Artificial intelligence and inclusive growth: Complimentary, contradictory or both? A Northern Powerhouse Perspective.

Authored by Jackie Davies and Professor Mark Boyle

Heseltine Institute for Public Policy and Practice

University of Liverpool

December 2018

CONTENTS

FIGURES

V1.0

Foreword

As elsewhere, there has arisen a new politics of inequality in the UK, underpinned by growing socio-economic inequalities, socio-spatial polarisation, uneven geographical development and imbalanced regional growth. Against the backdrop of globalisation, neoliberalism, and austerity, we now live it seems in the age of the 'left behinds' marked by a growing dislocation between representative democracy and popular sovereignty and a rise in political populism. Urban entrepreneurialism and trickle-down economics have failed a generation; a rising tide it transpires, does not life all boats. Counter-posed to the globalists and hypermobile 'anywheres', the left behinds constitute the 'somewheres', marked by a particular class, education and age profile, anchored in places now rendered redundant by global capital, and abandoned to managed decline and terminal marginality. Inclusive growth is recognised as the necessary anti-dote to the descent of socio-economic and socio-political exclusion into political populisms rooted in fear, resentment and retrenchment; one nation politics and good jobs for the many, not for the few, the call to arms. But how to do?

Meanwhile, a Fourth Industrial Revolution beckons. Whereas the First Industrial Revolution used water and steam to power production, the Second, electricity to create mass production and the Third, electronics and information technology to automate production, the future prosperity of the UK will depend on the data revolution, powerful new data analytic tools and more complex automated systems, including and in particular machine learning and artificial intelligence. And so 'artificial intelligence and the data-driven economy' (hereinafter data revolution/artificial intelligence or DR/AI) stands as one of the four Grand Challenges identified by the UK government in its 2017 White Paper *Industrial Strategy: Building a Britain fit for the future.*

In this new age, not only will software and code permit robotic devices to perform complex tasks; now sophisticated algorithms will enable machines to mimic aspects of human consciousness – perhaps to reach reflexive decisions, to undertake cognitive and sentient reflection, and even to make moral judgements. The extent to which the UK is able to finally address its pernicious problem with low productivity will in no small way depend upon its capacity to roll out DR/AI, broadly across sectors, and deeply within sectors.

These two historical forces intersect in particularly intense and unusual ways in cities, city regions and even rural areas in the Northern Powerhouse. Here the demand for inclusive growth is especially audible. Savaged by deindustrialisation and the victim of a spatially blind national economic strategy which has privileged growth in London and the SE of England and created a North-South divide in prosperity and opportunity, it is in the Northern Powerhouse that the politics of the left behinds is playing itself out with heightened vigour. Hope is being invested in the new national Industrial Strategy. And yet, DR/AI, a cornerstone of this strategy, risks aggravating existing inequalities.

Firstly, the 2017 *Industrial Strategy* White Paper observes that AI ecosystems are already more developed in some UK regions; London, Edinburgh, Bristol, Cambridge

and Edinburgh. Will these regions benefit from this head start so as to further entrench uneven geographical development and open up a new productivity gap between them and the Northern Powerhouse?

Secondly, whilst the impact of AI on the labour market is the subject of much debate, is it likely that it will polarise income inequalities, creating more very high and very low paying jobs at the expense of a squeezed middle.

Once machines replace human beings, 'No Humans Need Apply'?

Professor Mark Boyle
Director
Heseltine Institute

1. Summary

1.1 At a glance summary of this research

In the light of the 2017 White Paper *Industrial Strategy: Building a Britain fit for the future,* the UK government and, in preparing their Local Industrial Strategies (LISs), Combined Authorities (CAs) and Local Enterprise Partnerships (LEPs), will need to tackle two critical forces: the rise of big data and artificial intelligence and growing social and spatial inequalities. But it is a concern, that these two forces have the potential to unfold in tension.

The 2017 *Industrial Strategy* White Paper acknowledges that AI is already more developed in some UK regions; London, Edinburgh, Bristol, Cambridge and Edinburgh. Will these regions benefit from this head start to further entrench uneven geographical development and expose a new productivity gap between them and the Northern Powerhouse? Secondly, whilst the impact of AI on the labour market is the subject of much debate, it is likely that it will polarise income inequalities, creating more very high and very low paying jobs at the expense of a squeezed middle.

And so, the Heseltine Institute for Public Policy, Practice and Place are holding a public event in February 2019 to ask:

- How can public policy ensure that lagging regions in the UK are able to participate equally and fully in the data and AI revolution?
- How can public policy ensure that the data and AI revolution is harnessed to promote inclusive growth and to extend opportunities to Left Behind communities within the Northern Powerhouse?

National and local politicians, LEPs, representatives of Combined Authorities and leading AI practitioners and academics will be invited.

In preparation for the event, the Heseltine Institute commissioned this research project to better understand the issues outlined above and the extent to which the Northern Powerhouse LEPs are giving thought to the impact of Artificial Intelligence on their local economies.

This report addresses four key questions:

Why is this research needed? To inform the implementation of policies that recognise the likely unequal distribution of the impact of AI and the Data Economy on the Northern Powerhouse as a region and better understand the skills and jobs that are becoming more sought after, as well as those which are at most risk of automation, at both a local and regional level.

How did we do it? Secondary data was collected from the public domain of each of the eleven LEP's/CA's to better understand the dynamics of each LEP locality and included relevant reports and strategic documents. Primary data was collected through semi structured interviews (face to face and telephone) with a small sample of representatives of LEP's, CA's and business

What did we find? The North is very vulnerable to the impact of DR/AI and automation with potentially devastating consequences looming on the horizon. Therefore, it is imperative that DR/AI and IG are tackled simultaneously when responding to the call for LIS's, with more attention also paid to the peripheral issues that surround the broader impacts around these challenges in order to maximise the opportunities and minimise associated risks. There is also an opportunity for the Northern Powerhouse Partnership (NP11) to champion this agenda as a region, but only if it can master a 'GLOCAL' approach.

What is next for the Northern Powerhouse story around this emerging debate? In preparation for the Heseltine Institute for Public Policy, Practice and Place public event '*A Northern Powerhouse Higher Education Workshop – Humans need not apply? On the relationship between artificial intelligence and inclusive growth*', the above findings from this research project provide a collective of perceptions of the extent to which the eleven Northern Powerhouse LEPs are giving thought to the impact of AI on their socio-economic localities and provide the basis for discussion and debate.

2. Introduction

2.1 Background to research

Following the 2017 White Paper ***Industrial Strategy: Building a Britain for the future***, Mayoral Combined authorities (CA's) and Local Enterprise Partnerships (LEP's), in preparing their Local Industrial Strategies (LIS's), will need to pioneer public policies which support a fourth industrial revolution, delivering both enhanced productivity and inclusive growth.

