-in-contract-logistics>

- Wearable technology, such as augmented smart phones, worn-on-wrist devices and smart glasses can all provide additional information on goods' location, as well as instructing the wearers on the actions they need to take.

The data from all these sources, which can potentially be transmitted using blockchain technology to ensure security, are not just useful for the specific purposes for which they were collected. Machine learning and artificial intelligence (AI) can allow logistics companies to analyse the unstructured Big Data they collect to gain new insights into their existing operations and developing trends.

However, traditional logistics companies are not the only potential users of this data.

Companies with skills in data management rather than logistics can combine data on transportation cost and availability to offer shippers an overview of the transportation available and allow them to find automatically the best and cheapest combination of routes and carriers to get their goods delivered.

A further stage is the potential emergence of online platforms able automatically to match the needs of shippers with the services offered by transportation companies.

Automated warehouses

As well as advances in digitalisation, the logistics industry is also moving towards greater automation in the way that goods are moved and handled, with the vision of the fully automated warehouse as the apparent end goal.¹³⁷

Technologies being introduced to automate the movement of goods include:

- automated guided vehicles (AGVs) that move goods, typically on pallets, and can be used in large numbers – so-called swarms;
- conveyors that can move goods in any direction; and
- automated storage/retrieval systems (AS/RSs) with robotic shuttles moving on rails in three dimensions.

Technologies being introduced to automate the handing of goods include:

- robotic arms that mimic human actions;

¹³⁷ See Welcome to the automated warehouse of the future, The Verge, 8 May 2018
<https://www.theverge.com/2018/5/8/17331250/automated-warehouses-jobs-ocado-andover-amazon>

- scanners that recognise bar codes or radio-frequency identification (RFID) tags to determine location and the appropriate action to be taken; and
- automatic palletisers.

Human warehouse workers can also be aided in their work through:

- wearable device, such as smart glasses, which tell them which good to pick;
- exoskeletons, which multiply their power to pick or move heavy loads; and
- robots which do parts of the task, such as loading and unloading vehicles or picking.

In addition, drones can be used for monitoring both inside and outside the warehouse and, perhaps in the future, delivering to customers, while 3-D printing can remove the need for goods to be transported by producing crucial components on site.¹³⁸

Progress so far

The annual reports of the key logistics companies provide evidence that there has been substantial progress on the introduction of both digital systems and automated warehouses.

On digital systems:

- DSV Panalpina reported in relation to 2020: “Our workflows are highly digitalised, and our IT systems are integrated with both customers and suppliers. This enables us to monitor the entire supply chain and provide supply chain visibility services and propose optimisation initiatives.”
- The Deutsche Post DHL 2020 annual report stated that “digital transformation plays a crucial role in our strategy ... Between now and 2025, our digital transformation spending is expected to reach around €2 billion and is expected to contribute at least €1.5 billion annually to earnings by 2025.”
- FedEx in 2020 announced a multiyear collaboration with Microsoft combining the global digital and logistics network of FedEx with the Microsoft’s intelligent cloud. One result will be to “provide customers near-real-time insights — down to ZIP code, for example — to shine a digital light on the movement of physical inventory”.

There are already independent companies, Elemica Move, with its Eyefreight TMS module which offer shippers an overview of the transportation available, while XPO Logistics, for example, offers its own digital brokerage platform, XPO Connect. This allows customers to manage their transportation themselves, using a customisable personal dashboard and self-service analytics. The system allows carriers to post available truck capacity and bid on

¹³⁸ See Automation in logistics: Big opportunity, big uncertainty. McKinsey & Company, April 2019 <https://www.mckinsey.com/industries/travel-logistics-and-infrastructure/our-insights/automation-in-logistics-big-opportunity-bigger-uncertainty>

loads, while shippers can tender loads and track their freight in real time. Drivers also have access to the platform.

Companies also report some progress towards automated warehouses.

- DB Schenker, for example, has successfully tested the use of exoskeletons, autonomous logistics robots, using AI to store a map of their environment, and autonomous forklifts.
- XPO Logistics reports that ongoing robotics implementations planned in North America and Europe, with robotics working “cooperatively with humans or as standalone solutions”.
- Deutsche Post DHL reports that, “innovative technologies, such as wearable devices and collaborative robots, are being increasingly scaled across our operations to take us to the next level of efficiency”.
- Amazon states that it has 100,000 drive units, small AGVs, carrying goods around its facilities.¹³⁹

The obstacles

At first sight, there seem to be few obstacles to the increasing use of digital systems within logistics. Costs are falling and the need to make full use of digitalisation to stay competitive is clear. The one significant concern is the risk of a breach in security. The NotPetya cyber-attack in 2017 led to massive disruption at, TNT Express, which FedEx had just taken over. It is estimated to have lost \$300 million as a result of the attack.¹⁴⁰

However, there are other obstacles preventing the widespread introduction of automation.

In particular, financial arguments may tilt the scales against automation, because high initial costs mean that payback times are long. This was made clear in a recent interview with Bobby Clements, a senior manager in UPS, who points out that, until recently, extensive automation was only used in “dedicated facilities for clients willing to make a long-term commitment”.¹⁴¹ Elsewhere, where clients can decide to move their business elsewhere at short notice, UPS, like other contract logistics companies, has used traditional methods, with the bulk of the work done by people and only limited automation.

¹³⁹ What robots do (and don't do) at Amazon fulfilment centres, Amazon
<https://www.aboutamazon.co.uk/amazon-fulfilment/what-robots-do-and-dont-do-at-amazon-fulfilment-centres>

¹⁴⁰ NotPetya cyber-attack cost TNT at least \$300m, BBC, 20 September 2017
<https://www.bbc.co.uk/news/technology-41336086>

¹⁴¹ Bobby Clements, UPS Global Logistics and Distribution, in The Future of E-commerce fulfilment at UPS, Modern Materials Handling 9 July 2020
https://www.mmh.com/article/the_future_of_e_commerce_fulfillment_at_ups

This is now changing as costs fall and the emergence of companies, providing robotics as a service, reduces the initial cost. However, automation is not appropriate in all circumstances, as Clements points out with reference to the AutoStore robotic goods-to-person picking system that UPS uses in Europe. The system has, he says, “improved storage density and increased productivity, but it still has to fit a specific application because of the size of the bins and the volume required to justify the solution.”

Amazon, which operates its own dedicated facilities, does not need to be concerned that the client will move away before the initial investment cost has been recouped. Its operations are also large enough for it to be able to develop its own automated logistics equipment. (It bought the robot maker Kiva Systems for €775 million in 2012.) Amazon makes extensive use of robots, primarily in moving packages around its facilities, but its operations still employ hundreds of thousands of warehouse workers and the director of Amazon Robotics Fulfillment, Scott Anderson, said in 2019 that the technology was at least 10 years away from fully automating the processing of a single order picked by a worker inside a warehouse.¹⁴²

The overall picture is therefore that, although automation is being introduced to undertake some logistics tasks, it may often be cheaper to employ people than invest in automated equipment and that, in any case, there are many tasks which can still not be automated.

The impact

With automation only being introduced in a limited way, its impact on employment has also, so far, been small. In any case, the growth in e-commerce, which has been boosted by the pandemic, has increased employment across the whole of logistics except for freight forwarding.

