

# Systems thinking analysis of increasing unemployment in Western economies (such as the UK and US) due to automation

## Definition: unemployment

Although unemployment figures are generally low in the UK and US this is not reflective of materially affluent and financially secure lives. The relatively low levels of unemployment in the UK after the 2008 wage crisis was largely a result of self-employed people living off poverty wages (Srnicek and Williams, 2015: 93). Moreover 94% of new jobs in the US created between 2005 and 2015 are contract or temp jobs (Yang, 2018). Many people are in in-work poverty and the new gig economy, that is changing the face of human employment, is associated with a lack of social safety net and having a negative impact on people's sense of jobs security. Therefore, when I refer to unemployment in this study I am including in work poverty in that definition. Developments in automation and population pressures could exacerbate the impacts of this complex issue as they increase unemployment and workers exploitation. However, there is opportunity for flexible working, as long as there are fair social policies that ensure workers aren't exploited and institutions such as trade unions are strengthened.

## Introduction

The future of work in light of rapidly increasing advances in automation are unknown but it comes with both threats and opportunities. To prepare for its effects we must research which sectors and occupations will be the most affected by unemployment. The current data suggests that low and medium skilled workers both in manual and cognitive jobs will face further pressures from AI (UN, 2017: 1), especially in the transition period. Recent research also suggests that AI and other technologies will 'contribute and aid high skilled

workers who use flexibility, creativity and strong problem solving and interpersonal skills' (UN, 2017: 1). Moreover, it is likely that the precarious employment conditions and in work poverty that characterise many developed economies will be worsened during the transition to an automated economy (UN, 2017 14). Thus, we must have the right policies and institutions in place to protect already vulnerable workers. In this study, I will focus on the impact these drivers have on developed economies such as US and UK. I will be using the SPRIR model in systems thinking to explore the data and research around this topic. This model is useful as it allows us to analyse the multifaceted impacts (e.g social, psychological, economic, political and cultural) that are involved with high unemployment. This will help in answering which responses are best for addressing the drivers and impacts. In light of exploring the pressures and impacts these drivers have, I will analyse the West of England's response for tackling the local impacts of these future trends.

### **History matters- patterns in history**

One lesson we can learn from history is that there will be a significant amount of time between the actual technological breakthrough and the economic impact it has. During the second industrial revolution productivity growth rose rather slowly and was actually higher after the revolution than during it (UN, 2017: 10). Considering these significant time lags it is difficult to project when the real impact of technology will take place but the time where it creates the most significant change to the world of work is considered around 50-100 years away (Harris, 2016). However, it is predicted next 10- 15 years will see considerable especially for those in lower skilled, routine and predictive jobs (Yang, 2018). Many sight the industrial revolution as a lesson from history that advances in automation do not result in mass unemployment. The UN states that:

*'throughout history, technological innovations have enhanced the productivity of workers and created new products and markets, thereby generating new jobs in the economy. This will be no different for AI and 3D printing and robotics' (UN, 2017: 2).*

This statement appears to have considerable weight as since the first industrial in the early 19<sup>th</sup> century there have been several episodes of widespread anxiety over the job destroying effects of technology that have never come into fruition

(UN, 2017: 3). However even if technological breakthroughs do create new markets and jobs there is almost certainly going to a period of huge disruption, as has been in the past. Recent research has shown that those states in the Midwest, whose jobs have been automated way in the manufacturing sector, left 4 million excluded from the job market (Yang, 2018). The exclusion of lower skilled workers from the job market in crucial swing states is widely considered to have contributed to the election of Donald Trump in 2016 (Yang, 2018). High levels of unemployment in concentrated areas is not only socially and economically damaging to those individuals but will further political tensions and insight more extremist politics.

Yang (2018), an American entrepreneur who is running for the American presidency in 2022, argues that citing the industrial revolution as an example of how technological breakthrough creates more jobs is a 'lazy analogy'. It fails to take into account how different this technology is to the technology of the industrial revolution. Andrew McAfee (2015) states that

*'digital technologies are doing for human brain power what the steam engine and related technologies did for human muscle power during the Industrial Revolution'*

Thus, the impacts will be entirely different and, what some people are calling Industrial revolution 4.0 (Schwab, 2016) could permanently automate jobs away. As robots and AI get increasingly more efficient and more accurate than humans new jobs may not be created. Therefore, we cannot rely on the fact that industrial revolutions of the past have always created more jobs because we have never encountered technology like AI.