> '… *it is not enough to see growth in the national economy if your local economy is shrinking. It is not ambitious enough to have record jobs growth, unless those jobs are secure and delivering real growth in wages…one of my first actions as Prime Minister was to begin the development of a modern industrial strategy that would help businesses to create high quality, well paid jobs right across the country.*'[1]

The five foundations aligned to achieving the vision for a transformed economy through this industrial strategy are:

- Ideas – the world's most innovative economy
- People – good jobs and greater earning power for all
- Infrastructure – a major upgrade to the UK's infrastructure
- Business Environment – the best place to start and grow a business
- Places – prosperous communities across the UK

The four grand challenges identified in this document that need to be addressed within each LIS to achieve the above are:

- Artificial Intelligence (AI) and Data Economy – putting the UK at the forefront of the AI and data revolution
- Clean Growth – maximising the advantages for UK industry form the global shift to clean growth
- Future of Mobility – becoming a world leader in the way people, goods and services move
- Ageing Society – harnessing the power of innovation to help meet the needs of an ageing society

Within the UK there are 38 LEPS, which have been charged with delivering LIS's within the context of the national strategy, either directly through the LEP's or CA's. The first LIS's will be agreed with government by March 2019, with the aim of every part of the country having a strategy in place by early 2020.

The scope of this report is based on the 11 LEP areas within the North of England, home to 15 million people and over one million private sector businesses, with the 'Northern Powerhouse' being a vision to join up the towns, cities and counties '*pooling their strengths, and tackling major barriers to productivity to unleash the full economic potential of the North.*'[2] The Northern

---

[1] Forward from the Prime Minister. *Industrial Strategy: Building a Britain fit for the future.* Crown Copyright 2017.

[2] Northern Powerhouse Strategy, HM Government, Crown copyright, November 2016.

Powerhouse strategy was launched in 2016 to work toward achieving a sustained increase in productivity across the North through tackling four perceived barriers:

- Connectivity
- Skills
- Enterprise and Innovation
- Trade and investment

It also identified the key sectors the North has strengths in and the necessity to build on these assets:

- Manufacturing
- Pharmaceutical
- Energy
- Digital

A parliamentary group was officially launched in November 2017 to 'rebalance' the UK's economy away from being dominated by London and the South East, and in July 2018, the Northern Powerhouse Minister, Jake Berry MP, launched the newly formed NP11 government funded board, representing the chairs of the 11 LEP's within the Northern Powerhouse to advise the government on issues such as how to increase productivity, overcome regional disparities in economic growth and tackle the historic north-south divide.

This research focuses on the first challenge highlighted in the industrial strategy document - *AI and the Data Economy,* and its impact on achieving inclusive growth in the North of England which is predicted to see one of the highest levels of future automation in areas which have already suffered from de-industrialisation with many of them already unemployment hotspots.[3]

2.2   Purpose – why is this research needed?

The unprecedented speed and scope of change that AI and the Data Economy present from both an economic and societal perspective present policy makers with a significant challenge to ensure that the economic, social and ethical opportunities presented are maximised, whilst the risks are minimised.[4]

> *'With the eruption of AI, some of the market leaders in ten, even five years' time may be companies you've never heard of. In turn, some of today's biggest commercial names could be struggling to sustain relevance or have even disappeared altogether, if their response has been too little too late.'* [5]

AI, automation and robotics are technologies that have enabled automation to make greater inroads into the workplace raising concerns around whether jobs will be replaced or displaced and a need to better understand the impact this

---

[3] Future Advocacy (2017). *The impact of AI in UK Constituencies: Where will automation hit hardest? '*, available at https://www.futureadvocacy.com

[4] Future Advocacy (2016) *'An Intelligent Future? Maximising the opportunities and minimising the risks of artificial intelligence in the UK',* available at https://www.futureadvocacy.com

[5] PWC (2017) *'Sizing the prize: What's the real value of AI for your business and how can you capitalise?',* available at www.pwc.com/AI

will have.   Several studies predict up to 30 – 35% of UK jobs could be at risk of automation by early 2013, subject to the following caveats[6]:

- Job losses could be offset by new jobs created elsewhere. However, this is hard to predict since we do not know what these new jobs created might be.
- Some AI might not happen due to economic, legal or regulatory interventions.

What is certain, however, is that change is happening now, with AI being the key source of transformation, disruption and competitive advantage. Automation will both displace and replace the traditional workforce, with a higher risk of automation of jobs that require manual tasks, physical exertion and/or routine tasks through to a lower risk of automation of jobs that require an increased focus on social and literacy skills.

Furthermore, it is anticipated this change will be unequally distributed in terms of locations, sectors, age groups, gender and skill sets, with the North of England and the Midlands being the most vulnerable due to the largest proportions of high-risk jobs in sectors such as transportation and storage, manufacturing, wholesale and retail. There will be a disparity of income between high level and low-level jobs due to the projected shortage of skill sets for the increasingly automated world of work unless there is investment in more relevant type of education or training that better meets the needs of future industry. This is further compounded by the growth of nonstandard forms of employment such as temporary work, agency arrangements and zero-hour contracts which afford few rights and protections to low skilled workers.[7]   This will have a profound impact on individuals, families and communities.

Accelerated development of AI to automate business processes and enable businesses to augment their existing labour force with AI technologies will increase productivity and generate additional wealth with some predictions anticipated to increase global GDP by up to 14% by 2030[8]. So, if increased productivity equals increased wealth, how do we ensure this is recycled back into the economy to increase demand and drive the creation of new jobs?

The above illustrates the need for research to inform the implementation of policies that recognise the likely unequal distribution of the impact of AI and the Data Economy on the Northern Powerhouse as a region and better understand the skills and jobs that are becoming more sought after, as well as those which are at most risk of automation, at both a local and regional level.

> *'Implemented in the right way, new machines could raise productivity levels, phase out mundane work, boost lagging living standards, and open up the space for more purposeful and human-centric jobs to prevail. Equally, however, the onward march of technology could put downward pressure on wages, lead to greater monitoring in the workplace, and exacerbate economic, geographic and demographic*

---

[6] PWC (2017) *'Sizing the prize: What's the real value of AI for your business and how can you capitalise?',* available at www.pwc.com/AI

[7] RSA (2017), *'The Age of Automation: Artificial Intelligence, robotics and the future of low skilled work.'* Available at www.thersa.org/discover/publications-and-articles/reports/the-age-of-automation

[8] PWC (2017), *'Sizing the prize: What's the real value of AI for you business and how can you capitalise?'*, available at www.pwc/AI

inequalities. The point is that technology is a tool to be wielded by society, rather than an independent force with a mind of its own. Whether or not AI and robotics helps or hinders workers will come down to the choices we make as employers, policymakers, consumers, investors and the wider public.[9]

2.3   Procedure – how did we do it?

In preparation for the Heseltine Institute for Public Policy, Practice and Place public event '*A Northern Powerhouse Higher Education Workshop – Humans need not apply? On the relationship between artificial intelligence and inclusive growth*', a short research project was commissioned to better understand the issues outlined above and the extent to which the eleven Northern Powerhouse LEPs are giving thought to the impact of AI on their socio-economic localities.

