Digital Development Summit 2017
The Future of Work

Background Paper

The Digital Development Summit 2017 is hosted by the Institute of Development Studies in collaboration with the World Wide Web Foundation and Nesta with the support of the UK Department for International Development and the ESRC-DFID Impact Initiative.

For more information about the Summit visit www.ids.ac.uk/DigiDevSummit2017

“alongside great benefits, every technological revolution mercilessly destroys jobs and livelihoods – and therefore identities – well before new ones emerge.”

Mark Carney, Governor of the Bank of England,
cited in Allen (2016)

“Seizing the future in the digital revolution is not chance or fate — it is a matter of skill and foresight.”

(UNDP, 2015:9)

1 Introduction

- **How do we ensure no one is left behind in a rapidly digitising world?**
- **The Digital Development Summit 2017 is an opportunity to collectively envision how technology might be used to enable fairer wealth distribution and more sustainable livelihoods.**

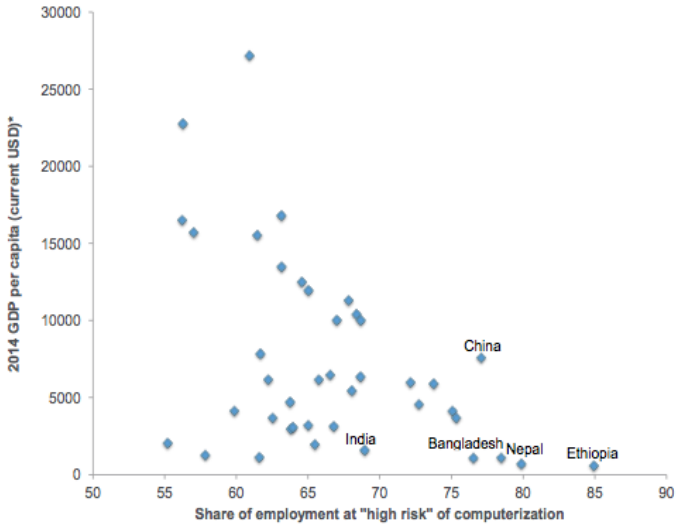
The impact of automation and technology on the world of work has received widespread news coverage in recent months. Advances in machine learning and artificial intelligence are enabling headline-grabbing technology such as self-driving trucks, but work is also being transformed in a multiplicity of ways by improvements in efficiency, and by enabling faster and deeper levels of globalisation. While the tone of media coverage varies from enthusiastic to doom-laden, there is agreement that significant and urgent changes are needed at many levels including:

- How businesses create and sustain jobs;
- How governments enable and support decent work; and
- The choices that people make in their working lives.

But governments, businesses and global institutions are not prepared for the impact of automation and digitisation. Labour market policies and training systems in most countries are not prepared for large-scale, rapid changes, and policymakers are not putting in place anticipatory and adaptive measures to cope with the impact of digital shocks and stresses.

These challenges are potentially even greater for developing countries, which will be hit hard by digitisation and automation. Data from the World Bank show that susceptibility to automation is negatively correlated with gross domestic product (GDP) per capita: the poorer the country, the more susceptible it is (see Figure 1).

Figure 1 Susceptibility to automation



Note: For Angola and Malta 2013 GDP per capita figures were used, Citi Research

Source: World Bank Development Report 2016; World Bank national accounts data (cited in Frey et al. *2016)*

While the widely cited figure that 47 per cent of jobs in the United States (US) are at risk of automation (Frey and Osborne 2017) has grabbed the headlines, prospects for people in lower-income countries are much worse (Frey *et al*. 2016). Reflecting the marked persistence of gender gaps in labour markets in emerging economies (OECD 2016) it is

clear that these losses will not be experienced equally by men and women. Men stand to gain one job for every three jobs lost to technology advances, while women are expected to gain one job for every five or more jobs lost (Amerasinghe 2016).

Yet this issue has not received in-depth consideration by the international development community, despite the fact that most people's working lives will be fundamentally changed either by direct automation or the indirect impacts of digitisation. Although Goal 8 in the recently agreed Sustainable Development Goals (SDGs), 'full and productive employment and decent work for all' cannot be achieved without considering the risks and benefits of digital technology, there has been an absence of debate on what digitisation means from the perspective of human development in low- and middle-income countries and on peoples' capabilities to live lives that they value, rather than from the perspective of impacts on market economics.

Too often trajectories of the future of work are treated as a pre-determined scenario in which technology decides the fate of millions of workers. Yet these are issues of politics and policy, as an editorial in *The New York Times* recently noted, 'the problem with automation isn't robots; it's politicians, who have failed for decades to support policies that let workers share the wealth from technology-led growth' (New York Times 2017). Yet we have a choice. We can create anticipatory social dialogue to co-determine the basis on which new technologies are adopted alongside any adaptive measures and mitigating strategies.

The Institute of Development Studies' (IDS), supported by the the ESRC–DFID Impact Initiative,[1] together with the World Wide Web Foundation and Nesta, are convening the inaugural Digital Development Summit to focus on these issues and kick-start dialogue. Our vision is that this event will launch a process of consensus-building and collective effort on how the international community – spanning governments, private sector, labour organisations, civil society and researchers – should be responding to these challenges. We also aim to contribute to a research agenda that can offer 'new conceptualisations and new theorisations' to have maximum impact in 'informing the alleviation of mid-21st century poverty and inequality' (Fairhead *et al.* 2014).

