

# Humber LEP Digital Skills Analysis

Final Report



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# Digital Terminology Glossary

# Digital Terminology Glossary

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**Artificial Intelligence (AI):** the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings.

**Autonomous Vehicles:** vehicles that can drive itself from a starting point to a predetermined destination in “autopilot” mode using various in-vehicle technologies and sensors, including adaptive cruise control, active steering, anti-lock braking systems, GPS navigation technology, lasers and radar.

**Big Data:** extremely large data sets that may be analysed computationally to reveal patterns, trends, and associations, especially relating to human behaviour and interactions.

**Cloud-Based Tools:** applications, services or resources made available to users on demand via the Internet from a cloud computing provider's servers.

**Industry 4.0 Technologies:** technologies which enable digital transformation of manufacturing/production and related industries and value creation processes; relating to automation and data exchange.

**Internet of Things (IoT):** the interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data.

**Machine Learning:** an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience

without being explicitly programmed.

**Robotics:** the branch of technology that deals with the design, construction, operation, and application of robots.

**Sensor Technology:** a device which detects or measures a physical property and records, indicates, or otherwise responds to it.

**Smart Homes:** a residence that uses internet-connected devices to enable the remote monitoring and management of appliances and systems, such as lighting and heating.

**Virtual Manufacturing:** the use of simulation-based technology to aid engineers in defining, simulating, and visualizing the manufacturing process of a product.

**Virtual Private Network (VPN):** a network that is constructed using public wires — usually the internet — to connect remote users or regional offices to a company's private, internal network.

**Virtual Reality (VR):** the computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors.

# Executive Summary

# Executive Summary

## Introduction

The Humber Local Enterprise Partnership (LEP) has a commitment to driving growth across the Humber economy for the benefit of communities in the four local authority areas of Hull, East Riding, North Lincolnshire and North East Lincolnshire.

The LEP works closely alongside its partners to help facilitate growth through three main areas:

- + a skilled and productive workforce
- + thriving successful business
- + an infrastructure that supports growth

Ensuring that the Humber LEP has a well skilled and productive workforce will enable it to take advantage of opportunities which present themselves in the area.

The Humber Skills Advisory Panel (SAP) Analysis Report identified Humber is prone to automation because of the high dependency on transportation and storage, manufacturing and wholesale and retail sectors. This indicates that as automation increases, the nature of jobs available will change as demand for technical and digital skills grow. Through a deep-dive review of digital skills and implications arising from automation, the Humber Digital Skills Analysis study aims to support the Employment and Skills

Board, local providers and employers to respond effectively to Humber's digital skill priorities. It will also contribute to the refresh of the Humber LEP's Employment and Skills Strategy by identifying the intervention areas required to address digital skill needs. In tandem, the Humber LEP is in the process of establishing a Local Digital Skills Partnership and findings from this study will help inform their future work plan.

This report emulates the structure of the SAP Analytical Framework to identify the digital skill needs, opportunities and challenges for the Humber. This includes a:

- + Literature Review to understand the importance of digital skills.
- + Digital Skills Analysis to explore digital skill needs based on current and future demand.
- + Digital Skills Supply Analysis to identify available digital provision and potential challenges.
- + Conclusions and Recommendations to summarise whether learner provision is meeting demand, drawing out key priorities arising from the evidence.

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# Executive Summary

## Introduction Cont'd

The Humber Digital Skills Analysis study was commissioned in a pre-COVID environment and whilst it is recognised that COVID will fundamentally change the demand and supply of digital skills going forward, the time lag in published data sources means that these issues are not fully reflected in the report.

## Literature Review

The literature review assesses the need to invest in and attain digital skills to address skill shortages and support productivity.

The literature review indicated there are digital opportunities in decarbonisation, sustainable supply chains and new modes of transport; due to the transition towards a greener economy.

An ageing population is facilitating growth in healthcare technologies; with expertise in Big Data, IoT and AI becoming more important for managing health and enabling 'smarter homes'.

In the manufacturing sector, technological change is found to have driven a greater focus on customer experience and customisation, which demonstrates a skill need for Big Data alongside other digital skills in the Humber.

There is a reported lack of business confidence to invest in new technology across a number of

Humber's priority sectors as well as a lack of knowledge among staff in how to use new technology. This is limiting the adoption of digital technologies and the productivity potential of key sectors.

The emergence of Industry 4.0 technologies in recent years, suggests that there is an increasing need to employ digitally skilled staff with the expertise in manufacturing, ports and logistics, energy, food and visitor economy.

The Covid-19 crisis is expected to lead three key digital themes going forward: a more remote workforce which is more reliant on digital technology; greater deployment of data-enabled services across different sectors and aspects of life; and continued growth in e-commerce.

## Demand Analysis

Since 2013, the digital technology sector in the Humber has seen strong employment growth of over 1,000 jobs (+16%), exceeding the national average (12%) however the growth rate is half of the Yorkshire and Humber equivalent (32%). The sector's growth has been mainly driven by gains in computer programming jobs. The education system will need to be responsive to Humber's changing job profile, as demand for digital skills increases.

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# Executive Summary

## Demand Analysis Cont'd

Job postings suggest there is a greater demand for non-digital roles compared to digital roles, although digital job vacancies have grown considerably over recent years. In terms of digital job roles, there have been growing job vacancies for software developers, IT support analysts and teachers which suggests that demand for digital skills is cross-cutting across different sectors.

The Employer Skills Survey data indicates a greater need for complex analytical skills and operational skills, compared to digital skills. In tandem, survey evidence indicate that over a third (35%) of respondents in the digital technology sector cited skill shortages as a barrier to their productivity. Although digital technology companies have good access to technologies, increased competition for labour and talent is felt to be a challenge facing their business. Investment in upskilling the local workforce was most reported as a helpful intervention by digital technology businesses, and data indicates employers would benefit from transferrable skills.

Occupations which are expected to be most exposed to automation are elementary, caring and personal service and administration which together account for

a quarter of Humber's workforce. Food manufacturing and retail sectors were also found to have the highest probability of automation, representing 11% of Humber's employment base. These findings suggest that there is a greater risk of automation across lower-skilled manual jobs compared to digital-intensive jobs.

The UKCES Working Futures data forecasts an expansion of jobs requiring high-level qualifications (Level 4+) by 2024, however the supply of people qualified at Level 4+ would be insufficient to meet this demand. In the information communication and technology (ICT) sector, employment growth is forecast to increase by at least 10% by 2024; driven mainly by growth in managerial and professional occupations as well as expansions in computer programming and telecommunication activities. By contrast, the manufacturing and engineering sectors are expected to see a decline in new jobs created by 2024, although higher replacement demand could offset this in the future. Going forward, there will be strong demand for workers with digital skills to fill new jobs in the ICT, professional services and media sectors and meet the changing nature of skills in manufacturing and engineering.

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# Executive Summary

## Supply Analysis

In 2019, there were 686 apprenticeship starts and 414 completions in the ICT sector which have fallen by 28% and 20% respectively since 2016. This is in line with the national trend of declining apprenticeship starts.

The location of apprenticeship achievements suggests that there is greater representation of providers based in East Riding and Hull that deliver apprenticeships compared to elsewhere in the Humber. Over time, there has also been a shift in apprenticeship delivery away from the public sector towards the private sector, which indicates the need to explore how to bridge the gap in digital apprenticeship provision.

The Humber currently provides higher education (HE) digital provision at the University of Hull and a number of further education (FE) colleges including Grimsby Institute of Further and Higher Education and Hull College. At the University, the largest number of HE enrolments are in medical subjects, business and administrative studies and biological sciences; which all require strong technical expertise. Over the last five years, science technology engineering and maths (STEM) subjects have seen large growth in enrolments, driven mainly by

engineering and technology (+52%) and computer science (+24%). Likewise, North Lindsey College had 40% of its HE enrolments in STEM subjects, largely in engineering and technology and computer science. These subjects have strong overlap with employer demand for website developers and programmers. The data indicates a growing supply of higher-skilled labour with digital skills, although this appears to be most concentrated in Hull compared to other local authorities.

The Humber has an extensive range of education provision. Over a third (36%) of all providers deliver digital courses linked to the digital and creative sector. The ESFA Datacube findings show that there is less provision available at Level 4 and above compared to Level 3 and below. By contrast, the desk-based review findings suggest that the higher-level digital skills provision is under-represented in the Datacube, where a number of additional providers were identified as providing these qualifications. The development of two Institutes of Technology, the recently opened University Campus North Lincolnshire (UCNL) and planned university centre in Grimsby are expected to offer more opportunities to secure higher-level digital skills.

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# Executive Summary

## Conclusions

The headline findings in relation to the study research questions are as follows.

*Are there a range of digital skills from essential digital skills through to the more advanced ones needed to understand areas such as machine learning and artificial intelligence?*

The evidence shows that there are a wide range of digital skills needed across the Humber which varies by sector. While more employers are seeking Industry 4.0 technology expertise in the manufacturing, ports and logistics, energy and food sectors, the visitor economy has seen increased demand for operational IT and digital skills. This suggests that an understanding of the essential digital skills is more important in this sector. In tandem, new technologies have opened up new opportunities in sectors and drivers of change such as decarbonisation and greater customisation of products / services. This is expected to increase future need for Big Data analytics and expertise in sensor technology and VR.

*What opportunities are there to upskill the ageing population who wish to continue working, and reskill those in jobs susceptible to technological change (e.g. automation)?*

The Humber has a growing ageing population which impacts on replacement demand for skills. Younger

people tend to be more digitally skilled, and the challenge is to attract young cohorts into priority sectors to drive competition whilst upskilling and reskilling the existing workforce. This will require a responsive education and training system which can adapt to digital needs. An ageing population also presents an opportunity to capitalise on healthcare technologies and lead innovation in this area; as well as using digital technologies to bridge the knowledge gap between younger workers and older workers.

*Is there evidence of digital maturity within the business – including digital strategy, Big Data Analytics, Cybersecurity, Integrated Digital Systems, Preparing for digital disruption, Digital innovations, Tech sector collaborations, Automation, AI and VR?*

The literature review suggests there is slow adoption of emerging Industry 4.0 technologies and a lack of expertise to use the technologies across most of Humber's priority sectors. This has been largely driven by a lack of business confidence. Although local education and training courses are covering these skills, there could be a need to support businesses from non-digital sectors to help improve productivity. This will require further investigation through employer survey / consultation to understand impacts of digitalisation on businesses' skill needs in the Humber.

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# Executive Summary

## Conclusions Cont'd

### *Which digital skills are employers demanding? Are these skills transferrable or specialist?*

The evidence indicates that while digital skills are important to Humber employers, complex analytical skills and operational skills were regarded as more significant in tackling skill shortages. This indicates a greater need for transferrable skills as opposed to specialist skills. In tandem, more job postings were found to advertise non-digital roles than digital roles which suggests digital skills are in relatively less demand compared to other skills.

### *How are digital skills likely to change in the next five to ten years?*

Nationally, the business services sector (of which ICT is a part) is expected to grow considerably by 2027 according to Working Futures forecasts. This suggests there will be increased demand for higher level skills in the ICT sector and therefore competition for highly skilled labour will increase. Going forward, the UK will need to respond to this demand requirement.

In the Humber, employment in the ICT sector is projected to grow by at least 10% by 2024 and will require more managerial and professional

occupations. Digital subsectors which are forecast to see high job growth are computer programming and wired telecommunication activities. The literature review evidence suggests that more managerial and professional roles are expected to have digital expertise and understand how to use new technologies. In tandem, the forecast decline in new jobs created in the manufacturing and engineering sector suggests that digital skills will be required to fill new jobs and also replace existing jobs in the future.

### *What proportion of jobs are susceptible to technological changes (through automation/digitalisation) and in which sectors/occupations?*

Occupations which are expected to be most exposed to automation are elementary, caring and personal service and administration which together account for a quarter of Humber's workforce. Food manufacturing and retail sectors were also found to have the highest probability of automation, representing 11% of Humber's employment base. These findings suggest that there is a greater risk of automation across lower-skilled manual jobs compared to digital-intensive jobs.

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# Executive Summary

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## Conclusions Cont'd

### *What are the future digital skills needed and do the labour force have these?*

The literature review findings point to increasing need for expertise in Big Data, Internet of Things, AI and robotics. Growing demand for STEM roles will require digital expertise to fill hard-to-fill vacancies. In tandem, there is forecast to be an expansion of higher-skilled jobs in the ICT, professional services and media sectors, and the data shows there would be an insufficient supply of people qualified at Level 4+ to meet this demand. Nevertheless, the number of STEM learners appear to have increased considerably over recent years, particularly in engineering and technology which should help to address the mismatch if growth is sustained going forward.

Further primary research is required to identify the specific future digital skills which will be in demand locally through engaging with employers and intermediaries.

### *What courses and training provision are on offer? Do these provide the current and future skills to satisfy the demand from employers?*

The Humber has an extensive range of education provision, and currently provides a mix of HE, FE and Apprenticeship provision in digital subjects. The ESFA Datacube findings show that there is less provision at Level 4 and above compared to Level 3 and below. The

desk-based review findings suggest that the higher-level digital skills provision is under-represented in the Datacube, where a number of providers were identified as providing higher level qualifications. This could indicate that more learners are choosing to pay directly for higher level digital skills. The development of two Institutes of Technology, the recently opened University Campus North Lincolnshire (UCNL) and planned university centre in Grimsby are expected to offer more opportunities to secure higher-level digital skills

### *Are education and training providers delivering courses to meet employer demand locally?*

Since the introduction of the Apprenticeship Levy, ICT apprenticeship starts and completions have fallen in recent years, reflecting the national trend of declining starts. Analysis of HE provision suggests that most learners are studying medical subjects, business and administrative studies and biological sciences which has some overlap with digital demand as these courses require technical expertise. However, growth in STEM enrolments i.e. engineering and technology and computer science suggests that there is a growing supply of higher-skilled labour with digital skills. Furthermore, the evidence indicates a greater representation of digital provision delivered in Hull (for both HE provision and Apprenticeships) compared to the other local authority areas. This could have disproportionate impacts on employers based outside of Hull which require digital skills

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# Executive Summary

## Recommendations

Mapping the digital skills demand evidence against supply has identified key priorities to consider in the future workplan of the Local Digital Skills Partnership.

- + Consider a sector-specific approach in improving digital skills in the workforce, which responds to different employer needs for digital skills. Further investigation through employer survey / consultations will help contribute to this.
- + Attracting young people in sectors facing digital skill gaps with a targeted focus on priority sectors, as well as considering Government support in retraining schemes would help raise the digital capacity of the Humber.
- + Review how business support interventions can help address lack of business confidence in adopting new technologies and improve their knowledge of new technologies to raise productivity. Further investigation through employer survey / consultations will help identify this need.
- + Offering business support to encourage workforce training which incorporates digital skills will help

ensure capabilities crosscut across sectors and improve Humber's competitiveness.

- + Retaining more STEM graduates within the Humber and ensuring that the education and training system aligns with sector and technological developments will help address the STEM mismatch.
- + Mitigating impacts of digital exclusion in less represented areas of the Humber will ensure that all benefit from digital skills. The rollout of the National Retraining Scheme will help achieve this.

# + Introduction

# Introduction and Approach

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support the Employment and Skills Board, local providers and employers to respond effectively to Humber's digital skill priorities. It will also contribute to the refresh of the Humber LEP's Employment and Skills Strategy by identifying the intervention areas required to address digital skill needs. In tandem, the Humber LEP is in the process of establishing a Local Digital Skills Partnership and findings from this study will help inform their future work plan.

This report emulates the SAP Analytical Framework structure to identify the digital skill needs, opportunities and challenges for the Humber. This includes:

- + **Literature Review** to understand the importance of digital skills.
- + **Digital Skills Demand Analysis** to explore digital skill needs based on current and future demand.
- + **Digital Skills Supply Analysis** to identify available digital provision and potential challenges.
- + **Conclusions and Recommendations** to summarise whether learner provision is meeting demand, drawing out key priorities arising from the evidence.

# Introduction and Approach

The Humber Digital Skills Analysis study was commissioned in a pre-COVID environment and whilst it is recognised that COVID will fundamentally change the demand and supply of digital skills going forward, the time lag in published data sources means that these issues are not fully reflected in the report. Nevertheless, early research indicates that the likely areas of future impact could include, but are not limited to:

- + Shift towards remote working and distance learning
- + Increased business recognition of the benefits of investing in digital technology
- + Availability of digital training and retraining schemes, targeting school pupils as well as the current workforce
- + Digital innovation in providing support and advice services
- + Widening of digital inequalities, particularly impacting disadvantaged people and rural localities.

Source: *Digital Transformation and Digital Divide Post COVID-19, 2020; How Covid-19 is shaping digital transformation, 2020; 6 ways that Covid-19 has accelerated our digital skills, 2020; Digital Skills to fight Covid-19, 2020.*



# Literature Review

## Introduction

The purpose of the literature review is to assess the need to invest in and attain digital skills to address skill shortages and support productivity. Our approach involved drawing on qualitative and quantitative research and policy documents in relation to each of the Humber's priority sectors. This section provides a high-level themed analysis of the messages arising. Further details are in the

## Headline Findings

- A wide range of digital skills are demanded across Humber's priority sectors, from essential skills to advanced digital skills.
- Emergence of Industry 4.0 technologies show there are increasing digital skill needs in manufacturing, ports and logistics, energy, and food. More employers are requiring technical skills to understand and work with Big Data, Internet of Things and AI.
- The visitor economy sector demands operational IT and digital expertise, indicating a greater need for essential digital skills
- An ageing population presents an opportunity to grow healthcare technologies – with expertise in Big Data, IoT and AI becoming more important for managing health and enabling 'smarter homes'.
- Technological change is resulting in a greater focus on customer experience and customisation – demonstrating a need to understand Big Data analytics and other emerging digital areas.
- Lack of business confidence to invest in new technology is limiting adoption of digital technologies across a number of priority sectors.