The impact of the increasing digitalisation, on the other hand, has already been significant and is likely to grow further. The potential impacts include:

- Much more intrusive and more permanent surveillance of workers than in the past. A wearable device can provide management with information on where workers are, what they are doing, and whether they are meeting their performance targets.
- A loss of individual autonomy and control over work as tasks are increasingly digitally or algorithmically managed. Loss of autonomy and control is a major psychosocial risk factor.

¹⁴² Amazon dismisses idea automation will eliminate all its warehouse jobs soon, Reuters, 1 May 2019 <https://www.reuters.com/article/us-amazon-com-warehouse/amazon-dismisses-idea-automation-will-eliminate-all-its-warehouse-jobs-soon-idUSKCN1S74B9>

- Less socially acceptable working patterns, as, based on an analysis of the digital information the system provides, management can plan the amount of labour it needs and when it needs it more precisely.
- The false self-employment, the low pay and poor working conditions, seen in other parts of the economy dominated by platforms, as platforms emerge as a way in which workers can bid for work. This is already happening in the area of last-mile deliveries in e-commerce.

These consequences are not inevitable, and digitalisation can also have direct positive benefits for workers, such as better monitoring of health and safety risks. However, workers and their unions must take action to guard against them.

Union concerns

Trade unions exist to advance the interests of their members, and, from a trade union standpoint, the key questions raised by automation and digitalisation in all these industries relate to those working in them.

The precise questions will vary depending on the situation, but some of those which are likely to be relevant include:

- What will be the impact on the numbers employed – both immediately and in the medium and longer term?
- What new jobs will be created? Who is going to manage the transition to these new jobs and how will it be managed?
- How will jobs change – in terms of content, skills needed and other issues such as degree of supervision (including machine surveillance)?
- What will be the impact on health and safety, both physical risks (less manual work) and psychosocial risks (greater stress/more repetitive work/less social contact)?
- Will the location of work change – more mobile working or a complete move?
- What will be the impact on earnings – both the total amount and how they are constituted (extent of performance-related pay)?
- Will working time change – both total amount and when it is worked (new ways of thinking about shift and night working)?
- What are the training and retraining needs – to do the new jobs, to maintain employability, to learn to do something else?
- Will the terms of the employment contract change – balance between fulltime/part-time, permanent/temporary and employees/self-employed?

However, as well as these questions of direct concern to those working in the industry, there are other questions relating to the local community and to their own organisation which unions should consider. These include:

- How will the local community be affected – will its economic health be damaged?
- Is there an opportunity to improve local services?
- Will there be consequences for public safety?
- Will unions themselves be affected – is the technology being introduced to weaken or to bypass unions?
- How will union membership and potential membership change?

Finally, there are questions that may seem more relevant to the employers than the unions but which the unions should still consider because of their impact on those working in the industry/company. These include:

- Whether the technological changes being proposed will actually work and will the promised benefits actually be delivered?
- Do they make economic sense – can the investment be recouped?
- What impact will the investment have on overall capacity – will overcapacity make the investment uneconomic?
- Who are likely to be the main beneficiaries of any changes – it may not be those carrying them out?

The answers to these questions are important because it is not just the investors who suffer if the results do not turn out as expected. For example, overcapacity may lead to lower prices and downward pressure on jobs and earnings in other companies. Unrealistically high expectations of automation and digitalisation may result in workers being given unacceptably high targets to fulfil. Unwise investments can lead to companies failing and jobs being lost.

Overall, it is important that unions do not simply accept that the automation and digitalisation projects will deliver all that is promised, even on their own terms. It is helpful to think of the obstacles – technological, economic, legal and regulatory and social – to avoid being dazzled by the apparent brilliance of what is proposed.

Union objectives

Fair automation and digitalisation

Unions at all levels, worldwide, European, national and local, are not against automation and digitalisation. They recognise that automation and digitalisation, like other technological advances in the past, can bring enormous benefits.

However, they want these benefits to be shared widely across the community as a whole and not captured by a small group. They also want to ensure that the introduction of automation and digitalisation does not harm those providing transport services or those using them.

Decisions on automation and digitalisation should be soundly based, examining the advantages and disadvantages of the introduction of each element of new technology, and not be driven by an unthinking belief in automation and digitalisation as goals in themselves. Those working in transport must be involved in these decisions. This applies at international, European, national and local/company level.

The precise way in which these benefits can and should be shared and harms prevented will vary from sector to sector within transport, but in almost all cases they will involve both those working in transport and the wider community.

Changes must be negotiated and agreed not imposed. Unions have the resources and the capacity to address transitions in a positive way for all the stakeholders involved.

Winning gains for those working in transport

For those working in transport the key concerns are:

- to avoid or at least limit job losses;
- to ensure that permanent, secure jobs are not replaced by precarious work, and that decisions on who works, where and when are not taken exclusively by an algorithm;
- to use automation and digitalisation to improve working conditions, including health and safety, rather than to see them worsened;
- to use automation and digitalisation to increase the opportunities for better and more fulfilling work and
- to share in the benefits brought by the introduction of new technology, through shorter hours and/or higher pay.

It is essentially that workers are involved in the decisions on the introduction of automation and digitalisation, to ensure that these concerns are addressed.

Winning gains for the wider community

For the community many of the key concerns directly match those of the workers.

Community demands include:

- preventing the introduction of automation and digitalisation leading to large-scale unemployment which impoverishes communities;
- maintaining well-paid jobs, which provide the tax revenues necessary to provide the services that a modern compassionate society needs;
- using automation and digital technology to move towards net zero, both in individual transport modes and as part of an integrated transport policy;
- guaranteeing a similar or improved level of safety for passengers and other transport users;
- using costs saving to provide better services and lower fares, rather than higher profits;
- ensuring the competition is fair between providers – based on the quality of service rather than the cost of labour;
- using new technological developments to provide new services, particularly for the most vulnerable; and
- using digitalisation to open up jobs in transport to previously excluded groups, such as the disabled.

Using automation and digitalisation to strengthen unions

Unions also want to use the challenges presented by automation and digitalisation as an opportunity to strengthen their position as representatives of working people, both in the workplace and more widely in the community. This involves:

- maintaining and, where possible, increasing union membership and organisation, through the recruitment and mobilisation of workers previously not involved, such as, in some cases, women and young workers;
- strengthening the involvement of existing members;
- establishing the union as a source of expertise and knowledge on the issues of automation and digitalisation; and
- building union influence on and in decision-making bodies.

At the very least, unions want to ensure that automation and digitalisation is not used as a tool to break union influence and power, as it has been in some industries and some countries in the past.

In some circumstances building union strength may require unions to adapt their existing structures and procedures to meet the needs of new groups of members and potential members. The transport workforce of the future may include more women, and it may also be younger. There may also be less manual work, although the change may be more marked in some areas (like the docks) than in others (like civil aviation).

It is also important to ensure that trade union leaders and representatives have the training they need to understand and respond to the challenge of automation and digitalisation, with the aim of strengthening their bargaining capacity and their ability to influence over the changes being introduced. This may mean reviewing and improving the training currently being provided.

It may also be the case that unions will have to make the case afresh for the benefits of collective action to employees whose experience and background has not been in areas where union membership was traditional and automatic.

Union instruments

Unions have three main instruments that they can use to achieve these objectives. These are:

- collective bargaining;
- union campaigning and lobbying; and
- adapting their organisational structures to match the changing situation.

The remainder of the toolkit aims to help unions use these three instruments in the most effective way. It includes:

- for collective bargaining – a model agreement that unions can use;
- for campaigning and lobbying – a framework covering the challenges that unions can raise; and
- for adapting their organisational structures to match the changing situation – suggestions on the actions unions can take.