This paper starts by considering the big picture, looking at current global challenges in the world of work and historical antecedents. It then focuses on the response in international development policy and research, using research funded through the Economic and Social Research Council–Department for International Development (ESRC–DFID) Joint Fund for Poverty Alleviation Programme project to understand the impact of digitisation both directly and indirectly on employment. The paper considers what this means for people's working lives in the next five years by looking at the impact of digitisation on the lives of five groups of workers in developing countries, from call centre workers to waste pickers. Looking at the experiences of these groups allows us to understand how digitisation might impact on and shape their working lives. Finally, it explores various adaptive measures that might redress the potential negative impacts of digitisation and enable new paths for the direction and use of technology to benefit humanity.

[1] This project has received support from the Impact Initiative, which aims to increase the uptake and impact of research from two major research programmes, jointly funded by the Economic and Social Research Council (ESRC) and the Department for International Development (DFID): the Joint Fund for Poverty Alleviation Research and the Raising Learning Outcomes in Education Systems Research Programme.

2 Digitisation and jobs: a historical perspective

- **The history and current trajectories of technological displacement of jobs: is this time different?**

It is undeniable that technological advances in recent decades have brought tremendous benefits, including the automation of mundane, dangerous and repetitive work. Positive visions of automation include the 'real prospect of no longer having to work long hours in boring, repetitive and physically debilitating jobs to meet basic needs' (Coppola 2014). The knock-on effects include more time and opportunities to enjoy at leisure or dedicate to social causes. Digital technologies also offer the possibility of collectively owned, democratically governed grass-roots models of economic organisation. These are often considered under the framework of the Platform Cooperativism movement (Zarkadakis 2016); such platforms provide cooperatively owned alternatives to digitally-enabled 'gig economy' platforms, such as web-enabled taxi business Uber, and provide a range of services from childcare (Quart 2016) to stock photography.

It is important to view current global trends in their historical context, as each industrial revolution and its accompanying era of automation have led to predictions of dystopian – or utopian – jobless futures. Economist John Maynard Keynes warned in the 1930s of technological unemployment or 'unemployment due to our discovery of means of economising the use of labour outrunning the pace at which we can find new uses for labour' (1933). But the first half of the twentieth century also saw imagined utopian futures inspired by the potential of new technology, offering fully automated economies and mass economic democracy (Srnicek and Williams 2015).

Although these issues are not new, there are ongoing debates between future-of-work optimists and pessimists over whether it will be different this time. After past displacements, society was able to create new work opportunities that were previously unimaginable. For example, before the start of the Industrial Revolution in the eighteenth centure, about 80 per cent of the world's population worked in agriculture. Today only about 33 per cent of the global population identify themselves as farmers and the rate is as low as 2 per cent in developed countries (World Bank 2016). Nevertheless, the pessimists argue that the situation is different now. For them, during the first wave of the Industrial Revolution in the late eighteenth century and the second wave in the late nineteenth century, technological displacement mostly affected one or a few sectors – such as agriculture during the first wave – and was accompanied by the creation of new industries and jobs. This time, however, technological advancements are permeating all sectors and not creating any new jobs. Furthermore, even the new jobs created by digital technologies are themselves susceptible to automation.

There is disagreement on the magnitude of employment displacement technology causes, with conflict between measurements of task- or employment-based calculations, and pessimistic or optimistic readings of possible trajectories (Roosevelt Institute 2015; Arntz *et al*. 2016). Analysis by the Organisation for Economic Co-operation and Development (OECD) (Arntz *et al*. 2016) found that only 9 per cent of employment could be automated, compared with the 47 per cent figure mentioned above in relation to US jobs. Measuring the degree of job displacement is a challenge in economies where large numbers of people are classified as being outside the labour force, despite being willing to work. Globally, two billion people are classified as outside the labour force, many of whom want to work. About two-thirds of these people are women, with a disproportionately high share in the Asia-Pacific region, especially in India and China, and in lower middle-income countries (Gelb and Khan 2016). Given that we have scant data about these people they are not mentioned and factored into debates.

As a result of automation, machines/robots are increasingly performing tasks from welding to working as shop floor assistants. As manufacturing becomes less labour-intensive, workers are generally less valuable to firms. In the US the lowest-paid jobs are under threat: 83 per cent of jobs offering less than $20 per hour are likely to come under pressure from automation (Furman 2016). Yet research shows that people tend to be overly optimistic about their own prospects. There is a degree of acceptance that, overall, jobs are becoming automated, but people's perception is that it will not affect them because no machine could do their job (Sparshott 2016).

As the price of computing power has dropped, the middle class has been 'hollowed out' with the loss of middle-skill, middle-wage positions that consisted of easily automatable routine tasks and complemented abstract, creative, problem-solving, and coordination tasks highly educated workers performed (Roosevelt Institute 2015). In turn, low-skill workers have moved to service occupations, which are difficult to automate because they rely heavily on dexterity, flexible interpersonal communication and direct physical proximity (Autor and Dorn 2013: 1590). Moreover, gender inequality is likely to increase as women typically have lower levels of digital skills and there is a significant gender gap in terms of women's access to digital tools. Globally, women are on average 14 per cent less likely to own a mobile phone than men (GSMA 2015). Research by the World Wide Web Foundation shows that poor urban women are about 50 per cent less likely to have access to the internet than men in the same age group with similar levels of education and household income (Web Foundation 2015).

Computers can even do skilled research work, such as legal casework, using deep learning algorithms (Moore 2016). Analysis of cancer patients medical records and identificaiton of evidence based treatment options can be done by systems such as IBM's Watson, which can draw on big data sets from patient records and clinical trials, as well as large volumes of text from medical journals. Such efforts underpin calls for the threat of *automation* to be reframed as an opportunity for *augmentation* through technology. However, it is increasingly clear that such opportunities are only available for certain kinds of roles – and arguably individuals – at the present time (Davenport and Kirby 2015). Strategies for augmentation are likely to be most accessible to individuals with high levels of in-demand skills, expertise and/or educational attainment.