Source: Humber LEP Digital Skills Brief, 2020; DfE Skills Advisory Panels – Analytical Toolkit for Local Skills Analysis, 2018

## Key questions to be answered:

- Are there a range of digital skills from essential digital skills through to the more advanced ones needed to understand areas such as machine learning and artificial intelligence?
- What opportunities are there to upskill the ageing population who wish to continue working; and reskill those in jobs susceptible to technological change (e.g. automation)?
- Is there evidence of digital maturity within the business – including digital strategy, Big Data Analytics, Cybersecurity, Integrated Digital Systems, Preparing for digital disruption, Digital innovations, Tech sector collaborations, Automation, AI and VR?

# Transition Towards a Greener Economy

Digital technologies can make energy and resource use more efficient, which is important as the economy is shifting towards becoming greener. Digital technologies are beginning to transform vehicle production, agricultural processes and supply chains, opening up new opportunities. Key themes are:

- + Decarbonisation:** There is an increased need to support decarbonisation in the Energy Intensive and Continuous Process Industries (EICPI) sector and other industrial sectors. Capital-intensive sectors are encouraged to seek new approaches to improve energy efficiency and productivity. Research shows that greater deployment of digital technologies such as Big Data and Internet of Things will help the EICPI sector address its challenge to become less carbon intensive, and increase the long term viability of the sector.
- + Local and Sustainable Supply Chains:** In the manufacturing sector, there is an opportunity to reduce reliance on international automotive supply chains and shift towards a more sustainable 'circular model' of manufacturing, through adopting digital technologies. There is growing demand for electric and hybrid vehicles, however evidence shows that productivity in the manufacturing sector is falling behind, due to the low adoption of digital and automation technologies in the UK. More local supply chains are collaborating and encouraged by Government to make greater use of AI, robotics, and Internet of Things technology to improve innovation.
- + New Modes of Transport:** The introduction of new and innovative modes of transport are being driven by technological advances, which has the potential to improve cost and energy efficiency in the ports and logistics sector. Evidence shows that climate change and sustainability is becoming increasingly important to port functionality. This presents an opportunity to deploy new maritime technology (related to autonomous vehicles, big data, digital capital systems) to strengthen Humber's reputation for maritime innovation.

# An Ageing Workforce

A growing ageing population is contributing to an ageing workforce, which is expected to have disproportionate impacts on some sectors. Embracing digital technologies such as Internet of Things and Data Analytics is reported to help reduce the skills gap between younger and older workers, as well as enable employers to become more adaptive to technological change. Key themes are:

- + **Opportunity for Healthcare Innovation:** Digital and creative sector research identifies the growing ageing population as an opportunity to grow healthcare technologies. Through the UK Industrial Strategy, the Government is supporting the creation of new care technologies to help meet the needs of an ageing society. Evidence shows that Big Data, Internet of Things and AI will become increasingly important for revolutionising the management of people's health and enabling 'smart homes'.
- + **Challenge to Replace Skilled Workers:** Evidence in the ports and logistics, energy, food and manufacturing sectors show that the ageing workforce is a significant challenge facing employers, where there is a need to attract young people into the sectors to replace skilled workers. This is largely related to the perceptions of these sectors among young people, as lacking career progression opportunities. National research shows that efforts to increase young people would help alleviate the challenges posed by the digital skills gap and bring new, technical expertise into the sectors.

Source: UKCES Sector Insights: Skills and Performance Challenges in the Digital and Creative Sector, 2015; UKCES Sector Insights: Skills and Performance Challenges in the Energy Sector, 2015; ERP, Food Manufacturing Industry Challenges, 2019, PwC Annual Manufacturing Report, 2019

# Literature Review: The Importance of Digital Skills Enhancing Customer Experience

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The rise in digital technologies has driven consumer demand for a more personalised experience and the opportunity to shape their products and services. This has made more employers seek digital and analytical capabilities which can help adapt their operations to respond effectively. Key themes are:

- + **Greater Focus on Customer Experience:** A common theme across a number of Humber's priority sectors is how technological change is placing greater importance on customer service. In the energy sector, research suggests that technology change has increased demand for expertise in big data analytics to better understand intelligent networks and how customer experience can be improved through technology to boost competitiveness. In the visitor economy, operational IT / digital skills are recognized as a skills gap and evidence shows this will become increasingly important to employers as more businesses will change how they interact with their customers.
- + **Demand for Personalisation:** Research shows that technology developments are encouraging manufacturing companies to design products with greater customisation. More customers are demanding experiences which are tailored to their needs and revolve around their personal preferences. In the manufacturing sector, this indicates a growing need for digital expertise (particularly with sensor technology and big data) to understand consumer patterns and future demand for 'virtual manufacturing'.

Source: Energy and Utilities Skills Partnership, *Many Skills: One Vision 2020*, 2017; LGA, *Supplying Skills for the Local Visitor economy*, 2019; Strengthening UK Manufacturing Supply Chains – an Action Plan for Government and Industry, 2015; MatrixNI, AMME Report, 2016

## Large Demand for STEM Roles

Technological change is reshaping a range of different sectors, which has resulted in high employer demand for STEM workers with digital skills. This presents a need to encourage more young people to consider STEM careers and retrain existing workers to meet demand and close the digital skills gap.

- + **Mismatch in STEM Demand and Supply:** Across the energy, food and manufacturing sectors, there is a mismatch between advanced level STEM participation and employer demand, which has increased the need for digital expertise, particularly digital engineering skills. National survey evidence shows that STEM roles are hard to recruit for, particularly in the areas of engineering, technology and food production. In the manufacturing sector, more companies are setting up training centres independently or in collaboration with other local companies to address these skill gaps. As the sectors become more digitalised and automated, there is expected to be continued demand for STEM roles in the future which require sufficient digital skills. This will have implications on Humber's education and skills system, as digital skills become more prominent across STEM disciplines.

Source: *Made Smarter Review, 2017; UKCES Sector Insights: Skills and Performance Challenges in the Energy Sector, 2015; ERP Investigation into High-Level Skill Shortages in the Energy Sector, 2014; Energy and Utilities Skills Partnership, Many Skills: One Vision: 2020, 2017; IGD, Bridging the Skills Gap: Developing Talent Across the Food and Grocery Industry, 2017*

# Keeping Up with Technological Change

More businesses are seeking to invest in digital technologies and new ways of working, but research indicates that there are low levels of confidence over digital changes and how this could impact the workforce. There is a need to raise digital capacity in the workforce but also encourage businesses with supporting their staff through the digital transition. In tandem, employers report frustrations with the current education system, and feel that digital skills should be more integrated into delivery. Key themes are:

- + **Slow Adoption of Technology:** Evidence shows that some businesses are finding it difficult to implement innovative technologies which has resulted in slow adoption of emerging technologies and poor understanding of them. In the ports and logistics sector, growing digitalisation has opened up the sector to cyber attacks which increases the need for more up-to-date cybersecurity technology and expertise. In the digital and creative sector, research shows that 69% of businesses surveyed felt they were fairly or very concerned with the need to adopt new technology in the next few years, indicating a lack of confidence to invest in technology. Across all of Humber's priority sectors, evidence suggests a skill need for workers to understand emerging technologies and integrate this effectively with the existing digital infrastructure.
- + **Quality of Digital Training and Education Provision:** In the energy and food sectors, research indicates that current qualifications are unaligned with sector and technological developments, which has resulted in technical skill shortages. To help meet employer needs, T-Levels and graduate training schemes are expected to help increase young people into these sectors which have stronger digital capabilities. In tandem, evidence in the digital and creative and visitor economy sectors identified that technological change will encourage more employers to increase digital content in their workforce training so that there is greater digital expertise across a range of roles.

Source: Food and Drink Sector: Opportunities and Challenges for Growth, 2014; Visit Britain, the UK Tourism Productivity Gap, 2019; Logistics Performance Index, 2018; Creative and Cultural Skills, Building a Creative Nation: The Next Decade, 2015; UKCES: Skills and Performance Challenges in the Digital and Creative Sector, 2015; UKCES: Skills and Performance Challenges in the Energy Sector, 2015; Food and Drink Sector Council, Preparing for a Changing Workforce: A Food and Drink Supply Chain Approach to Skills, 2019

# Emerging Industry 4.0 Technologies

The emergence of Industry 4.0 technologies was identified across the following sectors, which evidences the importance of digital skills to the Humber:

- + **Manufacturing:** Industry 4.0 technologies presents an opportunity to increase productivity-led growth. Expertise in AI, robotics and Internet of Things are often referenced as important for future growth in the sector.
- + **Ports and Logistics:** The sector has responded to digitalisation by implementing innovative autonomous technology in new vehicles and incorporating big data into logistics activities. There is a need for workers in the sector to understand this technology and integrate with existing digital infrastructure.
- + **Energy:** As businesses look to reduce carbon emissions through new emerging technologies, more managerial roles are required to have digital and advanced IT expertise than before to support the technology. Employers are increasingly seeking knowledge of new smart grid technologies and big data analytics.
- + **Food:** Greater emphasis is being placed on computer literacy, data analytics and ‘number crunching’ to operate new technology and adapt to automation of manual tasks. AI is referenced as a skill area in high demand due to increased numbers of ‘smarter factories’ and the need to become more efficient.
- + **Visitor Economy:** Industry 4.0 technologies are becoming more prominent in the sector, as it adapts to technological change. Research suggests that the diffusion of robotics and AI is slowly growing, and increased accessibility to big data would help the sector have a better understanding of its consumer markets. This indicates a growing requirement for digital expertise in the sector.

## Future Implications of Covid-19

The recent Covid-19 outbreak has resulted in employers and the workforce to change how they work, with the rise in remote working and home-schooling using digital technologies. This has placed greater emphasis on the need for essential digital skills, and benefits of upskilling and retraining people to adapt to digital change. Key themes are:

- + **A Changing Workforce:** Evidence shows that there is expected to be further demand for remote working technologies as more businesses will look to enhance their remote working capabilities. An increasingly remote workforce indicates that there will be a greater need to infuse cloud-based tools, virtual private networks (VPNs), laptops and mobility devices to support employees who wish to work from home in the future.
- + **Greater Deployment of Data Enabled Services Across all Sectors:** The Covid-19 crisis has brought an opportunity for companies across all sectors to consider areas of the business which can be digitised. Research suggests that the digital capacity of businesses will become a key requirement in order to become more resilient in the future. The need for faster access to data and automation is expected to speed up 5G network deployments and adoption of 5G equipment. In tandem, the crisis has also resulted in schools moving to online courses to teach pupils, which indicates greater diffusion of data enabled services into wider aspects of life and across different sectors.
- + **Rise in E-Commerce:** Research highlights that Covid-19 has helped to further accelerate e-commerce activity. The impacts of the crisis have meant more businesses have seen an increased share of their online sales as more consumers are shopping online. This provides an opportunity for businesses to consider how to engage with their consumers using technology, and have technology play a greater role in shaping their future growth.

Source: *The Economist, Less Globalisation More Tech: The Changes Covid-19 is Forcing onto Businesses, 2020;* *Deloitte, Understanding Covid-19's Impact on the Technology Sector, 2020*



# Demand Analysis of Digital Skills

## Introduction

This section provides an in-depth analysis of the current and future demand for digital skills in the Humber LEP area. It provides an insight into the current business and employer environments and how this impacting on demand for digital skills. It also identifies the current strengths and weaknesses in the local labour market and the variation between sectors and occupations.

## Headline Findings

- Digital skills were found to be in less need of developing in the workforce compared to complex analytical skills and operational skills.
- Fewer job postings for digital roles compared to non-digital roles, however demand for digital roles has grown over the last four years particularly for website developers and programmers.
- By 2024, Employment in the IT sector is forecast to increase by at least 10%, indicating a strong increase in the demand for digital skills. Key digital subsectors expected to grow are computer programming and wired telecommunications activities.
- Elementary, caring and personal service, and administrative occupations have the highest probability of automation, and together accounts for a quarter (25%) of Humber's workforce.
- Food manufacturing and retail trade make up 11% of Humber's employment base and have the highest probability of automation.

## Key questions to be answered:

- Which digital skills are employers demanding? Are these skills transferrable or specialist?
- How are digital skills likely to change in the next five to ten years?
- What proportion of jobs are susceptible to technological changes (through automation/digitalisation) and in which sectors/occupations?
- What are the future digital skills needed and do the labour force have these?

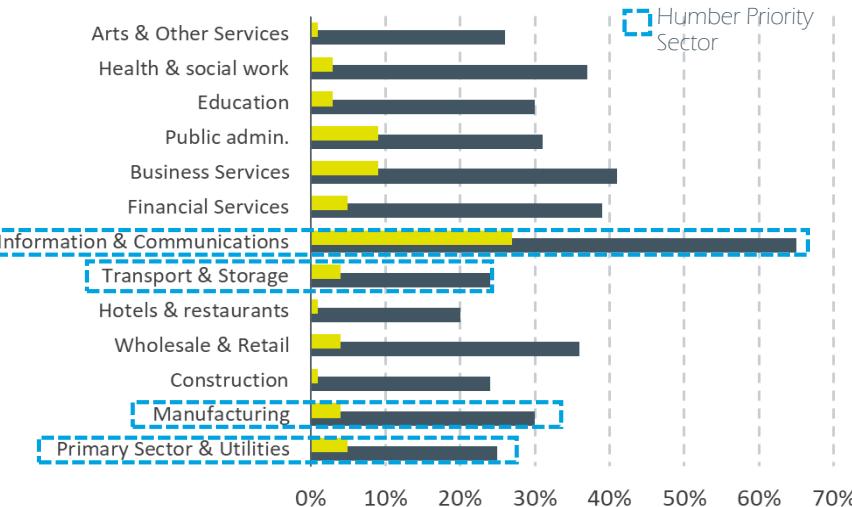
Source: Humber LEP Digital Skills Brief, 2020; DfE Skills Advisory Panels – Analytical Toolkit for Local Skills Analysis, 2018; Employer Skills Survey, 2017; BRES, 2019; ONS, 2019; EMSI, 2020; Annual Population Survey, 2019; Humber Productivity and Supply Chain Survey and Consultations, 2019; UKCES Working Futures 2014-2024.

# Digital Skills and Employers – National Context

- + The Employer Skills Survey (ESS) is a UK-wide survey which asks employers which skills are lacking in applicants to their business. The survey provides a breakdown by industry and occupation, and provides valuable context of the national labour market, which will influence the specific digital skill challenges of the LEP area. It also contains local-level data on skills that need developing in the workforce.
- + The ESS confirms that significant proportions of employers across the country report that digital skills are difficult to find across a wide range of different roles (occupations) and industries.
- + For all occupations and industries, at least 25% of employers reported digital skills as difficult to obtain. At an occupational level, for administrative, managers, associate professionals, and customer service, over 40% of employers reported digital skills as difficult to obtain. At an industry level, over 40% of employers in information and communications and business services reported digital skills as difficult to obtain
- + Employers were also asked to specify what the **main** skill found to be lacking amongst applicants was by occupation/role. Across occupations and industries, much fewer employers identify digital skills as the **main** skill lacking, rather than just **a** skill found to be lacking amongst applicants.

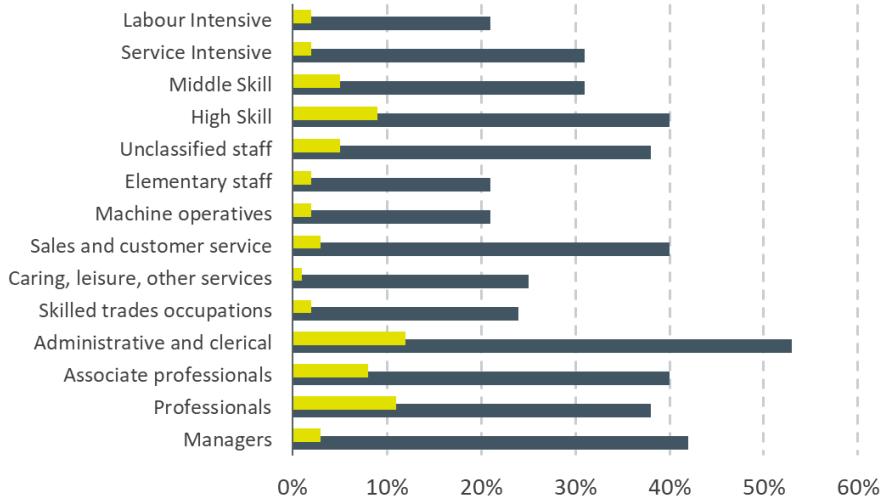
## Skill(s) found difficult to obtain from applications by industry, 2017

■ Digital Skills are the main skills difficult to obtain ■ Digital Skills are difficult to obtain



## Skill(s) found difficult to obtain from applications by occupation, 2017

■ Digital Skills are the main skills difficult to obtain ■ Digital Skills are difficult to obtain

