‘DIGITAL SKILLS’ FOR MEDICINES MANUFACTURING

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APPROACH TAKEN

- Strategic Thinking - What are ‘digital skills’ for Medicines Manufacturing Industry?
- Background research on current digital skills analysis across business: inc. CBI, CPI case study
- Interviews with a cross section of experts in digital skills to ensure definition across medicines design & manufacture
- Analysis of routes in to the industry with digital skills across the UK
- Provider analysis of what is currently available for digital skills across UK

Key deliverables:
- Clarify a long-term vision for digital skills aligned to Medicines Manufacturing Industry Partnership
- Provide a map of existing provision for digital skills within the UK (On-line global platforms out of scope)
- Suggested areas for improvement from analysis of training gaps and digital skills need
THOUGHTS ON ‘DIGITAL TRANSFORMATION’ FOR LARGER ORGANISATIONS

Bigger
Digital transformation is a driver of growth and the size of the prize is huge. Global, widespread, successful transformation in the industrial sector alone is estimated to be worth $0.8 trillion.4

Faster
Digital transformation could speed up business growth; evidence shows that 66% of technology adopters have maintained or increased their employee numbers,5 while 94% of businesses view digital technologies as a crucial driver of productivity.6

Stronger
Digital transformation can drive business resilience by improving productivity, employee engagement and international competitiveness. Investment in new systems and software that constantly updates, could also enable companies to outpace their own disruption.

REFERENCE CBI – BIGGER, FASTER, STRONGER REPORT – JUNE 2019
DELIVERING SKILLS FOR THE NEW ECONOMY, CBI (JUNE 2019)

Key findings in UK:

- **Two thirds** of businesses already have unfilled digital skills vacancies.
- **95%** of business expect their digital skills needs to grow.
- **58%** of firms say they’ll need significantly more digital skills in the next five years.
- **Less than one third** of businesses are confident that the UK business community will be able to access the digital skills they need in the next 3-5 years.
- **93%** of firms are taking action to address their digital skills needs.
- But almost half of businesses are **fishing in the same pool** for talent, by hiring external UK talent as their primary action to get the digital skills they need.

International leader benchmarks:

- **SINGAPORE**: Smart Nation initiative, Skills Future for Digital Workplace, to equip both individuals & companies with mindset and basic functional skills for future economy. Courses available online, & for those who want more specialist skills on cyber security, digital media, data analytics, digitisation of financial services and tech-enabled services.

- **FINLAND**: World Economic Forum places Finland in top 3 countries for availability of digital skills. Key factor for this talent pool is that government, in partnership with private sector, has set out a bold vision for accelerating development of advanced digital skills. Flagship initiative is their ‘1 percent’ AI scheme which pledges to support 55,500 citizens to learn root skills of AI technology.

- **SWEDEN**: European Commission places Sweden amongst most advanced digital economies, with strength in human capital. To sustain its comparative advantage, created bold ambition on widespread digital inclusion within its Digital Strategy. This is being delivered through a Digital Skills & Jobs Coalition, launched in 2018, focuses on skills uptake, life-long learning & full employment in part by collaborating with universities to produce reskilling courses for Swedish workforce.
WHAT IS THE MMIP OVERALL STRATEGY?

MMIP Key Objective: Grow GVA, Exports and Skilled Jobs in the UK through securing significant Capital Investments

2 core themes to the MMIP Strategy:

1) Optimise the whole value chain by working at the interfaces to add value
2) Improve the overall functional effectiveness and efficiency of manufacturing

Delivered through:

1) **Attracting** the commercial and clinical manufacturing of new types of medicines
2) **Anchoring + building** the commercial and clinical manufacturing of established types of medicines
3) **Developing a world leading digital manufacturing platform** *(Throughout the product lifecycle – design to make & test)*
DEVELOPING A WORLD LEADING DIGITAL MANUFACTURING PLATFORM:

- **Embedding Automation**: Embedding automation into innovative manufacturing processes and digital supply chains using skills such as advanced process control, software engineering and automated technology design to deliver short term goals for a world leading digital manufacturing platform.

- **Data-Driven Technologies**: Data-driven technology is leading to more open models of innovation. Global explosion in data production & advances in analytical tools means medicines manufacturing is increasingly data-driven, accelerating the R&D process, enhancing decision-making & enabling new business models to transform the industry, going beyond internal capabilities, compelling collaborative innovation strategies across organisational boundaries in the medium term.

- **AI for Manufacturing**: AI is a constellation of technologies that will transform the relationships between people and technology. From machine learning to natural language processing, AI allows machines to sense, comprehend, act and learn, bringing a new era of disruption & productivity where human ingenuity is enhanced by speed & precision for a long term simulation & transformation of a world leading digital manufacturing platform.
**Digital Awareness:**
- Know what’s possible, digital language, new technologies, how digital supports core

**Basic digital skills:**
- Business applications of social media, communication & collaboration tools
- Introduction to data handling, programming, system integration & automation, basic web development, problem solving and digital navigation
- What is data science, who is doing it and how to ask questions.
- Understanding machine learning, neural networks and AI applications

**Advanced digital skills:**
- Includes software engineering, front end development and data analytics
- Multi-factorial experimental design, integration, application & contextualisation, modelling
- Specific programming, visualisation, machine learning, data analytics, app development, technology expertise and concepts for AI application

**Leaders & decision makers:**
- Collaboration tools, removing the fear, informed ‘digital’ conversations
- Digital mindset: digital strategy & benefit of digital transformation, understanding data, decision making
- What is big data, machine learning, applications for AI & future technologies?
PYRAMID OF DIGITAL SKILLS WITHIN MEDICINES MANUFACTURING