Digital technological innovations have enabled and facilitated accelerating globalisation over the past 20 years and radically reduced the cost of moving ideas. This has enabled workers in developing countries to displace middle-skill manufacturing and back- and low-end service jobs in developed countries at unprecedented rates and volumes. Digital technologies are now allowing firms to outsource an ever-greater proportion of their production so that the 'contours of industrial competitiveness are now increasingly defined by the outlines of international production networks rather than the boundaries of nations' (Baldwin 2016). It has also allowed smaller firms to have a wider reach: the World Bank's World Development Report on Digital Dividends showed how firms on platforms such as Alibaba, China's leading e-commerce company, are smaller and younger and export more products to different destinations than firms selling offline (World Bank 2016).

As well as existing technologies, such as email and data optimisation, such efforts are increasingly using new technologies. Blockchain technology (the distributed ledger technology underpinning bitcoin), for example, is being used to revolutionise marine-based global supply chains by providing a permanent visible record of data, which was previously trapped in cumbersome legacy systems, to port officials, shippers and cargo owners (Marine Transport International 2016).

However, just as globalisation and digital technology once off-shored jobs to developing countries with low wages, it is feared that new technologies are making development driven

by foreign direct investment unattainable. The advent of 3D printing and increased robotisation in factories means that it is becoming more economical to produce goods with fewer employees closer to end-markets than in places with low wages and many employees.

3 Impact on developing countries

- **Exploring the impact of digitisation on employment in developing countries: no path to prosperity through export-led manufacturing growth?**
- **Women are at greater risk from automation and digitisation.**

Given these developments, what are the prospects for developing countries? The United Nations Industrial Development Organization's *Industrial Development Report 2016* strikes a positive note, suggesting that 'radical innovations' in technology could have positive economic impacts in developing countries, and that automation of knowledge work could generate approximately $1 trillion–$1.3 trillion per year (United Nations Industrial Development Organization 2015). But research elsewhere shows that as many as 85 per cent of jobs in Ethiopia and a substantial share of the workforce in countries such as China (77%), India (69%), Thailand (72%), and Nigeria (65%) are susceptible to automation (Frey *et al*. 2016). Jobs are particularly at risk of automation in countries that have relied economically on low-cost, export-oriented manufacturing.

A recent International Labour Organization (ILO) report found that 56 per cent of the total workforce in Cambodia, the Philippines, Vietnam, Thailand and Indonesia are at risk of being displaced by robots, with workers in the garment manufacturing industry being especially vulnerable. According to the report, 'the price advantage associated with mass production in low-cost, export-oriented regions like ASEAN will be challenged by increasingly affordable technologies'. However, this also illustrates how some already disadvantaged groups in society might be might be more negatively impacted by automation: in five ASEAN countries more than 70 per cent of workers in the textile, clothing and footwear industries are women (Chang *et al*. 2016). As these technologies are becoming increasingly affordable, the payback period for hiring robots is also decreasing rapidly, making them ever more lucrative investments (Frey *et al*., 2016).

Globalisation enabled by information technology enabled firms to move labour-intensive work to developing countries, propelling some Asian countries into growth with wide-ranging economic and social consequences. However, because of automation this path to growth might not now be available. Some economists have interpreted this as the potential cause of 'premature' deindustrialisation, as the employment share of manufacturing is arguably declining in low- and middle-income countries. This means that low-income countries will not be able to achieve rapid growth through job creation, with these trends towards deindustrialisation taking hold across the developing economies of Latin America, sub-Saharan Africa and most of Asia, 'leaving most of the world's urban proletariat dispossessed of its agricultural livelihood and without the opportunity to be hired for manufacturing jobs' (Srnicek and Williams 2015).

Despite growing Chinese investment in Africa there are few signs of a significant resurgence in industry (Rodrik 2016). An analysis of employment patterns in a broad cross-section of developing economies found a shift away from high-productivity manufacturing activities in Latin America and Africa. This has meant that structural change has ended up reducing growth in these countries in recent decades (McMillan and Rodrik 2011). In light of this, the SDG target 8.1 – 'Sustain per capita economic growth in accordance with national circumstances and, in particular, at least 7 per cent gross domestic product growth per annum in the least developed countries' (United Nations 2017) – seems unattainable.

The broader global economic picture has seen increases in inequalities: in the aftermath of the 2008 economic crisis, the resulting economic and social aftershocks have seriously

affected disadvantaged groups such as women and young people. Various factors could explain this trend, including skill-biased technological change and an expanding global labour force, as well as heightened capital mobility. Yet policy choices have also played a role. The Long Run History of Economic Inequality,[2] economist Thomas Piketty's ESRC–DFID Joint Fund for Poverty Alleviation Research programme, grabbed the headlines as it showed that the total annual income received by the top 1 per cent of families increased 135 per cent during the period 1980–2007 in the US and the United Kingdom. This research also demonstrated marked differences in continental Europe and Japan: 'the fact that high-income countries with similar technological and productivity developments have gone through different patterns of income inequality at the very top supports the view that institutional and policy differences play a key role in these transformations' (Alvaredo *et al*., 2013: 5).