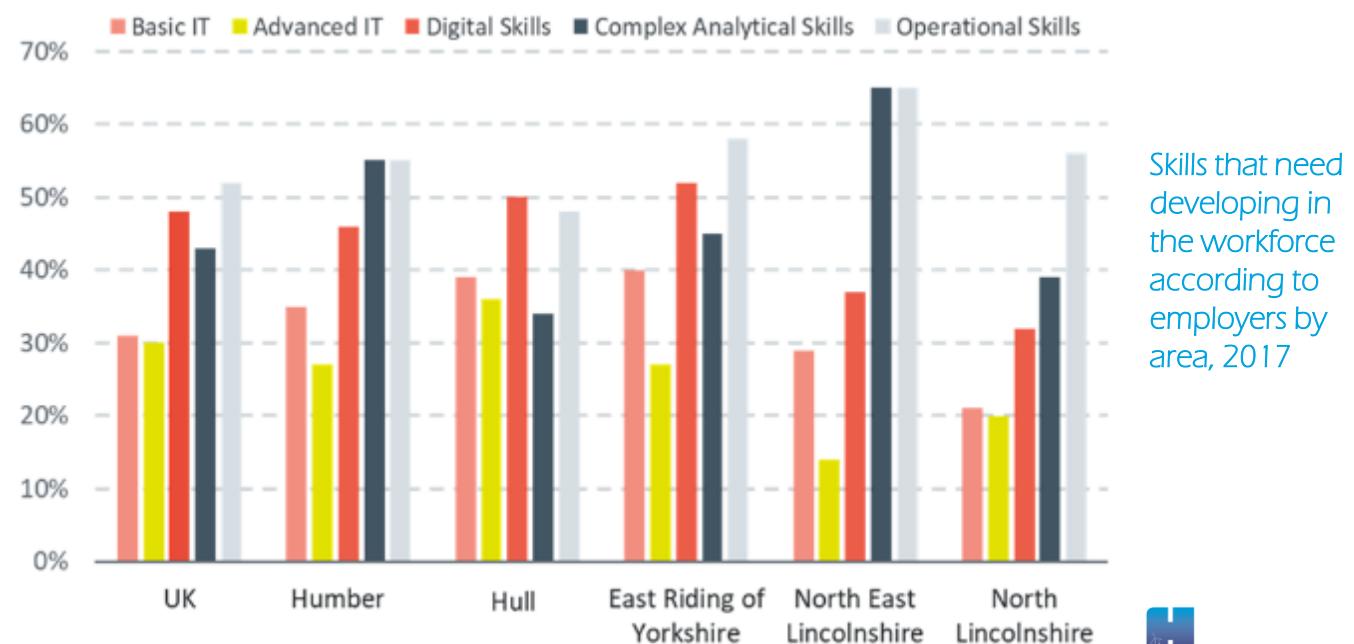


Source:  
Employer Skills  
Survey, 2017

# Digital Skills and Employers – Local Picture

- + The Employer Skills Survey (ESS) asked employers at a local level what skills they believed needed to be developed within the workforce. A choice of 13 specific skills is given, along with three general skills including Digital Skills, Complex Analytical Skills and Operational Skills, and are included in the chart below along with the two specific skills relating to IT.
- + In the Humber LEP area (hereafter referred to as the Humber), the broad Digital Skills category lags the broader categories of Complex Analytical Skills and Operational Skills, although in absolute terms it was still reported as needing development in the workforce by a large proportion (46%) of employers. Within the Humber, this proportion rises to 50% in Hull, where more employers see Digital Skills as in need of development than Complex Analytical Skills and Operational Skills. In the East Riding, more than half of employers report Digital Skills as needing development - more than Complex Analytical Skills but less than Operational Skills

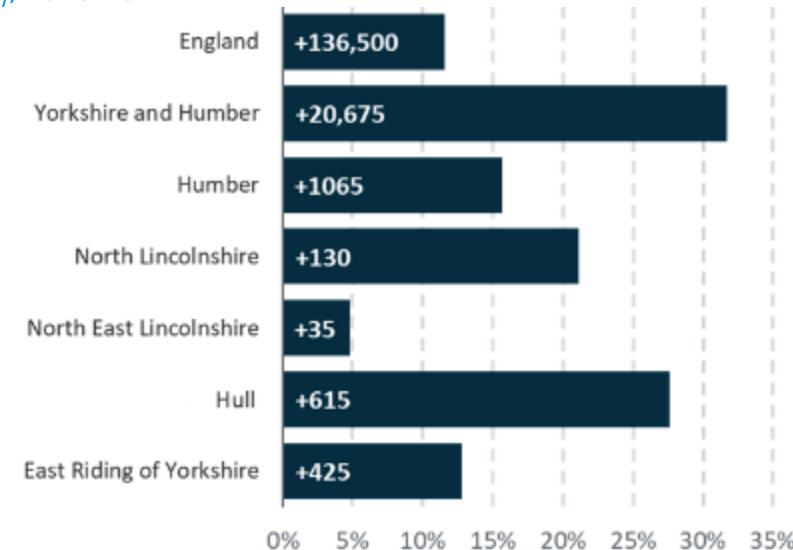
North and North East Lincolnshire had the lowest proportions of employers within the Humber reporting Digital Skills as in need of development, with 32% and 37% respectively. In North East Lincolnshire, Complex Analytical Skills and Operational Skills were much more likely to be identified as areas in need of development by employers, whilst Operational Skills were identified most in North Lincolnshire.



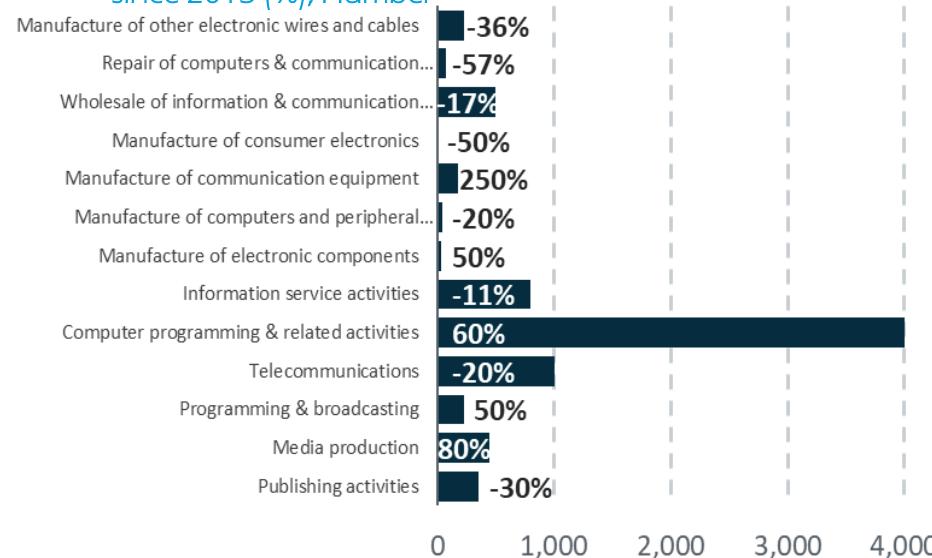
## Recent Growth in Jobs

- + The digital technology priority sector\* in the Humber has grown strongly since 2013, with an increase of over 1,000 jobs (+16%); accounting for 2% of total employment. Within the Humber, this growth is driven largely by Hull, which has grown the strongest out of the four local authorities, registering an additional 615 jobs over the period (+28%).
- + Digital technology jobs growth has been stronger than England overall by around 4 percentage points. However growth in the Yorkshire and Humber region (+32%), has outperformed the Humber's growth as well as Hull, the best performing local authority in the Humber.
- + Some digital technology sub-sectors have grown exceptionally strong since 2013. To contextualise this growth with the size of these subsectors, total employment is plotted on the x-axis, with growth since 2013 given as the percentage figure.
- + Computer programming and related activities are especially significant given that it is by far the largest subsector (employing 4,000) and has seen strong employment growth of +60%. This growth contrasts with employment decline in a number of sub-sectors, including information service activities (-11%), telecommunications (-20%), publishing (-30%), manufacture of electronic wiring (-36%), and wholesale of information & communication equipment (-17%).

Growth in digital technology employment (% - axis; absolute – inside bar), 2013-18



Digital technology subsector employment (2018) and growth since 2013 (%), Humber

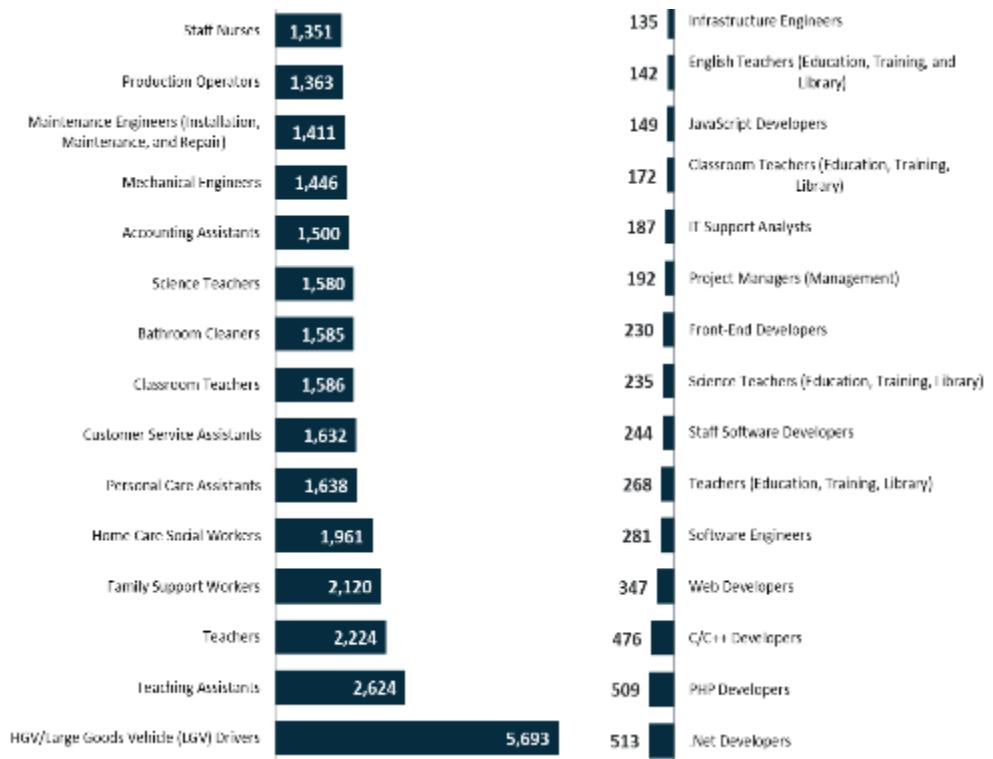


Source: BRES and ONS, 2019; \*see Digital Technology sector definition in Appendix

# Job Postings and Top Roles

- + The adjacent chart shows the top 15 roles in the Humber by number of job advertisements posted between 2016-20 according to EMSI, with the bars on the left showing all roles, and the bars on the right showing roles filtered by the requirement for digital skills (including software engineering, programming, data management, and softer digital skills such as Microsoft Windows).
- + This data demonstrates the comparatively low prevalence of digital skills amongst roles being advertised in current job vacancies, with no explicitly digitally focused roles apparent in the 15 most posted.
- + Whilst some of these top 15 roles may require interaction with digital technology, such as accounting assistants, digital skills are not of principal importance. The most frequent role advertised in the Humber overall was HGV driver, which saw over ten times as many job postings for .Net (website) developers – the most frequently posted job requiring digital skills.
- + Whilst the digital sector is far from the largest in the Humber in terms of total employment or total economic output (as measured by Gross Value Added), digital job postings are growing especially fast, with average growth of 149% in job postings across the top 15 digital skills-based roles. This indicates strong and growing demand for digital skills in the labour market.

**Top Roles by Job Postings in the Humber, 2016-20. Digital roles only on the right, all roles on the left**



Source: EMSI, 2020

Note: this only includes job advertisements posted online and scraped by EMSI. This provides a reasonable indication as to jobs that have been advertised in the Humber, although only captures those jobs which have been advertised online (and not those posted elsewhere).

# Job Postings and Recruiting Firms

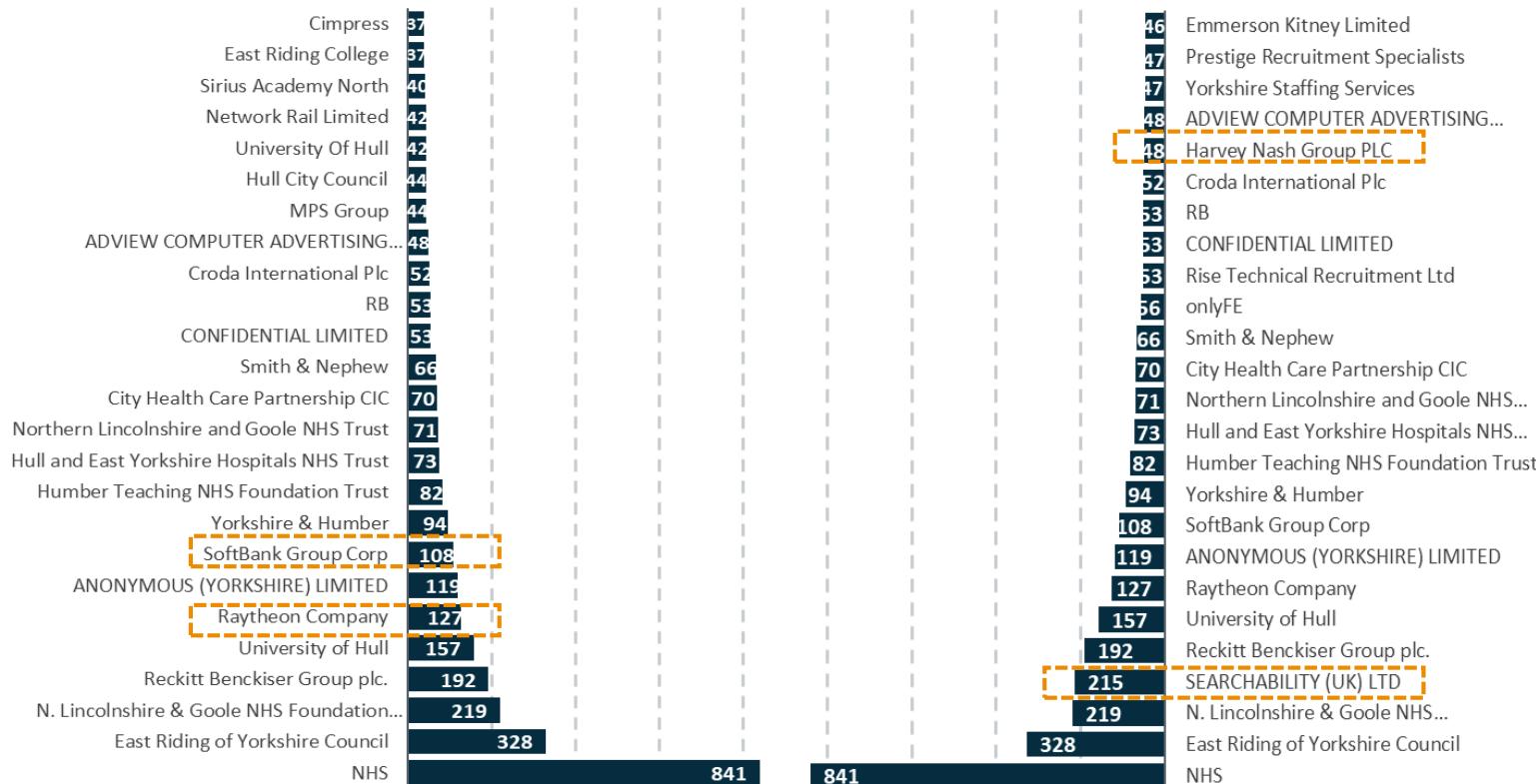
+ The adjacent charts show the top companies in the Humber by number of job vacancies posted between 2016-20. The bars on the left have been filtered to remove recruitment companies, as job postings from these firms reflects employment in other firms, and can give the (possible) false impression that they are themselves large employers. On the left, digitally intensive firms have been highlighted, and on the right, recruiters in the digital and tech sectors have been highlighted.

+ Whilst SoftBank and Raytheon are not specifically digital tech companies, they operate in high-tech sectors that will require technically skilled employees. They have sought to recruit at least 235 people between them in the Humber since 2016.

+ Searchability is a recruitment company specialising in digital tech recruitment, whilst Harvey Nash specialise in IT. They have sought to recruit at least 263 people in the Humber since 2016.

Top Companies by Job Postings in the Humber, 2016-20.

Recruiting companies included on the right, omitted on the left



Source: EMSI, 2020.

Note: this only includes job advertisements posted online and scraped by EMSI. This provides a reasonable indication as to jobs that have been advertised in the Humber, although only captures those jobs which have been advertised online (and not those posted elsewhere).

# Job Postings – Sub-sector and Occupation Breakdown

+ Based on the contents of the role, job postings in the Humber between 2016-20 have been assigned a Standard Occupational Classification. This allows for a detailed analysis of sub-occupations in the broader Digital category. The adjacent table lists all of the digital occupations that have seen job postings in the Humber between 2016-20, as well as growth in number of postings between this period.

+ Programmers and software developers have been in exceptionally high demand relative to other digital occupations, seeing the most job postings since 2016, by a margin of over 80% compared to web designers – the second placed digital occupation.

+ In addition to the high total number, postings for programmers and software developers have grown more than 100% during the period. This impressive growth is only less than IT and telecommunications professionals not elsewhere classified (+346%) and IT engineers (+158%).

+ Whilst job postings growth in the Humber is especially strong in these occupations, IT business analysts, architects and systems designers have seen a small reduction in the total number of postings since 2016, whilst IT project and programme managers have seen a sharp drop of -44%, albeit from the smallest total number of postings amongst digital occupations.

