PURPOSE OF REPORT

This report provides an update on the LEP Foresight Group and its most recent meeting exploring the challenges and opportunities to the GM economy presented by Artificial Intelligence and Data

RECOMMENDATIONS

The LEP Board is asked to consider the report and provide feedback

CONTACT OFFICERS:

Simon Nokes, Executive Director Strategy and Policy
simon.nokes@greatermanchester-ca.go.uk

David Rogerson, Principal – Strategy and Policy
david.rogerson@greatermanchester-ca.gov.uk
1. **INTRODUCTION**

1.1 The LEP recently established the Foresight Group to bring together leading business people and academics to look at GM’s long term opportunities and challenges. This includes potential ‘disrupters’ to business as normal aligned to the Grand Challenges of the Industrial Strategy and the issues and opportunities for GM over a 10-20 year time period.

1.2 In this way it will take a longer view that the Greater Manchester Strategy which necessarily focuses on a 5-10 year timescale and does not reflect global trends which will affect the city region over a longer time period. This will complement the work of the LEP Board in supporting the development of the Local Industrial Strategy as well as support the long term vision of the GMS to make Greater Manchester one of the best places in the world to grow up, get on and grow old.

1.3 The group meets three times a year for a themed discussion which is informed by a ‘think piece’ on the current and future landscape, complemented by speakers from relevant sector leaders and academia.

1.4 The most recent meeting took place on 17th May with guest speaker Mike Lynch of Invoke Capital; a leading technology entrepreneur and co-founded Invoke Capital which invests in, and supports, world-leading fundamental technology businesses emerging across Europe.

1.5 The meeting provided an opportunity to discuss the developing Artificial Intelligence and Data agenda and the implications for GM’s economic and strategic plans – see meetings minutes attached below.

2. **INDUSTRIAL STRATEGY - ARTIFICIAL INTELLIGENCE AND DATA**

2.1 The Foresight Group discussions were informed by the Industrial Strategy White Paper which highlights that the world is undergoing a technological revolution. AI will transform the way we live and work, from the way we diagnose and treat cancer to the security of online transactions.

2.2 This fourth industrial revolution is of a scale, speed and complexity that is unprecedented. The first industrial revolution mechanised production using water and steam power; the second created mass production using electric power; the third automated production using electronics and information technology.

2.3 This fourth revolution is characterised by a fusion of technologies that is blurring the lines between the physical, digital and biological worlds. It will disrupt nearly every sector in every country, creating new opportunities and challenges for people, places and businesses to which we must respond.

2.4 The Industrial Strategy White Paper recognises the significance of AI & Data Economy, identifying it as one of the four Grand Challenges the UK needs to address to put it at the forefront of the industries of the future. It acknowledges that AI and machine learning are general purpose technologies already starting to transform the global economy.

2.5 They can be seen as new industries in their own right, but they are also transforming business models across many sectors as they deploy vast datasets to identify better ways of doing complex tasks – from helping doctors
diagnose medical conditions more effectively to allowing people to communicate across the globe using instantaneous speech recognition and translation software.

2.6 The Strategy highlights that embedding AI across the UK will create thousands of good quality jobs and drive economic growth. It cites a recent study which found digital technologies including AI created a net total of 80,000 new jobs annually across a population similar to the UK. By one estimate, AI could add £232bn to the UK economy by 2030 as well as boosting productivity.

2.7 It will therefore be vital to provide for the different skills required by the developing economy as well as noting public concern on the potential loss of jobs arising from automation.

2.8 The UK is already a world leader in AI, with the building blocks to make significant advances. GM has been a significant player in this development, taking an early lead with Manchester University’s Computing Machine Laboratory producing some of the first stored programme computers such as the Manchester Baby and Manchester Mark 1.

2.9 Later Alan Turing made the city his home and was one of the pioneering thinkers in artificial intelligence, proposing an experiment that became known as the Turing Test: an attempt to define a standard for a machine to be called ‘intelligent’.