When low levels of inflation and labour market flexibility are given priority over job creation and decent wages, growing inequality is an almost inevitable outcome. A recent UNCTAD report on robots and industrialisation emphasised the importance of job creation: 'In many developing countries, in particular where the labour force is expanding rapidly, especially in urban areas, job creation remains the only assured way of tackling poverty on a sustained basis' (UNCTAD 2015). This will continue to pose risks for developing countries. Overall it seems likely that developing countries face even greater risks than more developed ones because of the likely loss of existing cost advantages in manufacturing, which means that export-led manufacturing growth as a path to prosperity is no longer a clear possibility for many countries.

4 Response from development policy and research

- **Critical issues for policymakers, practitioners and researchers.**
- **ESRC–DFID research on direct and indirect impacts of digitisation.**

Work on development policy and research looking at the impact of digitisation and automation has been fragmented. The Digital Development Summit 2017 presents an opportunity to convene key actors in this space, learn from existing research and explore policy options that are relevant for the developing world. This section highlights some of the important policy initiatives multilateral organisations have undertaken. It then looks at examples of empirical research work on these issues, funded through the ESRC–DFID Joint Fund for Poverty Alleviation Research and the Raising Learning Outcomes in Education Systems Research Programme, which aims to have 'far ranging and diverse impacts on the research community, on policymakers and practitioners, and on the lives of poor people in some of the world's poorest countries' (ESRC 2014).

The policy response in the development context has indicated the urgency of addressing this issue. Two of the last four World Development Reports – the World Bank's flagship annual publication – focused on 'Digital Dividends' (2016) and 'Jobs' (2013). On jobs, the Bank President Jim Yong Kim's foreword notes that:

> The problem for most poor people in these [developing] countries is not the lack of a job or too few hours of work; many hold more than one job and work long hours. Yet, too often, they are not earning enough to secure a better future for themselves and their children, and at times they are working in unsafe conditions and without the protection of their basic rights. (World Bank 2013: xiii)

[2] www.theimpactinitiative.net/project/long-run-history-economic-inequality

On digital dividends, the foreword warns that:

> The Report concludes that the full benefits of the information and communications transformation will not be realized unless countries continue to improve their business climate, invest in people's education and health, and promote good governance … competitive business environments, increase[d] accountability, and upgrade[d] education and skills-development systems [are needed] to prepare people for the jobs of the future. (World Bank 2016: xiii)

In 2015, the Roosevelt Institute and Open Society Foundation warned of the need for policymakers to 'develop tools and institutions to support an increasingly insecure workforce'. They argued for an intersectional approach to understanding the impact of digitisation that looks at how working-class and ethnic-minority communities might be disproportionately affected (Roosevelt Institute 2015). The ILO Future of Work Centenary Initiative[3] focuses on these issues through a high-level commission and the 108th Session (2019) of the International Labour Conference. The ILO's Decent Work Agenda,[4] which was reinforced by the UN's 2030 Agenda for Sustainable Development's Goal 8: Decent Work and Economic Growth,[5] calls for the promotion of sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. Other programmes include the $100m Rockefeller Foundation digital jobs programme,[6] headed by summit speaker Mamadou Biteye, which aims to connect Africa's rapidly growing youth population with sustainable employment opportunities.

These efforts by the international community on a macro-scale show us the broad-ranging issues and trajectories, but empirical research enables us to understand the human impacts of digitisation on communities and individuals around the world. Three projects funded through the ESRC–DFID Joint Fund for Poverty Alleviation Research programme show the value of research in disentangling the hype from the reality of digital development, and grounding our understanding of the impacts of digitisation on development outcomes and peoples' capabilities to live lives they value. This research offers critical insights and reality checks on the different ways in which digitisation has the potential to impact on employment by promoting economic growth, by providing opportunities for new youth employment, and enabling globalisation and outsourcing. The research cited in Box 1 also highlights the indirect impacts of globalisation, in this instance on the poor working conditions women experience in textile factories in India.

The women working in these garment factories are clearly not experiencing the sustainable or decent conditions the architects of the SDGs envisaged, but this in itself shows the value of such empirical work. This research illuminates the lived experiences of these women workers, showing that while they might be benefitting economically from this employment, they are still subject to abuse and 'patriarchal norms'.

This research can illuminate in a powerful way the range of impacts of digitisation on the working lives of individuals and communities in developing countries. But we need effective ways to systematically navigate the complex issue of how workforces in developing countries might respond to digital shocks and stresses and build mitigation and adaptation strategies.

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[3] www.ilo.org/global/topics/future-of-work/lang--en/index.htm
[4] www.ilo.org/global/topics/decent-work/
[5] www.globalgoals.org/global-goals/good-jobs-and-economic/
[6] www.rockefellerfoundation.org/our-work/initiatives/digital-jobs-africa/

Box 1 Researching the impact of digitisation

The Promises of Fibre-Optic Broadband: A Pipeline for Economic Development in East Africa by Digital Development Summit speaker Mark Graham responds to the ESRC's call for research that looks at the way digital technologies change the conditions by which economic growth translates into higher wages and better working conditions. This work analyses the 'Grand Visions' of the relationship between internet connectivity and economic growth and concludes that:

> […] many of those visions are hugely overblown. The current evidence base is mixed and inconclusive. We therefore need to ensure that we do more to ask the organisations and entities who produce Grand Visions to justify their claims, refusing that it is self-evident that ICTs will automatically bring about development. (Friederici *et al.* 2016)

The impact of mobile phones on young people's lives and life chances in sub-Saharan Africa by our second conference keynote speaker, Gina Porter, illuminates the realities of the impact of technology on young people's lives. Rather than seeing mobile technology as an automatic route to improving young people's life chances, this work highlights the negative impact of mobile phone use on young people in South Africa, especially in terms of the financial burden of such use:

> We are at a critical moment in the digital life of sub-Saharan Africa's youth: on the one hand, there is the prospect of enormous positive advances in education and associated improvement in young people's lives and life chances; on the other, the threat of wasted opportunity and damaged lives. There is an urgent need for action. (Porter *et al*. 2016)

Labour Conditions and the Working Poor in China and India, research that ESRC–DFID funded on sweatshop regimes in the garment industry in India, shows the degrading conditions in which women work. Proponents of globalisation celebrate outsourcing because, they argue, rather than produce goods expensively, it is much cheaper to import them. This is true for many economic sectors in the global North, of course, but the downside is that wages and working conditions in remaining jobs are subject to downward pressure:

> Supervisors are generally men, and many women workers report gender-based harassment as a key problem. Male supervisors often deploy abusive comments to discipline workers and remind them of production targets. Many may also engage in physical touching or degrading practices, such as appealing to sexual visual imagery when talking to their ‘subordinates’ on the shop floor. Indeed, the factory reproduces the same structures of oppression women often face in their private sphere. It epitomises the stretching of patriarchal norms across realms of production and reproduction, subjecting women to multiple masters. (Mezzadri 2016: 1889)

5 What does this mean for working lives around the world?

- **Exploring working lives to assess the impact of digital technologies in five very different groups of workers.**

The use of scenarios based on the working lives of communities around the world is a way to ground these abstract arguments and understand the impact on people's lived experiences, and also illuminate what interventions might make a difference to their lives. Using this kind of framework, it is possible to understand in a more systematic way the

different and changing vulnerabilities that workers might face, today and in the future. During the summit we plan to explore these scenarios in greater depth through group dialogue on 'How to build prosperity and resilience in the face of digital changes'.

We have drawn on research by the Overseas Development Institute (ODI), Practical Action, the ILO and others to show how five distinct worker groups in different contexts might experience technological change in the next five years. We have chosen these contexts to illustrate the breadth and variety of these impacts and the global reach of the challenges they represent, and to suggest trajectories and mitigation strategies that we explore in the next section. The scenarios will also be used during the summit so participants can collectively envision mitigation strategies.

Domestic workers in South Africa in the gig economy

Research by ODI looked in depth at the growing trend towards the 'Uberisation of domestic work', which is growing rapidly in developing countries. 'On-demand' platforms link households to domestic workers. They claim to offer rapidly accessible, cheap domestic services, and economic opportunities for domestic workers. There are an estimated 67 million domestic workers worldwide – 80 per cent of whom are women – who work in low-paid, insecure and exploitative conditions. The research showed that the on-demand domestic work industry is growing rapidly: companies in India are expanding by up to 60 per cent month on month, and in South Africa they are experiencing exponential growth. But the research found that that while the platforms offered workers some benefits, such as choice over when they work, the systems to rate and review workers 'reinforce unequal power relations and discriminatory structures' (Hunt and Machingura 2016). Such systems might also pose a threat to individuals through the erosion of workers' rights and full-time employment, and the disappearance of any health care and insurance benefits they may currently have access to. World Bank research shows that unions significantly increase wages and working conditions (Aidt and Tzannatos 2002), so the lack of effective workers' representation on gig economy platforms could pose a threat to individual wellbeing and wages.

Call centre agents in the Philippines

Approximately one million people in the Philippines are employed overall in the business process outsourcing (BPO) industry, delivering services such as back-office support, animation, software development and data transcription. Yet many of these jobs might soon be under threat from a range of technologies associated with 'agent-assisted automation' such as natural language processing technologies, which can now deal with long strings of words (Marr 2016). Some 89 per cent of salaried call centre staff in the Philippines BPO sector are at high risk from automation. In India, 640,000 low-skilled back office processing and IT support jobs are at risk (Fersht 2016). Since the early 2000s, India and the Philippines have benefitted from the BPO explosion, which was enabled by globalisation and digitisation. This sector has also been an area where women have had an opportunity for economic advancement, accounting for 59 per cent of the workforce (Chang *et al*. 2016).

Waste pickers in Nairobi

People working as waste pickers in Nairobi, Kenya, make use of affordable mobile phones and innovative software platforms to transform their working lives, pay bills and communicate with suppliers (Casey 2016). Waste picking is often seen as outdated and ineffective work, but research by global advocacy network Women in Informal Employment: Globalizing and Organizing (WIEGO) shows that waste pickers are, in fact, an integral part of the recycling value chain. When progressive laws have been passed that respect their agency, they have been able to organise and form unions and cooperatives. Forming these organisations has enabled municipal governments to negotiate with them and make formal agreements.

Microworkers in Kenya
Female 'microworkers' in Kenya working for 'impact sourcing' non-profit company Samasource carry out small digital processing tasks such as analysing images for a stock photo company. Microworkers in Kenya undertake routine digital tasks, through impact-sourcing mechanisms, which provide work to the unemployed. However this type of work can often now be performed by computers (Power 2015), leaving large swathes of people already in unpredictable work without a source of income. For example, content moderation used to be carried out manually but can now be done automatically. In 2016, Facebook's artificial intelligence systems reported more offensive photos than users did (Constine 2016). Workers in impact-sourcing companies typically earn in the region of $8 per day but lack security and social upgrading opportunities. Given the high likelihood of automation, it is possible that these young women will find themselves out of work in a country with a youth unemployment level of around 17.4 per cent (International Labour Organization 2016).

Truck drivers in the US
Long-haul freight delivery has been described as one of the most 'obvious and compelling areas for the application of autonomous and semi-autonomous driving technology', with possible savings of $70bn in labour costs (Shanker *et al*. 2013). The US depends heavily on trucks to move freight: 70 per cent of all the freight goes on trucks and around 3 million truck drivers and 8.7 million other people are employed in trucking-related jobs (American Trucking Associations 2016). Currently a truck driver earns approximately $40,000 per year, a higher income than 46 per cent of tax filers (Santens 2015).