Collective bargaining – model agreement

The background

Collective bargaining provides a mechanism through which unions can reach agreements with the employers to influence the introduction of automation and digitalisation. By reaching agreements, unions are able to limit employers' ability to introduce changes as they wish and ensure that the changes that do occur are accompanied by measures that limit the harms to the workforce caused by automation and/or digitalisation and allow them to share in the benefits.

Depending on the circumstances, these agreements may be negotiated and signed at a variety of different levels, from European to local:

- at European level, the European Trade Union Confederation (ETUC) and European employers signed a framework on digitalisation in June 2020;¹⁴³ the agreement starts from a joint acceptance that the digital technology should be introduced on the basis of consensus and it covers four issues
 - digital skills and securing employment;
 - modalities of connecting and disconnecting;
 - artificial Intelligence (AI) and guaranteeing the human in control principle; and
 - respect of human dignity and surveillance;
- at European sectoral level, there are already several joint declarations on the social effects of digitalisation, including one signed by the ETF covering Urban Public Transport in March 2021;¹⁴⁴ this commits UPT companies to:
 - an inclusive and participatory approach to the digital transformation;
 - ensuring job security and skills within digital transformation;
 - using digital transformation to improve working conditions and the work life balance; and
 - ensuring data protection, privacy, and dignity;
- at national level, it is possible to negotiate industry agreements on automation and digitalisation;
- at company level, there are some agreements which cover this issue; and

¹⁴³ European Social Partners Framework Agreement on Digitalisation, signed by ETUC, BusinessEurope, CEEP and SMEUnited 22 June 2020 https://www.etuc.org/system/files/document/file2020-06/Final%2022%2006%2020_Agreement%20on%20Digitalisation%202020.pdf

¹⁴⁴ Joint Recommendations on Digital Transformation and Social Dialogue in Urban Public Transport in Europe, signed by ETF and UITP 18 March 2021 <https://ec.europa.eu/social/main.jsp?catId=521&langId=en&agreementId=5730>

- at European and international level there are transnational agreements sometime signed by European Works Councils (see page), which cover issues like restructuring which touch on automation and digitalisation and could be extended to deal with the topic more explicitly.

The context in which these agreements are signed will also vary both between countries and between sectors/companies.

In some countries, the law provides employee representatives with extensive rights to be consulted before the sort of significant changes, generally associated with the introduction of automation and digitalisation, can be implemented (see page 108). Unions in these countries can anchor their agreements in this existing structure to ensure that the interests of the workers are protected and advanced. In other countries, legislation provides fewer rights and unions start from a lower base.

The differences between sectors/companies relate primarily to the strength of union organisation and nature of industrial relations. It will generally be easier to negotiate an agreement which takes account of union concerns in a sector/company where the level of union membership is high and there is a history of union success in negotiations, than in a sector/company where union membership is low.

The model agreement

Introduction

The text of a model agreement is included to provide ETF affiliates with a framework for responding to the introduction of automation and/or digitalisation. It also reflects the ETF's clear view that the introduction of automation and/or digitalisation must be negotiated. It cannot be imposed.

However, it is important to emphasise that the model agreement is intended as a guide. It is not prescriptive. Negotiators face a wide range of differing circumstances and operate against the background of a specific national and sectoral context. What is possible in one country and sector may be impossible elsewhere. It is also the case that, in some transport sectors, regulations, either national or international lay down precise rules on working conditions – in particular working time – which set a framework for negotiations.

It is hoped, however, that the model agreement will give some pointers to negotiators facing the challenges posed by the introduction of automation and/or digitalisation.

Some of its terms are drawn from real-life agreements that have already been negotiated. This is not just because these agreements provide ready-made solutions to the problems that negotiators face, but also because they indicate that these solutions have been acceptable to employers. Where this is the case, the source is *indicated in italics* below the term concerned. In most cases these agreements have been negotiated in areas where union organisation is strong. They have often only been achieved after difficult negotiations and in some cases industrial action. However, they indicate what can be achieved.

The model agreement is intended to be a text that, in favourable circumstances and with sufficient pressure on management, could be agreed. It is not intended to be a wish-list of maximum demands. Of course, in some circumstances, negotiators may wish to make more far-reaching demands and they may be successful.

The contents of the model agreement

The model agreement consists of 21 separate clauses, and it attempts to cover most of the issues presented by the proposed introduction of automation and/or digitalisation.

Clauses 1 to 3 cover the preamble, key definitions and the coverage of the agreement. However, Clause 4 is more significant as it provides for the establishment of a specific “Automation and digitalisation committee”, when “at least 10% of the workforce or more than [xxx] workers are affected” by automation and/or digitalisation. The figure of 10% is the threshold for action in the agreement signed by Ver.di and the employer Eurogate, in 2018. The reference to “more than [xxx] workers” has been added to take account of the fact that in larger workplaces 10% might be a too large a number. The arrangements for the functioning of this committee, which becomes the principal body dealing with automation and digitalisation, once the threshold has been passed, are set out in Clause 19 (see below).

Information and consultation arrangements are covered in Clause 5. It requires the employer to report regularly on automation and digitalisation developments, even where no major projects are proposed. When changes resulting from the introduction of automation and/or digitalisation are planned, the employer should provide details of these changes in good time. However, the employer should also provide information on the potential impact on the workforce, ranging from its impact on employee numbers to the consequences for monitoring and surveillance. Information should also be provided on the impact of the plans on the company itself, so that employee representatives have an understanding, among other things, of the potential risks involved in the project.

Clause 6 deals with employment guarantees and job security. It includes a commitment from the employer that there will be no compulsory redundancies and includes a list of

measures, including retraining, earlier retirement, transfers to other sites and finally voluntary redundancy compensation to allow this commitment to be met.

Clause 7 guarantees the terms and conditions of employees who are transferred to another employer following automation and digitalisation.

Clause 8 deals with training, retraining and qualifications. As well as providing for up to 12 months' training, at the employer's expense, including for work outside the company, it includes an assessment element to allow the individual to make a better choice about the training needed.

Clause 9 deals with changing occupational profiles and provides a mechanism for these changes to be jointly agreed.

Clause 10 deals with pay and earnings and contains no specific commitments. However, Clauses 11 to 16, which cover working time, health and safety, working away from the employer's premises, the right to disconnect, surveillance and monitoring and data protection, set out in greater detail how each of these issues should be dealt with.

Clause 17 on equality includes both a commitment to avoid discrimination as well as a commitment that both sides will examine whether the introduction of automation and/or digitalisation offers new opportunities for previously excluded groups.

Clauses 18 and 19 on employment contracts and relations with the unions include commitments from the employer that the introduction of automation and/or digitalisation will not be used to worsen standards, and the clause on unions also provides for union access to new groups of employees and to workers not on the employer's premises.

Clause 20 relates to the composition and working of the automation and digitalisation committee. It is a joint committee with equal representation of the employer and employee representatives, which takes decisions by a majority of 75% of the votes. In other words, it depends on a high level of agreement between the two sides. The precise make-up of the employees' side is not set out in the clause as this will certainly vary from country to country and possibly from case to case.

The final provisions in Clause 21 indicate that the agreement has no end date, but that after the first two years, either side can give notice of termination.

Situations in which the model agreement could be used

The model agreement is primarily written for use at company or workplace level, although some of its terms could be included in industry level agreements. It does not depend on a

specific national context, and some of its terms would be redundant in several countries, as their contents are already provided for by national legislation. The clause on surveillance and monitoring is an example of this.

