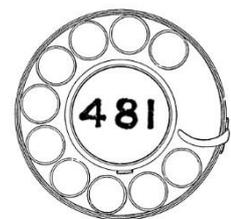
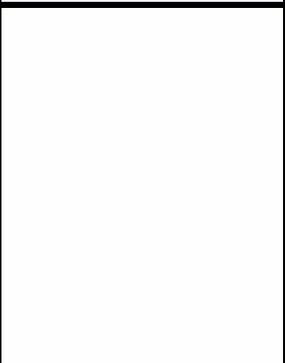
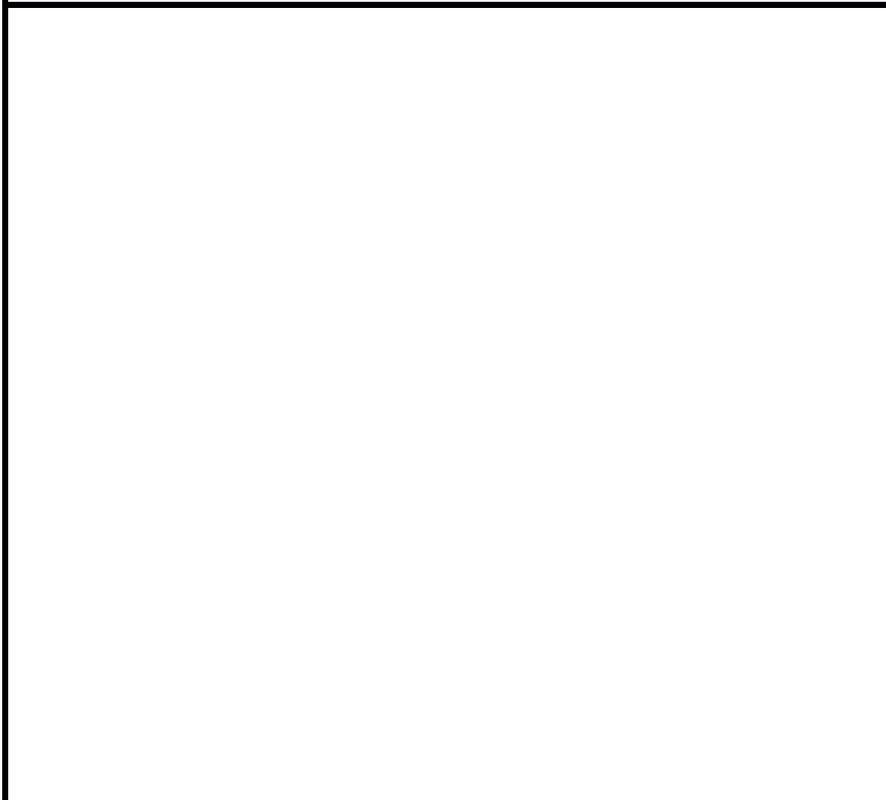


The Black Country, Work and a 4th Industrial Revolution

From Ay I to AI



My purpose in this essay, however, is not to examine the present or the near future, but to disembarrass myself of short views and take wings into the future. What can we reasonably expect the level of our economic life to be a hundred years hence? What are the economic possibilities for our grandchildren?¹

¹Keynes JM (1930/1963) *Essays in Persuasion*, New York: W.W.Norton & Co. 358-373

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Foreword

We would like to take this opportunity to thank all those who took the time to anticipate and act towards the future. The worlds we live in today would not be what they are without your thoughts and actions. Although it may have been impossible to anticipate the consequences of all your actions, the time and attention that you gave to your futures, our present, is welcomed and appreciated.

If the experience of history in our immersion institutes has taught us anything, it is that even with the benefit of hindsight, questions remain as to what decisions and which actions shaped our histories. Similarly, it is still the case today that it is difficult to venture beyond what appears to be self-evident, to re-imagine possibilities and to recognise your role in creating futures. However, the examples that you set and the lessons we have learned from your experiences of foresight, are still lessons that we teach and learn, as we continue to anticipate and shape our futures today.

Black Country, 2118

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From Ay I to AI: The Black Country, Work and a 4th Industrial Revolution

The Report in 60 Seconds

It is anticipated that developments in genetic engineering, nanotechnology, biotechnology, artificial intelligence, robotics, graphene and additive manufacturing (3D printing) will constitute a 4th industrial revolution.

A 4th industrial revolution is not just characterised by particular technologies but the connections and fusions between these technologies, the capacity to redraw the lines between physical, digital, and biological domains and the potential to further augment, if not substitute, for mental as well as physical labour.

There is no consensus as to the number of jobs that will be lost or created as a result of a 4th industrial revolution, but it is anticipated that the breadth of skills and functions afforded by new technologies will not only have an impact on the number and type of jobs available across all sections of the job market, but also have the potential to challenge existing divisions of labour and the nature, value and meaning of work.

A range of potential risks and opportunities can be identified (Table 1), but there is no consensus as to what constitutes a risk and opportunity or the means by which risks should be minimised and opportunities realised.

The report identifies three different orientations, **intensifiers**, **mitigators** and **liberators**, as to the impact a 4th industrial revolution could and should have on the future. Each of the orientations asks deeper questions about what sort of workplaces, economy, society and future, the people who live and work in the Black Country want.

No one agency will be in a position to meet the grand challenges of a 4th industrial revolution and subsequently further work will need to be done to surface, assess and develop the future readiness of all those who live and work in the Black Country.

In sum, efforts to anticipate a 4th industrial revolution need to venture beyond questions regarding its impact on the paid labour market and to consider under what conditions it will be possible to minimise the risks and maximise opportunities for all.

Table 1: Projected opportunities and risks of a 4th industrial revolution

Opportunities	Risks
<p>Creation of new knowledge, jobs, products and services.</p> <p>Productivity gains and increasingly bespoke products and responsive services.</p> <p>Improved ergonomics and augmented labour.</p> <p>Abolition of dangerous, repetitive and routine tasks.</p> <p>A connected world, open systems, and increased transparency and accountability.</p> <p>New collaborative and cooperative organisational forms, relations and practices.</p> <p>Possibilities of social emancipation and reductions in social, political and economic inequalities.</p>	<p>Jobless growth with significant levels of job destruction.</p> <p>Emergence of dominant oligopolies and increased concentrations of wealth.</p> <p>Precarious and polarised labour markets.</p> <p>Acute skills shortages in areas of growth and a mismatch between the demand for skills and the supply of education and training.</p> <p>The extension and intensification of monitoring, surveillance and the erosion of privacy.</p> <p>Increased opportunities for cybercrime and disruptive political and economic agents.</p> <p>Digital Taylorism and an 'algorithmic' management of behaviour.</p> <p>Policy and regulatory lag, including the weakening of collective action and social protection systems.</p>

Introduction

The aim of this report is to stimulate thinking, extend conversations and inform actions as to how the futures of the Black Country could and should be shaped. Particular attention is given to the anticipated impacts of a 4th industrial revolution. As is evident in the Black Country, technological change is not new. Previous industrial revolutions have seen job destruction and creation, changes in the organisation of work and had their impact on the social and physical landscape of the Black Country.

New technologies afford new risks and opportunities and a 4th industrial revolution has the potential to create new knowledge or even fields of knowledge, new products and services, new techniques and new forms of institutional relations and practices. A lesson to be learned from each of the previous industrial revolutions is that any efforts to anticipate the impact of new technologies need to be treated with a considerable degree of caution and humility. Change is a complex and dynamic process and within this report new technologies are recognised as one of a number of drivers of change. The extent to which such innovations take hold and accompanying risks and opportunities are realised, needs to be understood within the wider context of economic, social and political relations and practices.

As with previous industrial revolutions, the technologies that constitute a 4th industrial revolution have the potential to disrupt existing social, political and economic relations and raise a number of social, political, economic, and ethical questions. Who bears the risks and who will be able to take the opportunities of a 4th industrial revolution is yet to be determined and will depend in part on the response of policy makers and other stakeholders. The question that the report poses is under what conditions will it be possible for all people in the Black Country to minimise the risks and maximise the opportunities of a 4th industrial revolution.

Industrial Strategy

In November 2017 the UK government launched its Industrial Strategy. The strategy set out a long-term vision for how Britain can embrace technological change, address its productivity performance and increase the earning power of people across the UK. In the strategy, the government has identified 4 Grand Challenges. These are global trends that are projected to shape a rapidly changing future and which it is argued the UK must embrace to ensure all the opportunities are realised. The 4 are:

- Artificial intelligence – aiming to put the UK at the forefront of the artificial intelligence and data revolution.
- Clean growth – maximising the advantages for UK industry from the global shift to clean growth.
- Ageing society – harnessing the power of innovation to help meet the needs of an ageing society.
- Future of mobility – becoming a world leader in the way people, goods and services move.