Another thing to consider is that even after the first industrial revolution, which allowed for the end of much hard and monotonous manual labour, many of these jobs were then replaced by pointless jobs created, largely, in the service sector (Graber, 2013). What could result in a 15-hour week by 2030 (Maynard Keynes, 1963) may be prevented by the creation of pointless jobs that do not contribute to the overall well-being of the world's population (Graber, 2013). Graber (2013) argues these service sector jobs, that 80% were employed in the 2011 (ONS, 2016), are creating a meaningless economy that does not add any value to human welfare. Thus, we could be moving toward the end of human drudgery if we did not continue to create these jobs. It is also important to consider the 'moral and spiritual damage' (Graber, 2013) that spending every

day doing a job that individuals know is meaningless comes with. The ONS found that 11.8% of people in administrative and secretarial roles suffered from a mental health issue. This is the third highest occupation that has the highest percentage of mental health issues. It comes after caring roles (14.2%) and sales and customer service occupations (12.7%) (ONS, 2017).

### **History matters - who is affected**

As already discussed it appears that those that will be affected initially are lower skilled jobs. When looking at the 19<sup>th</sup> century industrial revolution it was 'characterized by technological change that raised the productivity of lower skilled workers relative to that of higher skilled workers' (White House, 2016: 1). This meant that the higher skill workers faced high numbers of unemployment from mass production technologies, with the result of productivity rising and inequality declining. This is contrast to the 20<sup>th</sup> century technological advancements when the internet rose the productivity of higher skilled workers and lower skilled workers (e.g switchboard operators, filing clerks, travel agents, assembly line workers) were vulnerable to replacement (White House, 2016: 1). The failure to improve education and institutional changes, as well as policy changes such as reduction in unionization and decline in minimum wage, has significantly contributed to the rising inequality of today. Last year the Equality Trust found that 1000 people had more wealth than the bottom 40% (Equality Trust, 2017). Thus, the type of technological change that is coming must be analysed to see who is affected and the inequalities that could be exacerbated by technology must be minimized with the right policy responses that will be discussed later in the report.

### **Questions about the assumptions in the statement**

Unemployment will have serious consequences for those in the UK and US, as employment provides money which people need to sustain fulfilled and decent lives. However, Snriek and Williams (2015) make the case that full employment was positioned as a necessary economic goal by conservatives. This then led to an overall societal aim that became the production of competitive subjects undergoing constant self-improvement in an endless effort to be deemed employable. Perhaps if employability didn't take up such a significant part of citizens lives the education system could be reformed to learning for the sake of learning and people would be free to choose what genuinely interests them rather than just which skills are most employable. A post work future where

society is able to increase human welfare and standards of living through technological advancements (Snireck and Williams, 2015) rather than human drudgery could improve aggregate human welfare as we pursue activities and skills we find preferable rather than what the 'market' demands.

### **What is the nature of this factor**

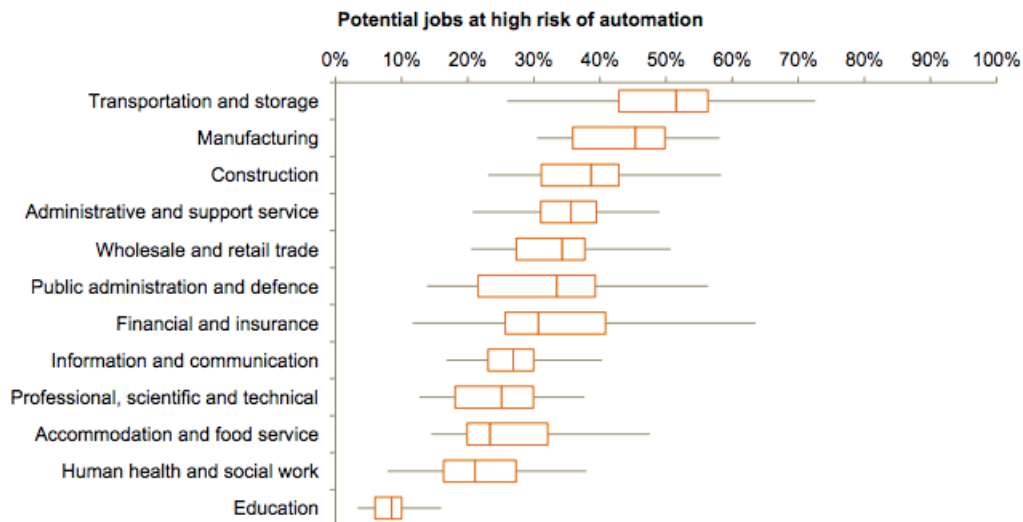
As it stands unemployment is a major concern for the future of our society. We already have increasing inequalities and employment provides material affluence as well as purpose to people's lives. It also helps with aggregate advancements in society. It is a cultural, economic, social, political and psychological factor.