The non-nationally specific nature of the model agreement also explains why throughout the text refers to “employee representatives” rather than unions, and it is described as an “agreement” rather than a collective agreement. In Germany, for example, agreements of this kind would frequently (although not always) be signed by elected employee representatives – the works council – rather than a union and would be works agreements (Betriebsvereinbarungen) rather than collective agreements (Tarifverträge).

The model agreement could be negotiated and implemented at any time, although – particularly with reference to the information and consultation clause – it would make more sense to agree it before the introduction on automation and/or digitalisation. However, it is not the case that the agreement is only relevant if major automation and/or digitalisation projects are planned. In many ways it makes more sense if it is negotiated at a time when no major projects are planned, as such projects should be easier to manage if its terms are observed.

The model agreement is primarily intended for sites where workers are already employed (brownfield sites), although it could apply where workers are being transferred from existing sites to new sites (greenfield sites). Some aspects of the agreement could also apply in completely greenfield sites, where a new workforce is being recruited. Clauses covering health and safety, working away from the employer’s premises and monitoring and surveillance, would remain relevant in these circumstances, but additional elements relating to recruitment and basic terms and conditions would also be required, and the sections on employment contracts and relations with the unions would need to be strengthened.

The model agreement is written to be used as a whole, and overall, there appear to be benefits in tackling automation and digitalisation in a single all-encompassing agreement. This allows the several interconnecting aspects of the process, notably, employment guarantees, retraining and changing occupational roles, to be addressed together. It also allows the setting up of a specific structure to deal with the issues presented by automation and digitalisation.

However, the agreement does contain some stand-alone elements which could be incorporated into other texts or expanded into separate agreements. These are the clauses on:

- working away from the employer's premises (remote working);
- the right to disconnect;
- monitoring and surveillance; and
- data protection.

In addition, the automation and digitalisation aspects of the clauses covering working time, pay and earnings, health and safety and equality, could be taken account of in more general agreements on these issues.

Text

1 Preamble

Both parties to this agreement recognise that automation and digitalisation are likely to play an increasing role in the future development of ... [the employer]. Both parties accept that automation and digitalisation present both opportunities and threats and both reject the introduction of systems which damage productivity and worsen services to consumers and the general public. They believe that an agreement, to which both parties are committed, is the best way of maximising the opportunities and minimising the threats and ensuring that automation and digitalisation operate to the mutual benefit of both sides.

2 Definitions

Automation means that a process is performed with reduced human intervention and some tasks previously carried out by workers are undertaken by machines.

Digitalisation means the use of digital technology, resulting not just in the automation of a wider range of processes than in the past, but also greater control over processes and workers.

A major change in working practices is where individual workers' jobs are altered in way which affects at least 20% of their working time.

The parties to the agreement commit to understanding these definitions in a broad sense and not to apply a restrictive approach which would counter to the spirit of this agreement.

3 Coverage

This agreement applies to all employees of [name of organisation]. This includes both manual and non-manual employees. It includes agency workers and workers who are dependent on [name of organisation] in a similar way to employees but are not on a standard employee contracts. The agreement does not apply to ...

The intention will be to extend the coverage as widely as possible. However, it may be necessary to exclude some workers.

4 Application

The principles of the agreement will apply in all cases where the workforce may be affected by automation and/or digitalisation.

However, when at least 10% of the workforce or more than [xxx] workers are affected, the provisions covering the operation of the automation and digitalisation committee shall come into effect.

The 2018 Future Agreement (TV Zukunft) between Ver.di and Eurogate has a 10% threshold for the operation of its Automation Commission. However, in larger workplaces it may be sensible to set a number rather than a percentage.

5 Information and consultation

The employer must report regularly (at least quarterly) to employee representatives (either the union or elected representatives) on developments in relation to automation and digitalisation, and it must inform and consult with employee representatives immediately when it is considering changes to existing practices in relation to automation and digitalisation and well before making proposals. Other than in exceptional circumstances, information and consultation should begin at least six months before specific proposals are presented.

The intention is that the views of the employee representatives should be heard at an early stage so that they can be integrated into the planning, development and/or introduction of automation and/or digitalisation.

Where changes to existing practices are being proposed, the employer will present information on the plans themselves and on the potential impacts of automation and/or digitalisation on the workforce. This information will indicate ways in which the proposed measures might affect women and men in different ways and will include their impact on:

- the number of employers/workers;
- qualifications and training;
- occupational profiles;
- working time;
- pay and earnings;
- health and safety;
- working away from employer's premises (remote working);
- surveillance and monitoring;
- data protection;
- equality;
- employment contracts and
- relations with the unions.

The employer will also present information on the potential impacts of automation and/or digitalisation on the organisation covering the:

- operational;
- structural;
- commercial; and
- financial consequences.

As well as being provided in a timely fashion, the information will be presented in a clear and understandable way.

Where automation and/or digitalisation projects evolve over time and are modified in the light of pilot projects or other ongoing developments, the employee representatives will be presented with updated information, as the process progresses.

The purpose of providing this information is to allow the employer and the employee representatives to reach agreement on the introduction of automation and digitalisation in line with the objectives set out in the remainder of this agreement and, in any case, in a way which does not harm the interests of the employees and, where possible, enhances them.

In reaching these objectives the employee representatives will make full use of their existing information consultation rights, as provided by national law and other relevant collective agreements.

This section is partly drawn from the German railway agreement, TV Arbeit 4.0, which includes the concept of a “digital road map, and states that “constant active monitoring” of the process will be required.

6 Employment guarantees and job security

It is recognised that, by its nature, automation potentially puts jobs at risk, and this can also be the case in relation to some aspects of digitalisation.

However, the employer guarantees that there will be no compulsory redundancies and – going beyond this – guarantees that, where possible, current levels of employment will be maintained and potentially expanded. This will mean that when older workers are retiring the employer will consider the possibility of recruiting an equivalent number of younger workers to replace them.

Implementing this guarantee requires a series of measures to be taken, some of which require time to be implemented, but in the short term, this will be achieved by an immediate halt to all work-related dismissals.

To deliver this guarantee in the longer term, the following measures will be considered:

- reducing overtime;
- offering available jobs at other sites in the same employer;
- cutting working time with no loss of pay;
- the offer of early part-time working close to retirement or early retirement;
- retraining, which can be also undertaken for external employment (see below);
- mobility payments to allow individuals to move to other work;
- a shift to part-time work;
- guaranteed earnings where employees take up lower-paid work as a result of automation and/or digitalisation; and
- voluntary redundancy compensation, with payments linked to age and length of service.

Where fewer than 10% of the workforce are likely to be affected by automation and digitalisation, these measures will be agreed between the employer and the employee representatives in the normal way, but where at least 10% of the workforce or more than [xxx] workers are like to be affected, these measures will be considered by the automation and digitalisation committee.

The 2018 Future Agreement (TV Zukunft) between Ver.di and Eurogate includes all these points.

7 Transfer to another employer

Where the introduction of automation and digitalisation results in a worker being transferred to another employer, the new employer will inform and consult on the terms of the transfer with the employee representatives of the organisation from which the employee is being transferred. In addition, the new employer will guarantee to maintain or improve all the existing terms and conditions of the transferred employee.