To meet these challenges the Industrial Strategy identifies what it describes as clear and complementary visions for each of its 5 foundations of productivity – ideas, people, infrastructure, business environment and places. Sector Deals, i.e. partnerships between the government and industry on sector-specific issues, are being developed to boost productivity, employment, innovation and skills. Construction, life sciences, automotive and AI sectors are set to be first of these new strategic and long-term partnerships backed by private sector co-

investment. With the aim of boosting innovation in the UK by 2030, the government has committed to an Industrial Strategy Challenge Fund (ISCF) (£725 million over the next 3 years) as part of efforts to embrace the opportunities afforded by a 4th industrial revolution and anticipate global trends shaping the future of the UK.

Black Country

There remains some dispute over the origins of the name and its boundaries, but what is not in doubt is that the Black Country has shaped and been shaped by a series of social, political, economic and technological transformations. The Black Country includes the Boroughs of Dudley, Sandwell, Walsall and Wolverhampton and covers 356 square kilometres. Home to over 1.1m people and 440,000 households, 15% of the people living in the Black Country are from Black and Minority Ethnic (BME) origins, compared to a national average of 9%. Levels of deprivation and children living in poverty are generally higher than the average for England².

The Black Country Core Strategy

The Black Country Core Strategy³ is a planning and regeneration plan, agreed by the four Black Country Councils, for the whole of the Black Country. The adoption of The Black Country Core Strategy in 2011 was designed to achieve growth and economic transformation. The strategy sets out the scale and form of development intended to create jobs, homes and an improved transport network. Part of the stated rationale for the strategy was to provide immediate planning policy and infrastructure provision 'certainty' for private sector investment and to facilitate the prioritisation of infrastructure investment against the Black Country's economic growth ambitions. At the time of the writing the core strategy was in the process of being reviewed in order to meet the area's projected development needs up to year 2036.

The Black Country is a polycentric region. Each of the Black Country's boroughs includes a number of historically distinct towns and villages, with ready access to the national road and rail network. The Black Country helps constitute the West Midlands Combined Authority, making up four of the eighteen local authorities and one of the four Local Enterprise Partnerships.

The Black Country Local Enterprise Partnership

The Black Country Local Enterprise Partnership (LEP)⁴ aims to create the conditions for enterprise to flourish resulting in greater economic prosperity across the Black Country area. The Black Country LEP aims to stimulate the drivers of economic development, education & skills development and infrastructure & environmental enhancements. This is done through its role in facilitating and co-ordinating the actions of private, public and voluntary sector organisations. The Black Country LEP states that the transformation of the Black Country's infrastructure and environment is fundamental to the future growth of the region's economy. In tandem with the Black Country core

² Public Health England (2017) Health Profile for England. London: HMSO.
<https://www.gov.uk/government/publications/health-profile-for-england>

³ The Black Country Core Strategy <http://blackcountrycorestrategy.dudley.gov.uk/>

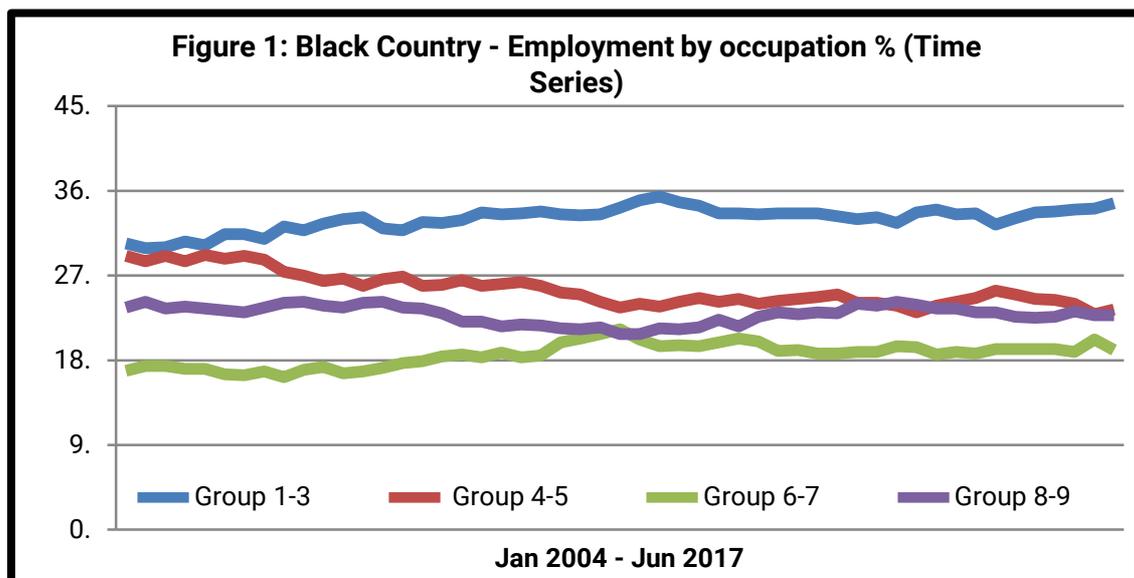
⁴ Black Country Local Enterprise Partnership (no date) <https://www.blackcountrylep.co.uk/>

strategy, the Black Country Strategic Economic Plan⁵ sets out the vision, objectives, strategy and actions to improve the quality of life for everyone who lives and works in the Black Country. The strategy builds on a 30 year vision and covers programmes to deliver across 3 drivers of change:

- People: Raising employability, education and skills;
- Place: Transforming the Black Country Infrastructure and Environment
- Business: Improving Black Country Business Competitiveness.

The Black Country LEP continues to review and update the Strategic Economic Plan.

Shaped by its industrial past, in the 19th century, the Black Country was one of the most heavily industrialised areas in the world. During the course of the 20th century, the Black Country, together with Birmingham and Coventry, constituted a vital part of the UK's manufacturing economy and was host to a number of globally known companies. However, as shown in Figure 1⁶, although manufacturing (groups 8-9) remains vital, other sectors, managers and professions (groups 1-3); and administrative and skilled trades (groups 4-5) and caring, leisure, retail and other service occupations (groups 6-7) also constitute a significant part of the Black Country's economy. Alongside these figures on employment, the upward trend for those who are self-employed also needs to be considered⁷.



The Black Country's distinct and significant industrial heritage continues to shape the present, but what about the Black Country's future? What risks and opportunities does a 4th industrial revolution hold for the Black Country and how can anticipating futures, alongside appreciating the past, inform what the people who live, work and play in the Black Country do today?

⁵ <https://www.blackcountrylep.co.uk/about-us/plans-for-growth/strategic-economic-plan/>

⁶ ONS (2018) Nomis, official labour market statistics – Local Enterprise partnership profile. <https://www.nomisweb.co.uk/reports/lmp/lep/1925185537/report.aspx?town=Black%20Country#tabempocc>

⁷ ONS (2016) Trends in self-employment in the UK: 2001 to 2015. <https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/trendsinselfemploymentintheuk/2001to2015>

Midlands Engine

A series of measures have been put in place to secure the government's ambition of making the Midlands 'a growth engine for the whole UK'. This includes the directly elected Mayor of the West Midlands Combined Authority, a commitment to HS2 and the launch of the Midlands Engine strategy⁸. The government's Industrial Strategy aims to rebalance the economy by committing to ensuring growth across the whole country. In the Midlands five key objectives have been established:

- i. Improving connectivity in order to raise productivity.
- ii. Strengthening skills in order to make the Midlands a more attractive location for businesses.
- iii. Supporting enterprise and innovation in order to foster a more dynamic regional economy.
- iv. Promoting the Midlands nationally and internationally in order to maximise trade and investment in the region.
- v. Enhancing quality of life in order to attract and retain skilled workers, as well as to foster the local tourist economy.

To support delivery of these objectives, the government has committed to investing, through the Local Growth Fund and Local Enterprise Partnerships, £392 million in the Midlands (£151 million for the West Midlands City Region) over a four year period.

A 4th Industrial Revolution

It is anticipated that developments in genetic engineering, nanotechnology, biotechnology, artificial intelligence, robotics, graphene and additive manufacturing (3D printing) will constitute a 4th industrial revolution⁹. The technologies associated with a nascent 4th industrial revolution are already beginning to transform the way that goods and services are produced, distributed and consumed in the Black Country. However, a 4th industrial revolution is not just characterized by particular technologies but the connections, crossover and fusions between these technologies and wider social, political and economic relations and practices. In this regard, it is anticipated that a distinguishing characteristic of a 4th industrial revolution will be the synthesis of technologies that have the potential to redraw the lines between the physical, digital, and biological domains¹⁰. It is the projected advances in AI, machine learning, digital learning and an expansion of the internet of things, enabling a new wave of intelligent robotics and automation, which serves as the focus of this report.