Areas of interest included technological malleability, economic feasibility, social desirability, business practicability and legal and regulatory considerations.

Secondary data was collected from the public domain of each of the eleven LEP's/CA's to better understand the dynamics of each LEP locality and included relevant reports and strategic documents.

Primary data was collected through semi structured interviews (face to face and telephone) with a small sample of representatives of LEP's, CA's and business which asked questions about their perception of the extent to which the LEP/CA was giving thought to the impact of AI on its local economy, including which sectors/jobs are/will be most impacted, the extent to which AI is featured in the LIS, what consideration is being given to the impact of AI on inclusive growth and how AI can be harnessed to promote inclusive growth. (see appendix A – Interview Questions)

---

[9] RSA (2017), *'The Age of Automation: Artificial Intelligence, robotics and the future of low skilled work.'* Available at www.thersa.org/discover/publications-and-articles/reports/the-age-of-automation

3. What did we find?

3.1 What is AI?

There is a broad array of definitions from the literature which can generally be pulled together in the definition offered by PWC[10] which defines AI as a collective term for computer systems that can sense their environment, think, learn, and act in response to what they're sensing and their objectives.

'*From the personal assistants in our mobile phones, to the profiling, customisation, and cyber protection that lie behind more and more of our commercial interactions, AI touches almost every aspect of our life. And it's only just getting started.*'

To support their definition, PWC dissect AI into the following categories, each of which clearly articulates the different roles of human and computer interaction in the emerging computer systems:
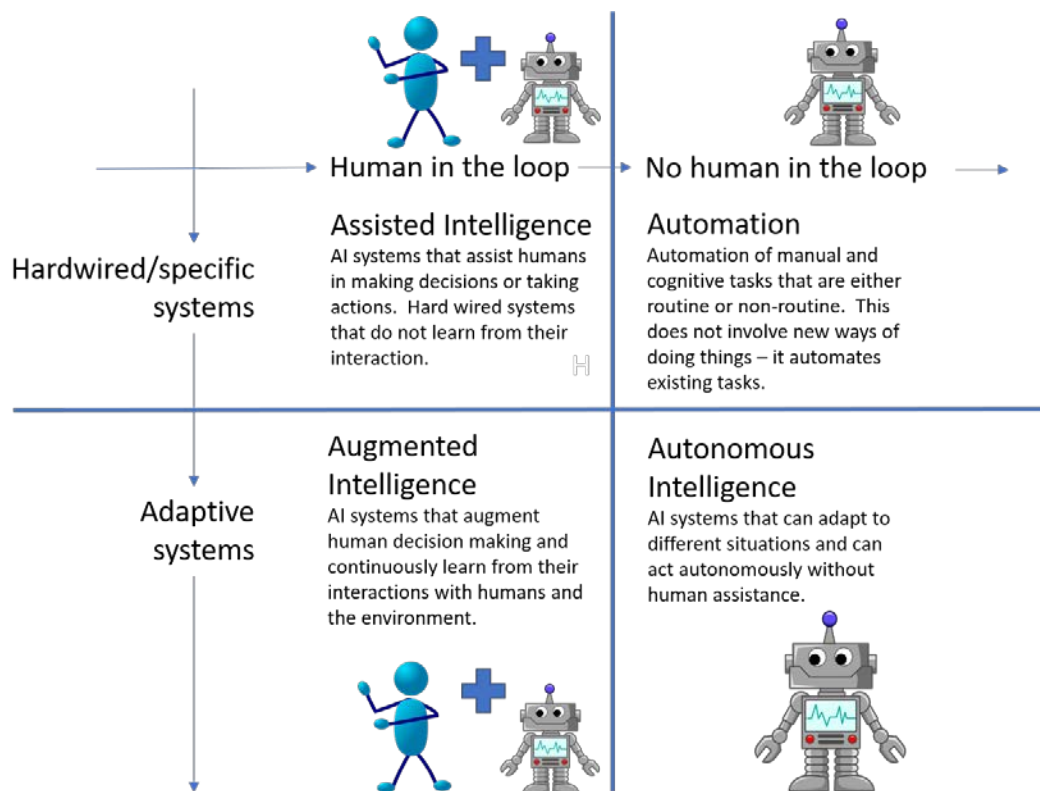

Figure 1 – PWC – Defining AI

AI technologies can also be described as computational systems that aim to reproduce or surpass tasks that would require 'intelligence' if humans were to

---

[10] [10] PWC (2017) '*Sizing the prize: What's the real value of AI for your business and how can you capitalise?',* available at www.pwc.com/AI

V1.0

perform them and include learning and adaption; sensory understanding and interaction; reasoning and planning; and extracting knowledge and predictions from large, diverse digital data. [11]

AI technologies have been in development for decades, but the past five years have seen an unprecedented level of interest and investment which has led to a very fast pace of new discoveries and improvements, even by the standards set by previous digital technologies.[12]