### **Pressure:**

### **Heterogeneity of the change**

### **Effect by industry sectors**

Data from PWC study (2017) revealed that the industries with jobs that are most susceptible to automation by 2030 are transportation and storage and manufacturing at around 52% and 45% respectively. Similarly, the wholesale retail sector has relatively high auto mobility estimate at 34%. However, the education sector only has auto mobility of 8%. For those with just GCSE level education or lower the estimated potential of automation is as high as 46% in the UK but this falls to only 12% for those with undergraduate degrees or higher. Thus, the research suggests that it is the working class and low level educated workers that are going to be most impacted by the unemployment that comes with automation, especially in the shorter term.



Source: PIAAC data, PwC analysis

The study also identifies 3 different waves of automation:

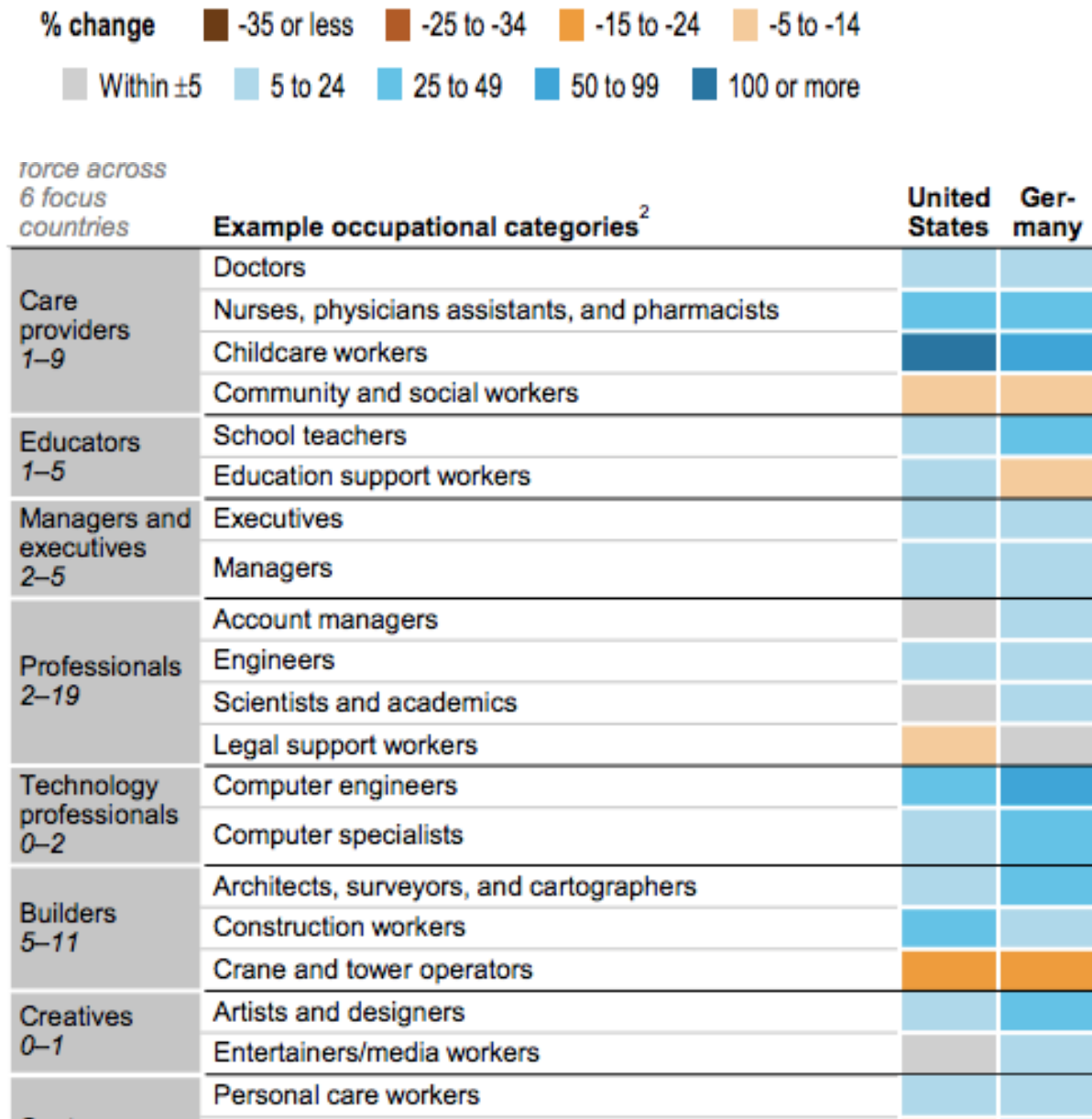
- 1) Algorithm wave: automation of simple computational tasks and analysis of structured data. This will affect areas like finance, information and communications, which is already happening.
- 2) Augmentation wave: focused on automation of repeatable tasks such as filling in forms, communicating and exchanging information through dynamic technological support and statistical analysis of unstructured data in semi controlled environments. Dynamic interaction with technology for clerical support and decision making. Also includes robotic tasks in semi controlled environments such as moving objects in warehouses.
- 3) Autonomy wave: automation of physical labour and manual dexterity and problem solving in dynamic real-world situations that requires responsive actions such as in transport and manufacturing