Internet of things

The 'Internet of Things' (IoT), that is, the number of, devices equipped with electronics, software, sensors, and network connectivity, enabling the collection, monitoring and exchange of data. Devices such as mobile phones, cars and household appliances, will be capable of collating and sharing vast

⁸ Department for Communities and Local Government (2017) Midlands Engine Strategy. London: HM Government. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/598295/Midlands_Engine_Strategy.pdf

⁹ Schwab K (2015) The Fourth Industrial Revolution, Foreign Affairs, World Economic Forum, Geneva. <https://www.foreignaffairs.com/articles/2015-12-12/fourth-industrial-revolution, and e-book> http://www3.weforum.org/docs/Media/KSC_4IR.pdf.

¹⁰ JRC/IPTS (2007) Consequences, Opportunities and Challenges of Modern Biotechnology for Europe, Joint Research Centre – Institute for Prospective Technological Studies, Seville, Spain; Kurzweil, R. (2005) The Singularity is Near: When humans transcend biology, New York, USA: Viking; Subramanian, V. (2009) Active Nanotechnology: What can we expect? A perspective for policy from bibliographical and bibliometrical analysis, Georgia Institute of Technology, Atlanta, USA; World Economic Forum (2017) Center for the Fourth Industrial Revolution.

amounts of data with users, each other and the enterprises that provide such devices. IoT has the potential to change production and consumption relations and practices. It is projected that IoT will be a significant driver of productivity in the short and medium term. The growth in the volume and speed of access to data enabled by these new technologies generates a number of opportunities, but also presents a range of challenges to existing institutions, relations and practices¹¹

Efforts to reduce and save labour by automating tasks have a long history¹². A 4th industrial revolution promises a new generation of machines with the capacity to think, sense, move, learn and act autonomously. Developments in machine learning and robotics mean that these new technologies will be able to operate across a much wider part of the skill spectrum than previous forms of technology. It is anticipated that such innovations promise a 'control revolution' that has the potential to transform supply chains, from extraction and production to distribution and consumption.

The potential of new technologies to transform the scale and speed of data collection and analysis and increase the capacity to personalise and customise goods and services is envisaged. Innovations in contracting, particularly with regard to the monitoring and verification of transactions and flexible and extended forms of co-ordination and communication are also anticipated¹³.

Through the optimisation of production and logistics, the smart consumption of resources and an increased capacity to anticipate risks¹⁴, the technologies of a 4th industrial revolution are projected to dramatically improve decision making¹⁵ and achieve significant productivity gains¹⁶.

Robots and Automation

It is projected that by 2020 1.7 million new industrial robots will be installed in factories worldwide and that this will be accompanied by an increase in robot density (i.e. industrial robots installed per 10,000 employees)¹⁷. In terms of units, it is estimated that there will be a significant increase in the worldwide supply of industrial robots between 2018 and 2020 (see Figure 2)¹⁸. A key driver for growth has been the automation of production in order to strengthen the competitiveness of industries and of notable interest to the Black Country, the automotive sector in particular.

¹¹ Arntz M Gregory T and Zierahn U (2016) The Risk of Automation in OECD Countries. A comparative Analysis, OECD, Social, Employment and Migration Working Papers No 189, Paris: OECD publishing.

¹² Beniger J (1986) The control revolution: Technological and economic origins of the information society. Cambridge, Mass.: Harvard University Press.

¹³ OECD (2017) OECD Digital Economy Outlook 2017 <http://dx.doi.org/10.1787/9789264276284-en>.

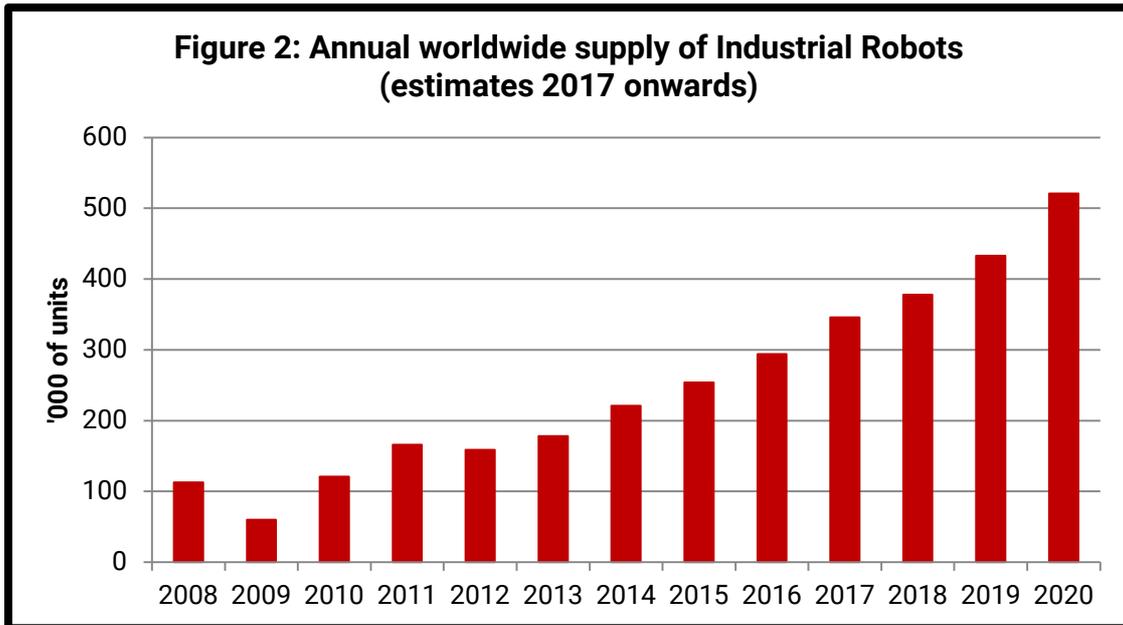
¹⁴ OECD (2017) The Next Production Revolution: Implications for Governments and Business, Paris, OECD Publishing, <http://dx.doi.org/10.1787/9789264271036-en>.

¹⁵ UK Government Office for Science (2016) Artificial Intelligence: opportunities and implications for the future of decision-making', Government Office for Science, London, <https://www.gov.uk/government/publications/artificial-intelligence-an-overview-for-policy-makers>.

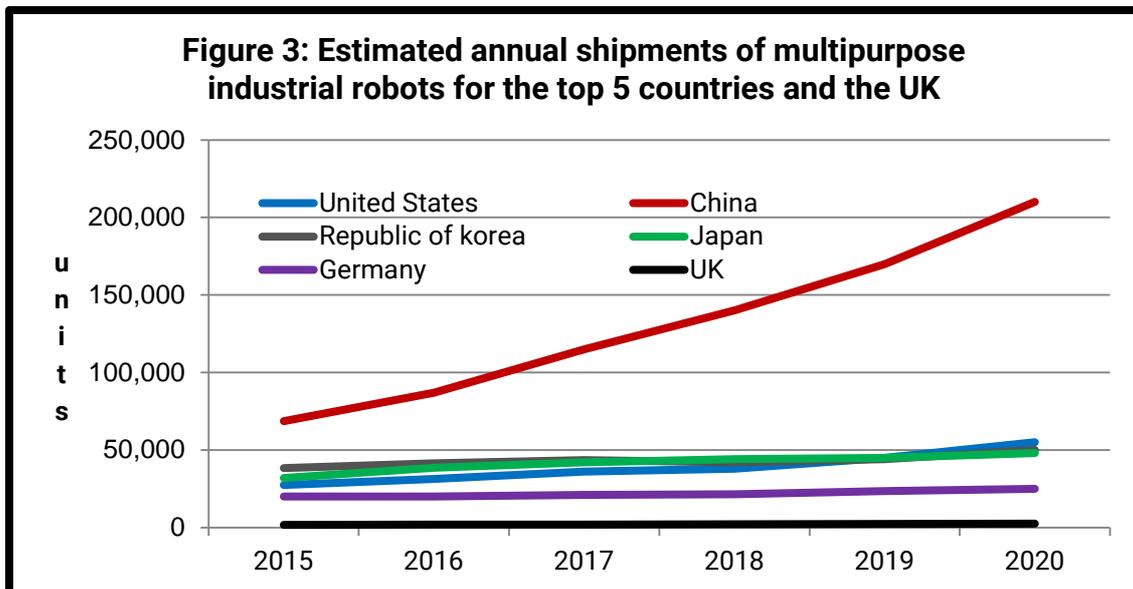
¹⁶ Purdy M and Daugherty P (2016) Why artificial intelligence is the future of growth, Accenture, October, www.accenture.com/futureofAI.