8 Training, retraining and qualifications

The introduction of automation and/or digitalisation is likely to produce a change in the skill requirements of at least some of the workforce and this will be the case both where elements of automation and/or digitalisation are introduced gradually and where they involve a major change to existing working practices.

They both require appropriate responses.

To enable workers to deal with ongoing and gradual change, there should be an increasing focus on skills linked to automation and digitalisation in all training and further training, provided during the employment. (This also applies to initial training for young workers – apprenticeships.) Workers must also be continuously trained for the job functions that result from automation and digitalisation through both on-the-job training and external training. This training will take place during working hours and the employer will pay both the wages of those undertaking training and all costs of the training (including, where necessary, travel and accommodation).

Where major changes to working practices are involved, those affected have a right to both an assessment of their existing skills and aptitudes, and training in new skills.

Every employee whose job is affected by a major change in working practices shall be entitled to participate voluntarily in an assessment of his or her basic further qualification capability. The assessment will be made in a structured form and may involve an external training provider. In addition to tried and tested procedures, the assessment will also include the systematic recording of existing qualifications, experience and vocational qualifications (such as IT skills and language skills). This enables the individual development opportunities for both the employee and the company to be determined. Every employee who participates in a measure to determine their further qualification capability can take advantage of a one-off preparatory support.

Following assessment, employees have a right to further training to improve their employability and gain a qualification. This training can last for a maximum period of 12 months and can be for external employment, both outside the immediate employer in other group businesses, or in an entirely different field. The training will be paid for by the employer, who will also pay the normal wages of the employees undergoing training.

Every employee whose job is affected by a major change in working practices shall be entitled to retraining for a new job, where such a job is available. If a qualification measure is not successfully completed despite retraining, or if it turns out within six months that the employee does not meet the requirements of the changed or new job, the possibility of another job is to be examined a second time, also in connection with a new qualification. The retraining will be paid for by the employer, who will also pay the normal wages of the employees undergoing training.

All proposals in relation to training, retraining and qualification must be discussed and agreed with the employee representatives, in the normal way, where fewer than 10% of the

workforce are likely to be affected by automation and digitalisation, or, where 10% or more are like to be affected, in the automation and digitalisation committee.

This section draws on the recommendations which resulted from the 2014 agreement between the Danish union 3F and the Confederation of Danish Industry and the 2018 Future Agreement (TV Zukunft) between Ver.di and Eurogate.

9 Changing occupational profiles

Occupational profiles may change as result of automation and/or digitalisation. The extent to which this occurs depends on how far changed work contents, work organisation, tasks and skills profiles and qualification requirements lead overall to new requirements and therefore to a change in occupational profiles.

Where either of the parties (the employer or the employee representatives) considers that this has occurred, they have a right to present their views to the other party with the aim of both sides reaching agreement on new occupational profiles and the allocation of employees to these profiles.

Allocation of employees to new occupational profiles should result in them receiving the terms and conditions (basic pay, additional pay elements and changed working conditions) appropriate to the new profile. Under no circumstances should it result in a worsening of their terms and conditions.

In view of the technical nature of the discussions on changing occupational profiles, this issue will be discussed in the automation and digitalisation committee.

The introduction is based on the German railway agreement, TV Arbeit 4.0

10 Pay and earnings

Automation and digitalisation potentially lead to higher productivity. Productivity gains from automation and/or digitalisation will be considered in pay negotiations so that workers also share in the benefits.

11 Working time

Automation and digitalisation potentially lead to a reduced need for human labour, permitting a reduction in working time. The employer agrees that reduced hours with no loss in pay should be a long-term goal following the implementation of automation and digitalisation.

The employer also accepts that a short-term cut in hours with no loss of pay (for up to six months) is an appropriate mechanism for meeting the employment guarantees in this agreement.

Any proposals to change working time patterns (such the introduction of shift work or changed starting and finishing times) must be agreed with employee representatives before they can be implemented.

Working time issues must be discussed and agreed with the employee representatives, in the normal way, where fewer than 10% of the workforce are likely to be affected by automation and digitalisation, or, where 10% or more are like to be affected, in the automation and digitalisation committee.

12 Health and safety

Automation and digitalisation present opportunities and risks relating to occupational health and safety at the workplace. Some risks linked to hard physical labour and close contact with dangerous equipment may be removed, but employees may be more exposed to psychosocial risks such as stress, isolation, monotonous work and a loss of control over work processes.

The employer must carry out a detailed assessment of the risks resulting from automation and/or digitalisation measures, as part of the overall risk assessment of the workplace. The employer must also provide employees and employee representatives with the results of this assessment.

Special attention shall be paid to any change in activity or job requirements. This applies above all to any change from predominantly physical activity to supervised screen-based work.

Following this assessment, the employer will agree with the employee representatives an annual plan of action to remedy any deficiencies or shortcomings. The employer and the employee representatives will assess progress on the implementation of this action plan on a regular basis over the year.

While respecting individual privacy, the employer undertakes to continue to monitor workers' health and safety following the introduction of automation and/or digitalisation and to provide the results of that monitoring to employee representatives in a way that respects individual privacy so that potential problems can be quickly identified and resolved

13 Working away from the employer's premises (remote working)

Digitalisation makes it possible for work to be done away from the employer's premises, while the worker continues to be in close contact with the organisation through a digital terminal.

Where workers choose to do some of their work remotely (at home or in some other location than the employer's premises) on a voluntary basis, the following arrangements apply:

- working from home or some other location is voluntary, workers must not be disadvantaged if they choose not to take up the option;
- in principle all workers have a right to take up this option, although the employer can restrict access, in line with criteria, which have previously been agreed with the employee representatives;
- workers have the right of an appeal to a joint body if their request for voluntary working away from the employer's premises is refused;
- workers must ensure appropriate security for the employer's information;
- the necessary equipment is provided by employers free of charge. Private use is possible within the framework of rules agreed with employee representatives.

14 Right to disconnect

Digitalisation allows workers – not only those working away from the employer's premises on a voluntary basis – to be contacted outside weekly working hours and during periods of leave. Workers are not obliged to respond to these contacts and will not be disadvantaged if they choose not to do so.

15 Surveillance and monitoring

Digitalisation will not be used for the surveillance or monitoring of either the performance or behaviour of workers unless this has been explicitly agreed by employee representatives.

Where monitoring or surveillance has been agreed for a specific purpose, the information obtained may not be used for another purpose without further specific agreement.

16 Data protection

The employer and employee must observe the relevant data protection regulations. The employee must be informed of the relevant data protection specifications both in relation to working away from the employers' premises and more generally.

The employer will not collect or analyse personal data on workers without the explicit permission of the workers themselves and the employee representatives.

17 Equality

Automation and/or digitalisation measures must be introduced in way, which avoids discrimination against workers on the basis of sex, race, colour, ethnic or social origin, genetic features, language, religion or belief, political or any other opinion, membership of a national minority, property, birth, disability, age, sexual orientation or nationality (for those with a right to work in the state).

However, the changes introduced by automation and/or digitalisation may also offer new opportunities to groups previously, in effect, excluded from certain job roles because of the way they were previously carried out. Both parties therefore commit to assess the introduction of automation and/or digitalisation to see whether it can be used to improve access from previously excluded groups.

Protected characteristics taken from EU Charter of Fundamental Rights Article 21

18 Employment contracts

The employer undertakes that the introduction of automation and digitalisation will not be used to move to less secure form of employment, such as:

- temporary contracts;
- very short hours or zero hours contracts;
- agency workers; or
- self-employment.