3.2   Estimated impact of AI: Job creation and displacement by industry sector

There have been a series of research papers which attempt to predict the impact of AI on employment and the sectors that are more vulnerable. Whilst they all differ slightly in terms of the projections, they are consistent in the types of industries that are most vulnerable. The following diagram illustrates the findings from the research undertaken by PWC and adopted by the Economic Research Council to provide a baseline prediction of what the future of work might look like, what jobs are likely to disappear or change and industries where we are likely to see completely new jobs emerging.
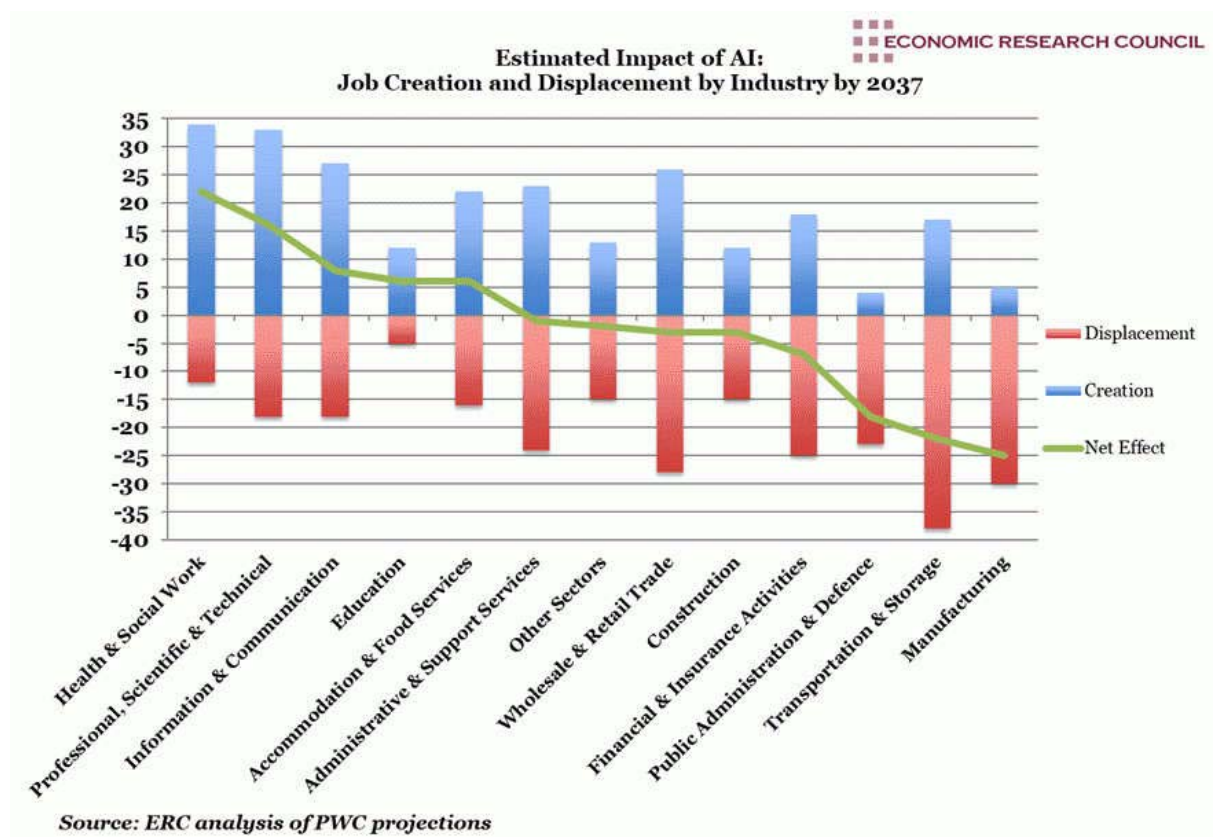

Figure 2 – PWC Projections

3.3 Overview of Northern Powerhouse and member LEP localities

The North of England is home to over 15 million people and over one million private sector businesses with an economy worth over £340 billion and accounting for 19% of UK output. It produces 19% of UK goods exports through seven international airports and 12 major ports and is home to over 20 universities four of which are ranked in the global top 100 universities.[13] The north has significant strengths in several sectors which are now shown to be some of the most vulnerable to DR/AI and automation as illustrated in figure 1.

There are 11 LEP localities within the Northern Powerhouse region:

- Cheshire & Warrington
- Cumbria
- Greater Manchester
- Lancashire
- Leeds
- Liverpool
- Humber
- North East
- Tees Valley
- York, North Yorkshire and East Riding
- Sheffield

LEP's are business led partnerships between local authorities and local private sector business set up to determine local economic priorities and undertake activities to drive economic growth and job creation, improve infrastructure and raise workforce skills within their local area. Their boards are led by a business Chair and board members comprise of local leaders of industry (including SME's), educational institutions and public sector representatives.

Each LEP and locality is unique, with its own governance and staffing structures. Some LEP's operate independently and rely on board members to carry out administrative duties, whilst some work in partnership with local and combined authorities and have designated staff to carry out administrative duties, either directly employed by the LEP board or seconded from local or combined authorities. Of the eleven Northern Powerhouse LEP localities, four have directly elected mayors who chair their area's combined authority and have direct responsibility for exercising the powers and functions devolved from Government, set out in their local area devolution deal. It is anticipated that this will increase to five in 2019.

The Industrial Strategy White Paper set out that the first phase of LIS's will be agreed with Government by March 2019, with the second and third phases to

---

[13]Northern Powerhouse Strategy, HM Government, Crown copyright, November 2016

be completed by March 2020. Agreeing a LIS for their area with Government is a necessary condition for Mayoral Combined Authorities (MCA's) and LEP's to draw down any future local growth funding being deployed through them.

3.4 Interview findings

3.4.1 Artificial Intelligence

It is generally accepted that AI is quite an old term that encompasses lots of technology as can be illustrated from the varying descriptions of AI by the different participants involved in the study:

> *'AI is in effect a computer programme that has got cognitive functions built into it. Built into its algorithms. But in the job that I do, because I work predominantly in manufacturing, we call it machine learning which has been around a long time now and starting to be, maybe honed. But AI in its purest sense is really, you know, a computer programme developing cognitive functions, not dissimilar to the human brain, speech recognition, autonomy, driverless cars, that kind of thing with some rudimentary decision making.'* Participant

> *'Using technology to use informed decisions and work smarter, revolutionise business. Big data is important in this area, utilising technology to make better informed decisions.'* Participant

> *'The use of computers and robots to carry out activity that would normally be done by the human brain I guess'* Participant

> *'Machine learning, so basically the use of sophisticated algorithms, assessing large quantities of data and utilising that to improve processes and services. We see AI as an opportunity, the work that we have done suggests that the most successful application of AI will be AI technology working alongside humans, so it's not about replacing, it's about augmenting the tasks that people are able to do, their ability to do a range of things or do those tasks more effectively.'* Participant

However, caveats to the above were discussed which included views that AI does not work how the human brain does and although it shows an advanced understanding of patterns, it does not understand 'how' we do what we do. There was a consensus of the huge potential for AI to outsource manual and repetitive tasks and so free us up to do more creative things.

Two types of AI impact on jobs were identified – AI that replaces workers, or AI that helps people do their jobs better.

3.4.2 Inclusive Growth

The ambition of the Industrial Strategy is to build a Britain fit for the future, with increased productivity and earning power for everyone, since currently the UK has greater disparities in regional productivity (including the Northern Powerhouse) which affects people in their pay, their work opportunities and their life chances.[14]

One participant defined Inclusive Growth (IG) as meaning *'all things to all people'* as it is poorly defined and understood, which best describes the findings from the variety of meanings participants attributed to it.