¹⁷ International Federation of Robotics IFR (2017) World Robotics 2017 <https://ifr.org/free-downloads/>

¹⁸ International Federation of Robotics IFR (2017) World Robotics 2017 <https://ifr.org/free-downloads/>



There are five major markets for robotics with China, the Republic of Korea, Japan, the United States and Germany representing 74 percent of the total sales volume in 2016 (See Figure 3)¹⁹. China has significantly expanded its market and is projected to cement its leading position as the largest market with sales coming close to the total sales volume of Europe and the Americas combined.



Further growth is expected to meet the demand for user friendly, connected and cloud robotics, that have the potential to provide smart production processes through more flexible automation and real time monitoring and adjustment. As AI and automation increasingly becomes a vital part of daily lives, and the pace of technological innovation accelerates, the potential of a 4th industrial revolution is beginning to be realised.

¹⁹ International Federation of Robotics IFR (2017) World Robotics 2017 <https://ifr.org/free-downloads/>

The Futures of (Paid) Work

Debates on a 4th Industrial Revolution, particularly with regard to intelligent robotics and automation, have tended to focus on disruptions to the paid labour market. The extension and intensification of automation have led to warnings of 'robots at the gate'²⁰ and raised anxieties and hopes over the prospects and implications of a jobless world and post work society.

Estimates on the impact of new technologies on the labour market differ with regard to the assumptions that are made as to the number of jobs subject to automation and the number of new jobs to be created through developments in robotics, and artificial intelligence²¹. Estimates on the number of jobs at high risk of automation range from almost 50%²², through to 30%²³ or 9%²⁴ (see Table 2). Table 3 extends and projects a particular scenario²⁵ as to the estimated proportion of jobs at potential high risk of automation by early 2030s applied to a range of industry sectors in the Black Country.

Table 2: Estimated proportion of jobs in the Black Country at potential high risk of automation based on a range of studies.

Current no. of employee jobs 2017	Frey and Osbourne		PWC		Arntz, Gregory and Zierahn	
	%	No.	%	No.	%	No.
494,200	48	237,216	30	148,260	9	44,478

Projections of existing jobs being lost due to automation need to be set against the potential of a 4th industrial revolution to boost productivity and generate additional jobs elsewhere in the economy. It is anticipated that in terms of paid work, there will be growth and an increased demand for highly skilled labour, most notably for people with skills that enables them to operate the technological systems created by advancing technology. However, it is also anticipated that there will be a demand for skills in those jobs that machines cannot perform. That is those jobs that rely on what will increasingly be recognised as intrinsically, if not exclusively, human traits and interpersonal abilities such as empathy, creativity and system skills²⁶. Such skills will also be vital for anticipating and responding to the challenges of a 4th industrial revolution.

²⁰ Rajadhyaksha A and Chatterjee A (2018) Robots at the gate: humans and technology at work. Barclays Impact Series. London Barclays

https://www.investmentbank.barclays.com/content/dam/barclaysmicrosites/ibpublic/documents/our-insights/Robots-at-the-gate/Barclays-Impact-Series-3-Robots_at_the_Gate-3MB.pdf

²¹ International Labour Organisation (2016) Technological changes and work in the future: Making technology work for all. Issue Note 1 http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/publication/wcms_534201.pdf ; UK Commission on Employment and Skills (2014) The Future of Work: Jobs and Skills in 2030, London.

²² Frey C and Osbourne M (2013) The Future of Employment: How susceptible are jobs to computerisation. Oxford: Oxford Martin School Programme on the Impacts of Future Technology.

²³ PWC (2017) UK Economic Outlook. Section 4. Will robots steal our jobs? London: PriceWaterhouseCoopers.

²⁴ Arntz M Gregory T and Zierahn U (2016) The Risk of Automation in OECD Countries. A comparative Analysis, OECD, Social, Employment and Migration Working Papers No 189, Paris: OECD publishing. <http://dx.doi.org/10.1787/5jlz9h56dvq7-en>.

²⁵ PWC (2017) UK Economic Outlook. Section 4. Will robots steal our jobs? London: PriceWaterhouseCoopers.

²⁶ NESTA (2017) The Future of Skills: Employment in 2030. NESTA <https://www.nesta.org.uk/publications/future-skills-employment-2030>

Table 3: Illustration of a scenario for the proportion of jobs in the Black Country at potential high risk of automation by early 2030s.

Industry	Employment share of total jobs			Jobs at potential high risk of automation - Black Country	
	Black Country	W. Mids	Great Britain	No.	%
Water, sewage and waste management	0.8	0.6	0.7	2191	62.6
Transportation and support services	6.3	6.1	4.9	15,792	56.4
Manufacturing	13.9	11.8	8.1	28,768	46.4
Wholesale and retail trade	19.3	17.2	15.3	37,840	44.0
Administrative and Support Services	9.0	8.1	9.0	14960	37.4
Financial and insurance	1.8	2.4	3.6	2576	32.2
Public Administration and defence	2.9	3.7	4.3	4173	32.1
Electricity and gas supply	1.1	0.5	0.4	1590	31.8
Real estate	1.3	1.3	1.6	1692	28.2
Information and communication	1.6	2.7	4.2	1911	27.3
Professional, scientific and technical	4.5	6.8	8.6	5120	25.6
Accommodation and food services	4.7	6.6	7.5	5355	25.5
Construction	4.0	3.9	4.6	4266	23.7
Arts and entertainment	2.0	2.4	2.4	2007	22.3
Other services	2.9	3.7	2.4	2418	18.6
Human health and social work	15.0	14.2	13.3	11,390	17.0
Education	8.7	9.1	8.9	3315	8.5

Sources: ONS workforce jobs survey for employment shares (2017); PwC estimates using PIAAC data from OECD. High risk of automation is defined as 70% or over based on technical feasibility considerations only. Employee jobs exclude self-employed, government-supported trainees and HM Forces. Data excludes Agriculture, forestry and fishing; Domestic personnel and self-subsistence and mining and quarrying.

One significant difference between a 4th industrial revolution and previous waves of technological innovation is the potential to substitute for human brains as well as hands. The breadth of skills and functions afforded by these new technologies means that the impact of automation is likely to be felt across all sectors²⁷. Therefore, although the ability to automate skilled and non-skilled labour manual has been the predominant feature of the 20th century, the 21st century is beginning to witness job displacement that extends from blue to white collar professions. With that said, based on current tendencies, it is manual and routine tasks that are projected to be most susceptible to automation in a 4th industrial revolution, whereas social, creative and critical thinking skills will be relatively less subject to automation. The likelihood of automation appears lowest in education, health and social work, and highest in sectors such as manufacturing, retail, transport and storage.

Given the significance of transportation and support services, manufacturing and wholesale and retail trade jobs in the Black Country, it is anticipated that the region will be disproportionately impacted by automation. It should also be noted that those most at risk from automation will tend to be, on average, those who have the lowest wage. Consequently, the projected uneven impact of technologies across different sectors may further widen income disparities²⁸ and will have implications for the role of technologies in shaping wider social and political relations.

The Management and Organisation of Work

A 4th industrial revolution is anticipated to not only have an impact on the number and type of jobs available in the future, but also on how work is organised and how people work. A 4th industrial revolution has the potential to restore and create new forms of production and work practices. There is the potential to transform the economic landscape by creating opportunities for new entrants, challenging incumbent providers and raising questions regarding the form and function of operations, finance and strategy. With the promise of being able to continually instruct and monitor workers in real time, without the costs of supervision outweighing its benefits, what is described as algorithmic management²⁹ is changing the organisation of work.