- Embedding Automation
- Data Driven Technologies
- AI for Manufacturing

Data Science Specialists & Bio/Chemo Informaticians. Software and Process Control/Automation Engineers

Advanced digital knowledge for specific roles including: Data Analysts, Leaders, Technologist, Scientists, Engineers

Specific data design & analytics, digital content within current roles across the business including leaders and Board

Digital awareness across occupations: data mgt, digitalisation platforms, simple data design & analytics, process control

Computer literacy, basic digital problem solving skills, digitisation platforms across workforce. Collaboration tools.
FREE MINI DIGITAL SKILLS COURSES

- Accenture free on-line courses ~ 2-8 weeks – i.e. social media, digital marketing, cyber security, coding, clinical bioinformatics, data science, data mining, MedTech: AI & Robotics.
  - https://www.futurelearn.com/
- Digital marketing for individuals and businesses in Scotland
  - https://www.digitalskillsscotland.co.uk/
- Google Digital Garage – i.e. basics of code, machine learning, elements of AI, cloud computing concepts, data analytics
  - 10-60 hour course free, some extended courses require fees
  - https://learndigital.withgoogle.com/digitalgarage/courses
LINKEDIN LEARNING - £20 PER MONTH FOR OVER 13,000 COURSES
GENERAL CPD - SKILLSET

- Royal Society of Biology – Programming for Biologists – 1 day, £130
- Southampton Data Science Academy/Alan Turing Institute
  - Short courses, 6 weeks, in data science, AI, Machine learning, data security ([Link](#))
  - Institute of coding boot camps, face to face, £500-2000 ([Link](#))
- Oxford University short courses ([Link](#))
  - For example: An Overview of Data Science, 10 weeks, £235
- Cambridge Spark corporate training in data science ([Link](#))
  - Flexible delivery, Intensive courses of 2-3 days a module
  - £4,500 per person for cohorts of ~10 people
- De-Coded Data Academy – [Link](#)
  - Programming in Python and R, Advanced, predictive and prescriptive analytics, Machine learning, Operationalising data projects, ethics
  - 18 month technical skills programme, delivered by blended learning, £15,000 per person
  - Use apprenticeship levy to fund Level 4 apprenticeship, 20% off-the-job learning
CPD FOR DATA SCIENCE/DATA ANALYTICS

- Corsham Institute Future Skills – 12 week programme developing software engineers (Link)
  - Access to talent & Level 4 apprenticeships in software development & data analytics
- SysMIC – 5hrs per week over 6 months, comprehensive online course in systems biology, partnership with UCL (Link)
  - Aimed at PhD students and researchers in the biological sciences to improve maths and programming-related skills if you work within systems biology, 3 modules, introduction, advanced tools and research project. £1,250 per module
- Cambridge Spark Applied Data Science boot camp – 6 months taught over weekends (Link), £8,000 per student
  - K.A.T.E. platform combining computer science, mathematics, statistics and domain expertise to predict trends, optimise performance, improve decision making, and increase business competitiveness
- Digital Leaders Academy – lectures, workshops, networking and conferences (Link)
CPD FOR ARTIFICIAL INTELLIGENCE SPECIALISTS

- Free on-line courses for AI
  - Google partner with Udacity ([Google AI](https://googleai.com)), in-depth and not aimed for beginners
  - Stanford Machine Learning – 56 hrs, highly rated ([Stanford](https://www.stanford.edu/)), taught by founder of Google’s deep learning research unit
  - Free on-line programme from Columbia University, option to pay for certification if needed ([Columbia](https://www.columbia.edu/))
- British Computer Society – Chartered Institute for IT
  - BCS Essential Certificate in Artificial Intelligence – ([Link](https://www.bcs.org/))
- On-line Microsoft Professional Program for Artificial Intelligence – 9 courses, $990 ([Microsoft AI](https://www.microsoft.com/))
  - Introduction to AI, 4 weeks, 3-4 hrs per week, FREE (Cert £81) – ([Microsoft Intro AI](https://www.microsoft.com/))
  - Deep Learning explained, 6 weeks, 406 hrs per week, FREE (Cert £81) - ([Microsoft Deep Learning](https://www.microsoft.com/))
- AI & Machine Learning – 6 week short course – Southampton University ([Link](https://www.southampton.ac.uk/))
- On-line course in AI from Said Business school & Oxford University ([Link](https://www.said.ox.ac.uk/)) 6 weeks, 7-10 hrs a week, £2,650
DIGITAL LEADERSHIP - MINDSET

- Cambridge Spark – Data Science for Executives – 0.5 day training (Link), £600 per person
  - Demystifying Data Science & its application & benefits in industry. Big Data, Machine Learning, AI and Natural Language Processing
- Digital Leaders Academy, shared professional online space and face-to-face programmes, partner with TechUK – Link
  - ½ -1 day training courses, ~£500 per session. Networking, lectures and conferences on specific topics delivered
- DeCoded – London based education business that specialises in teaching executives business skills - Link
  - Data literate, digitally empowered leaders (~20), intensive 2d bootcamp, or as 4x0.5d modules over 1yr - £700 per module
- JISC – National Digital Leadership further & higher education provider - Link
  - Become a digitally-informed & empowered leader – Four day programme over two residential workshops. £1,665-£1,800.
- IN>PD CMI Level 7 Digital Leadership – Link
  - Help current & future leaders adapt to challenges of a fast-paced digital environment. 4d workshops across the UK, £2,450 + VAT
- Cranfield Digital Leadership & IT programme – Link
  - Tools, capabilities & insights to help drive digital agenda & shape future business 3 x 3d residential @Cranfield, £9,290 + VAT
- Warwick Business School, Executive Diploma in Digital Leadership – Link
  - Develop a successful strategic roadmap & lead seizing opportunities in a digital age – 1yr, 4 x 4 day modules, £18,000