> *'It's growth that benefits one might say the many not the few. So, the benefits of growth are spread both geographically and across different labour market groups within our society...So it's about it being shared equally so that everyone benefits and not just some parts of the economy'.* Participant

> *'IG underpins everything. Making sure that everyone has the same access to education, healthcare, jobs and opportunities is critical. However, the role AI has to play in it may inhibit it.'* Participant

Another suggests IG can be viewed in two ways – from a people and place perspective and from an individual perspective, in the sense that everyone should have the same opportunities in things such as access to work.   When asked if a sector profile had been conducted which assessed the impact of AI in relation to IG, most participants advised that it had not been done that way, and that although both topics run across everything, they could see now that the challenge is in bringing them together.

> *'They both run across everything and interact, sort of in the way you've described but our challenge over the next 12 months will be to bring them together so we understand what the opportunities and challenges around AI are and what the opportunities and challenges around IG are and bringing them together so we can amplify the good stuff and mitigate the bad stuff – how that plays out remains to be seen over the next few months. I don't think they're opposed if we can get the working together.'* Participant

One approach to encouraging inclusive growth within the Northern Powerhouse seems to be through good employment charters:

> *'as this area develops, it is important it develops in a way that supports a more inclusive form of growth in an inclusive society.'* Participant

---

[14] Crown Copyright (2017), *'Industrial Strategy: Building a Britain fit for the future'.*

Several respondents also claimed that IG should not just focus on good jobs alone, but also areas such as physical infrastructure, transport, housing, public sector reforms which require financial investment to create the high-quality neighbourhoods needed to recruit/attract the right businesses.

Another key area identified was skills:

> *'One of the big messages coming out of that, the requirement for people, whether or not they are working with AI, to be skilled up to be able to meet the needs of the changing future economy which AI is going to grow.'* Participant

> *'Jobs for life long gone. We need to better interpret the job market, but also to give people the skills to do that for themselves. CV's. How often would you print CV's off? Now you use social media.'* Participant

There seems to be common agreement on the type of skills that are needed to meet the future requirements of jobs/apprenticeships and how to achieve these outcomes specific to their growth areas through their local skills strategies.

> *'At the moment there is a huge skills gap. If we do nothing differently, nothing will change. Hopefully devolution for skills will provide opportunities. Look at growth sectors, where are replacement and future jobs. For instance, the low carbon economy, we know there is a generational gap of apprenticeships. The ageing population as the skilled retire but there is no-one to step in to meet the rising demand. This is an opportunity to create more apprenticeships that won't be replaced by AI.'* Participant

> *'We know at the moment our education and training system isn't delivering people who are especially well equipped for the world of work generally, let alone the future world where automation is going to potentially change all of that and that's why we've got a really strong focus on compulsory education, lifelong learning so people have got the potential to respond to issues faced through their career.'* Participant

However, for some there was a feeling that the Industrial Strategy only pays lip service and is missing the basic starting point for interventions which should be introduced from primary school age.

> *'Ignoring this fuels inequality since PTA's in prevalent areas are able to fill the gaps but more deprived areas are unable to and so are falling back straight away.'* Participant

> *'Should start early in life to better understand the job market.'* Participant

> *'We need them now at 17, not later after graduation, and they will get younger. We need to get them trained up from a very early age to get them on track. Learn from Silicon Valley, they start at primary school to get them on the path.'* Participant

Another key area identified was apprenticeships and some participants expressed their views that apprenticeships should be favoured in some industry sectors over graduates if they can get them early with core basic skills to mould into the company way and then they can then provide them with the right skills. They felt graduates are coming out with skills and behaviours that are not appealing to business as things have moved on and there is a danger they won't have the updated skill sets needed for the new technology.

> *'One of the big areas around sector wide development, skills and training and everyone moving into this new way of thinking, the public sector should be a facilitator and enabler of what happens, what the private sector needs in essence, as opposed to the public sector deciding what it needs to be and then given to the private sector, because at the moment the speed of growth is considerable, and colleges and universities primarily and historically have not been able to keep up with the tides of change. Staff here are developing skills every day, updates every few weeks, how do they keep up with that? The future should be partnering with big companies, so skills are industry ready. AI underpins this.'* Participant

One participant suggested that inclusive growth is also about how policy encourages the use of front facing automated systems to replace the role of people in local/national government departments and the negative impact this can have on individuals who do not have sufficient ICT skills to access the services they need.

> *'Automated systems such as universal credits. No ICT skills? So these people can't fill in online forms properly and so get sanctioned.'* Participant

3.4.3 Complimentary or Contradictory?

Responses were mixed, but predominantly positive.

> '*Entirely complimentary. We need to concentrate on future growth and jobs and where that growth is going to come from in an increasingly globalised world. But we also need to ensure it is equitably distributed.'* Participant

'It's our choice. AI is like any other technology, just a tool to do what we put it to do, and I think a lot of our conversation has been around policy, governance, culture. The economy, left to its own devices, I personally think AI will lead to extraordinary growth in the economy. It will lead to some of the country, both geographically and in terms of demographics doing really well and absolutely leaving other bits of the country behind and it will do it slightly worse than we've already done in previous generations of technologies. If explored in this conversation, then I think there's the opportunity for us to do much better than that and to have an uplifting effect on much more of the country. But whether that happens or not is not to do with AI as a technology, it is to do with leadership, politics, it's to do with the choices business leaders make.' Participant

'Over the period, I think there will be more winners than losers, but the transition may be painful.' Participant

'Well I think it's interesting because, it's an observation really, that the national industrial strategy, it calls AI the data revolution, a grand challenge, but it's kind of really positioned as an opportunity essentially. We need to get a slice of this action because it's going to be happening globally and how do we position ourselves? It doesn't really reflect the other aspect that we've been talking about, which is the potential, the kind of Schumpeterian if I can use that term, destruction of existing jobs in industries, which could well occur as a result of AI. And obviously there is, as you alluded to, there's a debate about the impact of future technology on existing jobs and if they disappear how they'll be replaced and what people do. Is it, are there going to be more jobs created than destroyed and all that kind of thing? So, the industrial strategy doesn't really reflect on that at all actually, it doesn't talk about how the UK needs to respond to some of those things and the labour market transition issues that will occur. So that's, thinking about it, that's kind of a mission and I think the idea of inclusive growth in the industrial strategy is not, it doesn't really, whether some of the technological changes will actually impede that happening. Your questions have made me think about that, so thank you.' Participant

'I'd like to think they could be complimentary but that's around the people who are leading the agenda, or how people work together. I think they'll be contradictory if you aren't taking people along with you. These interventions, these innovations can't happen unless people make them happen, people embed them into their organisations or people invest in them.' Participant

3.4.4 Economic Feasibility

Economic feasibility is about understanding and addressing the issues thrown up by the potential winners and losers in the current and future adoption of DR/AI in the local, regional and national industrial sectors. What will be the jobs lost, jobs changed, and jobs gained?