An algorithm is a self-contained step-by-step set of operations to be performed (e.g. calculation, data processing, and/or automated reasoning tasks). Algorithmic management and governance, that is the use of data, software and connectivity, to allocate, optimise and evaluate work flows practices, is already evident and likely to be extended and intensified across different sectors of the labour market and the operation of social institutions. Efforts to manage performance and control production processes are not new. Each industrial revolution has created changes in the way that work is organised and subsequently had a significant impact on the relations between employers and employees. Algorithmic management can be seen as an extension of the computing business systems that have helped shape work conditions for years, but the capacity and reduced costs of new technologies enable the seemingly oxymoronic distant but intimate supervision of workers. The 'real-time' monitoring of workers and issuing of personalised 'service level assessments' have already enabled the growth of new platform business models. Digital platforms that

²⁷ Deloitte (2015) From brawn to brains. The impact of technology on jobs in the UK. London: Deloitte

²⁸ PWC (2017) UK Economic Outlook. Section 4. Will robots steal our jobs? London: PriceWaterhouseCoopers

²⁹ Lee MK Kusbit D Metsky E. and Dabbish L (2015). Working with machines: The impact of algorithmic, data-driven management on human workers. In Proceedings of the ACM/SIGCHI Conference on Human Factors in Computing Systems (CHI 2015), 1603-1612

make use of algorithmic management are projected to further enable and impact on the management of distributed and diverse workers across large distances and at a large scale. In a range of settings, engineers³⁰, warehouse workers³¹, baristas³², and delivery workers³³ jobs are assigned, optimised, and evaluated through tracked data and algorithms. The capacity to extend and intensify the remote and real time tracking of process and outcomes could be transformative.

A 4th industrial revolution has the potential to further enhance the flexibility of when and where work is undertaken, but it is also projected to blur the boundary between private life and work, thereby intensifying an 'anytime, anywhere' attitude to work. It should also be noted that the same technology that tracks workers is also building the data sets that will facilitate the further automation of roles and tasks, thereby enabling the future displacement of human labour. In this scenario, an increasing number and breadth of workers will potentially be faced with the choice of either working like a machine or being replaced by a machine.

Heteromation

Heteromation marks a subtle but significant shift in the relation of humans, labour and technology. The history of automation has been characterized by efforts to augment, reduce, if not remove, human labour from production processes. A 4th industrial revolution has the potential for a variation of such developments, in what is described as heteromation³⁴. This is where humans appear to be displaced from production processes, but as consumers of products and services, become a vital part of production systems. The current form of AI that enables automation makes use of algorithms that are dependent on large amounts of data from multiple users. A vital source of such data is provided by people's engagement with free and paid for services including search engines, video games, social media, and in some instances, personal health, credit and insurance records. An essential characteristic of heteromation is that the enterprise providing the service and product, by harvesting the data generated by users, benefits from what is in effect, the uncompensated labour of users / producers ('producers'). Echoing the extension and intensification of monitoring and feedback seen within algorithmic forms of management, the users of products and services, effectively become components of the technological systems that those products and services need to function. The line between producer and user is blurred, as the data that is harvested from users becomes vital to the very operation of the product and service. Somewhat ironically, those who have been displaced and made redundant by automated technologies are drawn back in and become essential to the operation of these heteromated processes³⁵

³⁰ Hodson H (2014). The AI Boss that Deploys Hong Kong's Subway Engineers. *New Scientist*

³¹ McClelland M (2012). I Was a Warehouse Wage Slave. *Mothers Jones*

³² Kantor J (2014). Working Anything But 9 to 5. *NYT*

³³ Davidson A and Kestenbaum D (2014). The Future of Work Looks Like a UPS Truck. *NPR*

³⁴ Ekbia HR and Nardi BA (2014) Heteromation and its (dis)contents: The invisible division of labor between humans and machines. *First Monday*, [S.l.], ISSN 13960466. Available at:

<<http://firstmonday.org/ojs/index.php/fm/article/view/5331>>. Date accessed: 15 mar. 2018.

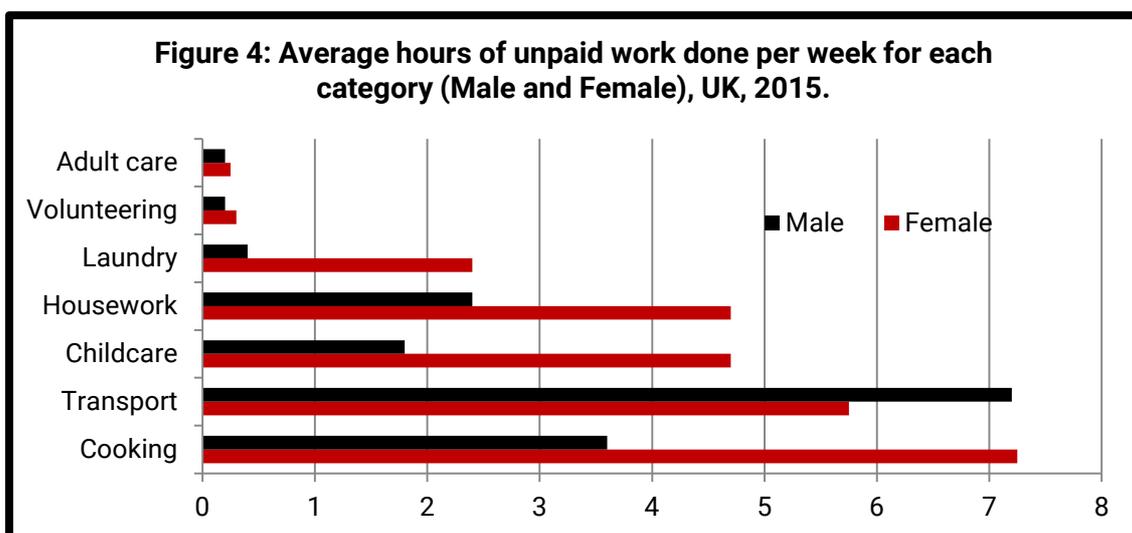
doi:<http://dx.doi.org/10.5210/fm.v19i6.5331>.

³⁵ Ekbia HR and Nardi BA (2012) Inverse instrumentality: How technologies objectify patients and players, In: P.

Leonardi B, Nardi, and Kallinikos J (editors). *Materiality and organizing: Social interaction in a technological world*. Oxford: Oxford University Press, pp. 157–176.

Division of Labour

A less immediate and tangible impact of a 4th industrial revolution is the potential changes in the meaning that is attached to work. Machines substituting human labour can lead to a literal and figurative sense of redundancy or conversely, lead to a reclaiming of meaningful work, where value is no longer defined by a labour market. In discussions on a 4th industrial revolution and the future of work, the focus has tended to be on paid work, or more specifically, paid jobs. Given that it is estimated that unpaid work, that is non-market services which households either produce for themselves or for other households, has an estimated value of £1.01tn, equivalent to approximately 56% of the UK's Gross Domestic Product (GDP), or a value of £38,162 per household, a shift in focus is required³⁶. As women carry out an overall average of 60% more unpaid work than men, a 4th industrial revolution provides an unprecedented opportunity to rethink work and existing divisions of labour and reduce gender pay gaps (See figure 4)³⁷.



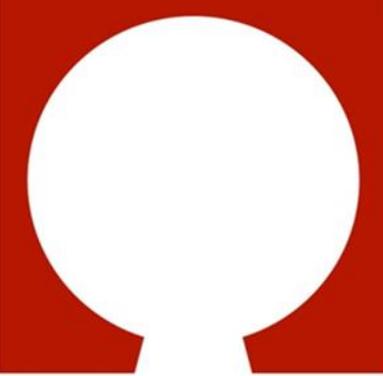
It is projected that a 4th industrial revolution will have a disruptive impact on the division of labour and unpaid work. Echoing discussions with reference to the paid labour market, the technologies, products and services of a 4th industrial revolution, could provide the opportunity to automate a range of unpaid work, roles and tasks. This in turn could create more leisure time, increase the opportunities to engage in education or enable access to paid labour markets. However, given the current gender imbalances in what are projected to be growth areas of highly paid sectors of the labour market (STEM subjects) considerable action will need to be taken to ensure that a comprehensive and diverse pool of talent is educated, recruited and promoted in these areas³⁸. Conversely, given the scale of technological unemployment envisaged in particular scenarios, a 4th industrial revolution may provide an opportunity to revisit the nature, distinctions and value that is given to paid and unpaid work and labour. It is at this point that the report considers some of the alternative futures that are being claimed as part of 4th industrial revolution.

³⁶ ONS (2016) Household Satellite accounts: 2005 to 2014.
<https://www.ons.gov.uk/releases/householdsatelliteaccounts2011to2014>

³⁷ Source: UK Harmonised European Time Use Survey (HETUS), 2015

³⁸ Voss G (2014) The Second Shift in the Second Machine Age: Automation, Gender and the Future of Work, in Our Work Here is Done: Visions of a Robot Economy, NESTA.