Thus, any jobs that have a significantly repetitive characteristic will be able to be automated. The report finds 30% of all jobs in the UK as susceptible to automation by 2030. This is not only a UK issue but expands to other developed economies such as America where the federal reserve characterised 44% of all jobs as routine and therefore at risk of being automated.

### **Effect by occupation**

The McKinsley Institute (December, 2017) focused their report on occupation rather than sector and found that those with the highest potential impact of automation on employment were physical ones in predictable environments as

well as collecting and processing data. They found that automation would have less effect on jobs which involved managing people, apply expertise and social interactions. Although their data did not look directly at the UK we can draw conclusions from those countries with similar economies.



Again, this research supports previous studies that it is those is lower skilled employment and with less education that are most at risk of losing their jobs to advances in automation. However, there is increasing risk across all occupations beyond the scope of these studies which are only projecting up until 2030.

Although the study predicts that demand for jobs will be there, there will be a process of these people switching occupational categories and having the right skills for these new jobs.

## **Measurement**

The study by PWC (2017) study was originally measured just across the UK, US, Germany and Japan but then was extended to over 200,000 workers across 29 countries. The larger sample size makes for more accurate estimates of relative auto-mobility of jobs in industry sectors and across different types of workers (by age, gender or education level). They are measuring the rate of change from previous studies such as Frey and Osborne (2013) that took data from the O\*Net and used standardise feature of an occupation and put them into a machine learning algorithm to generate a probability of computerisation. However, they only generate one predication per occupation. They also used a study from Arntz, Gregory and Zierahn (2016) that made a critical distinction between not whole occupations but particular tasks that are conducted as part of that occupation.

## **Type of change**

**Threat-** unemployment could yield greater inequality with its potential to disrupt labour markets. As automation if substituted for labour across the economy, the net replacement of workers by machines might increase the gap between returns to capital and returns to labour. Schwab (2016) argues that 'talent more than capital will represent the critical factor of production' which could lead to an increasingly segregated job market and increased social tensions.

**Opportunities-** the displacement of workers by technology may in aggregate result in a net increase in safe and rewarding jobs. In the long-term people, we could have a reduced working week and have more time to pursue leisure activities and celebrate craft skills. Individuals may find satisfying jobs as skilled gardeners, artists, cooks, small urban organic or bee keepers (Turner, 2018). This could improve overall human well-being as people will no longer have to do



meaningless jobs they don't enjoy. Moreover, reducing the working week could be part of our response to climate change as it would likely lead to a significant reduction in energy consumption and our overall carbon footprint (Snireck and Williams, 2013: 116).

## **Second order change**

**Increase in mental health issues-** There is also the potential for increase in mental health issues as work in Western capitalist societies often provides purpose, meaning, autonomy and fulfilment to people's lives. Although arguably many people doing so called 'bullshit jobs' (Graber, 2013) do not find real meaning in their lives through their occupations. Despite this when people are trying to find meaning in their lives work is frequently a placeholder for this project. Thus, being out of work is frequently associated with increased mental health issues and a study found that between 2000 and 2011 one in five of an estimated 223,000 suicides were linked to unemployment.