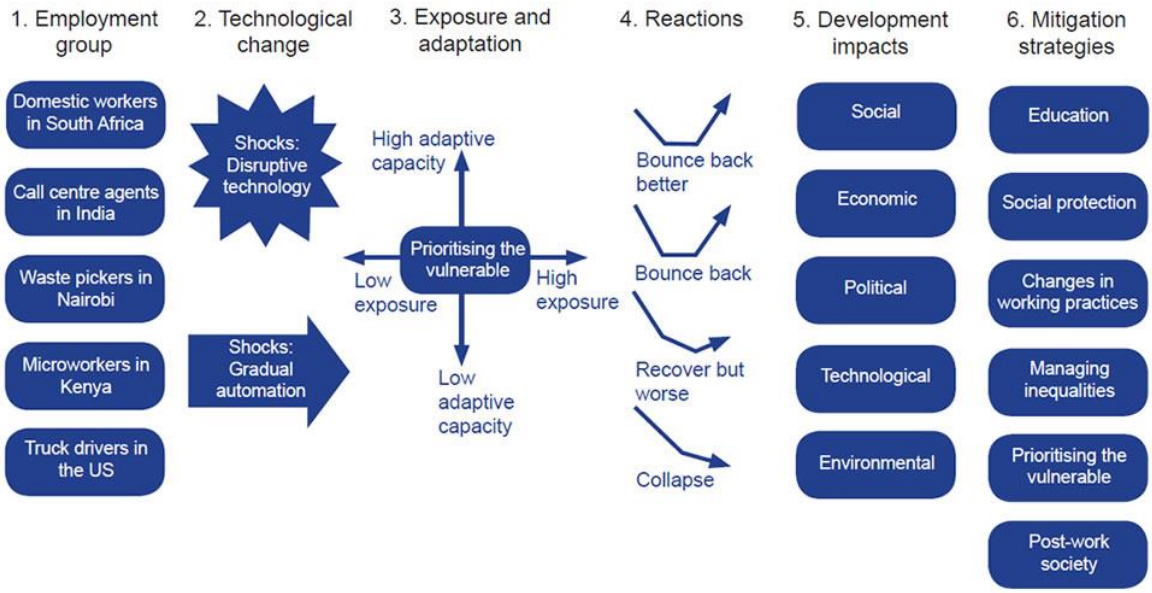
While automation will replace most of the workforce, some roles will probably be available for more highly skilled individuals who possess more technical qualifications. The remaining drivers are likely to see wages rise by 50 per cent and the higher level of training may lead to some form of unionisation.

5.1 Towards a resilient workforce? Adapting to the shocks and stresses of technological change

Interest is growing in building workforce resilience to technological change in the face of such uncertainty. The concept of 'resilience' has been widely used to describe the ability of a community or society to absorb disturbance and reorganise while undergoing change. It has been adopted in many fields from disaster management to conflict analysis, ecological management, financial stability and community development, to understand the processes by which different individuals, groups, communities and organisations anticipate, respond to and navigate different shocks and stresses – or do not (DFID 2011). For any technological shock or stress, a given individual, workforce, sector or industry, or even country, can be thought of as exhibiting different levels of *exposure* to specific changes. They can also be seen as having varying degrees of *adaptive capacity*, namely the capability to anticipate and adapt to new technological developments.

Applying resilience to the relationship between digital technology and employment deepens our understanding of the dynamic and diverse factors that mean that one individual or group might thrive while another might not (see Figure 2).

Figure 2 Exploring workforce resilience



We can see from the scenarios of working lives set out above that different groups face very different kinds of risks from the shocks and stresses of technological change. This can lead to a variety of outcomes or trajectories: bouncing back better, bouncing back, recovering but finding oneself in a worse situation, and collapse. By way of example, domestic workers might 'bounce back better' by organising using digital platforms to collectively bargain with employers for higher pay. Similarly, microworkers in Kenya might benefit from government funding for activities that promote women's engagement with the technology industry, such as the technical training programme run by non-profit organisation AkiraChix,[7] which targets young women from poor social and economic backgrounds in Nairobi.

6 Mitigation strategies: addressing the impacts

The responses described above do not only depend on an individual's ability to organise or get trained; they are political choices made by governments, private companies and policymakers. Tracing the potential reactions to disturbance of these different groups illuminates the ways that society can enhance individuals' and groups' adaptive capacity, mitigate risks and reduce exposure to them, and also deal with reactions through mechanisms such as innovations in social protection.

6.1 Education

The skills and digital literacy required to stay relevant in the job market are likely to change rapidly given the fast pace and broad reach of technological change and automation. Automation is making it less and less likely that workers will be able to do the same job for life. A shift to life-long learning may be needed for workers to remain relevant in the formal job market throughout their lives (World Bank 2016). Education systems may need to refocus on areas where humans are likely to retain a competitive advantage over technology. These include jobs that rely on interpersonal interaction such as nurturing and caring, persuasion, coaching, critical thinking, sales, ethics, creative jobs in research and entertainment, and jobs requiring physical dexterity – for example, electricians and plumbers

[7] http://akirachix.com/training-program/

– as well as developing the science and technology skills that allow humans and machines to augment each other (Singh and Montt 2016).