Table 4: Three orientations to the risks and opportunities of a 4th industrial revolution

Intensifiers	Creative Disruption
	<p>Intensifiers anticipate that a 4th industrial revolution promises a dynamic, prosperous and radiant future, particularly for those willing and able to adapt to future demands and conditions. Intensifiers argue that new technologies could and should enable the sharpening of competitive edges, as goods and services are able to be provided on a larger scale, over shortened time-scales, at a cheaper unit cost and in increasingly personalised forms. Intensifiers argue that although there will be job losses in particular sectors, new jobs and opportunities will be created through the growth of new industries.</p>
Mitigators	Maintaining Balance
	<p>Whilst recognising the opportunities of a 4th industrial revolution, mitigators argue that unless anticipatory actions are taken, the social costs of such changes could outweigh the benefits. Attention is drawn to the disruptive nature of new technologies and the uneven distribution of risks and opportunities. Proposals include calls to review and update education and training and the establishment of new social contracts that make explicit the rights, responsibilities and expectations of a new age. The aim is to manage the transition to and through a 4th industrial revolution and ensure that risks are minimised and opportunities are made available to all.</p>
Liberators	Positive Liberty
	<p>Liberators argue that a 4th industrial revolution has the potential to enable a paradigm shift in the way we live and work. New technologies, particularly automation and a digital dividend, possess the capacity to enable a reduction in the working week, increase leisure time and most importantly secure sustainable incomes and resources for all. In the same way that the industrial revolution enabled the possibility of a post scarcity society, it is argued that a 4th industrial revolution has the potential to create a post work society, enabling all people to determine and pursue their own interests.</p>

Alternative Futures

How the future is conceived, helps structure the decisions which are taken today³⁹. The aim of this report is to explore the potential impact of a 4th industrial revolution in order to extend the horizon of what are possible and desirable futures and actions to be taken today. Each wave of technological innovation has stimulated debates about the positive and negative impacts of technology on work and society. The tensions that exist within debates over the hopes and fears of technology are exemplified in Keynes 1930's essay 'Economic Possibilities For Our Grandchildren.' In the essay Keynes highlights that the advancement of new technologies can lead to the rise of technological unemployment – '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'. And yet within the same essay, Keynes goes on to consider the prospect that by the time his grandchildren are adults, the same advances in technology could usher in a new 'age of leisure and abundance'.

Similar tensions are evident in contemporary projections of the risks and opportunities of a 4th industrial revolution. When considering the relationship between new technologies and work, it is important to note that technology is not neutral and affords new experiences, whilst foreclosing others. The options and choices available as to how these new opportunities are realised are shaped by a range of wider social, political, and economic interests⁴⁰. When seeking to take advantage of the extended horizons of possibility created by new technologies, it is anticipated that tensions will increase between those seeking to use technology to intensify and optimise existing relations and practices and those seeking to disrupt established relations and practices. Which of these is deemed preferable will in part reflect current and projected positions and a number of scenarios are available for what could be the future of work⁴¹. This report identifies 3 orientations to the risks and opportunities of a 4th industrial revolution. These orientations are described as Intensifiers, Mitigators and Liberators (See Table 4 for a summary). These different orientations as to what are possible and preferable futures are highlighted with the aim of surfacing and stimulating conversations as to how the futures of the Black Country could and should be shaped.

Intensifiers and Creative Disruption.

Intensifiers anticipate that a 4th industrial revolution promises a prosperous and radiant future, particularly for those willing and able to adapt to future demands and conditions. Arguing that to date, advances in technology have reduced the number of dull and dangerous jobs, and in turn created new opportunities⁴², intensifiers project that a 4th industrial revolution has the potential to enrich, rather than immiserate the population. A 4th industrial revolution is seen as an opportunity to intensify and



³⁹ Rhisiart M. Stormer E. & Daheim C. (2017) From foresight to impact: The 2030 Future of Work scenarios. *Technological Forecasting and Social Change*. 124: 203-213.

⁴⁰ Zuboff S (1988) *In the age of the smart machine: the future of work and power*. New York: Basic Book.

⁴¹ UK Commission for Employment and Skills (2014) *The future of work. Jobs and Skills in 2030*. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/303334/er84-the-future-of-work-evidence-report.pdf

⁴² <https://www.forbes.com/sites/federicoguerrini/2015/11/09/the-war-of-reports-on-artificial-intelligence-robots-and-jobs-is-actually-a-fight-for-your-mind/#20200ae67df0>

optimise existing social, political and economic relations.

Dark Factories and Lights Out Manufacturing

Dark factories or lights out manufacturing, describes production processes that can run in the absence of human labour, and can therefore operate without lighting, heating and air conditioning. The FANUC (factor automated numerical control) facility in Japan is an example of a dark factory, where in a complex of 22 factories, robots operate in a lights out environment⁴³. Tasks that involve dangerous working and difficult working conditions are conducive to lights out manufacturing, with the promise of reduced and stabilised labour costs and reduced scrap rates. Lights out Manufacturing is not a new phenomenon, but limited capital investment and technological limitations have limited their expansion. With a 4th industrial revolution, it is projected that the development of machine learning and smarter and more dexterous automation systems, will see the reduction of human labour in manufacturing, if not an increase in dark factory facilities⁴⁴.

Intensifiers argue that new technologies enable the sharpening of competitive edges, as goods and services are able to be provided on a larger scale, over shortened time-scales, at a cheaper unit cost and in increasingly personalised forms. This is exemplified by the growth of digital platforms and global crowdsourcing clearing houses that offer enterprises a large supply of 'crowdworkers' that compete to provide a range of simple and complex tasks⁴⁵.

The anxieties associated with such a position is that widespread automation, and a delayed or limited policy response, would result in large scale technological unemployment, polarized societies and a raft of social and political issues and crises. However, intensifiers' argue that jobs and work should not be conflated. Yes, a 4th industrial revolution may lead to certain jobs being lost, but new jobs will be created with the development of new industries and opportunities⁴⁶. Furthermore, intensifiers argue that over time, absolute levels of income will increase, as wealth 'trickles down', particularly in a newly expanded service sector.

Competition Law and Antitrust Tools

It is anticipated that a 4th industrial revolution will extend and intensify the challenges the digital economy has posed to existing antitrust and competition laws. The form, volume and speed of data have the potential to disrupt competition. Whilst recognising that efficiencies could be gained through the use of algorithms to improve pricing models, predict market trends and customise services, there is also a concern that it would be possible for enterprises to achieve and sustain collusion without any formal agreement or human interaction, thereby reducing competition⁴⁷. Whilst seeking to support

⁴³ FANUC (no date) About FANUC <http://www.fanuc.eu/uk/en>

⁴⁴ Knight W (2016) China is building a robot army of model workers. MIT Technology Review. <https://www.technologyreview.com/s/601215/china-is-building-a-robot-army-of-model-workers/>

⁴⁵ Irani, L. (2013) The Cultural Work of Microwork. *New Media and Society*, 17(5), 720-739. Irani, L., & Silberman, M. (2013). Turkopticon: Interrupting Worker Invisibility in Amazon Mechanical Turk. In *Proc. of CHI*, 611-620.

⁴⁶ Rajadhyaksha A and Chatterjee A. (2018) Robots at the gate: humans and technology at work. Barclays Impact Series. London Barclays

https://www.investmentbank.barclays.com/content/dam/barclaysmicrosites/ibpublic/documents/our-insights/Robots-at-the-gate/Barclays-Impact-Series-3-Robots_at_the_Gate-3MB.pdf

⁴⁷ OECD (2017), Algorithms and Collusion: Competition Policy in the Digital Age www.oecd.org/competition/algorithms-collusion-competition-policy-in-the-digital-age.htm

entrepreneurship and innovation, those advocating the benefits of competition are recognising the potential limitations of existing antitrust tools and techniques, particularly with regard to increasing concerns over the growth and dominance of digital oligopolies and anti-competitive practices⁴⁸. Going forward, when considering potential mergers, an enterprise's data assets will need to be considered. In short, policy makers and regulators will need to be more AI and data literate when determining how best to promote competition⁴⁹

With an increasingly competitive marketplace, it is projected that there will be a demand for developments in biotechnology that sustain high performance over longer periods and provide a competitive edge. Advances in biology, pharmacology, cognitive science and communications that enable enhanced functions such as strength, vision, hearing and memory, will blur the lines between natural and enhanced human performance⁵⁰. The use of technology to augment human performance raises a number of questions over the ethics and unforeseen consequences of such developments⁵¹. However, intensifiers argue that policymakers should resist the urge to intervene as self-regulation and the response of crowds and the marketplace will provide a responsive form of accountability in what is a dynamic and fast changing landscape.

Mitigators and Maintaining Balance.

Whilst recognising the opportunities of a 4th industrial revolution, mitigators coalesce around the concern that the social costs of such changes could outweigh the benefits. Although it is projected that a number of high skilled jobs will be created, it is also anticipated that new technologies may not only lead to significant job losses, but also intensify and extend surveillance of work processes through the extension and intensification of digital Taylorism.