All proposals to make changes in these areas must be discussed and agreed with the employee representatives, in the normal way, where fewer than 10% of the workforce are likely to be affected by automation and digitalisation, or, where 10% or more are like to be affected, in the automation and digitalisation committee.

19 Relations with the unions

The employer undertakes that introduction of automation and digitalisation will not be used to reduce the influence of the unions.

Where digitalisation allows more workers to work away from the employer's premises, for example, at home or as mobile workers, the employer will provide electronic methods to allow the unions to communicate with these workers and to receive communications from them. This will include specific space on the employer's intranet (where present). These communications between the unions and workers will remain confidential and the right of the unions to make use of the employer's electronic means of communication will continue during any periods of industrial action.

Where new groups of employees are recruited as a result of automation and/or digitalisation, the unions will be given an opportunity to meet them on the employers' premises and to persuade them of the benefits of union membership.

20 Automation and digitalisation committee

Where 10% or more of the workforce is likely to be affected by automation and/or digitalisation, an automation and digitalisation committee shall be established.

The committee will consist of eight members, four representing the employees and four the employer. The employee representatives will be chosen by the [...]

The committee will be managed jointly by an employees' representative and an employers' representative. The chair changes every six months. The Commission shall adopt its own rules of procedure, which shall also regulate its administration and the ability to work (accessibility, address, distribution and filing of documents, etc.).

The committee will take decisions by a majority of 75% of the votes. A quorum is given with at least six members, whereby each side must be represented by at least three members.

The committee may decide on a one-off or longer-term basis to make use of technical or legal experts for either the employer or the employee representatives. The cost of these experts will be paid by the employer.

These provisions come largely from the Future Agreement (TV Zukunft) between Ver.di and Eurogate. In this agreement two employee members are works council members and two are appointed by the union Ver.di, although all must be Ver.di members. The way that these representatives are chosen is likely to vary from country to country, depending on national representational structures.

21 Final provisions

This agreement shall come into effect on ...

It shall continue in force until one of the parties gives at least three months' notice of termination and, in any case, for at least two years after it the date first came into effect. Both parties commit to attempting to re-negotiate the agreement if it is terminated.

Campaigning and lobbying – a framework for union action

Campaigning and lobbying: the reasons for doing it

Moving outside the workplace to influence the public more generally has to be an important part of union activity on automation and digitalisation for three reasons:

- to build support in society for union positions in relation to the employer
 - for example, if the union is on strike, support from the public improves the morale of the strikers and puts extra pressure on the employer;
- to bring pressure to on governments (local, regional, national and potentially also at European level) to change their policies or adopt new ones
 - meeting some union demands, for example, on changes to taxation policy or government subsidies, depends entirely on political decisions ; and
- to strengthen the presence of the union in the local community and wider society
 - this makes it easier for the union to recruit and organise new members and more difficult for employers or those hostile to the unions to dismiss the union as a narrow interest group.

The reasons may in some cases overlap, particularly where the government is also the employer, or where it is the government's policy that is driving employers to take the actions they are taking, but generally they do not conflict.

Specific union objectives in campaigning and lobbying

Where employers propose automation and digitalisation measures that the unions oppose, there are two likely union responses:

- that the measures should be withdrawn; or
- that action should be taken to mitigate the damaging effects of the proposed measures on the workforce and, where necessary, on the wider community.

Getting a proposal withdrawn

Asking that a proposal be withdrawn is a straightforward demand that needs no further elaboration in terms of the demand, although it will still benefit from gaining public support through campaigning and lobbying.

Mitigating the impact

Action to mitigate the damaging effects of proposed measures is likely to be much more varied. At company level, the most effective way of mitigating the impact of damaging automation and/or digitalisation measures is to ensure that they are introduced through

negotiation rather than being imposed, and the model agreement on pages 38 to 45 provides a framework for negotiation.

Outside the company, the mitigation measures needed will vary depending on the type and extent of the automation and digitalisation that is being proposed. Where job losses are planned, a range of policy responses are possible.¹⁴⁵ These include:

- outplacement support – helping workers who are about to be made redundant to recognise their abilities and use effective tools for job search (in some cases those facing redundancies may be transferred into a separate company, known as a *Transfergesellschaft* in Germany, where they receive support and training);
- retraining post redundancy – where workers who have already lost their jobs are given support to improve their labour market prospects, including retraining and assistance with job-seeking; and
- area-specific support schemes, which include infrastructure spending in the area and special local bodies for creating and finding new jobs.¹⁴⁶

These programmes need funding, so unions may not simply be demanding that such schemes are set up but also that they are adequately financed, from local, national or EU sources.

Creating a different policy framework

As well as campaigning and lobbying on measures to mitigate the impact of automation and digitalisation measures, unions may wish to campaign for changes in the policy framework that would make it less likely that that automation and digitalisation measures it opposes would be introduced in the first place.

Examples of policies linked to automation and digitalisation that unions might consider calling for include:

- a robot tax or another way of increasing revenue from corporations with high automation processes, because currently, unlike the employees they replace, robots

¹⁴⁵Toolkit: Responding to major job losses from What Works Centre for Local Economic Growth https://whatworksgrowth.org/public/files/Toolkits/16-10-11_Responding_to_major_job_losses.pdf

¹⁴⁶ The actions planned by the Commission on Growth, Structural Change and Employment in Germany (Kommission Wachstum, Strukturwandel und Beschäftigung), which has been set up to deal with the impact on the regions affected of Germany's exit from coal fall into this category. The programme This aims to provide better local transport connections, improved training opportunities, new research facilities, new entrepreneurial opportunities and other measures to boost economic competitiveness. It is to be funded through a combination of national and EU funding.

do not pay the taxes or the social security contributions that societies need to provide decent public services;

- an end to subsidies and tax concessions linked to measures to cut jobs through automation and digitalisation; and
- changes in employment legislation so that employers cannot employ workers on bogus self-employed contracts, where workers are dependent on platforms and apps to find work .

Arguments unions can use in campaigning and lobbying

ETF unions have powerful arguments they can use to counter damaging proposals for automation and digitalisation, and these can be presented as a series of questions that the unions can pose.

Is it safe?

This is one of the most powerful arguments the unions can use, particularly in areas where members of the public are directly affected as passengers. If automation and digitalisation is being used to remove staff from passenger-carrying transport, does that put passengers at greater risk, particularly in an emergency?

This has been the main message of a campaign to retain guards (a second member of the train crew) by the UK rail union RMT. This includes pages on the union's website, downloadable leaflets, short films and a question-and-answer booklet, directed at the public. The material contains clear and convincing arguments showing why it would be unsafe to remove guards from trains, written from the points of view of the difficulties faced by passengers. The short films also set out passengers' experiences without guards in a dramatic and engaging way. (The International Transport Workers' Federation is also campaigning more widely on the need to have a second safety-critical person on board trains.)

However, even in areas where they are not present as passengers, automation can still put the public at risk, for example, through a driverless truck or a goods train being involved in an accident and spilling a dangerous cargo, with a damaging impact on the environment and public safety.

What will it mean for the local community?

If automation means employment in a specific transport business falls dramatically, what does that mean for the other businesses in the area (local shops, cafes, garages etc) which depend on those workers for custom? And what about future employment prospects?

What will it mean for public services?

If men and women who pay taxes and make pension and social security contributions are replaced by machines who do not, what will that mean for the tax base and pension and social security funds, and in turn the services – from health care to the police – and the pensions that they support?