2.10 Since then, GM and the UK as a whole have developed some of the best research institutions in the world and globally recognised capability in AI-related disciplines including maths, computer science, ethics and linguistics.

2.11 The UK also has substantial datasets in public institutions where AI can be explored safely and securely. Strengths range from underpinning technologies (ARM’s microchips, microcomputers of Raspberry Pi) to innovators pushing boundaries in robotics and the Internet of Things. Maximising the opportunities created by AI and advanced data technologies, and responding to the potential impacts on society are seen as critical by Government.

2.12 The recently announced Artificial Intelligence Sector Deal is an early Government response to the AI challenge with additional work to be carried out under four additional priorities:

- Make the UK a global centre for AI and data-driven innovation;
- Support sectors to boost their productivity through AI and data analytic technologies;
- Lead the world in safe and ethical use of data and AI giving confidence and clarity to citizens and business; and
- Help people develop the skills needed for jobs of the future.

3. GREATER MANCHESTER CONTEXT

3.1 The Foresight Group noted that many of these national drivers were reflected in the Greater Manchester economy and that the city region also has a number of key assets which could be exploited to strengthen the city region’s response to these challenges and allow us to take full advantage of the opportunities.

3.2 The key areas included the following:
• **Place Making:** GM's size, strong governance and shared vision makes it an excellent test bed for exploring AI issues in the real world including regulation and data sharing. It also helps create places where people want to live, work and invest which will help attract leaders in the field from their traditional bases in Oxford, Cambridge and London.

• **Science and Innovation Audit:** GM LEP partnered with Cheshire East LEP in developing the Audit which identified our area’s core strengths in health innovation and advanced materials, along with our fast growth opportunities which focused on the future potential of digital, energy, and industrial biotechnology. It demonstrated that GM is characterised by an exceptional level of partnership and connectivity.

• **Economy:** Greater Manchester is the fastest growing UK city with the highest level of investment outside of London. Government is exploring how to support particular sectors to boost their productivity through AI and data analytic technologies in areas where GM has strengths including cybersecurity, life sciences; construction; manufacturing and energy.

• **Connectivity:** The Greater Manchester Transport Strategy 2040 focuses on creating an integrated, sustainable and well-co-ordinated transport system. Manchester Airport is a significant regional asset with direct flights to over 200 destinations.

• **Digital Infrastructure:** GM's new Digital Strategy sets a bold a vision to be one of the best places in the world for developing and harnessing digital technology to drive improvements across all areas of economy, society, and all geographies. GM was the first area in the UK to pilot next generation broadband and is a key UK hub for data hosting. Superfast broadband serves 90% of homes and small businesses. The UK IoT demonstrator (CityVerve) is trialling new technologies.

• **Higher Education:** GM has around 100k students attending a range of universities and higher education institutions with a density of specialisms producing over 30,000 graduates per annum. This is an ideal talent pool to provide innovation for start-up businesses and a pipeline of talent for incoming and businesses scaling up.

• **Business Innovation:** GM is home to nationally significant companies, world-class commercial developments and over 100k SMEs. GM initiatives such as CityVerve, Graphene Engineering Innovation Centre and Manchester Science Park show how better use of technology and data can drive innovation across a range of private sector partners. Jaguar Land Rover has also outlined plans to open a software, IT and engineering centre in GM as part of plans to introduce connected technologies into future vehicles.

**Cybersecurity:** GM is a leading centre for cybersecurity (GCHQ and Cyber Security Centre) and Government has committed to reinforce the UK position as a global centre for cybersecurity to ensure the safe and ethical use of data and AI.
• **Health and Social Care Devolution**: GM's groundbreaking devolution in health and social care provides a unique opportunity to tackle the fragmentation of the sector through integration initiatives such as Health Innovation Manchester; driving innovation and exploring the benefits of better data sharing

4. GREATER MANCHESTER RESPONSE

4.1 The Foresight Group explored a number of areas which should be considered when responding to the drivers, challenges and opportunities highlighted above.