> '*Automation will bring big shifts to the world of work, as AI and robotics change or replace some jobs, while others are created. Some occupations will grow, while others decline.*' [15]

In order to work toward maintaining/achieving full employment, workers will need to adapt, as their occupations evolve alongside increasingly capable machines which include (but not limited to) higher educational attainment; spending more time on activities that require social and emotional skills, creativity, highly cognitive capabilities and other skills relatively hard to automate.

> '*We can't sit by and allow AI to decimate, we must build now the skills and resilience of people across the likely impacted areas…do we want to go down the road where this is done to us, or do we want to take charge?*' Participant

3.4.5 Technical malleability

> '*Don't have good broadband connectivity…still some work to get underpinning infrastructure.*' Participant

3.4.6 Business practicality

Although AI is here, it is accepted that it is not yet widely adopted due to the high cost of investment. For instance, the cost of robot versus cost of humans.

> '*Some AI comes at such a high cost that it won't translate into job losses.*' Participant

> '*Dark Warehouses. They are like automated rubix cubes. They are not being delivered yet because low skill labour is cheaper than investment capital, but the tipping point is coming as investment costs start falling and labour costs rise.*' Participant

Also, many smaller organisations are relatively unaware of the DR/AI agenda and as one participant suggested, '*don't know what they don't know*'. Therefore, from a skills and education perspective, there is also a need to continually

---

[15] McKinsey & Co (2017), '*Jobs lost, jobs gained: Workforce transitions in a time of automation*,' available at www.mckinsey.com/mgi

educate and update the business community on the emerging developments in this new era, which if not addressed could significantly impact on their current business models and productivity. This is equally relevant to big companies too.

> '*Big company's business models could go out of business overnight with the new applications being developed. Lots of organisations are sleepwalking through this new world. You could get a couple of smart graduates creating an application or algorithm that could wipe out an industry.*' Participant

3.4.7 Social desirability and acceptance

It is generally acknowledged that increased productivity generates more wealth, which can be re-distributed in several ways, with the most usual being the distribution of profits to shareholders. It can also be used to lower prices to consumers or paying employees higher wages, but how often does this happen? So, if AI is predicted to generate increased productivity and hence, more wealth, how can we ensure this additional wealth is equitable and recycled back into the economy to increase demand and drive the creation of new jobs?

> '*AI and robotization have the potential to increase the productivity of the economy and in principle, that could make everybody better off, but only if they are well managed…All the worst tendencies of the private sector in taking advantage of people are highlighted by these new technologies.*'[16]

> '*It would be a dangerously naïve assumption that the profit motive will drive organisations to make the right choices about tech adoption and application.*'[17]

To achieve this increase in productivity we know that machines will perform some or all the tasks that humans do, leading to displacement, replacement or creation of new jobs and the potential implications of this in terms of skills and wages. We are also aware of the predictions of significant income polarisation resulting in an increase in demand for high wage, high skill areas, declining middle wage occupations and both replacement and displacement in low skill, low wage occupations. Additionally, areas which face higher probabilities of job replacement, with little future of re-deployment may face further downward pressure on wages as competition for fewer jobs increases. So how do we encourage social desirability and acceptance of this new world? It is imperative that whilst policy makers and businesses embrace automation's benefits they

---

[16] Joseph Stiglitz (2018), 'AI and the future of work', available at https://royalsociety.org/news/2018/09/the-impact-of-AI-on-work/

[17] Daviddsouza 180 (2018), *'On the future of work – a brief note', available at* http://daviddsouza.com/2018/12/13/on-the-future-of-work-a-brief

simultaneously balance this approach by addressing the worker transitions brought about by these technologies, such as mid-career job training, enhanced labour market dynamism and enabling worker re-deployment.[18]

Alongside these tensions, data management and data use also provide challenges for social desirability and acceptance as the Cambridge Analytica revelations have shown and raises the question of what progress is and who it is for? History shows us that societies can act in advance to create well founded responses that contribute to bringing the benefits of disruptive technologies into being, but that without a framework giving entrepreneurs and decision makers sufficient confidence about acceptable data uses, application that would have been widely welcomed may be lost'[19]

> '*We have done a study of residents to understand their views of data sharing, especially around health and social care devolution, public service reform where potentially it needs better data sharing between agencies so individuals can get a better experience…we consulted with 2,000 residents who were happy for data to be used when for a specific purpose, but less comfortable with general sharing of data when no clearly articulated purpose. They want to know why, how etc, so there is a big challenge around the ethics side of things.*' Participant.

3.4.8 Governance (Ethical/legal/regulatory considerations)

It is unanimously agreed by all participants that debate is needed to uncover policies that are required to curb monopoly powers and fairer redistribution of the immense wealth that is and will be created by DR/AI. This includes discussions on the type of regulatory structures, needed to address issues around taxation models, labour bargaining power, Intellectual property, re-definition and enforcement of competition laws, corporate governance laws, the way financial systems operate, and data management and use. When questioned about these issues, participants highlighted the following perceptions and additional potential issues:

> '*AI in the industrial strategy to become the leading nation? It's like the wild west at the moment.*' Participant

> '*Outcomes are governed but not the technology itself.*' Participant

> '*impact of digital infrastructure on outcomes is nowhere in any corporate governance.*' Participant

> '*Not enshrined in the policies on which investment is made.*' Participant

---

[18] McKinsey & Co (2017), '*Jobs lost, jobs gained: Workforce transitions in a time of automation',* available at www.mckinsey.com/mgi

[19] The British Academy & The Royal Society (2017), '*Data Management and use: Governance in the 21st Century',* available at www.royalsociety.org *and* www.britishacademy.ac.uk

Other examples of issues identified by participants included:

Bias in algorithms -

> '*Bias in algorithms create barriers for people. It's like a Tesco card on a much bigger scale. Will that profiling knock people out? Yes. Role for policy makers to put governance in place? Yes. I don't think people understand the ramifications of how their data is being used. Block chain, one system talking to another system, another system etc. Ramifications are huge and all that based on data to inform the next step etc.*' Participant

When asked are we thinking about these impacts enough when addressing issues such as these in the use of AI, for example employee recruitment?

> '*It's an area that's not been well researched or well understood. I guess most people, when you talk about ethics and AI, I think most people will think that's just a bit boring and won't be that interesting, but when you talk about it in the way that you do, that AI can discriminate against people then that just becomes a much more serious issue'.* Participant

> '*I don't think we are at a local level, and I don't think we are at a national level. I think there is some move towards that. Government set up an institute of data ethics which is starting to get thought about.'* Participant.