Does the whole scheme make sense in its own terms?

This question is likely to be particularly important where public investment is involved, but it is also worth asking in private sector schemes benefiting from public subsidies. Not all automation and digitalisation schemes deliver the promised return. Are the benefits as certain as the scheme's backers have promised?

Does it take us closer to the type of society we want?

It may be more difficult to make the more general points that automation and digitalisation which only benefits the owners of the technology and not society in general while costing jobs is not progress, and that switching workers from secure jobs to platform-based work damages people's futures. But these are also points that needs to be made.

The targets for union campaigning and lobbying

In campaigning and lobbying for the union's demands it is important to identify the target groups. These are likely to be:

- union members in the sector or company affected;
- the local community, facing similar problems and potentially economically affected by any job losses;
- workers in related industries;
- civil society and other interest groups (such as passenger organisations, environmental groups and civil liberties groups where the issue is worker surveillance);
- the media;
- sympathetic academics
- local and national politicians;
- employers; and
- the government.¹⁴⁷

¹⁴⁷ This was the approach taken by Ver.di Bremen in its campaign "Our work, our port, our city" (Unsere Arbeit, unser Hafen, unsere Stadt) launched in 2018, with the aim of negotiating a new far-reaching agreement with Eurogate on automation. Its "onion" strategy aimed to work out from the union's members to its other targets.

Campaigning pointers

Each campaign will be different, depending on the issues involved and broader context, but in general in campaigning it is important to:

- analyse the balance of forces – establish which individuals and groups are in favour of your position and which are opposed;
- identify and target the key decision-makers;
- keep the campaign simple and communicate in a direct and straightforward way;
- understand what the public thinks and begin your arguments from that point; and
- make the campaign around real people and real events rather than abstract slogans.

It may then be useful to draw up a path forward identifying the specific stages to be reached and how to reach them.

Adapting union organisation – suggestions for action

Facing a changing workforce

It seems likely that as automation and digitalisation is introduced, the composition of the workforce will change. There is likely to be more need for workers with advanced digital skills, although they will not automatically be well paid. There may also be less need for manual labour, although not, for example in e-commerce.

Overall, it seems likely that the transport industries will begin to employ more women and young people than at present. However, it is important to recognise that this change will not apply uniformly across transport. In some industries, such as the docks, which have traditionally drawn workers from closely knit communities with sons following fathers into the industry, the change may be particularly noticeable. In others, such as civil aviation, the proportion of female employees is already fairly high, and there are many young workers among cabin crew, although of course the gender breakdown within occupational groups (both pilots and cabin crew) remains very uneven.

There may also be changes in the employment status of some in the transport industry with an increase in the number of self-employed. This is not just the case in the ride-hailing sector, where, until recently, self-employment is almost universal in the platform-based companies like Uber. It can also be the case in civil aviation, where pilots may be required by some companies to work on a self-employed basis, in logistics, where platform-based employed is increasingly used to provide the “last-mile” deliveries in e-commerce, and more generally, where self-employed IT contractors may be brought in for specific projects.

These workers are all potential union members and unions may need to adapt their organisational structures and methods if they are to be able to recruit and organise them successfully. They are unlikely to be able in the future to count on the automatic support for the union that was traditional in some industries in the past.

Key areas for action

As the ETUC noted in a recent statement on organising and recruitment, it is not possible or appropriate to propose, a single model for recruiting and organising these groups, given unions' very different national and sectoral situations, and their very different structures, traditions and legal frameworks.¹⁴⁸ However, it is possible to indicate some ways in which

¹⁴⁸ https://www.etuc.org/sites/default/files/document/files/14_en_organising_and_recruitment_final.pdf

unions have sought to tackle the recruitment and, as importantly, the active involvement of new groups of members.

These include:

- specific structures/committees for specific groups of members;
- ensuring that the leadership reflects the membership;
- ensuring that the training offered to union leaders and representatives is appropriate; and
- reviewing union policies and demands, as the priorities of new groups of members may not be the same as those of existing groups.

These four elements can be tackled separately but in practice they are linked. It is likely that the future leadership will first emerge in the structures for specific groups of members and that it will be in these structures that the policies that match the priorities of these groups of members will be developed, and appropriate training worked out.

The starting point – comparing the union with the workforce

An important starting point is to have a clear understanding of how union membership and leadership compares with overall employment in the industry, and to consider how this might change in the future. Lack of information may be a problem, but it may be possible to make comparisons by sex and age, as well as the areas where people work. If it is, these should be drawn up, looking both overall membership and the leadership.¹⁴⁹

Specific structures/committees for specific groups of members

Many unions have separate women's and youth structures.¹⁵⁰ They provide an area in which specific concerns can be addressed, although it is important that the concerns of these groups of members are also considered in the union's main structures.

There may also be other groups which would like the opportunity of meeting separately. These may sometimes be based on individual characteristics, such as groups of black members or disabled members, in other cases they may be based on occupations.

¹⁴⁹ The German rail union EVG includes this approach in its guide *Aktive Gemeinschaft Organisieren & gestalten* <https://www.eva-akademie.de/fileadmin/website/downloads/aktionsbrosch%C3%BCre.pdf>

¹⁵⁰ Ver.di, the services union in Germany, for example, has a women's conference, which meets every four years and a women's committee which meets three times a year and it organises a range of meetings and events. Ver.di also launched "Perspektive U35" in 2011. It is aimed at encouraging and training union members aged under 35

Unions will have their own views as to whether they wish to set up separate structures for these groups, and it can be damaging if union activities become splintered with no central focus.

However, at least, unions should consider whether their existing representational structures are still appropriate and should look specifically at what might best suit new groups of members. In this exercise, it is important that the views of members themselves are heard.

Ensuring that union training is appropriate

Automation and digitalisation present new challenges. It is important that union representatives and those in a position of leadership in the union are given the training they need to face them. This is already happening. In Germany, for example, the services union Ver.di offered a series of seminars on digitalisation in 2020.¹⁵¹

Ensuring that the leadership reflects the membership

If those in leading positions in the union do not reflect the membership, it may be more difficult for them to develop policies that the membership wants, and this is equally the case in relation to the overall workforce.

Some unions have introduced quotas for under-represented membership groups, and this can be a way to ensure that their views are heard when the union takes decisions. It may also make sense for them to have priority access to union training.

Women, in particular, are frequently under-represented in union leaderships. As the ETF's 2017-22 work programme states:

“While more women are joining trade unions, they are often under-represented in decision making structures. Thus, training of women union leaders is as important as the training for women in the transport industry!”

Reviewing union policies and demands to make sure that they match current needs

Unions have their own democratic mechanisms for setting policies, but they need to be kept under-review to ensure that the concerns of all members are reflected. At local level this means thinking about the issues members care about, their current concerns and their hopes and ambitions.¹⁵²

¹⁵¹ Fit für die Digitalisierung: Seminarangebote

2020 https://www.verdi.de/++file++5d7b97152193fb3d0b019d92/download/2186_08_FitFuerDigitalisierung_I_NTERAKTIV.pdf

¹⁵² The TUC pocket guide to organising & campaigning, TUC 2019

https://www.tuc.org.uk/sites/default/files/2019-10/Pocket_Guide_To_Organising%26Campaigning_2019.pdf

At national level this may involve major surveys of membership views. For example, the German services union Ver.di surveyed its membership in the public sector in 2019. The results showed that 92% of the 210,000 who replied said that they wanted the freedom to choose between more time off and more money. This was adopted by the union in its bargaining demands for 2020.