4.2 The group agreed on four key priorities including:

   i. **Skills and Education** – Exploiting GM’s assets to lead the cutting edge of AI development as well as strengthening residents' skills to take advantage of the developing economy. This includes boosting graduate attraction and retention both in the UK and internationally

   ii. **Infrastructure**. Ensuring GM infrastructure can support business to thrive with the establishment of 5G (including access to buildings for tech), the roll out of fibre broadband, access to power and integrated transport system

   iii. **Funding** – Securing resources to drive innovation and business growth through mainstream investment, Venture Capital and Government support for start-ups

   iv. **Communications/Branding** – Improving the story that GM tells the world, showcasing the strength of the city region’s offer and attracting new investment

5. NEXT STEPS

5.1 The outcomes of the discussion will inform the development of the GM Local Industrial Strategy and also feed into current related activity including the GM Digital Strategy; the development of the Full Fibre Broadband Programme; and the development of the GM Productivity and Inclusive Growth Programme being delivered by the Growth Company.

6. RECOMMENDATIONS

6.1 The LEP Board is asked to consider the report and provide feedback
GM Local Enterprise Partnership Foresighting Group

Economic Opportunities and Challenges of AI & Robotics
17th May

Attendees
Mike Lynch  Invoke Capital
Mike Blackburn  GM LEP
Nancy Rothwell  University of Manchester
Chris Oglesby (Chair)  Bruntwood
Jonathan Moore  City Executive for Manchester, ARCADIS Design and Consultancy
Prof Colette Fagan  Vice-President for Research and Professor of Sociology, University of Manchester
Jason Stockwood  Chief Executive of Simply Business
Professor Magnus Rattray  UoM lead for AI/machine learning and Heads of Data Sciences Institute
Elan Raja  Runs - Nvidia and working to launch a Deep learning institute that focuses training on AI.
Dr Natasha McCarthy  Head of Policy (Data) - Royal Society

Officers
Eamonn Boylan  CEX, GMCA
Sheona Southern  Managing Director, Marketing Manchester
David Rogerson  Principal Policy and Strategy, GMCA
John Holden  Assistant Director Policy and Strategy, GMCA

1. THINK PIECE

The discussion was informed by the think piece developed by the University of Manchester. The multi-media online content consisted of contributions from leading academics discussing various applications of AI and robotics and the resulting policy implications and advice. There as a focus on:

- Hazardous Environments
- Healthcare
- The Agri-food Industry
- AI and Robotics – Promises and Risk Management
- Fairer Working Arrangements for a Digital World
- Improving Trust in and Communication with Intelligent Machines
- Ensuring Social Justice in AI Development

Summary points of comments received in response to the think piece are as follows:

- Need to better represent end users in the development process
- Policy makers can learn from the past technology revolutions to prepare
- Future predictions on the scale of changes to the workplace

2. OPENING REMARKS- MIKE LYNCH, GUEST SPEAKER

During the last 5 years AI has seen a step-change, a breakthrough which is beyond the normal incremental development change. World leaders are talking about AI including Putin, Macron and May. Computers have moved from 60's where they replaced repetitive tasks, to now performing complex tasks e.g. several reliable
papers have been published outlining that speech recognition computers are more reliable than humans.

It is important to note that machines make decisions in a different way to humans, which is not easy to understand. There will be a trade-off between decision making accuracy and explainability. The more explainable to a human the decision, the less accurate it will be.

We need to make sure that we focus on solving the right problems. Approaches that work best do not exclude all human input, rather they work alongside humans. Maybe that AI can do 99% but still need 1% human input.

Data is the fuel of this revolution and AI needs access to it. This makes data of strategic and commercial importance.

The requirement for data creates a natural tendency towards monopolies. The more data an AI has, the better it becomes and the more it is used, the more data it collects and the better it gets ad infinitum.

This revolution will be larger and deeper than expected, however, there has been massive hype and also failure to date. Estimate that 30% of jobs will be affected by AI (not necessarily lost) and there will be political ramifications as it’s envisaged that there will be strands of society that will be most affected, although this will generate rapid growth and new jobs will be created e.g. cyber security estimated £1.25 bn in 2 years.