Mitigators argue that unless anticipatory action is taken, the promise of a prosperous and sharing economy will be realised as a precarious, hollowed out and polarised 'gig' economy that reinforces and exacerbates existing inequalities and divisions. Mitigators fear that a 4th industrial revolution will lead to significant increases in technological unemployment, with those in work being paid an hourly or piecework rate with minimal or zero regulation and without access to social security cover.

Within this scenario, in a bid to keep humans competitive with robots, governments may be tempted to further deregulate the labour market. This might forestall further investment in automation and keep employment rates relatively high, but only serve to extend and intensify the experience of precarious labour and exacerbate the polarisation of society. Consequently, mitigators, whilst recognizing the potential benefits of a 4th industrial revolution argue that actions need to be taken to manage the transition to new forms of work and to ensure that new technologies will work for all.

⁴⁸ OECD (2018) Digital Economy, Innovation and Competition. <http://www.oecd.org/daf/competition/digital-economy-innovation-and-competition.htm>

⁴⁹ Economist (2017) The world's most valuable resource is no longer oil, but data. The Economist, May 6th.

⁵⁰ EY (2015) Megatrends 2015: Making sense of a world in motion. London: EY.

⁵¹ Dyson, A. and Harris, J. (eds.) (2014) Ethics and Biotechnology. London: Routledge; Renn, O. and Roco, M. C., (2006) Nanotechnology and the need for risk governance, Journal of Nanoparticle Research, 8(2): 153–191.

In order to manage transitions and be fit for the 21st century, mitigator's proposals include calls to review and update education and training. Based on current tendencies, it is projected that a 4th industrial revolution will present significant challenges to the form and function of education and training. One major challenge will be how to know which knowledge and skill sets will be needed in a 4th industrial revolution, especially for industries that haven't been created yet. In the short to medium term mitigators argue that it is important to ensure that regions and employers are able to attract and develop those with the requisite technical knowledge, skills and experience to operate and realise the benefits of a 4th industrial revolution. Alongside this, there is a recognition that for those seeking work within a disrupted labour market, there will be a premium on acquiring and demonstrating the skills and knowledge that appear to be least amenable to automation, that is creative skills, critical thinking and the so-called 'soft skills' associated with work in education, health and social work. However, arguably what is most important, across all sectors, is the development of skills knowledge and experience that enable individuals, communities and institutions to anticipate changes and operate in an open, dynamic and contested context.

A New Social Contract

It is anticipated that one of the main challenges of a 4th industrial revolution will be to ensure that the system of social and employment rights and regulations are fit for a changing labour market and dynamic social relations. New technologies are making it easier to break down production processes into small parcels and to engage people in forms of 'gig' work. Without changes to regulations, the increasing number of self-employed, sole trader incorporations and zero-hour contracts that make up the gig economy, could lead to reduced revenue for governments and exclude workers from contributory social protection systems such as unemployment benefits, sick pay and pensions⁵². One potential response is for countries to review and extend their social and labour protections to people who are working non-standard / un-salaried contracts in part time or in serial part time or temporary jobs⁵³. It has been proposed that a guiding principle for 4th industrial revolution contracts and social protection is that regulations should aim for equal treatment of all workers whatever their type of contracts. Whilst recognising that increasingly complex and global supply chains and sub-contracting may make it hard to identify transgressions and enforce protections, it is argued that technology could play a vital part in efforts to monitor compliance and enforce new regulations.⁵⁴

Beyond education and training, mitigators argue that regulatory, if not structural, solutions will need to be developed if all workers are to benefit from the opportunities of a 4th industrial revolution. Mitigators argue that unless anticipatory actions are taken, employment rights and rights to privacy will be eroded and large scale

⁵² TUC (2016) Living on the Edge: The rise of job insecurity in modern Britain. London: Trades Union Congress. <https://www.tuc.org.uk/sites/default/files/Living%20on%20the%20Edge%202016.pdf>

⁵³ Good Work: the Taylor review of modern working practices. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/627671/good-work-taylor-review-modern-working-practices-rg.pdf

⁵⁴ Kuddo, Arvo; Robalino, David A.; Weber, Michael. 2015. Balancing regulations to promote jobs : from employment contracts to unemployment benefits (English). Washington, D.C. : World Bank Group. <http://documents.worldbank.org/curated/en/636721468187738877/Balancing-regulations-to-promote-jobs-from-employment-contracts-to-unemployment-benefits>

technological unemployment will reduce the tax base and constrain the capacity of governments to fund public services and social protection, at a time when it will be most needed. Subsequently without a strengthening or remodelling of existing statutory and regulatory frameworks, there is the strong possibility of a 'race to the bottom', resulting in the gradual collapse of labour standards and social protection models⁵⁵.

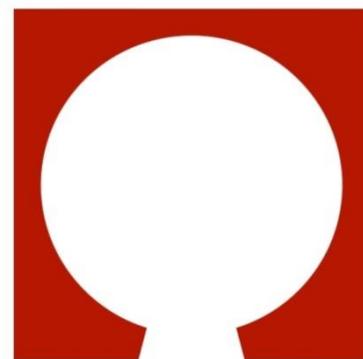
Taxing Robots

A combination of new business models and platforms and the nature and scale of automation have led to warnings of a regulatory lag and a legal vacuum being created. This has led to calls for a review and updating of social and fiscal policies to help meet the challenges of a 4th industrial revolution. Short to medium term proposals focus on the digital economy and a digital tax package, including changes to corporation tax rules and plans for companies with significant online revenues, to pay a tax on turnover for particular revenue streams, including online trading, advertising on social media, search engines and the sale of user data⁵⁶. Additional proposals include limiting tax incentives for investments in automation, through to the requirement for corporations to report on the extent and proportion of the contribution of robotics and AI to the economic results of a company. Data on the latter enables the calculation of a robot tax⁵⁷. It is argued that receipts from a digital levy and robot taxes can mitigate disruptions and manage a transition to a 4th industrial revolution by supporting social security, funding education and re-training and or supporting a universal basic income.

Without wanting to halt advances in technology, curb efforts to increase growth and innovation or necessarily change the overall social, political and economic relations, mitigators argue that action and collaboration across countries, governments, the private sector, and civil society will be necessary in order to make a 4th industrial revolution work for all. A major challenge will be to understand and assess the working of AI and algorithms in order to ensure that policies, regulations and oversight are not only possible, but appropriate and effective. In sum, mitigators argue that a 4th industrial revolution will require a new social contract that makes explicit the rights, responsibilities and expectations of a new age.

Liberators and Positive Liberty.

Liberators argue that there is potential paradigm shift in the way we live and work⁵⁸. A 4th industrial revolution has the capacity to enable a reduction in the working week, increase leisure time and secure sustainable incomes and resources for all. In this scenario a 4th industrial revolution creates the conditions of a new economic paradigm, where new technologies promise a post work society built on a cooperative, participatory and sharing



⁵⁵ Standing G (2011). *The precariat: The new dangerous class*. London: Bloomsbury Academic.

⁵⁶ European Commission (2018) Questions and Answers on a Fair and Efficient Tax System in the EU for the Digital Single Market. European Commission http://europa.eu/rapid/press-release_MEMO-18-2141_en.htm

⁵⁷ Delvaux, M (2016) Draft Report with recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL)). Brussels: Committee on Legal Affairs. European Parliament

⁵⁸ Srnicek N. Williams A (2016) *Inventing the Future: Postcapitalism and a World Without Work*. London: Verso. Frayne D (2015) *The Refusal of Work: rethinking post-work theory and practice*. London: Zed books. Frase P (2016) *Four Futures: Life after Capitalism*. London: Verso.

economy.

Highlighting that contemporary relations and attitudes to work are themselves the product of previous industrial revolutions, liberators argue that it is unsurprising that a 4th industrial revolution could also refashion the meaning and organisation of work. In the same way that the industrial revolution fostered the factory system and enabled the possibility of a post scarcity society, it is argued that a 4th industrial revolution has the potential to create a post work society. Liberators suggest that a failure to take the opportunity to rethink the relationship between work and society could result not only in a growing disparity between the economic winners and losers, but also have dire consequences for the environment.

Questioning the idea that all paid jobs are useful, whilst also highlighting the undervaluing of unpaid roles, liberators argue that it is not jobs per se that people require, but access to resources, meaning and purpose⁵⁹. As jobs have and will continue to offer inadequate levels of income, meaning and purpose to many workers, then it is suggested that a 4th industrial revolution provides a welcome opportunity to consider alternatives.