DR/AI and Ethics -

> '*If just using technology without looking at the Ethics, then you can potentially get some unhelpful uses of that technology.'* Participant

It has been suggested that the principles of governance of data could be used for the governance of AI since although AI will provide specific challenges, it is not unrelated or separate to broader data governance.[20] Such an approach will require navigating significant choices and dilemmas to argue, challenge and debate and adhere to the proposed four principles to protect individual and collective rights and interests; ensure that trade-offs affected by data management and data use are made transparently, accountably and inclusively; seek out good practices and learn from success and failure and enhance existing democratic governance.[21]

Questions to be addressed include:

- How are individual and collective risk negotiated?

---

[20] Independent Review (2017), '*Growing the Artificial Intelligence Industry in the UK', available at https://www.gov.uk/government/publications/growing-the-artificial-intelligence-industry-in-the-uk*

[21] The British Academy & The Royal Society (2017), '*Data Management and use: Governance in the 21st Century', available at* www.royalsociety.org *and* www.britishacademy.ac.uk

V1.0

- Uncertain future of 'ownership'- who owns IP, wealth etc?
- What is the role of human agency?
- How do we overcome tensions between how data is managed and used, since tensions are growing and the potential implications of the ways they are accommodated are accumulating?
- Meanings in policy, law and public discourse of notions are changing and will continue to change in such areas as accountability, agency, consent, privacy and ownership. How do we navigate and manage this?

Some participants suggested public sector commissioning could also be used in a smarter way to encourage a more ethical and equitable approach:

> *'Public sector commissioning to set the rules of the game, so a way through smarter commissioning not just about costs but improving outcomes.'* Participant

DR/AI and the Tax system –

Is our fiscal taxation model fit for purpose in this new emerging economy, since what works for today's economy may not necessarily be appropriate for tomorrow's economy? This was the perception of a few of the participants who suggested that this was an important issue for the future of inclusive growth nationally and one that needs to be debated at all levels of the economy, as it will have a massive impact on society if not addressed and managed accordingly.

> *'We need to look at the tax system to see how we can spread the wealth, but how do you tax a company whose product is free? For example, Facebook, Spotify, Google Ads. That's the way the whole industry is going. No-one knows how to tax it. Don't know how to tax the new economy that is developing. Need to figure out how to do that then when re-engineered the fiscal base decide what we spend it on, health etc. Feels like we're trying to apply old policies to new ways of doing things which does that ever really work? I don't know. Look at Fortnight, it's free but earns billions per month. Growth at a pace unforeseen but could go obsolete overnight. How do you govern that tax model?'* Participant

> *'To what degree are they familiar with and bought into the impact that digital technology will have over the next 10, 20, 30 years and to what degree do they understand what do they need to do about it? to what degree does anyone know what to do with it? I think by and large across the public sector there's insufficient agreement that the changes that digital technology will create are going to be transformational and important. There's lots of awareness of technology and awareness is much better than it was, but it's the agreement that this is so important that we need to change the way we think about tax.'* Participant

3.4.9 AI and IG – The role of the Northern Powerhouse

There was a consensus from participants that the North is more vulnerable to AI and the challenges this presents for inclusive growth, and that there is a significant North/South divide relating to the DR/AI and Inclusive growth agenda.

> *'If you look at the percentage of jobs that will be affected by these technologies over the next few decades it's the same order of magnitude as what happened last century and you look at Sunderland, Birmingham, Burnley, Coventry, multi decade tanking of the economy and all of the horror that comes with that. We just can't do that again. It's an imperative we've got to get this right and that means not just saying AI is an important technology, or that we've got to invest money in autonomous vehicles, it's right across we start the conversation. What's the impact of those things going to be and how do we make sure the impact is good?'* Participant

> *'Daresbary is leading the way, but the challenge is that we don't have the eco-systems that other city regions have. Birmingham, London, that is where the bigger firms are. Yes we are behind.'*

Ideas of how the Northern LEP's/CA's might encourage better eco-systems included:

- Investment in physical infrastructure and connectivity
- Investment in digital connectivity
- Access to the right skills and tools
- More place-based initiatives to encourage clusters of business innovation
- Positioning of both local city regions and the Northern Powerhouse offer.

However, some participants felt that there was also variation within the Northern Powerhouse, with some LEP areas more enabled to succeed than others based on geography, governance and resources.

> *'Some LEP members have money and time to take out, others don't.'*
> Participant

It was also felt that if the Northern Powerhouse is to succeed as a collaboration, the government needs to get behind it more.

> *'The Northern Powerhouse is an interesting concept. It's only a strapline, no cash attached. It's only because leaders linking together.'*
> Participant

There were mixed views on the role of the Northern Powerhouse in terms of the value a northern layer will add to the individual LIS's of the 11-member LEP regions and the need to be clear about the 'global' and 'local' issues.

'They will need to, but careful to keep local. Only where areas can join, for instance transport, trade, skills, housing, and then it gets local, different in different areas.' Participant

'We need to think bigger than local – we need a regional strategy.' Participant

The overwhelming consensus was that addressing the skill gap that AI will exacerbate in the North and mitigating the risks this poses to inclusive growth is an absolute priority for individual LEP areas and the Northern Powerhouse as a whole.

4. What is next?

4.1 Summary of findings

So, what does this all mean and what should we do next to progress the Northern Powerhouse story around this emerging debate?

From the primary and secondary data collection, it is apparent that the Northern LEP's are giving significant thought to the impact of DR/AI on their local communities. However, in many cases they are taking a silo approach to this task and not looking at these two intersecting and interdependent strands of DR/AI and IG in unison and so missing out on the potential synergy that might come from considering them together.

It is generally acknowledged that DR/AI and IG do not by themselves dictate whether they compliment or contradict each other, it is how we approach them that determines that.

It is apparent that the priority for all the LEP regions in the North is addressing the impact of DR/AI on jobs, but mainly from an upskilling perspective and not necessarily the additional peripheral issues that surround the broader impacts of DR/AI around inclusive growth ambitions. These additional issues were drawn out from participant interviews and responses and grouped into the following themes, which they felt demanded further debate if we are to determine the type of impact the implementation of this technology will have on our societies, be that negative or positive:

- Equitable wealth distribution
- Data Management and use
- Governance (i.e. ethical/legal/regulatory)
- Taxation models

Again, it was generally acknowledged that DR/AI as a technology cannot decide the outcomes above, it is our choices and decisions around how we adopt the new technologies that will ultimately decide that.