Whilst the AI revolution is going on there are also sociological effects – systems are so complex because we all think and make decisions and we all make comments and have opinions – that’s why we have politics – could a robot be a politician?

Discussion around AI being biased and the need for it to understand human issues such as equality and sexism, so ethics is a challenge for AI.

There is a still a big gap between “narrow” AI (e.g. a fox in a garden) and "broad" AI (e.g. a fox in a city). We are moving towards broad, but we should not assume there is a direct line between narrow and broad. Broad AI is orders of magnitude harder than narrow (e.g. a smart missile can be extremely effective in the field based on existing AI, but getting it to understand its own supply chains would be impossible at the moment).

There are clear opportunities for Greater Manchester including:

- Acting as a test bed for getting systems to work in the real world (this is a major challenge)
- Creating a centre of excellence hub around which to kindle this new sector/approach (including making compute resource available)
- Working with firms to unlock the productivity benefits of this approach (e.g. 18% increase in profitability seen in retail from use of AI, would be similar impact in legal).
- Exploring regulation, for example making it possible to test driverless vehicles, making data freely available etc.

**Discussion**
A number of points were discussed:

*Deep Learning System Capabilities*
Deep learning systems can watch a video and predict what will happen next but for the replacement of complex human/animal thought processes and actions AI is a long way off as this is more difficult to assess than we think as it requires past experience and inference e.g. what data does the robotic fox need to avoid getting hit by the bus when stalking rabbits. A thought about the best deep learning is the human gut instinct.

**Data Ecosystems**
Discussion around how to accelerate the ecosystem. China has an advantage in the large data sources it has, but we should not underestimate the power of the western consumer and willingness to give data away. Agreement that UK has top class research base but the challenge is converting to public services and economic impact. Education and R&D needed to evolve: collection – curation – infrastructure.

There were differing views on the value of data curation. On the one hand, moving to standardised data can be very powerful, on the other the power of AI is the ability (and benefit) from dealing with messy datasets. Data cleansing, if done poorly, can take out the real world. It can also be very expensive so as to reduce the profitability of the approach.

**AI Infrastructure**
AI infrastructure will be influenced by how much firms/governments want to invest. There’s a major role for multinationals in setting the ecosystem in which AI will run. Risk that there is a new arms race between countries, places, councils etc.

Not knowing how AI works creates significant ethical issues – around legal responsibility, blame etc. – which society will need to grapple with.

Will need to adapt to new privacy norms. In the future it will be very difficult to prevent de-anonymization for example. However, experience shows that people are ok with this if they see that they get something back in return.

3. DISCUSSION POINTS AROUND 5 KEY IDEAS / OBJECTIVES

The Chair focussed discussion on the following key objectives:

- **Ideas:** How do we make Greater Manchester a more innovative economy
- **People:** How do we provide good jobs, new skills and greater earning power for all
- **Infrastructure:** How do we contribute to a major upgrade to the UK’s infrastructure
- **Business Environment:** How do we make Greater Manchester the best place to start and grow a business
- **Places:** How do we ensure that Greater Manchester is one of the most prosperous communities in the UK

**Key Objective 1: Ideas:** How do we make Greater Manchester a more innovative economy?

It was suggested that there are 4 key priorities to make GM a more innovative economy:

(i) Skills & talent – including schools
The group consensus was that education, training and skills were key priorities to unlock the potential of AI/robotics, including lifelong learning, helping create an adaptable, skilled workforce.

(ii) Data
It was noted that 90% of the world’s data was created in the last 2 years and it was suggested that the key driver relating to devolution would be to capture data from 3 million people as this would provide GM with a strong sample for geo-analysis and become a powerful tool for innovation initiatives, taking a lead from Estonia which is considered to be one of the most citizen data lead society.

The group discussed Health Innovation Manchester’s role to drive innovation into the Health sector and there was a suggestion that provision of some data to share for medical purposes and data sharing between departments for early diagnosis could be mandatory.