**Job postings by Digital Standard Occupational Classification, Humber**

Occupation	Unique Postings from Jan 2016 - Feb 2020	% Change (Jan 2016 – Feb 2020)
Programmers and software development professionals	3,638	+104%
Web design and development professionals	2,019	+89%
IT user support technicians	1,494	+62%
Information technology and telecommunications professionals n.e.c.	1,518	+346%
IT operations technicians	1,323	+45%
IT specialist managers	1,146	+45%
IT engineers	390	+158%
IT business analysts, architects and systems designers	507	-5%
IT project and programme managers	169	-44%
Information technology and telecommunications directors	10	n/a

*Note: this only includes job advertisements posted online and scraped by EMSI. This provides a reasonable indication as to jobs that have been advertised in the Humber, although only captures those jobs which have been advertised online (and not those posted elsewhere).*

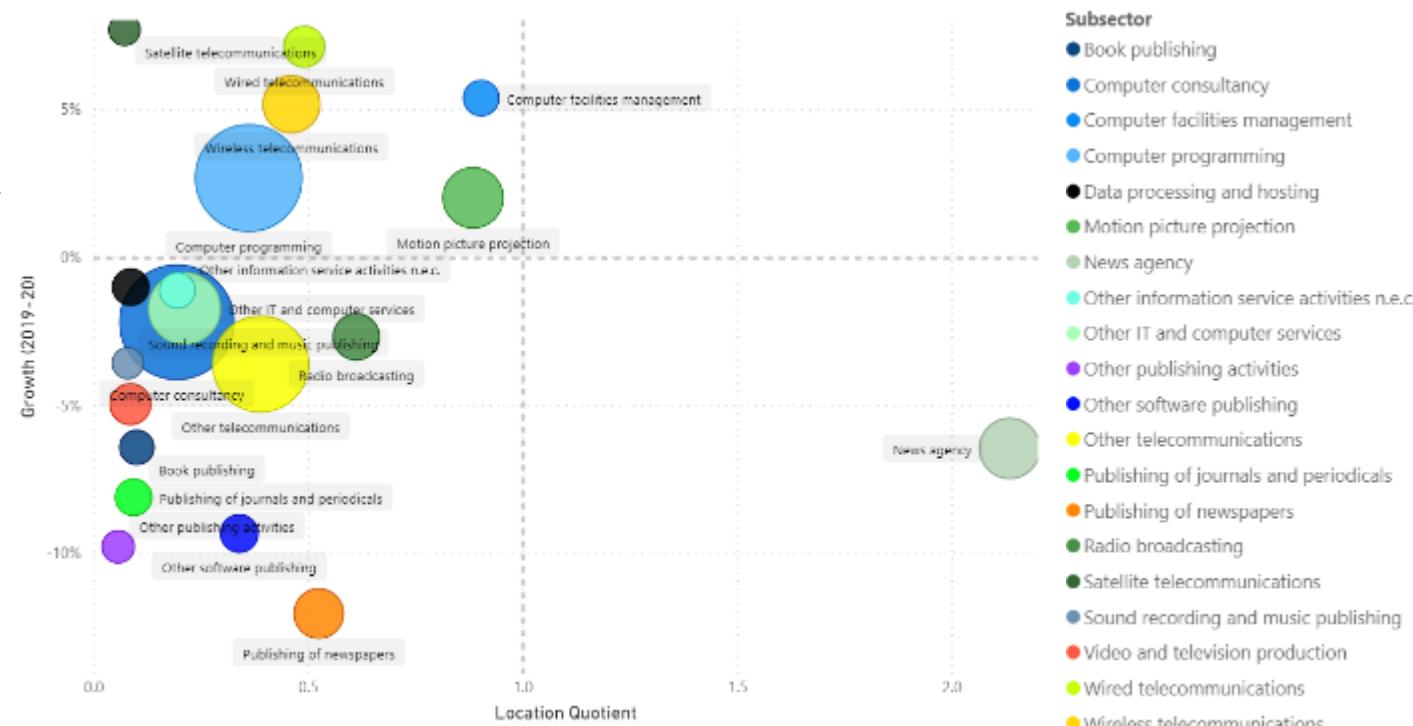
# Job Postings – Sub-sector and Occupation Breakdown

+ Employee jobs data from EMSI provides a Standard Industrial Classification breakdown of the digital sector right up to 2020, which at the time of writing is ahead of the ONS Business Register and Employment Survey (whose latest year is 2018). This allows us to identify up-to-date variation in employment within the digital sector. The scatter chart below plots the growth in employees in each digital sub-sector in the past year (2019-20), as well as the sub-sector Location Quotient (i.e. how concentrated employment is in the Humber compared to the national average).

+ Since 2019, most digital subsectors have experienced small to moderate decline in the total number of employees. This decline has been especially acute in the publishing of newspapers.

+ As of 2020, news agency activities represent the only digital subsector in the Humber with a positive Location Quotient – i.e. an employment density greater than the national average. This reflects the Press Association as a major employer in Howden, employing 600 people. However, this may not illustrate the number of employees who live in Howden.

Digital Subsector Employees by Growth (2019-20) and LQ Classification, Humber



Source: EMSI, 2020. Note: this only includes job advertisements posted online and scraped by EMSI. This provides a reasonable indication as to jobs that have been advertised in the Humber, although only captures those jobs which have been advertised online (and not those posted elsewhere).

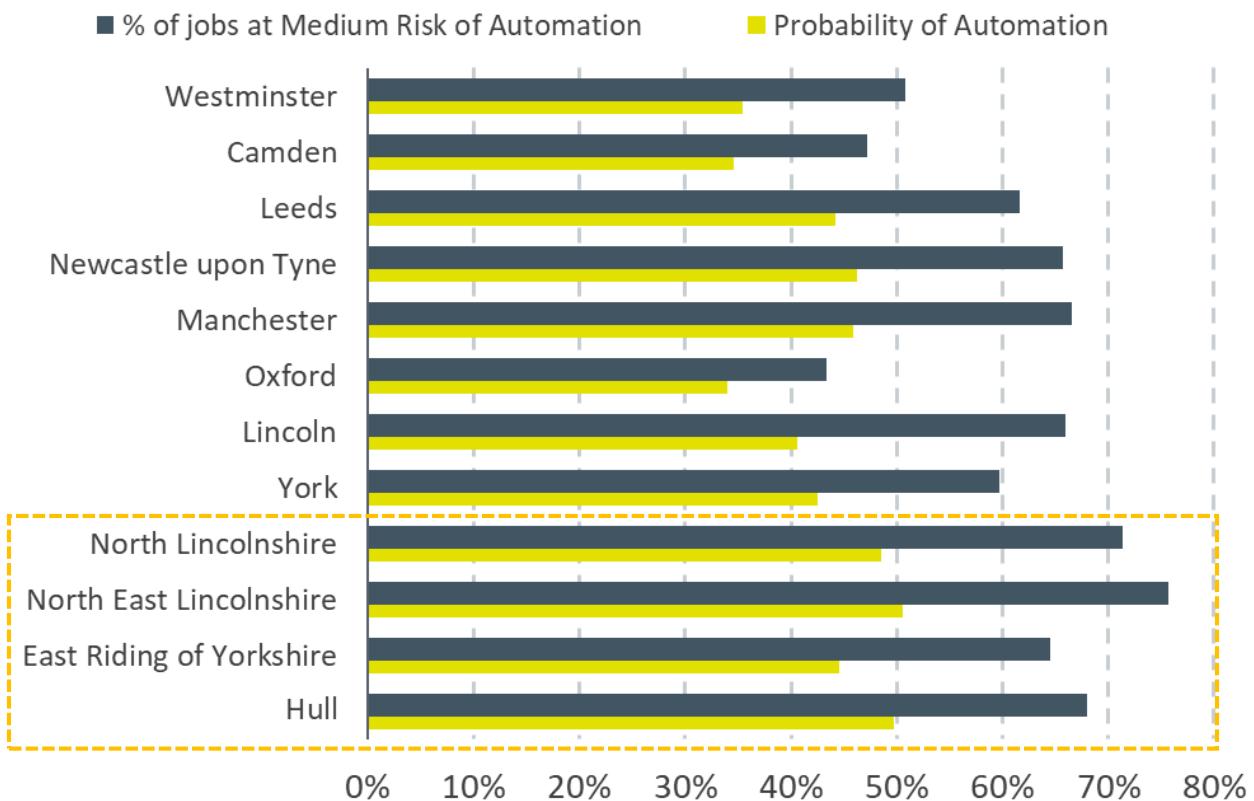
# Automation

+ The ONS provide a general appraisal of exposure to automation, as well as specific estimates of the proportion of jobs by degree of risk to automation in each local authority.

+ Local authorities in the Humber score highly both on the general probability of automation (yellow bar) and the proportion of jobs currently at medium risk of automation (out of three categories low – medium – high).

+ Out of 325 local authorities, North East Lincolnshire ranks the 16<sup>th</sup> highest for probability of automation. Within the Humber, this is followed by Hull at rank 35/325. North Lincolnshire ranks better at 62, with the East Riding of Yorkshire showing the lowest probability of automation within the Humber at rank 182.

Exposure to Automation by Local Authority, 2017



# Automation

- + The largest type of occupation in the Humber is elementary administration and service activities (which makes up 10% of employment). These occupations constitute 8/10 of the occupations with highest probability of automation.
- + The next most prevalent occupation is caring and personal service occupations. This group of occupations contains some roles, such as care escorts and childminders, which are in the highest 1/3<sup>rd</sup> of occupations by probability of automation. The group also contains roles such as senior care workers and ambulance workers, which are less likely to be automated.
- + Administrative occupations constitute almost 7% of the Humber's workforce, and these occupations are also some of the most exposed to automation. For example, sales administrators are in the highest 15% of occupations by probability of automation, with a wide range of other administrative and clerical occupations falling within the highest 25%.

Top occupations by probability of automation and their prevalence in the Humber (2019)

Occupation	Probability of Automation (2011-17)	Humber - top occupations	Occupation share of total (%)
Waiters and waitresses	73%	Elementary administration & service	9.9%
Shelf fillers	72%	Caring personal service occupations	8.1%
Elementary sales occupations n.e.c.	71%	Corporate managers and directors	7.0%
Bar staff	71%	Administrative occupations	6.9%
Kitchen and catering assistants	69%	Sales occupations	6.2%
Farm workers	69%	Process, plant and machines operatives	5.1%
Sewing machinists	69%	Transport & mobile machine drivers/operatives	4.5%
Cleaners and domestics	68%	Teaching and educational professionals	4.3%
Tyre, exhaust and windscreen fitters	68%	Other managers and proprietors	4.2%
Vehicle valeters and cleaners	68%	Skilled metal, electrical and electronic trades	4.1%

# Automation

- + The adjacent table shows the top 10 industries by probability of automation alongside the top industries by employment in the Humber.
- + The largest sector by employees in the Humber is education (which accounts for 7.3% of employees). This sector is among the very least exposed to automation, with a probability of automation score of 34% (which is within the lowest 1/10<sup>th</sup> of sectors).
- + The next most prevalent sector is health. Which, like education, is among the sectors least exposed to automation, with a probability of automation score also of 34% (within the lowest decile of sectors).
- + The next two industries by share of employees, manufacture of food, and retail trade, are both highly exposed to automation.
- + Food manufacturing accounts for approximately 5.7% of the employees in the Humber, and has a probability of automation of 52.6% - which places it in the top 15% of sectors by probability of automation.
- + Retail trade accounts for 5% of employees in the Humber, and has a probability of automation of 58.3% and is the 3<sup>rd</sup> highest ranking sector (out of 86 in total).

Top industries by probability of automation and their prevalence in the Humber (2019)

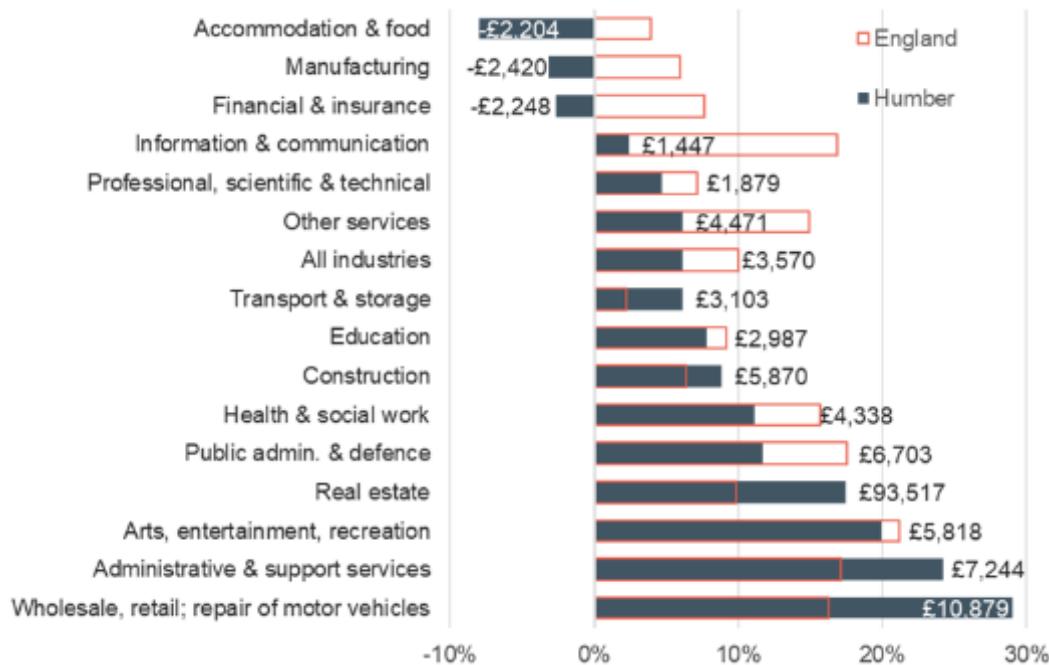
SIC07 – Description	Probability of automation (%)	Humber - top industries by employees	Industry share of employees
Food and beverage services	63%	Education	7.3%
Accommodation	60%	Human health activities	6.1%
Retail trade (except motor vehicles)	58%	Manufacture of food products	5.7%
Wholesale and retail; repair of motor vehicles	58%	Retail trade, except of motor vehicles and motorcycles	5.0%
Crop and animal production	57%	Wholesale trade, except of motor vehicles and motorcycles	4.6%
Postal activities	56%	Employment activities	4.6%
Goods- and services-producing of private households	55%	Public administration and defence; compulsory social security	4.6%
Manufacture of wearing apparel	54%	Specialised construction activities	4.2%
Other personal service activities	54%	Land transport and transport via pipelines	3.4%
Services to buildings and landscape activities	54%	Warehousing and support activities for transportation	3.4%

Note: Automation data tables for all industries are included in the Appendix

# Productivity

- + Total economic output (GVA) produced per full-time equivalent worker (FTE) can be used as a measure of productivity. The data shows that the information and communication sector is much less productive in the Humber than England, and recent growth in productivity has also been slower than national levels.
- + In the Humber, of all sectors which have seen productivity growth since 2013, information and communication saw the smallest growth.

Change in GVA per FTE, 2013-18 (absolute change at end of bar)



Productivity (GVA per FTE) by industry and area, 2018

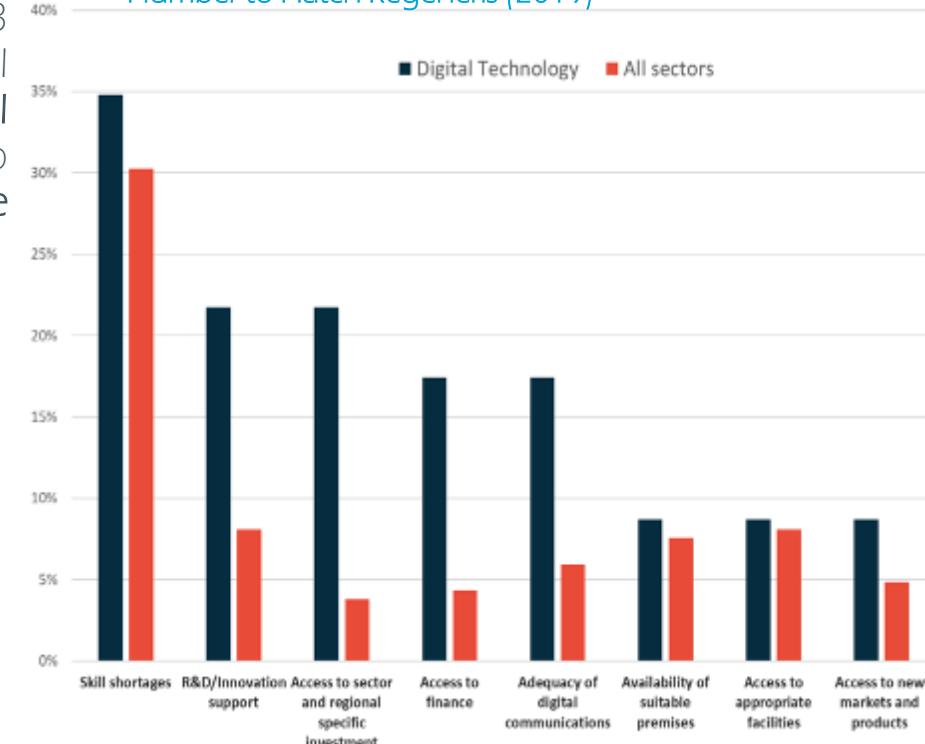
Sector	Humber	England
Agriculture, mining, electricity, gas, water, waste	£137,715	£119,392
manufacturing	£74,621	£78,950
Construction	£72,647	£90,839
Wholesale, retail trade; repair of motor vehicles	£48,292	£55,753
Transportation & storage	£53,753	£58,950
Accommodation and food	£25,278	£32,615
Information & communication	£61,447	£116,240
Financial & insurance	£82,609	£143,805
Real estate activities	£628,966	£573,574
Professional, scientific, technical	£41,879	£64,560
administrative & support services	£37,107	£46,907
Public administration & defence	£64,000	£158,914
Education	£41,222	£105,906
Health and social work	£43,325	£45,750

Source: BRES and ONS Regional GVA (Balanced), 2019; Hatch Regeneris

# Digital Evidence in the Humber

- + 157 businesses took part in the Hatch Regeneris Productivity and Supply Chains survey in 2019. 23 businesses identified their primary sector as digital technology, with just over 1/3 of these (35%) citing 'skill shortages' (more than any other factor) as a barrier to productivity. This was 5% more than the all sector average of 30%.
- + Impacts are also felt in the supply chain. When asked about what challenges they have faced in managing their supply chains in the past 3 years 22% digital technology survey respondents selected 'Increasing competition for labour and talent', which, although lower than the all sector average, was the 3<sup>rd</sup> most frequent supply chain challenge named by digital technology respondents. When asked about what they considered to be future supply chain challenges, the proportion of digital technology businesses citing 'Increasing competition for labour and talent' rose to 26% - the joint 2<sup>nd</sup> most frequent
- + Consultation with one digital business suggested that recruitment can be difficult within their Humber office relative to their office in the South East, where recruitment tends to be easier. Despite the business being able to operate remotely and recruit outside of the Humber, it was suggested during the consultation, that if the skills and talent were available locally, they would look to recruit in the area.
- + One respondent also highlighted that increasing access to digital technology was reducing the demand for their service, even though consumers did not have the necessary expertise to best use software, fearing that certain digital technologies and expertise could become redundant, as a result.