The idea of a world freed from work is far from new and has been a recurrent and prominent theme in visions of the future. From Marx's vision of workers able to 'hunt in the morning, fish in the afternoon, rear cattle in the evening, criticise after dinner'⁶⁰ to the 'age of leisure and abundance' envisaged by Keynes⁶¹, liberation from long, draining and monotonous jobs has been a promise of a number of social, political and technological revolutions. Drawing on and extending such traditions, liberators argue that a post work world, in some variants, supported through the provision of an unconditional basic income, promises a calmer, more equal, pleasurable, thoughtful, and politically engaged society.

Universal Basic Income

Universal Basic Income (sometimes called Unconditional Basic Income, Citizens Income or just Basic Income) is a proposed economic system in which all adults within the economy receive a guaranteed basic income irrespective of whether they have a 'job' or not. In some variants, replacing existing social security systems, basic income is a non-means tested, non-withdrawable and unconditional regular payment made to every individual. It is argued that machine based wealth, if shared, would enable all citizens to receive a sustainable basic income. It is argued that a basic income acknowledges that everyone plays a part in generating the wealth currently enjoyed only by a few, ensures that everyone is guaranteed a secure base and that all work pays. In sum, a universal basic income is projected to provide all people with the freedom to develop and contribute talents for the benefit of all⁶².

Liberators argue that the technologies of a 4th industrial revolution have the potential to support the growth of sharing economy that facilitates sustainable forms of co-production and a variety of forms of value and exchange that incorporate

⁵⁹ Santens S. (2017) It's Time for Technology to Serve all Humankind with Unconditional Basic Income. Medium <https://medium.com/basic-income/its-time-for-technology-to-serve-all-humankind-with-unconditional-basic-income-e46329764d28>

⁶⁰ Marx K and Engels F (1845 / 1970) The German Ideology. London: Lawrence and Wishart.

⁶¹ Keynes JM (1930/1963) Essays in Persuasion, New York: W.W.Norton & Co.. 358-373

⁶² Standing G (2017) Basic Income: And how we can make it happen. London: Pelican.

environmental and social value, alongside financial concerns (particularly in the form of alternative currencies, local currencies, time-banks, social investment and social capital).

A Manifesto for a Post Work World

Demand Full Automation; Demand Universal Basic Income; Demand the Future⁶³.

With a projected reduction in demand for human labour within the formal and paid marketplace, there is the potential for re-valuing the form and function of the work that humans do undertake. Arguing that existing social, political and economic relations and practices are not desirable or sustainable, a manifesto for a post work world contends that the technologies of a 4th Industrial revolution offer the opportunity to reclaim an emancipatory future capable of liberating humanity from work, advancing standards and ensuring and expanding freedoms for all.

Whilst sounding unrealistic to some, liberators argue that it is unrealistic to imagine that work and the wider organisation of work and society will continue as it is during the course of a 4th industrial revolution. Consequently, it is argued that working towards a post work world is the realistic option, particularly given the unemployment and inequalities envisaged by the levels of automation a 4th industrial revolution could bring.

Next Steps

Technologies do not determine the future, but new technologies do afford new opportunities and risks. In 1980, André Gorz, a French social and economic theorist, argued that automation and its impact on work and society could be considered a central political issue of the 21st century⁶⁴. Today, the prospect of a 4th industrial revolution continues to raise a number of social, political, economic, and ethical questions about what sort of economy and society is probable, possible and preferable. The aim of this report has been to stimulate and inform conversations both within and beyond the Black Country as to how to anticipate and create futures for all. This is part of ongoing efforts to share assessments of current tendencies and inform debates, plans and actions that anticipate the risks, opportunities and responsibilities of today and tomorrow⁶⁵.

Based on current tendencies, it is projected that a 4th industrial revolution will not only have an impact on the level, type and organisation of work, but also has the potential to disrupt social, political and economic relations. Current projections suggest that the risks and rewards of a 4th industrial revolution are unlikely to be spread evenly unless anticipatory action is taken. Particular attention will need to be given to the uneven distribution of risks and opportunities of a 4th industrial revolution depending on employment sector, age group, gender, BME groups, educational attainment and socio-economic group.

Of course, one of the major challenges and contradictions when anticipating futures, is how can one prepare for the unknown? For example, what skills, knowledge and

⁶³ Srnicek N. Williams A (2016) *Inventing the Future: Postcapitalism and a World Without Work*. London: Verso.

⁶⁴ Gorz A (1985) *Paths to paradise: On the liberation from work*. Boston: South End Press.

⁶⁵ Connor S (2017) *Global Megatrends and the Black Country*. Wolverhampton: The Dial 481 project / University of Wolverhampton.

experience are needed for jobs that do not exist yet and in a world that it is projected will change rapidly? Prioritising investment in the development of knowledge and skills in science, technology, engineering and mathematical (STEM) subjects that are necessary for a 4th industrial revolution may appear to be self-evident. However, it is also anticipated that social, creative and critical thinking skills will not only prove resistant to automation, but will also continue to represent an area of growth and will be vital to efforts to anticipate and engage with the disruption and challenges of a 4th industrial revolution.

It may not be possible to prepare for the unknowable, but it is possible to explore and examine the way the future is imagined and understood, in order to open up current opportunities and gain a sense of ownership over the future. Since the future does not exist yet, any uncertainty over the future becomes a space where alternative futures and means of realising them can be imagined, rehearsed and refined. As such, the report is not an attempt to forecast what the future will be, but to help rethink assumptions about what the future could be.

The tendencies that have been highlighted in this report offer a projection of where we may be heading, but this is not the same as asking and answering the question of where do we want to go. What the discussion of intensifiers, mitigators and liberators has attempted to highlight, is that the position taken does in part depend on the values, interests, and capacity (perceived and actual) of the agents concerned. By articulating multiple positions and preferred futures, it is possible to assess the difference between where we are today and where we want to be and also begin to work through how best to close the distance. This not only highlights the responsibilities we have to future generations but also, shows how by exploring the future, it is possible to open the present.

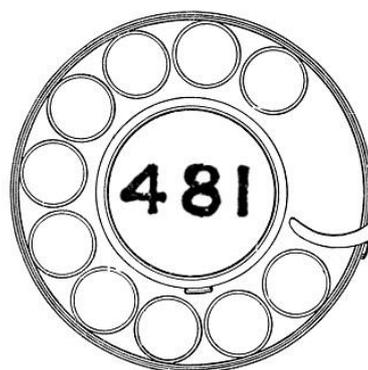
To this end, it is argued that there is a requirement and opportunity to increase the capacity of strategic foresight across the Black Country particularly with regard to anticipating the grand challenges of the industrial strategy. This work is to include the development and examination of scenarios that consider the probable and possible social, economic and political conditions of the Black Country. Given the uncertainty that remains over the impact of a 4th industrial revolution, at this point, rather than privilege one future or particular response to the risks and opportunities of a 4th industrial revolution, what is vital is that there is an investment in efforts to surface and develop the diverse visions and networks of resources, relations and practices that exist across and beyond the Black Country.

In reality there is no 'do over'. What an increased capacity for foresight offers is an opportunity to not only increase the number and quality of efforts to explore how a 4th industrial revolution can optimise existing practices and relations, but also identify and rehearse some of new things that could be done. The future is something that we all share, even if we don't all agree on what the future should be. An engagement with multiple scenarios and the opportunity to develop policy and practice prototypes, not only enables a rehearsal of responses, but also facilitates efforts to ask and answer the question, 'under what conditions will it be possible for all people in the Black Country to minimise the risks and maximise the opportunities of a 4th industrial revolution?'

Good endings do not mark what once was, but point to an opening of what might yet be.

The Dial 481 Project

What does the future hold? It may not be possible to know the future, but it is possible to explore futures in clear, rigorous and creative ways in order to anticipate potential risks and opportunities. The **Dial 481** project works with individuals, groups and institutions to bring future orientated approaches to life on real projects. The **Dial 481** project aims to stimulate thinking, extend conversations and inform actions as to how the futures of the Black Country could and should be shaped.



For more information you can:

Follow the **Dial 481** project on twitter @Dial481

Email stuart.connor@wlv.ac.uk

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About the Author

Stuart Connor is a Reader in Social Welfare at the University of Wolverhampton. With a background in policy analysis, in books published to date, 'What's Your Problem?' and 'Social Policy for Social Welfare professionals', co-authored with Graeme Simpson, a recurrent theme is to not only understand the impact that policies have on people's lives, but to also explore how people can and should have an impact on policies and future practices. This is reflected in the work of the **Dial 481** project and research exploring the potential of strategic foresight to inform policy and practice.



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