However, it is not necessary to carry out large-scale surveys. the existence of online tools like SurveyMonkey make it possible for smaller organisations to get a much better picture of what members want.

At the very least, unions should consider carefully whether their demands take account of the needs of all groups in the union.

Reviewing union processes and procedures

As well as looking at policies and demands it is also important review the union's processes and procedures to ensure that they continue to be relevant and effective.

This can simply involve looking at whether the union's means of communicating with its members are still appropriate, for example, by considering using social media channels to supplement existing communication. But it can also involve thinking about whether meetings take place at the right time and in the right place, whether virtual meetings would make more sense, whether the way meetings are organised helps members take part, and whether new members are welcomed and supported.

As a minimum, the union should make sure that members know how the union works and how they can make their voices heard.

Presenting the union's aims and achievements

There is a similar need for explanation in terms of the union itself – both its aims and achievements. With low levels of union membership in many countries and a public and political atmosphere which may be hostile to unions, it is no longer sufficient to believe that non-members, or even some members, will automatically understand what unions are for and what they have achieved.

Unions should not be shy of making the case for collective action and identifying the benefits that workers have gained from union action in the past, as way of pointing towards what can be won in the future.

Information and consultation rights

At EU level

The general approach on information and consultation at EU level is for the employer to inform employee representatives on economic and financial issues but give them greater rights in relation to the issues that affect their day-to-day working lives. The EU framework directive on information and consultation (Directive 2002/14/EC), passed in 2002, requires EU member states to provide practical arrangements for information and consultation with employee representatives which “shall cover:

- a) information on the recent and probable development of the undertaking's or the establishment's activities and economic situation;
- b) information and consultation on the situation, structure and probable development of employment within the undertaking or establishment and on any anticipatory measures envisaged, in particular where there is a threat to employment;
- c) information and consultation on decisions likely to lead to substantial changes in work organisation or in contractual relations, including those covered by the Community provisions referred to in Article 9(1) [on collective redundancies and business transfers].”

This legislation has been incorporated into national law in all EU states and provides a minimum level of rights, although, in Ireland, employees must specifically request these rights and negotiate how they will be introduced. However, in most states national legislation, generally introduced before the 2002 EU directive, provides rights on information and consultation, which go far beyond those set out in the EU framework directive.

National information rights

Many countries require employers to provide employee representatives with information on their plans. In France, for example, in companies with at least 50 employees, the employee representative body, the CSE (Comité Social et Économique – Social and Economic Committee) must be informed and consulted on a regular basis, normally annually on:

- the strategic direction of the company;
- the company's economic and financial situation; and
- the company's social policy as well as working conditions and employment.

The CSE is helped in this by being given access to a database of company figures, which among other things includes:

- financing, debts and taxes;
- pay for employees and managers; and
- the company's financial performance, including turnover and profits.

In the Netherlands, management must provide the works council with details of trends in employment and social policy and the company's own report and accounts (both annually); the company's prospects and trends in the company's activity particularly its investment plans (twice a year); and details of long-term corporate plans (if prepared). The works council also has the right to ask for all the information it reasonably needs to carry out its tasks.

In Sweden, where workplace level employee representation is through unions rather than through a works council, the employer is obliged to keep the local union informed of its general economic situation, production levels and personnel policy. Unions should also be given access to company accounts and other corporate documents and, provided it is reasonable to do so, the company should provide the unions with copies of other documents they request. An agreement on efficiency and participation from 1982 (the UVA agreement) provides further detail on the type of information to be provided to the unions. As well as stating that they should “be given insight and influence over the undertaking's economic situation, planning, budget and follow up work”, it also requires managerial assessments for the future to be explained so that the unions have an opportunity to deal with and assess: “the market outlook for the undertaking, its purchasing activity, its competitive position, product development, and production equipment as well as employee security and development of work”.

National consultation rights

Consultation with employee representatives on issues likely to lead to changes in levels of employment, work organisation or working conditions, including those impacted by the introduction of automation and digitalisation, is also found widely across the EU, as examples from Germany, France, Finland and the Czech Republic show.

In Germany, the employer must inform and consult the works council when changes are planned which may have a negative impact on the workforce. The measures covered by this requirement to consult include:

- important changes in organisation, purpose or equipment; and
- the introduction of entirely new work methods and production processes.

In these circumstances, the works council can seek to reach agreement on a so-called “reconciliation of interests”, which deals with the implementation of the changes the employer plans with the aim of avoiding or limiting any disadvantages to the employees. It can also agree a so-called “social plan”, which seeks to compensate the employees for these disadvantages, and this social plan is subject to so-called “enforceable co-determination”. In other words a conciliation body can impose an agreement if the employer and the works council cannot agree.

In France, the list of issues on which the CSE must be consulted includes among other things:

- measures likely to affect the size or structure of the workforce; and
- the introduction of new technologies.

The timetable for consultation must provide “sufficient” time, for the CSE to consider the issue and present its view.

In Finland, like Sweden, employee representation at the workplace is through the union, which has the right to be involved in so-called “cooperation negotiations” on changes in the way the business operates or organises its work. Purchase of machinery and equipment, changes in the products or services offered, other work changes or the use of external labour, are all examples of the issues covered by this. The employer should present the issue to the union in good time and with adequate information and should discuss the issue in cooperation negotiations “in the spirit of cooperation to obtain consensus”, although there is no obligation to reach an agreement. Where the changes involve job losses, the information provided should cover the reasons for the measures, an initial estimate of their extent (for example, the number of jobs to be lost), the method the employer proposes to use to select the employees affected, and a timetable for implementation. However, the employer is also required to provide employee representatives with a plan of action to promote employment, which should be drawn up with the public authorities, and the cooperation negotiations must consider ways of limiting the numbers affected and mitigating the consequences for those who lose their jobs.

In the Czech Republic, both unions and works councils, as representatives of the employees, must be consulted about a wide range of issues, including measures affecting employment, particularly collective redundancies. and health and safety issues.

European Works Councils

A European works council (EWC) is a body which brings together employee representatives in a multinational company from across Europe. Workers in companies which have at least 1,000 employees in the EU member states and at least 150 in each of two or more of these states are entitled to ask for an EWC but they do not exist in all companies fulfilling these requirements.

Typically, the members will be the senior lay employee representatives from each country where the company has operations, although some smaller sites may not be included. The EWC normally meets at least once a year – some meet more frequently – and where there are major changes, such as substantial restructuring, it will normally hold an extraordinary meeting.

The role of the EWC is to be informed and consulted by senior management at European level on the group's performance and prospects. Discussion will typically cover the group's annual results, position in the market and broad plans. Substantial changes in the group's structure, such as major take-overs or closures are also likely to be discussed, although probably after the key decisions have been taken. The EWC may also become involved in discussing and drawing up some aspects of group policy at European level, such as common health and safety standards or equal opportunities aims. This gives it an opportunity to discuss and be informed and consulted about automation and digitalisation.

The EWC is not just a meeting with European management. At each EWC meeting, always before the session with management and increasingly frequently afterwards as well, there is also a meeting of all the employee representatives on their own. This gives them a chance to compare notes and develop their own initiatives. The costs of all the meetings are borne by the employer. These include paid time-off, travel, accommodation and interpretation.

Most EWCs also have a steering committee, normally made up of senior representatives from several European states, to co-ordinate developments between meetings and discuss the agenda with senior management.



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