**Increased political extremism-** as people become unemployed often they look for other people to blame or look for other forms of meaning and community by joining radical groups.

## **Drivers**

### **Automation / advances in technology**

There is an increasing drive towards technological advancement to increase productivity. The White House states 'technological progress is the main driver of growth of GDP per capita allowing output to increase faster than labour and capital' (White House, 2016: 2). Developed countries are competitive with one another and are likely to be at the forefront of technological breakthroughs. So far technology has mostly benefitted the consumer who are now able to afford and access the digital world. Technology has increased standards of living and lifestyle efficiency. Activities such as contacting people on the other side of the world, booking flights to the other side of the world, listening to huge range of

music and accessing vast amounts of information can be done so quickly and effectively. For this reason, it appears unlikely that developed countries will stop trying to improve and advance technologies. This means that we must respond to the pressures and impacts of the state variable, rather than the driver, as automation is not inherently problematic and could be an opportunity for social progress.

However now it appears that technological innovation is moving to a 'supply side miracle with long term gains in efficiency and productivity' (World Economic Forum, 2016). At the moment automation is most likely to replace lower skilled workers, putting downward pressure on their wages and increasing inequality (US Government, 2016). One factor to consider is the winner takes all nature of information technology markets. This means that only a few may come to dominate the market thus labour productivity increases wouldn't translate to higher wages. It will be important to implement the right policies and institutions to ensure this does not happen (US Government, 2016)

### **Sub driver**

#### **Population increases**

When looking at patterns in history the value of labour rose when the population fell dramatically after the black death (Dorling, 2013). The surplus population has already begun to put downward pressure on wages, especially the working class (Srineck and William, 2013: 98). It has also contributed to the 'the ongoing shift towards non-standard forms of employment which is associated with reduced worker benefits and welfare protection' (UN, 2017: 14). Thus, response to population matters are also to be considered in the rise of unemployment.

### **Impacts**

#### **Threats**

#### **Increasing job insecurity**

Already there has been a move towards a gig economy that is associated with a flexible labour force that have little protection and rights. Thus, workers are increasingly subject to exploitation which will lead to reduced overall well-being.

### **Polarisation of jobs**

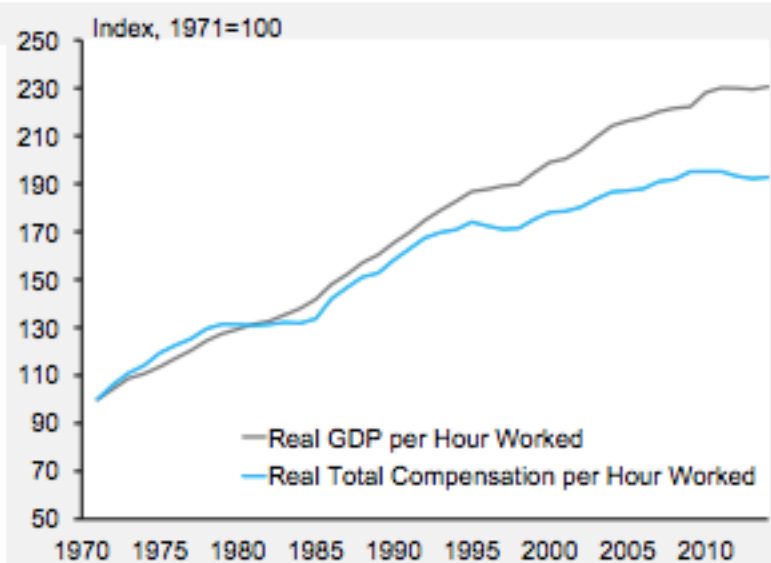
There is general trend that fewer jobs will be required in the new economy and those jobs available will require increasingly specialised skills (Harris, 2018).

### **Growing inequality**

The benefits of technological developments have not been shared. Many countries have witness a decline in labours share of GDP. According to a recent estimate the three leading companies of Silicon Valley employed some 137,000 workers in 2014 with a combined market capitalisation of \$1.09 trillion. By contrast in 1990 the three largest companies in Detroit has a market capitalisation of \$36 billion and employed about 1.2 million workers. Thus, the wealth that is being created in technology is only for few highly skilled workers while lower skilled workers face severe threats of unemployment. Especially as the strength of trade unions has been eroded there is little protection for those in vulnerable working conditions.