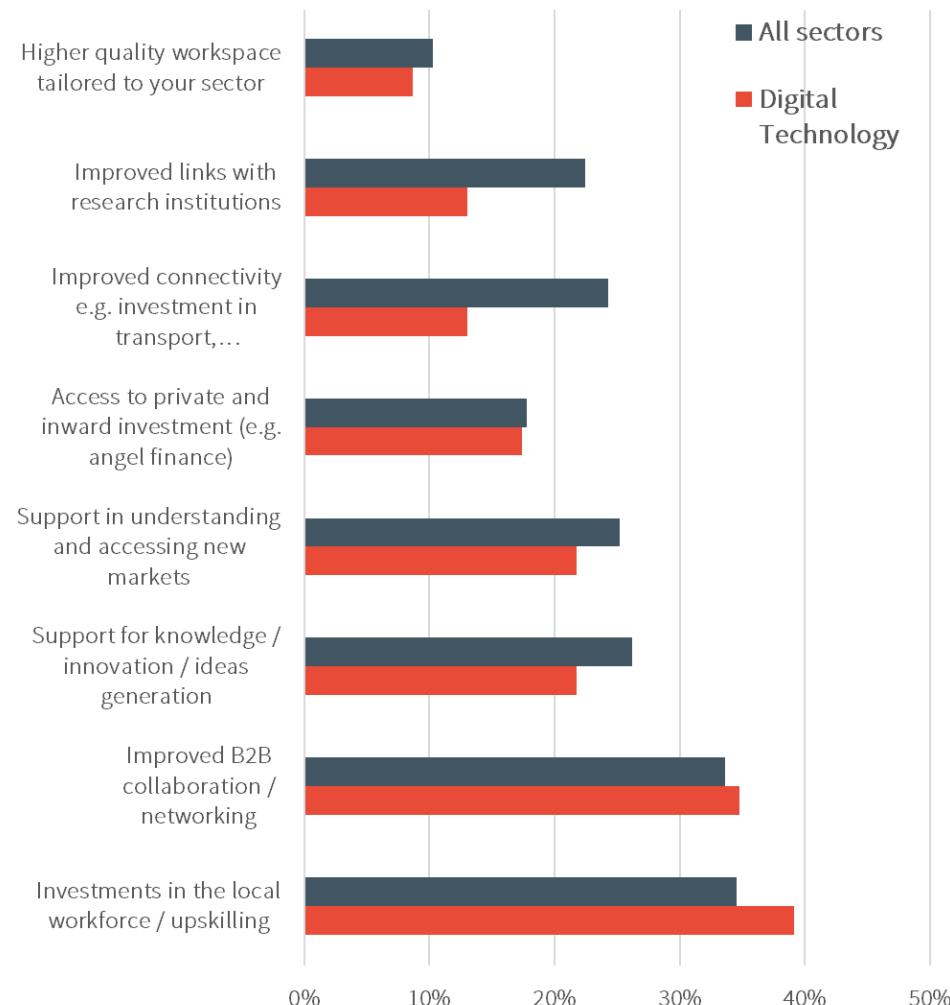
Barriers to productivity cited by businesses in the Humber to Hatch Regeneris (2019)



# Digital Evidence in the Humber

- + Respondents chose from a list of possible interventions those which they thought would best help supply chain and productivity issues - 39% of digital technology businesses stated 'Investments in the local workforce / upskilling' would be a helpful intervention. This was the most popular intervention, and was favoured by digital technology businesses on average slightly more than businesses in other sectors.
- + The survey also demonstrated the prevalence of digital technologies and the need for digital skills across sectors, with a majority of businesses operating in multiple sectors recording digital technology as one of their sectors.
- + In addition to a web survey, Hatch Regeneris also conducted face-to-face and virtual consultations with businesses in the Humber. A number of firms in other sectors spoke of the importance of digital technology to their operations, with firms in heavy and process industries in particular praising the high quality of digital technology available to them.

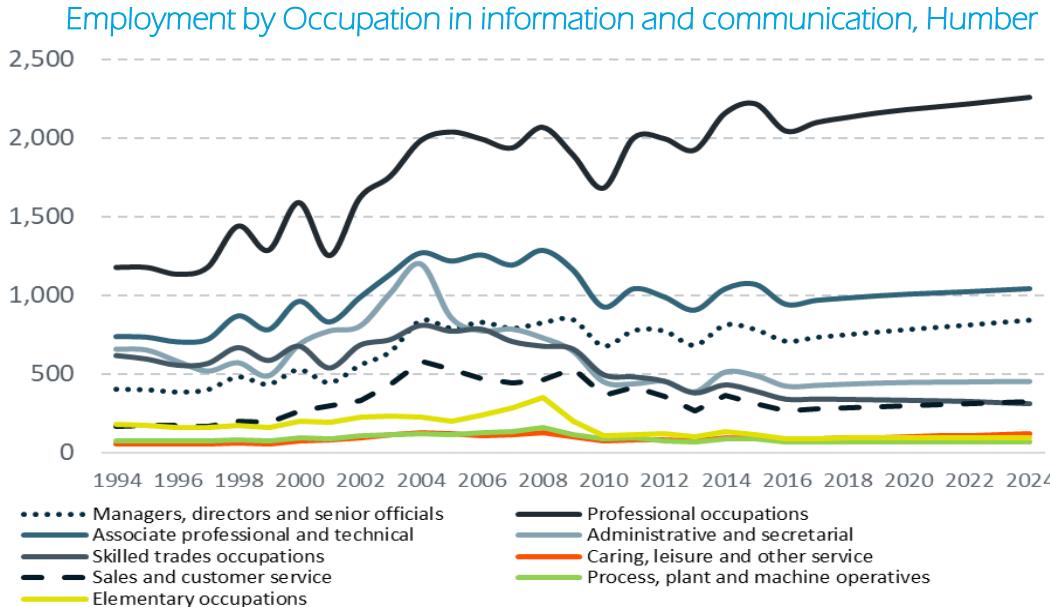
Possible beneficial interventions cited by businesses in the Humber to Hatch Regeneris (2019)



Source: Humber Productivity and Supply Chain Survey and Consultations, 2019; Hatch Regeneris. Survey base: 23 Digital Tech businesses and 157 businesses across all sectors

## Future Demand

- + Working Futures data provides comprehensive modelling the future UK labour market. It projects the future size and shape of the labour market by considering employment prospects by industry, occupation and other factors – at a national and LEP level. Overarching trends at the UK level are projected to 2027, providing a basis for most of the coming decade. Key trends will consist of overall expansion of the UK working population, but a small decline in economic participation rates which reflect the ageing of the total population. Especially strong growth in employment is forecast for the business services sector (+5.9% during 2017-27), of which information and communication is part of.
- + Regarding skills, nationally, the number of jobs in occupations typically requiring a high-level qualification is expected to continue to grow to 2027, although the supply of highly qualified people is projected to grow quicker, resulting increasing ‘qualification intensity’ in most occupations, with increasing competition amongst higher skilled workers.
- + In the Humber, Working Futures data projects that by 2024, the proportion of managers, directors and senior officials will more than double in the information and communication sector from 1994 levels. The proportion of professional occupations in the sector will also have increased some 90% by 2024. Conversely, administrative and secretarial and skilled trades will both see significant decreases in employment, of approximately 31% and 50% respectively, by 2024 based on 1994 levels.
- + Whilst making up fewer workers in the sector, increases of more than 100% (doubling) are projected for caring, leisure and other service staff, as well as sales and customer service staff.



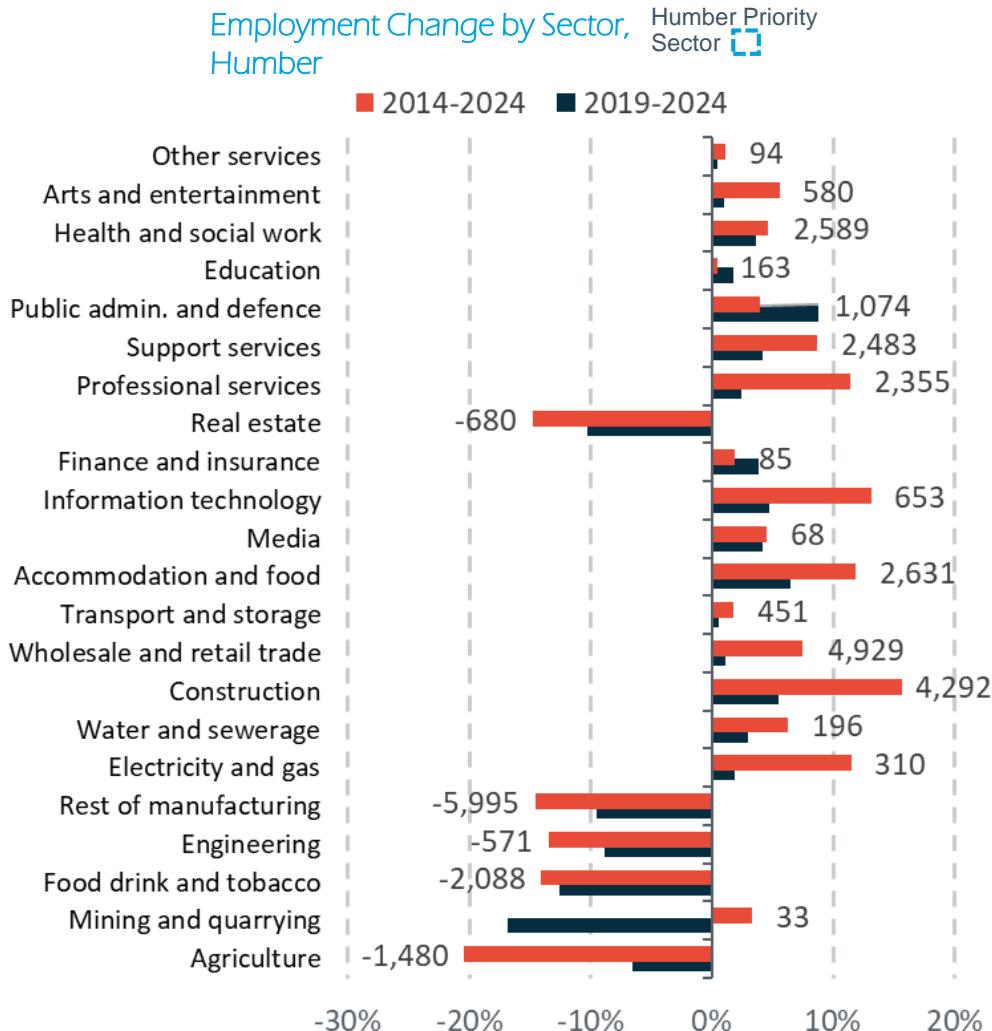
Source: UKCES Working Futures, 2014-24

Note: Data presented shows projected performance before Covid-19.

# Future Demand

**+** Digital Skills are found in virtually all sectors of the economy, although most of all in the information technology sector. Working Futures data projects that information technology sector employment will have grown over 10% from 2014 levels by 2024 – consisting of more than 650 jobs (of which around 250 will come after 2019), projecting a strong increase in the demand for digital skills. Indeed, of all the industries aligned to the LEP's priority sectors, information technology will see the strongest growth in percentage terms.

**+** This starkly contrasts with sharp contractions in manufacturing and engineering (aligned to the engineering and assembly priority sector). Working Futures projects declines in employment above 10% for each of these sectors over the decade ending in 2024.



Source: UKCES Working Futures 2014-2024.

Note: the forecast data reflects projected performance before Covid-19.

# Future Demand

+ Data from EMSI projects jobs growth at a sub-sector level. This allows us to see which aspects of digital are predicted to grow and which are not within the Humber, as growth will occur unevenly within the digital sector. Overall, EMSI predicts a moderate decline of 1.9% of jobs in the digital subsector (SIC Code 22 – digital activities). It should be noted that this is consistent with the growth in jobs projected for the information and communication sector by *Working Futures*, which is a broader sector than digital.

+ Indeed, the largest current digital subsector by number of employees, computer consultancy, is predicted to see a 7% decline in the number of employees between now and 2027. This contrasts with growth of approximately 7% predicted for the similarly sized computer programming digital subsector, and stronger growth in wireless (13%) and wired telecommunications activities (18%) – which corroborates the *Working Futures* prediction of moderate net jobs growth in the broader information and communication sector in the Humber.

**Projected growth in jobs for Digital subsectors, Humber (2020-27)**

Subsector	Jobs (2020)	Projected Jobs Growth (2020-27)
Computer consultancy activities	1,126	-7%
Computer programming activities	1,106	7%
Other telecommunications activities	731	-11%
Other information technology and computer service activities	413	-5%
Wireless telecommunications activities	266	13%
Wired telecommunications activities	91	18%
Data processing, hosting and related activities	47	-2%
Computer facilities management activities	41	14%
Other software publishing	41	-28%
Satellite telecommunications activities	13	18%

Source: EMSI, 2020

Note: the forecast data reflects projected performance before Covid-19.

# Key Implications for the LEP's Local Digital Skills Partnership

- + Since 2013, the digital technology sector has seen strong employment growth (+16%), exceeding the national average (12%) however the growth rate is half of the Yorkshire and Humber equivalent (32%). The sector's growth has been mainly driven by gains in computer programming jobs. The education system will need to be responsive to Humber's changing job profile, as demand for digital skills increases.
- + In terms of job postings, data suggests that there is a greater demand for non-digital roles across all sectors compared to digital roles, although digital job vacancies have grown considerably over recent years. In terms of digital job roles, there have been growing job vacancies for software developers, IT support analysts and teachers which suggests that demand for digital skills is cross-cutting across different sectors.
- + The ESS data suggests a greater need for complex analytical skills and operational skills, compared to digital skills. In tandem, survey evidence indicate that over a third (35%) of respondents in the digital technology sector cited skill shortages as a barrier to their productivity. Although digital technology companies have good access to technologies, increased competition for labour and talent is felt to be a challenge facing their business. Investment in upskilling the local workforce was most reported as a helpful intervention by digital technology businesses, and data indicates employers would benefit from transferrable skills.
- + Occupations which are expected to be most exposed to automation are elementary, caring and personal service and administration which together account for a quarter of Humber's workforce. Food manufacturing and retail sectors were also found to have the highest probability of automation, representing 11% of Humber's employment base. These findings suggest that there is a greater risk of automation across lower-skilled manual jobs compared to digital-intensive jobs.
- + By 2024, there is forecast to be an expansion of jobs requiring high-level qualifications (Level 4+), however the supply of people qualified at Level 4+ would be insufficient to meet this demand. In the IT sector, employment growth is forecast to increase by at least 10% by 2024; driven mainly by growth in managerial and professional occupations as well as expansions in computer programming and telecommunication activities. By contrast, the manufacturing and engineering sectors are expected to see a decline in new jobs created by 2024, although higher replacement demand could offset this in the future. Going forward, there will be strong demand for workers with digital skills to fill new jobs in the IT, professional services and media sectors and replace existing jobs in manufacturing and engineering.



# Supply Analysis of Digital Skills

# Introduction

This section provides an analysis of the current digital skills supply and availability in the Humber. This includes drawing on learner participation and characteristics in digital sectors, and a comparison of current FE and HE digital provision to identify emerging gaps and whether the region faces any particular challenges in meeting the demand for digital skills.

## Headline Findings

- There have been decreasing ICT apprenticeship starts and achievements over the last few years, in line with the national trend.
- In 2018/19, the University of Hull saw the largest number of enrolments for medical subjects, business and administration and biological sciences.
- The University has seen high growth in enrolments for STEM subjects over recent years, particularly in engineering and technology (+52%) and computer science (+24%). This indicates a growing supply of graduates with digital skills in the Humber.
- In 2014/15, North Lindsey College (now part of DN Colleges Group) had the largest proportion of STEM enrolments, accounting for 40% of its total.
- Over a third (36%) of education and training providers deliver digital related courses. Most are in information technology and computer science.
- Findings from the ESFA Datacube and desk-based research suggests that Level 4+ digital skills appear to be served by a privately-funded market, where more people are paying directly to access higher-level

## Key questions to be answered:

- What courses and training provision are on offer? Do these provide the current and future skills to satisfy the demand from employers?
- Are education and training providers delivering courses to meet employer demand locally?

*Source: Humber LEP Digital Skills RFO Key Questions, 2020; DfE Skills Advisory Panels – Analytical Toolkit for Local Skills Analysis, 2018; Humber LEP Datacube, 2020; HESA, 2019; HEFCE, 2014; Desk-based research undertaken by Hatch Regeneris*

# Apprenticeship Provision

This analysis is based on the Education and Skills Funding Agency (ESFA) Datacube data we received, which draws on learner provision across all sector subject areas, level of study and providers. For the purposes of this study, the analysis will focus predominantly on ICT provision delivered in the Humber.

- + Over the period 2016-19, apprenticeship starts across all subjects fell by 19% in the Humber whilst apprenticeship achievements were down by 11%. The core ICT sector subject areas represented 2.6% of apprenticeship starts (with a known subject area) in the Humber in 2018/19, up from 2.3% in 2016/17. In terms of achievements, the share grew from 2.3% to 2.8% in the same period.
- + The downward trend in starts is reflected in all digital sector subject areas such as ICT and media & communication, where apprenticeship starts decreased by up to 88% between the academic years 2016/17 and 2018/19.
- + There was a decline in achievements for ICT for users and ICT practitioners during 2016-19. Conversely, over the same period achievements grew by 59% in media and communication, although this growth is driven by a relatively modest increase of 22 achievements. Publishing and information services also saw a similar percentage increase, but from a much smaller

Sources: Humber LEP Datacube, 2019. Note: Data presented includes full academic years 2016/17, 2017/18 and 2018/19.