6.2 Social protection

Social protection includes a wide range of initiatives that transfer income or assets to the poor, protect the vulnerable against risks to their livelihoods, and enhance the social status and rights of the marginalised. This can cover welfare benefits, cash payments and grants. More recently there has been significant interest in universal basic income (UBI) as a form of social protection. This involves sufficient money being given unconditionally to every citizen regardless of work status, net worth or income, at a level to ensure the individual's basic subsistence. Such a policy instrument could help ensure that no citizens live below – or at least too far below – the poverty line.

UBI proponents suggest income security could lead to people spending more time on things they actually care about and improving society, and thus see an increase in creativity and innovation. It could also give people more time to become active, well-informed citizens, and be invested in further education or training. Different models for administering UBI have been proposed, from lump sums of money given at a certain age (e.g. when citizens turn 18 years old); to pre-determined amounts given annually, weekly or monthly to all citizens; natural resource profits shared equally among all residents; and aid-driven initiatives. How to make UBI work is likely to vary from context to context (see Box 2).

Just as increased unemployment due to a mass automation of jobs provides an incentive for UBI, the ILO (2017) projects that lack of decent employment opportunities and increasing inequality are likely to incentivise an increase in migration as people seek to improve their livelihoods. Much of the debate about UBI has been concerned with providing it to all citizens or legal residents. However, this could potentially leave out groups that are particularly vulnerable, including immigrants, refugees and displaced people.

6.3 Changes in working practices

Another option is to regulate working hours so that people have to work less and therefore more employees are needed to do the same job. Current models of the accepted working week came about as a result of hard-won battles by workers, as the demand for shorter hours was a key component of the early labour movement. During the Great Depression (1929–39) in the US, the working week declined by over 18 hours over a period of five years (Hunnicut 1988).

Rather than eight-hour workdays, the official workday could be changed to six hours. Another option would be to change the working week from five days to four. Such a policy measure could have positive implications for human health and productivity. Being overworked is associated with mental illness, high blood pressure and stroke (Campbell 2014; NHS 2015). Better employee health could translate into employees taking reduced numbers of sick days. Some businesses may dislike decreasing the number of working hours per employee because it could mean they have to hire more staff. However, the OECD (Luxton, 2016) found that working fewer hours correlates with increased productivity, meaning that under shorter working days businesses might benefit by having to pay for fewer sick days and from employees' increased output.

Box 2 Implementing a universal basic income

Pilots are currently being considered in a wide range of economic contexts. For example, in January 2016, Finland launched a universal basic income (UBI) pilot in which 2,000 unemployed people between 25 and 58 years old receive €560 per month for two years unconditionally, even if they find work.

In Namibia, a UBI pilot was implemented in 2008 in the Otjivero-Omitara settlement in which all residents who had been living in the settlement since 2007 received $100 per month unconditionally. Positive results quickly appeared. Just six months after the pilot's launch, the prevalence of underweight children dropped from 42 per cent to 17 per cent, and the number of parents paying school fees and buying uniforms increased by more than 100 per cent. School drop-out rates decreased from 30–40 per cent before the pilot to 5 per cent six months after the pilot began and to almost zero after a year.

Economic and poverty-related crime dropped by over 20 per cent and women reported feeling less pressure to engage in transactional sex (sexual relationships where the giving of gifts or services is an important factor). Moreover, income in the community increased by more than the size of the grants. Contrary to what UBI opponents have suggested, rather than becoming lazy, more people were working after the introduction of the grant and grantees were able to leverage their grants to earn more from economic activities. A later study found that one year after the pilot began the percentage of people involved in economic activity had risen from 44 per cent to 55 per cent. Moreover, there was no evidence showing that people receiving the grant were turning to addictive substances or behaviours (Basic Income Grant Coalition 2014 and 2008).

Funding for the Namibian UBI pilot was provided by the Evangelical Lutheran Church, but the project came to an end in in 2013 when funds dried up. The project restarted 11 months later in 2014 after receiving funding from another church. The Namibian experience shows that donation-based UBI is possible, but may face sustainability issues if donors are no longer willing or able to continue funding. Nonetheless, new donation-based schemes are currently in the pilot stage.

Give Directly is a donation-based UBI initiative running a long-term randomised control trial in Kenya, where everyone in 40 villages will receive money for 12 years; people in 80 other villages will receive the same amount for two years; 80 villages will receive a lump sum equivalent to the amount for two years; and a control group of 100 villages will receive nothing (Give Directly 2016). In Uganda, charity-based UBI pilot '8' aims to provide €8 a week to 50 households in a village located in the Fort Portal region (Eight 2016).

6.4 Managing inequalities in digitally enabled employment

New economic models of work such as the gig economy leverage the power of social networks and technology to promote new models of consumption, novel employment and income-generation opportunities, and radical models of economic development and growth. The advent of the gig economy has led to an erosion of the traditional employer–employee relationship where employers provide their employees' benefits.

We will have to think about ways of providing social protection for those in the gig economy. But this would require universal and portable benefits: available to all citizens regardless of the type of employment they are in and who could take them with them from job to job (World Economic Forum 2015). However, portable benefits may not offer sufficient protection to gig economy workers if machines replace the jobs they currently perform on digital platforms as well. For example, benefits may be of no use to Uber drivers replaced by autonomous vehicles. Moreover, workers in the gig economy seldom receive the training

and support that workers in traditional employment have access to. Failure to put people working in the gig economy on an equal footing with traditional employees may lead to a two-tier employment system, further increasing inequality (*ibid*.).

6.5 Prioritising the vulnerable

Inclusion and reducing inequality in a future where work is increasingly automated will require prioritising the vulnerable. A study in the US found that Hispanics, African Americans, and women hold only 8 per cent, 7.4 per cent and 36 per cent of tech sector jobs respectively (US EEOC 2016). The same trend seems to hold globally, even in online outsourcing workplaces, which are being touted as an opportunity for developing countries. Those taking up online outsourcing opportunities are more likely to be young men, and who are well educated because much of the demand for online outsourcing comes from English-speaking countries (Kuek *et al.* 2015).