A study by Citi economics (2015) weighted average estimate of the so-called productivity gap for 16 advanced economies. It shows how the advanced world as a whole has seen productivity decouple from the compensation paid to workers. The graph implies that over time a greater fraction of output produced per hour worked in the advanced world has gone to

**Figure 4. Advanced economy average productivity gap**



Source: European Commission, Citi Research

property owners in the forms of profits rather than workers in the form of compensation. Erik Brynjolfsson and Andrew McAfee (2014) argue that the reason why wages have failed to keep up with productivity is because ordinary workers are unable to adapt to an ever-increasing pace of technological change.

### **Crisis of capitalism**

Srnicek and Williams (2015) argue that rapid automation, expanding surplus population and the continued imposition of austerity will lead to a new crisis of capitalism. This crisis could mean that work collapses as a disciplinary measure holding society together. It may manifest itself as not only in unemployment figures, but also increased precarity and jobless recoveries.

### **Responses**

#### **Response 1: Government Investment in new technology and AI**

This response addresses the driver in the situation as if care is taken to responsibly develop AI then advances in AI technology hold significant potential for innovation that could benefit citizens. Moreover, the idea of technology destroying jobs is synonymous with advancements in material progress. For example, technology that finds new efficiencies in the medical sector will bring down the cost of medical care for future generations. Therefore, government investment is crucial. Unemployment in certain sectors that results because of this is not something to prevent by stopping the driver but ensuring that technology develops in a way that its benefits can be shared by all citizens and not just a minority of elite tech companies.

#### **Response 2: Education**

This strategy addresses the impacts of job insecurity and growing inequality for future generations. Delivering this training and education will require a lot of investment and research to gauge where the jobs for the future are and what skills future workers need. As the last industrial revolution replaced physical strength, the government's response was to invest more in people's intellectual strength. However, this industrial revolution will be replacing both. The core

cognitive competencies such as maths, reading and writing that are the focal point of our education systems need to be accompanied with skills on how to be creative. Another skill that The Bank of England's chief economist Andy Haldane states that the highly skilled and highly paid jobs of the future may involve more EQ (emotional intelligence) than IQ (O'Connor, 2016). However, this education needs to start now to ensure that the next generation are prepared for the future of work.

### **Response 3: Strengthen trade unions**

As job insecurity increases, trade unions are needed more than ever to protect workers in the insecure job market where inequality is increasing and workers' rights are declining. The strengthening of trade unions should be a solution to the pressure of unemployment we will continue to see. Trade unions must adapt their organisational structure to the new gig economy. John Harris (2018) argues that the unions system of membership as full time and part time is now redundant in the labour market. He discusses the idea of a new individual lifetime membership that instantly adapts to people moving in and out of jobs.

### **Response 4: Universal Basic Income (UBI)**

A potential response could be Universal Basic Income which would involve giving every citizen a liveable amount of money without any means testing. By introducing a UBI that is a sufficient amount of money to live on this would address the impact of workers jobs insecurity and increasing exploitation. A UBI changes the condition of the workers and ensures that they could not be coerced into in work poverty. This would give some power back to workers as they could reject jobs that pay too little, required too much work, offered to few benefits or were demeaning. This would then mean that hazardous and unattractive work would be better paid while invigorating and attractive work would be less well paid. Moreover, as wages for the worse jobs rose there would be incentive to automate them. This would create a positive feedback loop where the nature of work would become a measure of its value not its profitability. A UBI would also recognise the unpaid labour of most domestic work (Srnicek and Williams, 2013). UBI could reach the bottom income families and households that would improve their quality of life immediately. The government could get this done effectively and far easier than it could trying to

re-educate those who have found themselves unemployed. Andrew Yang, who is running to be president of America in 2022 and founder of Venture for America, is advocating for a UBI that would put individuals below the poverty line. Thus, it is not a work replacement but a supplement and mobility enhancer. Yang (2018) also argues that this response could also address the issue of rising mental health issues as if you have a consistent income coming through then you would be able to start thinking about what you want to invest that money into or the business/ organisation you might start. However, he recognises that UBI is only part of the solution and there would need to be a cultural shift in what we find meaningful in life to avoid an increase in mental health issues.