Total Number of Apprenticeship Starts and Leavers by Sector Subject Area and Academic Year in the Humber

Sector Subject Area	2016/17 Starts / Achievements	2017/18 Starts / Achievements		2018/19 Starts / Achievements		Change, 2016/17 - 2018/19 Starts / Achievements	
Agriculture, Horticulture and Animal Care	283	238	181	173	208	124	-27% -48%
Crafts, Creative Arts and Design*	9	21	1	4	10	3	11% -86%
Media and Communication*	59	37	33	25	47	59	-20% 59%
Publishing and Information Services*	8	7	-	5	1	11	-88% 57%
Business, Administration and Law	9,241	5,230	6,059	5,224	6,707	3,550	-27% -32%
Construction, Planning and the Built Environment	1,329	862	1,723	737	1,698	885	28% 3%
Education and Training	474	298	213	302	414	194	-13% -35%
Engineering*	886	495	702	499	1,091	582	23% 18%
Manufacturing Technologies*	5,629	2,868	2,325	2,896	3,529	2,065	-37% -28%
Transportation Operations and Maintenance*	1,176	905	800	680	1,194	523	2% -42%
Health, Public Services and Care	8,641	4,835	4,253	4,753	4,022	2,252	-53% -53%
ICT for Users*	228	128	152	188	197	121	-14% -5%
ICT Practitioners*	728	390	675	381	489	293	-33% -25%
Leisure, Travel and Tourism	976	680	446	756	243	274	-75% -60%
Retail and Commercial Enterprise	11,613	5,389	7,091	4,745	6,649	3,652	-43% -32%
Science and Mathematics	21	31	14	19	2	11	-90% -65%
Unknown	128,005	92,773	109,197	84,196	110,191	88,038	-14% -5%
Total	169,306	115,187	133,865	105,583	136,692	102,637	-19% -11%

Note: all sector subject areas are Tier 1, except for \* which denotes Tier 2.

# Apprenticeship Provision

- + In 2018/19, there were 686 Humber learners who started information and communication broad sector apprenticeships, with 414 having achieved completion. For both starts and achievements, there was a moderate decline (-28% and -20% respectively) from 2016/17, during which 956 apprenticeships began and 518 achieved completion.
- + During 2016-19, there were 62 Humber providers which delivered apprenticeship starts either in ICT, media & communication, or publishing & information. This equates to approximately 12% of Humber's total providers who saw apprenticeship starts during the period.
- + In 2018/19, the largest provider of information and communication apprenticeships was Hull Business Training Centre (138 starts) which has a presence in Hull, Grimsby and Scunthorpe. The significant contribution of the Armed Forces as a provider of information and communication apprenticeships is also notable at 130 starts. This figure may be skewed by the Army logistics training centre based in Leconfield
- + In terms of provider sector and funding stream, there has been a marked shift over the period 2016-19 towards private sector public-funded delivery. By contrast, General FE and other public funded providers have declined significantly (-53% and -57% respectfully) according to apprenticeship starts.

Top Providers of Apprenticeships – information and communication broad sector, Humber (2018/19)

Provider	No. Starts	No. Achievements
Hull Business Training Centre Limited	138	69
British Army	130	115
Baltic Training Services Limited	94	36
DN Colleges Group	38	28
Kingston Upon Hull City Council	37	41

ICT, Media, Communication, Publishing apprenticeship starts by funding stream, Humber\*

Sector of Provider	No. Starts (2018-19)	% of Starts (2018-19)	Growth (2016-19)
General FE College incl.	58	8%	-53%
Tertiary			
Other Public Funded i.e. LA's and HE	169	25%	-57%
Private Sector Public Funded	459	67%	33%

Source: Humber LEP Datacube, 2019; Note: Data presented includes full academic years 2016/17, 2017/18 and 2018/19

\*In 2018/19 Sixth Form Colleges saw 0 ICT apprenticeship starts

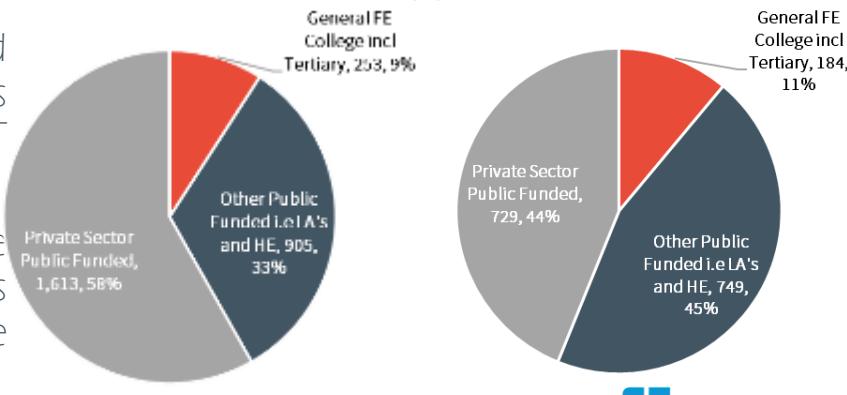
# Apprenticeship Provision

- + Of these sector subject areas, level 4 (advanced skill) apprenticeship achievements are relatively rare in the core ICT subject areas, with only a very small number of achievements (two) during the period 2016-2019. This likely being indicative of the continuing appeal of higher education routes for those aspiring to work in ICT.
- + In the ICT for Users sector subject area, level 2 apprenticeships are most commonly delivered in the Humber; accounting for 59% of achievements in 2018/19. This proportion has remained relatively stable since 2016.
- + Over the same period, ICT for practitioners experienced the largest proportionate decline (-25%) in apprenticeship achievements compared to other digital sector subject areas. For 2016/17, level 2 achievements outnumbered level 2, but declined (-28%) to 2018/19, whilst level 3 achievements grew by 9%.
- + In terms of ICT apprenticeship delivery, FE colleges play a relatively minor role in provision, accounting for just 9% of starts and 11% of achievements in the Humber. Public funded private sector apprenticeships represent the largest share of ICT starts (58%), and other public funded apprenticeships (delivered by local authorities and higher education institutions) account for the most ICT achievements by a narrow margin (45%).
- + For ICT practitioners apprenticeship delivery, Hull Council saw the largest number of achievements (121) across the academic years 2016/17 – 2018/19, whilst the Hull Business Training Centre (HBTC) had the most ICT for users achievements (176).

Digital apprenticeship achievements in the Humber by level and sector subject area

	2016/17	2017/18	2018/19	Change, 2016/17 - 18/19
<i>ICT for Users</i>	128	188	121	-5%
Below Level 2	5	12	3	-40%
Level 2	84	127	68	-19%
Level 3	39	49	48	23%
Level 4 Plus	0	0	2	
<i>ICT Practitioners</i>	390	381	293	-25%
Below Level 2	60	33	5	-92%
Level 2	191	161	138	-28%
Level 3	133	183	145	9%
Level 4 Plus	6	4	5	-17%
<i>Media and Communication</i>	37	25	59	59%
Level 2	9	11	8	-11%
Level 3	22	14	43	95%
Level 4 Plus	6	0	8	33%
<i>Publishing and Information Services</i>	7	5	11	57%
Below Level 2	2	1	2	0%
Level 2	5	4	9	80%
<i>Grand Total</i>	562	599	484	-14%

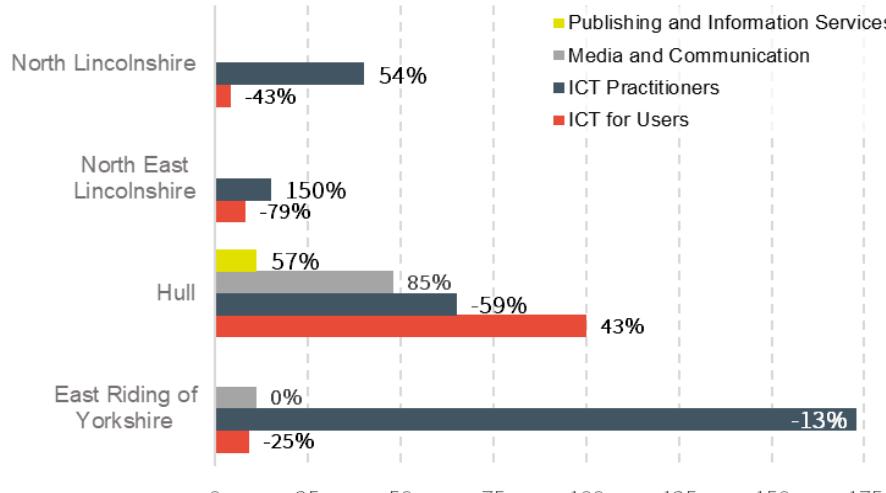
Starts (L) and Achievements (R) of ICT for Users + ICT Practitioner Apprenticeships in the Humber by type of provider between 2016 and 2019



# Apprenticeship and Post-16 Provision

- + The adjacent chart shows digital apprenticeship achievements at local authority level. The size of the bar indicates the number of achievements in 2018/19, with the number on the bar showing growth in achievements since 2016.
- + The predominance of ICT Practitioners, especially in the East Riding, is apparent, although the number of achievements in this sector subject area has declined slightly since 2016. This is also the case in Hull, where the decline is sharper, but there is strong growth in both ICT for users and Media and communication achievements.
- + By comparison, the Publishing and Information, and Media and Communication sectors generally account for smaller numbers of achievements across the Humber than the two ICT subject areas, with no achievements in North and North East Lincolnshire in 2018/19.
- + Regulated qualifications and diplomas make up the bulk of enrolments in the digital sectors of ICT, Media, Communication and Publishing & Information, however, more than a third (36%) of qualifications remain non-regulated in the academic year 2018/19.
- + In absolute terms, the number of enrolments has fallen across all types of qualifications between 2016/17 and 2018/19, although the share of non-regulated qualifications has grown by 5% whilst Awards, Basic Skills and Certificate qualifications have slightly decreased.

Apprenticeship achievements (axis) by Local Authority and sector subject area, 2018/19 with change since 2016/17 (bar)



Type of qualification for ICT, Media, Communication, Publishing enrolments in the Humber, 2018/19

Qualification	No. Enrolments (2018-19)	Share of enrolments	% change in share of enrolments since 2016/17
Award	2	0%	-3%
Basic Skills Maths and English	29	6%	-4%
Certificate	38	8%	-2%
Diploma	141	31%	0%
Other Non-Regulated	160	36%	5%
Other Regulated	80	18%	4%
Total	450	-	-

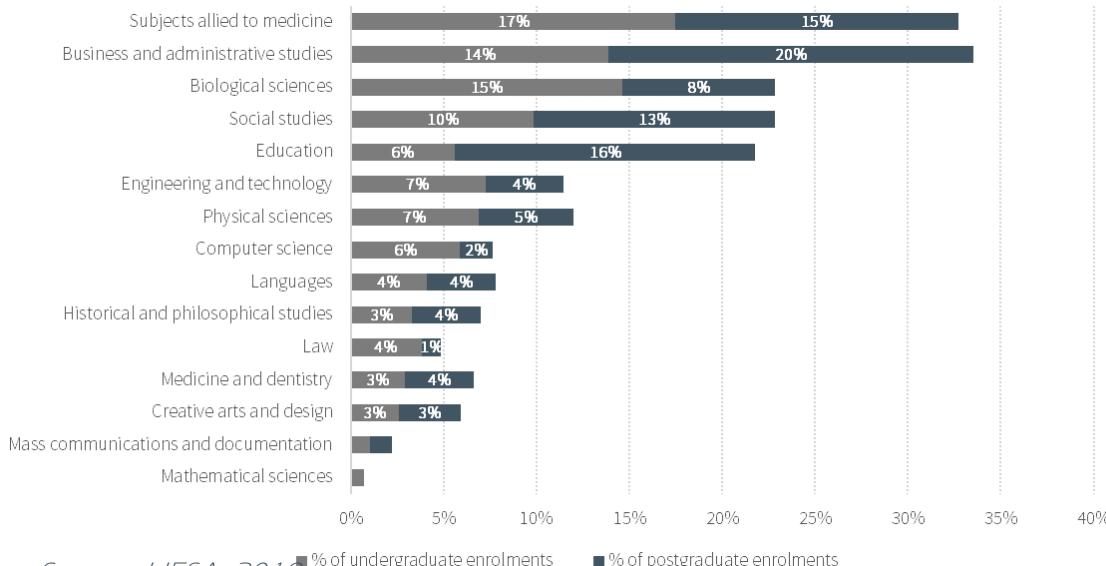
# HE Provision at the University of Hull

+ In 2018/19, there were 16,090 enrolments at the University of Hull. 82% accounted for undergraduate students and 17% represented postgraduate students.

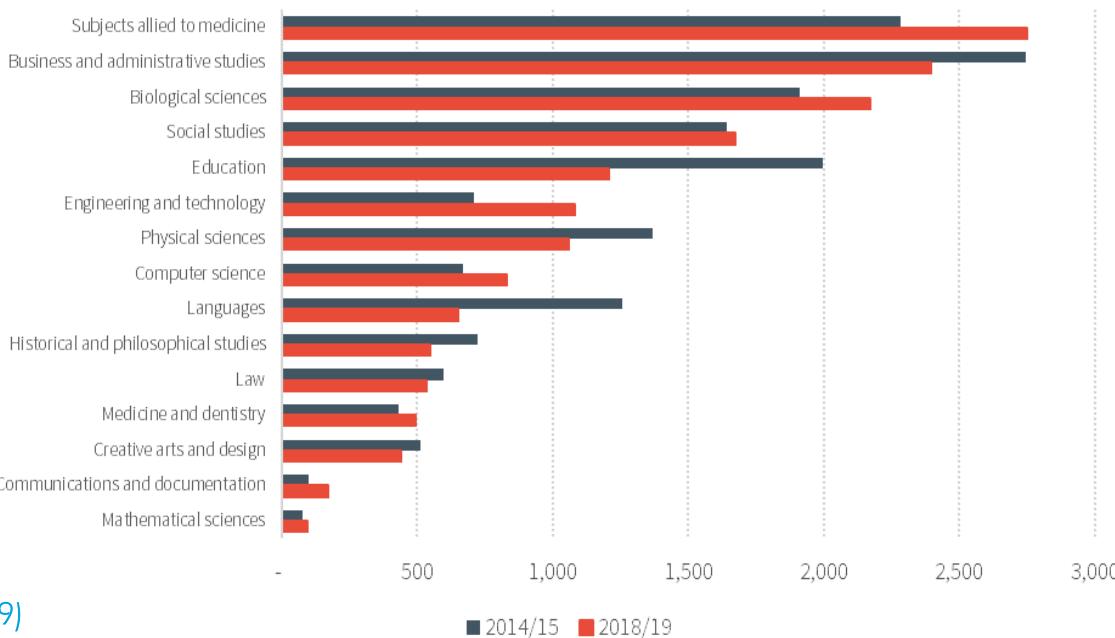
+ The subjects with the largest proportion of enrolments were subjects aligned to medicine (17% of total), business and administrative studies (15%) and biological sciences (14%).

+ STEM subjects saw high growth in enrolments during 2014-2019, particularly engineering and technology (+52%) and computer science (+24%) which are strongly linked to digital skills.

Total HE Enrolments by Level of Study (2018/19)



Total HE Enrolments at the University of Hull by Subject of Study



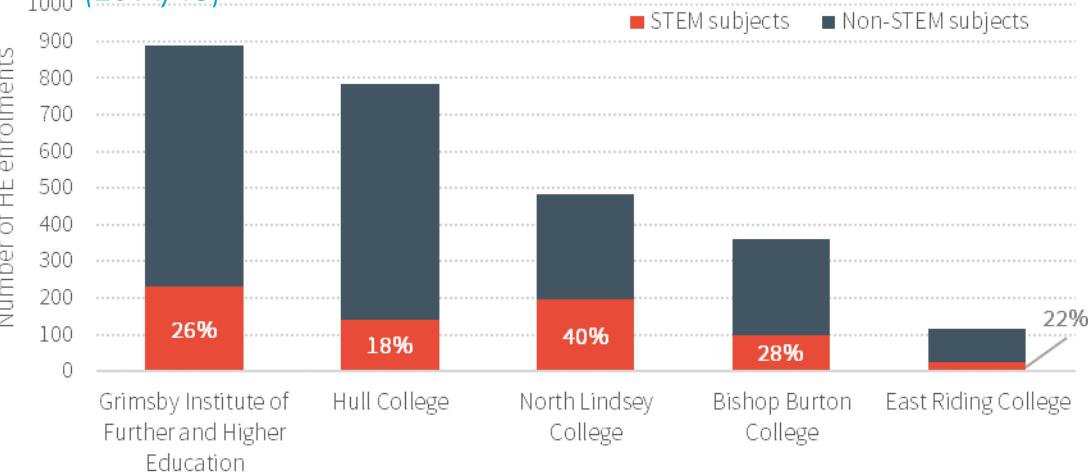
+ In 2018/19, undergraduate students were more likely to study digital-related subjects, compared to postgraduate students. While STEM subjects, creative arts and design and business and administration studies represented 72% of undergraduate enrolments, 61% of postgraduate enrolments were in these subjects. For postgraduate study, there was a larger proportion of students enrolled on social studies and education which have a lesser focus on digital skills.