Digital divides generally mirror broader structural inequalities. People who live in poorer countries and rural areas, or belong to marginalised groups, including women and the elderly, are on average less likely to be online or make use of advanced technology (Ramalingam and Hernandez 2016). Creating education opportunities for society at large to keep pace with technological change may not be enough. Such opportunities are generally taken up by those with identities that already make them likely to be digitally aligned (white, upper-class, male, young). Policy measures that target groups that are less likely to have the experience and digital literacy necessary to augment automation will be needed to ensure these groups are not left behind. This will require reversing current trends.

ITU (2016) found that the global digital gender gap between men and women's access to the internet continues to widen, growing from 11 per cent in 2013 to 12 per cent in 2016. Moreover, the World Wide Web Foundation (2016) found that as people get older, the digital gender gap increases substantially. For people over the age of 75, there is a 45.8 per cent difference beween the number of men and women online globally. This shows that people's probability of being online is likely to be shaped not by one but multiple identities; for example, an poor older woman in a rural area from a marginalised community. The World Bank suggests a range of mitigation strategies to address the risks technology poses to women's jobs, including addressing the gender wage gap, promoting women's entrepreneurship, and implementing a comprehensive framework to achieve harmonisation of work and family responsibilities and changing attitudes towards unpaid care work (Amerasinghe 2016).

Much of the debate on the future of jobs has also focused on the formal sector, with little attention paid to the two billion working-age adults classified as being outside of the workforce. Some 82 per cent of South Asians, 65 per cent of sub-Saharan Africans, 65 per cent of people in East and Southeast Asia, and 51 per cent of people in Latin America work in the informal economy, yet no attention is paid to how automation affects their livelihoods (Bonner *et al.* 2013).

6.6 A post-work society?

None of these policies in isolation will be likely to tackle the potential inequality and social ills that may arise from accelerating automation. A combination of some of these and other policies may be needed. We may be on the verge of a 'post-work society' in which the advantage of having humans performing tasks becomes less and less clear. Whether this will mean an abundance of leisure time and the end of drudgery, or masses of poor people struggling to get by and a few rich people who own or augment the machines that replace humans, or something in between, will depend on how we react to current and future trends.

We may have to begin looking into concepts that previously sounded outlandish for fresh ideas to make the best of the situation. For example, 'fully automated luxury communism'

(FALC) suggests we fully embrace automation while giving everyone in society common ownership over everything that is automated (Merchant 2015). In a FALC society almost all work would be automated, everyone would receive an equal universal income, and the little work that humans still did would be organised in non-hierarchal and decentralised models similar to Wikipedia.

More broadly it is important to discuss mitigation strategies as part of a broader social discourse on a managed transition to decent work, rather than as individual policy measures that can be applied in a sticking-plaster fashion. Nordic countries, for example, have used a range of technology assessment processes (Schot and Rip 1997) to enable anticipatory social dialogue to co-determine the basis on which new technologies are adopted alongside any adaptive measures. We hope that the Digital Development Summit 2017 will be a means to launch just such a dialogue.

7 What next for researchers, policymakers and practitioners?

The trajectories the communities described in this Paper give some insight into the complexity of issues related to the impact of digitisation on people's working lives. The mitigation strategies also indicate potential mechanisms that might be deployed across relevant areas, including individual and formal education, social protection measures, and industrial policy and regulation. Yet overall there is a lack of cross-disciplinary collaboration and initiatives that take a universalist approach across developing and developed countries.

Researchers and policymakers lack shared processes to collectively assess the impact of digital technologies on working lives, and envision and determine ways in which these technologies might be used to enable more equitable wealth distribution and sustainable livelihoods.

The Digital Development Summit 2017 is a chance to identify approaches to these challenges that:

- Are anchored in workers' realities, contexts, priorities and concerns;
- Are iterative and flexible, with regular adaptations to keep abreast of changing contexts;
- Work within the reality that digital shocks and stresses will disproportionately affect women, children, older and disabled people, and politically marginalised groups;
- Take multi-sector, multi-disciplinary approaches that bring together social, economic and cultural factors;
- Are long-term and collaborative, building on new networks and partnerships; and
- Are consistent with international and national commitments such as SDG 8 and others.

Based on our research, researchers, practitioners and policymakers who are seeking to better navigate the intersection of digital technologies, jobs and development might consider specific questions. These include:

- **What is the nature of the digital automation of interest and who are the relevant stakeholders?** – What specific technologies are we interested in, and what choices are being made by which actors that make their impacts of interest or concern?
- **What are the focus sectors or jobs that might be impacted?** – What are the specific types, sectors or industries of jobs that might be affected?
- **What are the extent, direction and likelihood of potential impacts?** – The potential size and scale of the impact on jobs: positive in terms of creating new jobs or negative in terms of destroying existing jobs.
- **What are the potential social, economic and political repercussions?** – The wider effects of job-related changes, both direct and indirect.

- **What policy and practice measures are possible and feasible?** – How the impact of technology on jobs can be made more inclusive, with a fairer share of the benefits for more of the population.
- **How do we tailor policies for people working in the informal sector**? – Just as they are less likely to be online or own a mobile phone, women are less likely to work in the formal sector than men and make up the majority of the world's population considered to be outside the workforce.

8 Credits

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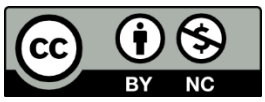

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