### **Response 6: Reduced working week**

Another response that could address the pressure of the loss of jobs in certain sectors is a reduced working week. The New Economics Foundation argues that this would help alleviate unemployment in the sectors that are going to suffer the most from advances in automation as a shorter working week would help to redistribute paid and unpaid time more evenly across the population. It would also help avoid the impact of increased mental health issues and inequality as it could reduce stress levels and help us make the cultural shift away from 'living to work, working to earn and earning to consume' (New Economics Foundation, 2014).

### **West of England Combined Authority Plans**

Last year Theresa May announced UK's Industrial Strategy, which is 'a long-term plan to boost the productivity and earning power of people throughout the UK' (HM Government, 2017). The Industrial Strategy's aim is to prepare against the four grand challenges of the future. These challenges were identified as artificial intelligence, ageing society, clean growth and future of mobility. A key part of the response to these challenges is 'to help businesses create high quality, well paid jobs across the country' (HM Government, 2017). As a result of this the West of England Combined Authority (WECA) was established in February 2017 and is receiving devolution funding to address the challenges in the South West.

The WECA identified that there are areas of deprivation, unemployment and in work poverty in the South West that are masked by headlines of a highly skilled workforce in technology and engineering. A part of the solution to those in in work poverty has been the Future Bright Programme which will 'boost skills and opportunities for up to 3,000 adults' (West of England Combined Authority, 2016) across the South West. This is a two-year employment and skills programme to ensure that those who have become entrenched in insecure and low paid work get into more secure, more meaningful and better paid careers. The service mainly involves improving skills but works more closely with individuals to balance priorities and overcome personal barriers. The latter I believe to be the most promising part of the service. It is difficult to see that reskilling adults, who have been employed in low skill sectors for a long time, will put them into long term secure employment. The biggest growth sectors in the West will require more specialised skills and the retraining burden of those in low skill jobs to jobs into the biggest growth areas i.e advanced engineering and aerospace creative, seems unrealistic. Moreover, the data around the efficiency of government funded adult retraining programmes ranges between 0% and 37% in independent studies (Yang, 2018). The scheme states that it will work with employers, housing associations and registered social landlords but there is no mention of working with trade unions. The recent successes of some trade unions in securing those who work in the gig economy rights (Roberts, 2018, Hinsliff, 2018) is a positive sign that they are still a powerful institution in securing better conditions for workers. For example, The Independent Workers Union of Great Britain secured improvements in pensions, holiday and sick pay for cleaners at the University of London and a pay rise averaging 25% for bike couriers in five work places across London (Harris, 2018). Supporting trade unions, and encouraging individuals to become members of them should be part of WECA's solution. Although it would only be part of the solution, as work becomes increasingly short term and freelance, it would help provide longer term protection and personal security in the fast changing face of the labour market.

The WECA has also identified a skills shortage in construction in the South West and are investing £6 million for boosting construction skills at City of Bristol College. This may provide a short-term solution to unemployment, as there are many construction upcoming opportunities in the South West (Clensey, 2017). However, according to recent data, construction is to be relatively susceptible

to automation by 2030. This could potentially disrupt the employment opportunities that the youth are being trained for. Although there is conflicting data around this a study by Nesta (2018) found that there was pockets of opportunity in agriculture, skilled trades and construction. If construction jobs could be automated then government may choose not to implement these new technologies in order to save construction jobs. However, this is not an ideal situation and to avoid a scenario where workers are doing jobs that could be automated in order to 'find things to do', we should take the increased productivity of technologies as increased leisure time. To ensure this happens we should start advocating now for investment in these new technologies as well as a reduced working week. If we try to save low productivity, low paid and zero-sum jobs we will have a society that continues to spend their lives working without gaining any aggregate increase in human welfare (Turner, 2017).

It is positive that the increasing inequality if the job market is being recognised by central government and they are investing into preventing further polarisation. The West of England Combined authority has the opportunity to provide the most vulnerable workers with increased security and equip them for the changing nature of work. It may be that the reskilling of the workers on Future Bright provide them with flexible skills that will adapt to the job market. Moreover, the estimated automation for the construction sector could be further away than current data predicts meaning we will still need a significant supply construction workers by 2030. I believe it would be a constructive and effective step for WECA to involve trade unions in the protection against unemployment and in work poverty. However, considering the hostility of the Conservative party towards trade unions it is unlikely that Tim Bowles, conservative and chair of the WECA, will incorporate them into the solution for the challenges the labour force in the South West faces.

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