# HE Provision at FE Colleges

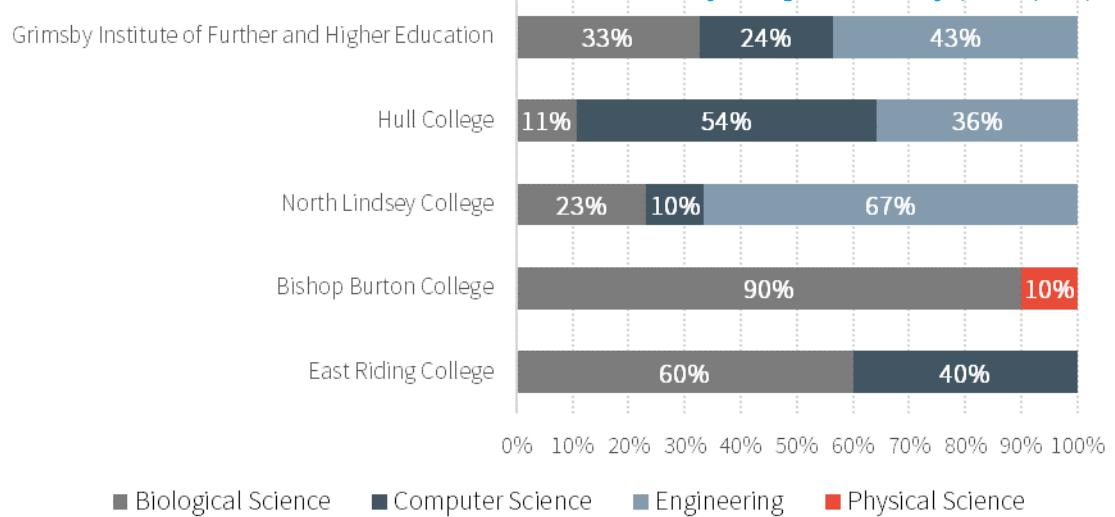
+ Although Grimsby Institute of Further and Higher Education had the highest HE enrolments, North Lindsey College had a greater proportion of STEM enrolments accounting for 40% of its total. By contrast, Hull College had a lower proportion of STEM enrolments (18%).

+ The data shows that nine in ten (90%) STEM enrolments at Hull College were for computer science and engineering and technology. There are similarly high levels of enrolments in these subjects at Grimsby Institute of Further and Higher Education and North Lindsey College; suggesting that FE colleges are delivering digital skills to match demand in the labour market.

Total HE Enrolments in Humber's FE Colleges by STEM and Non-STEM subjects (2014/15)



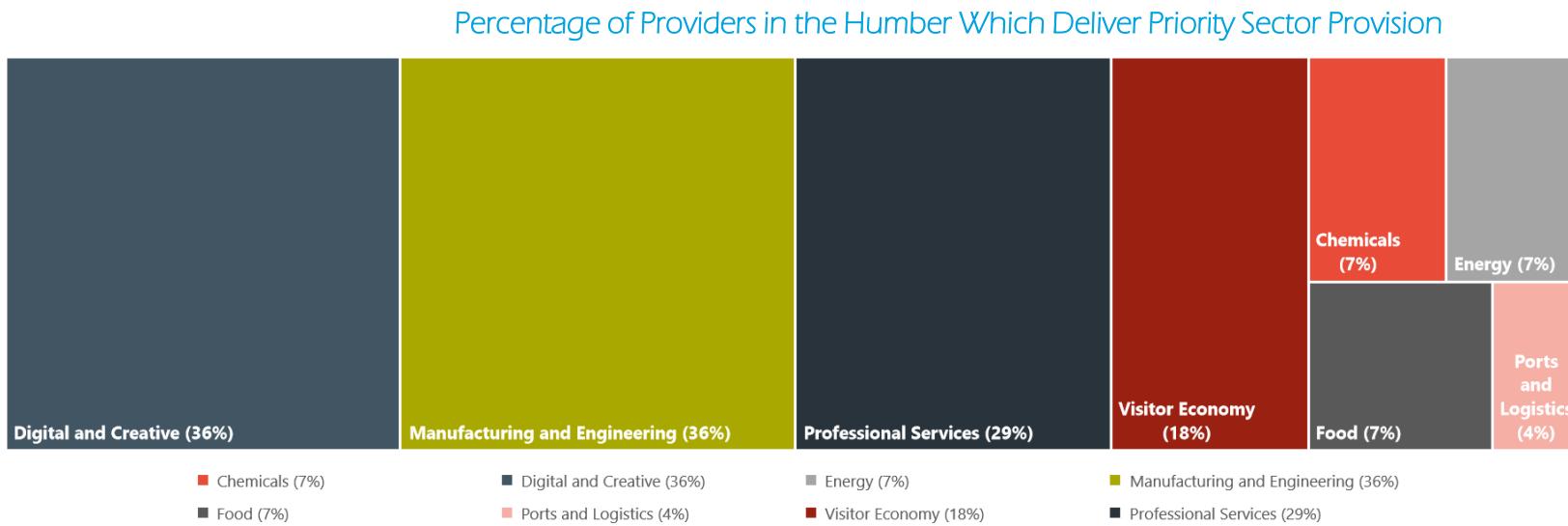
Total STEM HE Enrolments by Subject of Study (2014/15)



# Mapping Education and Training Provision

The mapping provision analysis is largely based on desk-based research undertaken, and as such, the findings presented reflect the available course information online at the time of commission. This may not include all providers. The findings should be treated only as indicative.

- + At present, the Humber is home to c. 30 providers, of which 58% are ‘private sector public funded’, 18% are categorised as ‘other public funded’ (i.e. local authorities and higher education institutions) and 12% are sixth form colleges.
- + There are approximately ten education and training providers which deliver digital courses aligned with the Digital and Creative sector. This accounts for just over a third (36%) of total providers in the Humber. The identified providers are: DN Colleges Group, East Riding College, Franklin College, Grimsby Institute of Further and Higher Education, Hull College, John Leggott Sixth Form College, University of Hull, Wilberforce College, Wyke Sixth Form College and YH Training Services Limited.



Source: Desk-based research; Hatch Regeneris

Note: These findings have been crosschecked and verified by the ESFA Datacube data relating to the academic year 2018/19

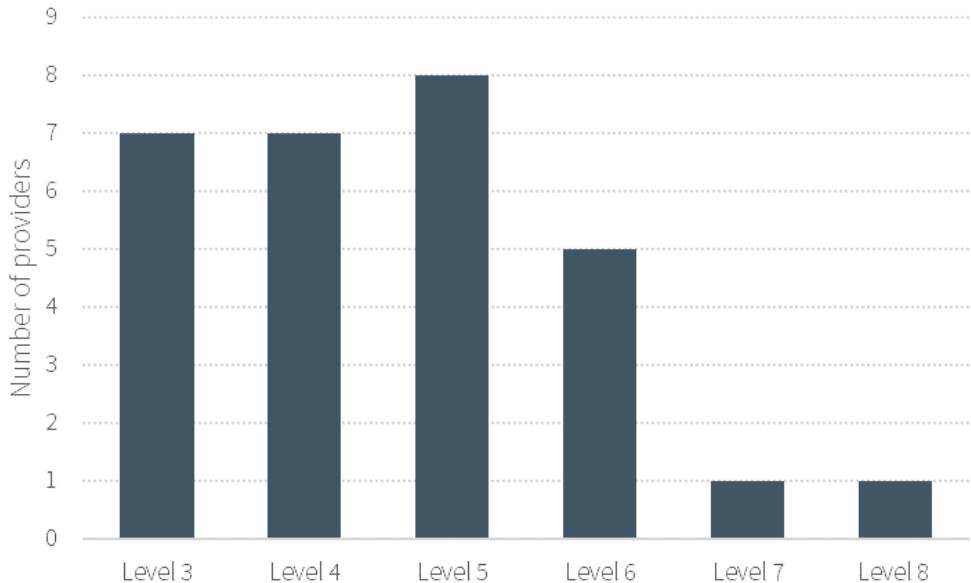
# Digital Provision Mapping

- + The ESFA Datacube findings show that 51% of digital enrolments were at Level 3, 45% at Level 2 and a minority (2%) at Level 4 and above.
- + The desk-based research suggests that higher level digital skills provision is under-represented in the ESFA findings, as the review indicates a number of providers who are serving the Level 4 and above qualification requirements. As shown in the adjacent chart, of the c. 10 digital providers, 7 providers deliver Level 3 qualifications while up to 8 deliver at Level 4 and above; largely delivering Level 4 and 5 qualifications. This may suggest there is a larger privately-funded market in the Humber, where learners are choosing to pay directly for higher level digital skills instead of accessing ESFA or HESA funding.
- + There is currently more digital provision based in Hull which is home to approximately four providers (40%) who deliver digital courses. These providers are: University of Hull, Hull College, Wilberforce College and Wyke Sixth Form College. There are similar levels of digital skills provision across the remaining three local authorities (20% in each area).

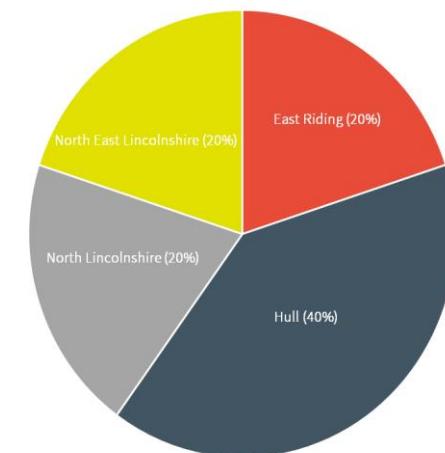
Source: Desk-based research; Hatch Regeneris

Note: These findings have been crosschecked and verified by the ESFA Datacube data relating to the academic year 2018/19

Digital Provision in the Humber by Level of Study Available



Digital Provision by Local Authority

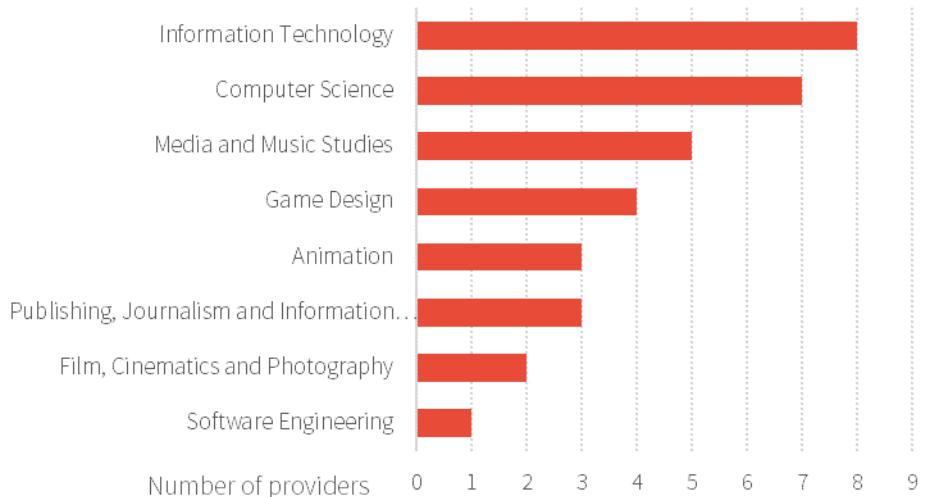


# Digital Provision Mapping

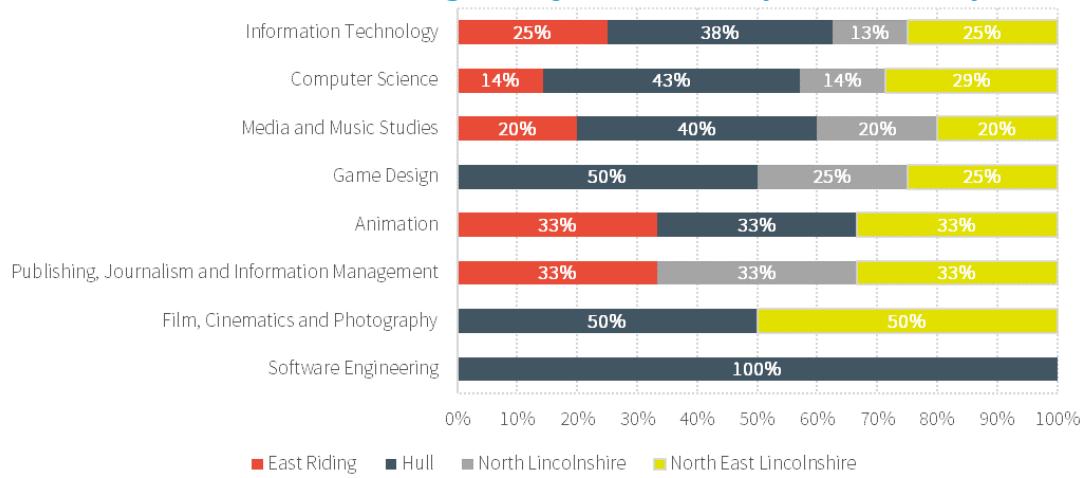
- + The desk-based review indicates that of the c. 10 digital providers in the Humber, 8 deliver courses in 'information technology' and 7 provide 'computer science' (70%).
- + There is an underrepresentation of provision in 'software engineering', and 'film, cinematics and photography', where up to 2 providers deliver these courses.
- + There are a range of digital subjects delivered in each of the four local authority areas:
  - + There is a higher concentration of 'games design', 'film, cinematics and photography' and 'software engineering' courses provided in Hull
  - + There is a higher concentration of 'animation', 'publishing, journalism and information management' courses provided in North East Lincolnshire
  - + There is a good balance of 'information technology', 'computer science' and media and music studies' courses provided across the Humber.

Source: Desk-based research; Hatch Regeneris

Humber Providers Which Deliver Digital Subjects



Digital Subjects Provided by Local Authority



# Digital Provision Mapping

The tables below present the digital skills content analysis of Humber's sector provision. Skills are highlighted in bold to show greater coverage of digital skills and overlap of skills across key priority sectors.

- + The analysis of skills content shows that courses related to the digital and creative, and engineering and manufacturing sectors have the largest coverage of digital skills compared to the rest of Humber's priority sectors.
- + Across these sectors, digital skills tend to cover software package expertise (such as Microsoft Office and Adobe Photoshop), software development, and Industry 4.0 technologies (robotics, AI, sensors and big data). This indicates that Humber's providers are equipping learners with digital expertise required by employers now and into the future.

Digital Skills Coverage in Digital and Creative Provision	Digital Skills Coverage in Engineering and Manufacturing Provision	Digital Skills Coverage in Other Priority Sector Provision
Adobe Photoshop	CAD	Computer-aided Problem Solving
Microsoft Office	Computer-aided manufacturing and Planning	Sensors
Games Development	Robotics	
Cybersecurity	Automation	
Software Engineering	Virtual Engineering	
AI	Programming	
Informatics	AI	
Website Development	Sensors	
Robotics	Data Analytics	
Simulation and Visualisation	Computer Networks	
Social Media Strategy		
IoT		
Database Systems		
Big Data		

Source: Desk-based research; Hatch Regeneris

# Key Implications for the LEP's Local Digital Skills Partnership

- + In 2019, there were 686 apprenticeship starts and 414 completions in the ICT sector which have fallen by 28% and 20% respectively since 2016. The location of apprenticeship achievements suggests that there is greater representation of providers based in East Riding and Hull that deliver apprenticeships compared to elsewhere in the Humber. In tandem, there has also been a shift in apprenticeship delivery away from the public sector towards the private sector, which indicates the need to explore how to bridge the gap in digital apprenticeship provision.
- + The Humber currently provides HE digital provision at the University of Hull and a number of FE colleges including Grimsby Institute of Further and Higher Education and Hull College. At the University, the largest number of HE enrolments are in medical subjects, business and administrative studies and biological sciences; which all require strong technical expertise. Over the last five years, STEM subjects have seen large growth in enrolments, driven mainly by engineering and technology (+52%) and computer science (+24%). Likewise, North Lindsey College had 40% of its HE

enrolments in STEM subjects, largely in engineering and technology and computer science. These subjects have strong overlap with employer demand for website developers and programmers. The data indicates a growing supply of higher-skilled labour with digital skills, although this appears to be most concentrated in Hull compared to other local authorities.

- + The Humber has an extensive range of education provision. Over a third (36%) of all providers deliver digital courses linked to the digital and creative sector. The ESFA Datacube findings show that there is less provision at Level 4 and above compared to Level 3 and below. The desk-based review findings suggest that the higher-level digital skills provision is under-represented, where a number of providers were identified as providing these qualifications. The development of two Institutes of Technology, the recently opened University Campus North Lincolnshire (UCNL) and planned university centre in Grimsby are expected to offer more opportunities to secure higher-level digital skills.

# +

# Conclusions and Recommendations

# Key Digital Priorities Emerging from the Evidence

The headline findings in relation to the study research questions are as follows.

*Are there a range of digital skills from essential digital skills through to the more advanced ones needed to understand areas such as machine learning and artificial intelligence?*

The evidence shows that there is a wide range of digital skills needed across the Humber which varies by sector. While more employers are seeking Industry 4.0 technology expertise in the manufacturing, ports and logistics, energy and food sectors, the visitor economy has seen increased demand for operational IT and digital skills. This suggests that an understanding of the essential digital skills is more important in the visitor economy sector. In tandem, new technologies have opened up new opportunities in sectors, and drivers of change such as decarbonisation and greater customisation of products / services are impacting on digital skill demands i.e. Big Data analytics and expertise in Sensor technology and VR.

*What opportunities are there to upskill the ageing population who wish to continue working; and reskill those in jobs susceptible to technological change (e.g. automation)?*

The Humber has a growing ageing population which impacts on replacement demand for skills. Younger

people tend to be more digitally skilled, and the challenge is to attract young cohorts into priority sectors to drive competition whilst upskilling and reskilling the existing workforce. This will require a responsive education and training system which can meet digital requirements. An ageing population also presents an opportunity to capitalise on healthcare technologies and lead innovation in this area; as well as using digital technologies to bridge the knowledge gap between younger workers and older workers.

*Is there evidence of digital maturity within the business – including digital strategy, Big Data Analytics, Cybersecurity, Integrated Digital Systems, Preparing for digital disruption, Digital innovations, Tech sector collaborations, Automation, AI and VR?*

The literature review suggests there is slow adoption of emerging Industry 4.0 technologies and a lack of expertise to use the technologies across most of Humber's priority sectors. This has been largely driven by a lack of business confidence. Although local education and training courses are providing digital skills, there could be a need to support businesses to embrace digital skills to improve productivity. This will require further investigation through primary research to understand the impacts of digitalisation on businesses' skill needs in the Humber.