Discussion followed around the trust and legal implications regarding sharing data and there was a feeling that this would be more relaxed going forward as younger generations have a more casual attitude to open source data.

(iii) Infrastructure & connectivity
General points re connectivity and infrastructure but already in GM’s short/medium term strategies.

(iv) Target business to develop innovation
The group noted that GM has around 100k SMEs and innovation development is key for their potential to be maximised, followed by a suggestion to springboard from lessons learned from CityVerve where initially all businesses wanted to own data and could have achieved more if shared and more open.

Manchester will need to deal with information governance issues – the interoperability pilot in health is a big opportunity to overcome part of this.

The Digital sector in GM feels like it has momentum. Need to capture this to use technology to create inclusive growth.

Key Objective 2: People: How do we provide good jobs and greater earning power for all?

It was felt that universities, schools and colleges need to understand how communities and businesses will use AI and adopt it.

One of the benefits of GM is its universities and density of specialisms. At the University of Manchester for example they are bringing together their ethics people with their AI people so that AI is not completely mathematical. Can create more powerful outputs.

It was noted that with 100k students Manchester had the ideal talent pool to provide innovation for start-up businesses and a pipeline of talent for incoming and businesses scaling up.

Key Objective 3: Infrastructure: How do we contribute to a major upgrade to the UK’s infrastructure?
There was discussion about meeting the needs of businesses coming into GM and that connectivity, decent affordable accommodating and talent were all key. This was considered to be included in the next 5 year strategy and the group were challenged to think beyond to the next 10 year horizon.

We need to capitalise on key assets such as the Airport and its international links

**Key Objective 4: Business Environment:** How do we make Greater Manchester the best place to start and grow a business?

It was noted that the demands of volume going through Cambridge start-up labs couldn’t be accommodated locally, so GM should be developing and shouting about its infrastructure and capacity for start-ups.

A partnership with Cambridge and / or establishing an AI lab within the University system were briefly discussed as options to explore. The Group also mentioned that innovation and AI should be included in our early learning and schools curriculum. A radical shake-up of our education system was required to achieve this.

**Key Objective 5: Places:** How do we ensure that Greater Manchester is one of the most prosperous communities in the UK?

The creation of a hub of expertise/centre of excellence was raised several times by the group, envisaging that if GM becomes the first, then others will follow. The suggestion was made to invite world tech leaders to GM, creating a vision and pool of excellence to correlate with GM’s deep learning, innovation and rich data.

It was discussed that in reality, the population will be interested in services, that the consumer voice matters and that the power of the online platforms like Facebook will be significant as they have significant amount of segmented consumer data. It was noted that humans must work with AI/data to create new systems rather than replace humans and we should develop solutions with humans/AI in mind.

The group discussed that the marketing and communications around AI/tech created by other cities (with lesser comparable offer than GM) had been successful in creating positive perceptions. The group concluded that GM’s story needed to be told and branding and marketing were essential to GM’s success. This should include talking up the reality of GM’s offer including MSP, talent, CityVerve and HiM alongside other strengths including GCHQ HQ, cyber, GEIK and other tech assets. A sector by sector approach was suggested as a sensible approach and there was a suggestion that business sectors would partner and invest to build the story and develop centres of excellence.

Mike Lynch said in conclusion: “put the flag in the ground” and “get on with it” later adding that GM needs to tell GM’s story, leading with E-commerce and Health.

4. ROUND TABLE SUMMARY OF PRIORITIES

- Health & Social Care (for all ages including independent, dignified later life)
- Skills & Education (be radical with education – currently unfit for purpose)
- Place Making - build and communicate quality of life/leisure
- Create Data Systems - collation and use of data (policy changes, create radical standards)
- Market the GM offer (wrap up and market, bullish about GM – get on with it)
- Build centre of excellence/innovation hub
5. NEXT STEPS

The outcomes of the discussion will inform the development of the GM local Industrial Strategy and also feed into current related activity including the GM Digital Strategy; the development of the Full Fibre Broadband Programme; and the development of the GM Productivity and Inclusive Growth Programme being delivered by the Growth Company.