There was a general consensus from participants that the North is more vulnerable to the impact of AI and automation from both a regional and local level due to the largest proportions of high-risk jobs in sectors such as transportation and storage, manufacturing, wholesale and retail and will see a disparity of income between high level and low-level jobs due to the projected shortage of skill sets for the increasingly automated world of work unless there is investment in more relevant type of education or training that better meets the needs of future industry. Desk research confirmed that trying to understand the skills and jobs of the future against current jobs and those at risk of automation either by replacement or displacement is one of their key priority areas and they all followed similar approaches of analysis which this report attempts to pull together.

The success to future proofing our workforce will be in effectively and efficiently updating and matching the workforce requirements to the constantly emerging

workplace opportunities. It will not be about reaching a destination, but more a continuous journey, the pace of which will only accelerate in line with the constantly emerging technologies, some of which we have no idea of what they might look like.
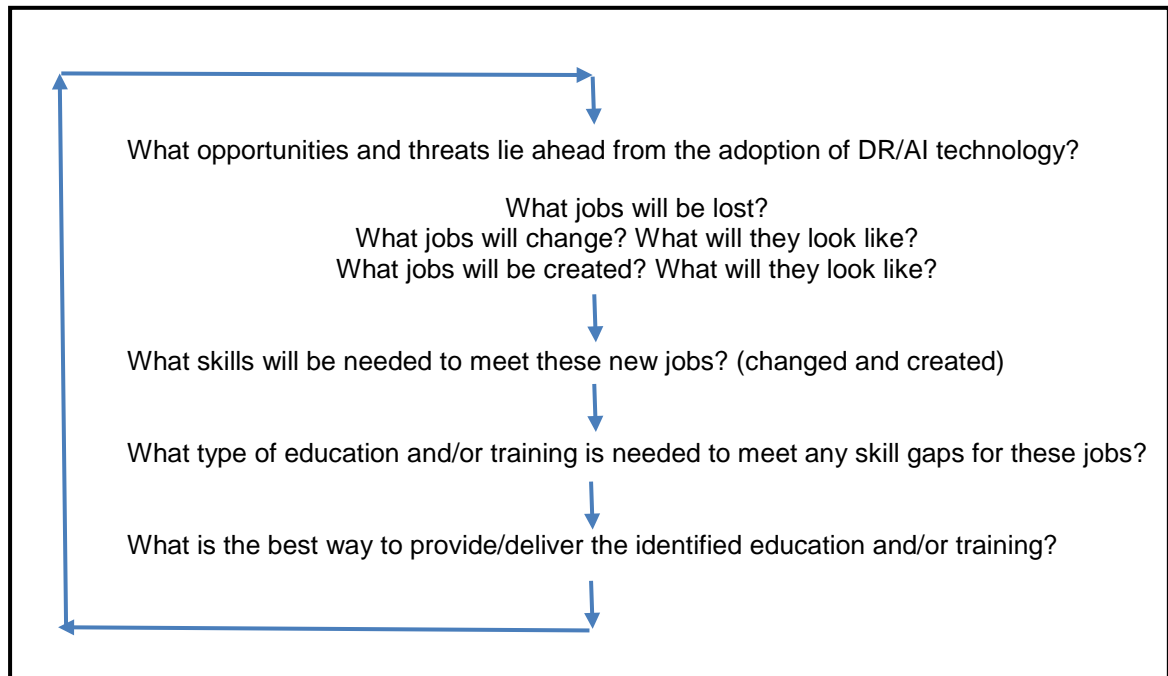

What opportunities and threats lie ahead from the adoption of DR/AI technology?

What jobs will be lost?
What jobs will change? What will they look like?
What jobs will be created? What will they look like?

What skills will be needed to meet these new jobs? (changed and created)

What type of education and/or training is needed to meet any skill gaps for these jobs?

What is the best way to provide/deliver the identified education and/or training?

Figure 3 – Future proofing our workforce

There was also a feeling by some participants that there is a need for government intervention at an earlier stage of an individual's life in terms of developing the future workforce and that policy makers could learn from best practice in other parts of the world where a 'cradle to grave' policy has been adopted with interventions happening as early as kindergarten and primary school level.

Alongside this, some participants felt there should be a more collaborative approach with the business sector around the skills and education agenda to keep up with the exponential growth and development of new technologies in the workplace. It was suggested by some that we need new ways of doing things as what we have in place today may not be enough to get us to where we need to be tomorrow.

Understanding and interpretation of IG differs slightly, but that is likely due to the diversity of local agendas, although the themes that run through them all are similar in that the success of inclusive growth is highly dependent on the future of good jobs and skills. However, some participants went further to say that its about much more than just jobs and skills and covers areas such as infrastructure (physical and digital), mobility and access.

In terms of the Northern Powerhouse partnership (NP11), the consensus was that such a collaboration has the potential ensure that DR/AI is adopted in a way that encourages regional inclusive growth, but that any strategies for this

V1.0

need to be developed in a 'GLOCAL' way that co-ordinate issues that are common to all LEP areas, whilst respecting that some issues are unique and need to be addressed locally.

4.2 *Key messages to inform debates at Conference Workshop*

In preparation for the Heseltine Institute for Public Policy, Practice and Place public event '*A Northern Powerhouse Higher Education Workshop – Humans need not apply? On the relationship between artificial intelligence and inclusive growth*', the above findings from this research project provide a collective of perceptions of the extent to which the eleven Northern Powerhouse LEPs are giving thought to the impact of AI on their socio-economic localities and provide the basis for the following key messages which it is hoped will further inform the debates for the conference and workshops.

- There is a pressing need for DR/AI and IG to be addressed simultaneously in responding to the LIS's to ensure a more comprehensive understanding of the potential cause, effect and impact each has on the other.

- There is a pressing need for the peripheral issues that surround the broader impacts of DR/AI around inclusive growth ambitions to be debated so that we can better anticipate our future and ensure that the economic, social and ethical opportunities presented are maximised whilst the risks are minimised.

- It is acknowledged that the North is more vulnerable to the impact of AI and automation. Whilst the dynamics and tensions differ in the 11 LEP localities, the overarching challenge remains the same – how to best prepare for the future workforce? This is a huge challenge and one that can benefit from frank discussions and debate between the diverse range of actors across national and local government, education and industry to develop creative responses to an increasingly emergent, dynamic and complex environment in which the old way of working may no longer be a valid option.

- It is acknowledged that there is huge potential in the collaboration across the LEP localities through the Northern Powerhouse partnership to lobby and co-ordinate the agreed issues around connectivity, skills, enterprise and innovation, trade and innovation, but it needs to adopt a 'GLOCAL' approach to also reflect the individuality of the different localities.

V1.0