*Continued  
overleaf*

# Key Digital Priorities Emerging from the Evidence

## *Which digital skills are employers demanding? Are these skills transferrable or specialist?*

The evidence indicates that while digital skills are important to Humber employers, complex analytical skills and operational skills were regarded as more significant in tackling skill shortages. This indicates a greater need for transferrable skills as opposed to specialist skills. In tandem, more job postings were found to advertise non-digital roles than digital roles which suggests digital skills are in relatively less demand compared to other skills.

## *How are digital skills likely to change in the next five to ten years?*

Nationally, the business services sector (of which ICT is a part) is expected to grow considerably by 2027 according to Working Futures forecasts. This suggests there will be increased demand for higher level skills in the ICT sector and therefore competition for highly skilled labour will increase. Going forward, the UK will need to respond to this demand requirement.

In the Humber, employment in the ICT sector is projected to grow by at least 10% by 2024 and will require more managerial and professional occupations. Digital subsectors which are forecast to

see high job growth are computer programming and wired telecommunication activities. The literature review evidence suggests that more managerial and professional roles are expected to have digital expertise and understand how to use new technologies. In tandem, the forecast decline in new jobs created in the manufacturing and engineering sector suggests that digital skills will be required to fill new jobs and also meet the changing nature of replacement jobs.

## *What proportion of jobs are susceptible to technological changes (through automation /digitalisation) and in which sectors/occupations?*

Occupations which are expected to be most exposed to automation are elementary, caring and personal service and administration which together account for a quarter of Humber's workforce. Food manufacturing and retail sectors were also found to have the highest probability of automation, representing 11% of Humber's employment base. These findings suggest that there is a greater risk of automation across lower-skilled manual jobs compared to digital-intensive jobs.

# Key Digital Priorities Emerging from the Evidence

## *What are the future digital skills needed and do the labour force have these?*

The secondary data drawn on for this study did not identify specific future digital skills which will be in demand and will require further investigation through primary research to understand local perspectives. However, the literature review findings point to increasing need for expertise in Big Data, Internet of Things, AI and robotics. Growing demand for STEM roles will require digital expertise to fill hard-to-fill vacancies. In tandem, there is forecast to be an expansion of higher-skilled jobs in the IT, professional services and media sectors, and the data shows there would be an insufficient supply of people qualified at Level 4+ to meet this demand. Nevertheless, STEM learners appear to have increased considerably over recent years, particularly in engineering and technology subjects which should help to address future skill requirements.

## *What courses and training provision are on offer? Do these provide the current and future skills to satisfy the demand from employers?*

The Humber has an extensive range of education provision, and currently provides a mix of HE, FE and Apprenticeship provision in digital subjects. The ESFA Datacube findings show that there is less provision at Level 4 and above compared to Level 3 and below. However, the desk-based review findings identified a

number of providers offering higher level qualifications in digital skills within the Humber, which suggests that higher-level digital skills provision may be under-represented in the Datacube. This could indicate that more learners are choosing to pay directly for higher level digital skills. The development of two Institutes of Technology, the recently opened University Campus North Lincolnshire (UCNL) and planned university centre in Grimsby are expected to offer more opportunities to secure higher-level digital skills.

## *Are education and training providers delivering courses to meet employer demand locally?*

ICT apprenticeship starts and completions have fallen in recent years, which reflects the national trend of declining starts. Analysis of HE provision suggests that most learners are studying medical subjects, business and administrative studies and biological sciences which has some overlap with digital demand as these courses require technical expertise. However, growth in STEM enrolments i.e. engineering and technology and computer science suggests that there is a growing supply of higher-skilled labour with digital skills. Furthermore, the evidence indicates a greater representation of digital provision delivered in Hull (for both HE provision and Apprenticeships) compared to the other local authority areas. Ensuring employers outside can access digital skills provision is key.

*Continued  
overleaf*

# Digital Priorities and Implications

Mapping the digital skills demand evidence against supply has identified key priorities to consider in the future workplan of the Local Digital Skills Partnership:

- + Consider a sector-specific approach in improving digital skills in the workforce, which responds to different employer needs for digital skills. Further investigation through employer engagement will help contribute to this.
- + Attracting young people in sectors facing digital skill gaps with a targeted focus on priority sectors, as well as considering Government support in retraining schemes would help raise the digital capacity of the Humber.
- + Review how business support interventions can help address lack of business confidence in adopting new technologies and improve their knowledge of new technologies to raise productivity. Further investigation through employer survey / consultations will help identify this need.
- + Offering business support to encourage workforce training which incorporates digital skills will help ensure capabilities are transferable across sectors

and improve Humber's competitiveness.

- + Retaining more STEM graduates within the Humber and ensuring that the education and training system aligns with sector and technological developments will help address the STEM mismatch.
- + Mitigating impacts of digital exclusion in less represented areas of the Humber will ensure that all benefit from digital skills. The rollout of the National Retraining Scheme will help achieve this.



# Appendix

*Focus Group*

*Literature Review Tables*

*Digital Technology Sector Definition*

*Probability of Automation Full Industry Tables*

*Broad SOC Occupation Definitions*

*Broad SIC Industry Definitions*

# Digital Skills Focus Group Feedback

## Purpose of the Workshop

The Humber LEP held a workshop with key stakeholders on Thursday 23<sup>rd</sup> June 2020. The purpose of the workshop was to:

1. Brief participants on the aims and objectives of the study
2. Share key messages from the study
3. Facilitate discussion with participants to get their views on:
  - + How disruptive technologies are impacting on skill requirements?
  - + Humber's digital skill opportunities and challenges?
  - + How Covid-19 has impacted on digital skill needs
  - + Perspectives on the emerging strategic priorities from the evidence

The workshop concluded with identification of next steps.

The following points were raised by attendees at the workshop.

## How are disruptive technologies impacting on skill requirements?

- + It would be helpful to map the transferability of digital skills across different sectors which will help providers to respond to local needs
- + Local training providers described the technologies they are currently providing training for, including CAD and IoT, automation technology, AR/VR/MR digital visualisation, drone tech, 3D printing, cyber risk, vertical and AR for food manufacturing which illustrates how providers are responding to the digital skills implication of new technologies
- + Smaller enterprises struggle to find people with digital skills to implement change and maintain competitiveness. These businesses require support to realise their digital potential
- + Participants cited figures which illustrate the digital skills lag in the Humber: 9% of all workers are completely offline; over 60% of workers have not been given any digital skills training by their employer. There needs to be a focus on digital training to meet the needs of Industry 4.0

# Digital Skills Focus Group Feedback

## Issues and Opportunities

- + Digital inclusion and digital confidence are particular issues facing SMEs. It requires a focus on both basic and advanced digital skills to develop SME digital capabilities.
- + There needs to be a deeper dive into the particular groups of people who are falling behind in terms of their digital skills, i.e. by age or socio-economic group. This will help to guide who needs to be targeted/prioritised for support and investment
- + People need to be trained in the digital skills which employers demand. Often, providers focus on teaching people Microsoft Office, but in order for learners to use digital tech effectively in the workplace providers need to understand what is required
- + The new Institutes of Technology will facilitate higher level digital provision. The introduction of T-levels will also support technical skills development at Level 3 as a progression route to Level 4+. The Digital T-Level route will help to meet digital skills demand.

- + The University of Hull attracts a strong degree of local learners (50% of all enrolments are from within the Humber). However, graduates are less likely to be retained in the Humber compared to FE students. The Humber needs to see an increase in digital skill teachers, but often struggles to compete with salaries available in the digital sector

## Impact of Covid-19 on digital skill needs

- + Covid-19 has been a key disruptor which has illustrated how digital infrastructure, access to digital hardware and digital skills are required. It has helped drive innovation but has also highlighted where there are gaps in the support system.
- + People have accelerated their digital skills in response to Covid-19. We have seen greater adoption of digital technology than before, and business confidence in using technology has increased.

# Digital Skills Focus Group Feedback

## Impact of Covid-19 on digital skill needs Cont'd

- + Training providers have seen increased demand from businesses seeking basic digital skills provision for their staff. Covid-19 has demonstrated the importance of basic digital skills and where gaps in the workforce exist
- + Covid-19 has changed the way training is being delivered through virtual rather than face-to-face means. This has driven innovation amongst training providers and an appetite from learners to embrace new ways of learning. Digital skills delivery is likely to be an ongoing feature in the future
- + Covid-19 has also illustrated how education can be delivered more effectively, for example to meet the skills needs of rural areas
- + Covid-19 has highlighted digital poverty which is limiting access to learning or other services. This gap will widen if it isn't addressed

## Emerging Priorities for Action

- + There was mixed views on whether the Humber needed to focus on those emerging priorities which would have the most significant impact on the workforce given Covid, whilst other participants felt that all emerging priorities required equal consideration
- + All participants agreed that digital inclusion should be placed high on the agenda
- + The increasing employer demand for analytical and complex problem solving skills and higher level technical skills illustrates the need for L4+ provision to meet workforce requirements
- + It was suggested that 'Digital Capabilities' may be a more appropriate focus given the range of capabilities (technologies and skills) that are required to meet employers digital requirements

# Digital Skills Focus Group Feedback

## Emerging Priorities for Action

- + There is a need for a 'digital first' leadership model that needs to be widely adopted. There has been feasibility work into a Level 6 Digital Skills Professional Apprenticeship by providers but the demand assessment found demand was too disparate from employers. Further research is required to help employers to recognise and articulate the digital capabilities they require and a commitment to investing in these skills. Collaborative working between business support providers and the Digital Skills Partnership could support this exercise
- + Mechanisms for facilitating greater graduate retention, both generally and specifically those with digital capabilities, within the Humber requires further exploration.

# Digital Skills Focus Group Attendees

First Name	Surname	Job Title	Company
Adam	Greenwood	Director of Apprenticeships and Skills	University of Hull
Daniel	Brett	Assistant Principal	Bishop Burton College
Mick	Heatlie	Director	ACTnow
Bill	Meredith	Chief Executive and Principal	Bishop Burton College
Derek	O'Toole	Chief Executive	Hull College
Elizabeth	Needleman	BT Group North Director	BT
Mark	Temple	CEO	Digital Ministry Ltd
Alan	Worthing	Director of Business	KCOM
Mark	Modena	Director	Winning Moves Ltd
Shadi	Ghezelayagh	Principal Research Officer	Department for Education
Steve	Patterson	Director of Digital Technologies	DN Colleges Group
Sharon	Gamble	Head of Service	HTAE
Howard	Gannaway	Senior Associate	Learning and Work Institute
Debra	Gray	Principal	Grimsby Institute of Further and Higher Education & Deputy Chief Executive of TEC Partnership
John	Stopforth	Head of Creative & Digital	DN Colleges Group
Peter	Kennedy	Principal	Franklin College
Rachel	Ellis-Jones	Deputy Principal	Bishop Burton College
Hannah	Keogan	Senior Statistical Officer	DfE Skills Advisory Panels Programme Team
Shane	Foster	Digital Skills Partnership Manager	Humber LEP
Gill	Dillon	Employment and Skills Manager	Humber LEP
Teresa	Chalmers	Executive Director of Employment and Skills	Humber LEP
Lauren	Newby	Associate Director	Hatch
Natalie	Maposa	Senior Consultant	Hatch

# Literature Review – EICPI Sector

Document	Overarching Themes	Digital and Automation Themes
The Industrial Strategy, Clean Growth Strategy and Industrial Decarbonisation and energy Efficiency Action Plans to 2050	<ul style="list-style-type: none"> <li>Key trends: double the use of renewable fuels by 2020; increase biofuels volume target to 12.4% by 2032; ban on conventional petrol and diesel car sales by 2035</li> <li>Drivers of change: targeted emissions reduction of at least 80% by 2050; increasing competition from US and China; high operating costs; environmental legislation</li> </ul>	<ul style="list-style-type: none"> <li>Key trends: decarbonisation of the EICPI industry especially difficult given the need for large amounts of energy</li> <li>Specific skill requirements: Big Data (data science); Carbon Capture Storage; Hydrogen</li> <li>Skill gaps: graduate-level engineering (annual shortfall of 20,000 graduates); R&amp;D</li> <li>Opportunities: EICPI hub in the Humber LEP one of largest in UK, huge economic potential for the area in decarbonising industry</li> <li>Challenges: maintaining viability in the face of increasingly demanding environmental legislation and uncertain international markets</li> </ul>
AutoNation	<ul style="list-style-type: none"> <li>Key trends: demand for physical skills since 2009 down between 10-30%</li> <li>Drivers of change: approximately 12% of jobs are at risk of automation within 20 years in the UK; however risk of automation does not necessarily mean net job losses.</li> </ul>	<ul style="list-style-type: none"> <li>Challenges: food and drink processing – a sector dependent on the EICPI supply chain - has a heavy presence in the LEP, and has a 52% high exposure of tasks to automation</li> </ul>
EICPI Sector Report, HoC Committee on Exiting the EU	<ul style="list-style-type: none"> <li>Key trends: sector is 97% SME; Hull is one of four major UK centres</li> <li>Drivers of change: approximately 12% of jobs are at risk of automation within 20 years in the UK; however risk of automation does not necessarily mean net job losses</li> </ul>	<ul style="list-style-type: none"> <li>Skill gaps: capital rather than labour intensive, needing graduates and experienced apprentices.</li> <li>Challenges: food and drink processing has a heavy presence in the LEP, and has a 52% high exposure of tasks to automation</li> </ul>
Deloitte – Chemical Industry Trends (2017)	<ul style="list-style-type: none"> <li>Key trends: volatile oil prices; steady but vulnerable growth in chemistry-related manufacturing across the globe; long term slowdown in the Chinese economy; changing production controls by OPEC; resurgence in drilling activity in the US</li> </ul>	<ul style="list-style-type: none"> <li>Key trends: EICPI executives increasingly pursuing growth through adoption of new technologies</li> <li>Opportunities: high performance computing and chemical data storage; machine learning and predictive analysis; 3D printing</li> <li>Challenges: more than five in 10 chemical firm executives concur that their organizations lack a digital transformation strategy</li> </ul>

# Literature Review – Manufacturing and Engineering Sector

Document	Overarching Themes	Digital and Automation Themes
Review of trends in manufacturing and global supply chains, and their impact on UK freight (2019) Government Office for Science	<ul style="list-style-type: none"> <li>Key trends: increasing importance of technology across key industries such as manufacturing and retail</li> <li>Drivers of change: sustainability pressures and technological advances</li> </ul>	<ul style="list-style-type: none"> <li>Opportunities: digitise manufacturing and exploit servitisation; leverage opportunities presented by additive manufacturing and related technologies</li> <li>Challenges: reduce the carbon intensity of logistics activity and increase energy efficiency</li> </ul>
Supporting Industry Post-Brexit: Supply chains and the automotive Industry (2017) CIVITAS	<ul style="list-style-type: none"> <li>Drivers of change: continued and significant UK's trade deficit and productivity gap with rest of world</li> </ul>	<ul style="list-style-type: none"> <li>Opportunities: reducing automotive industry reliance on international supply chains and improve general sustainability provides opportunity for adoption of new technologies</li> <li>Challenges: potential friction in future European trade – possibility to digitise borders in response</li> </ul>
Strengthening UK manufacturing Supply Chains – An action plan for government and industry (2015) HM Government	<ul style="list-style-type: none"> <li>Key trends: decreasing UK manufacturing output, lack of investment in technical education</li> <li>Drivers of change: globalisation, commercialisation of innovation and technology</li> <li>Drivers of change: match funding of up to £500m for collaborative R&amp;D projects in automotive, ultra-low and zero emission vehicles and CAV testing infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>Opportunities: collaborative innovation with local supply chains - greater customization enabled by digital tech</li> <li>Challenges: retain large market share in mature high value sectors, and slow down growth in components imported</li> <li>Opportunities: the UK's reputation for engineering innovation and manufacturing excellence, over £40bn of export revenue achieved in 2016</li> <li>Challenges: significant changes in how cars are built, powered and driven</li> </ul>
Automotive Sector Deal, 2018		
PwC Annual manufacturing Report, 2019	<ul style="list-style-type: none"> <li>Key trends: By 2025, it's estimated that the global worth of Internet of Things technology will reach \$6.2 trillion</li> <li>Drivers of change: ageing workforce poses a threat for businesses, where experienced workers are retiring and too few are coming into the sector to replace them</li> </ul>	<ul style="list-style-type: none"> <li>Key trends: manufacturing companies are increasingly starting their own training centres either on their own or in collaboration with other local companies to address skill gaps</li> <li>Opportunities: weaker sterling may boost international competitiveness</li> <li>Challenges: Brexit uncertainty - businesses in the sector are holding back on investment plans including digital, due to uncertainty around funding and strategic planning impacting business' ability to adopt disruptive tech</li> </ul>

# Literature Review – Manufacturing and Engineering Sector

Document	Overarching Themes	Digital and Automation Themes
European Commission Business Innovation Observatory: Advanced manufacturing, 2013	<ul style="list-style-type: none"> <li>Drivers of change: access to finance - determines the ability of companies to capitalize on new technology; increasing pressure of regulatory requirements on manufacturing companies</li> </ul>	<ul style="list-style-type: none"> <li>Skill gaps: difficulty moving from low to high volume production ; innovations require specific skills for development and operation phases</li> </ul>
MatrixNI AMME Report, 2016	<ul style="list-style-type: none"> <li>Drivers of change: shift towards more sustainable, 'circular' model of manufacturing caused by environmental pressures</li> </ul>	<ul style="list-style-type: none"> <li>Key trends: products likely to be designed with much greater customer specificity, through technology and ICT developments including sensors; rise of virtual manufacturing</li> <li>Opportunities: increasing interaction and collaboration between firms enhanced by communication tech, facilitating co-production between firms</li> </ul>
Made Smarter Review, 2017	<ul style="list-style-type: none"> <li>Key Trends: whilst the UK has failed to fully capture the benefits of the 'third' industrial revolution, it is in a leading position to develop and implement the technologies of the 'fourth' industrial revolution</li> <li>Drivers of Change: the convergence / synergy of specific emerging tech such as AI, robotics, Internet of Things has the potential to unlock massive productivity gains</li> </ul>	<ul style="list-style-type: none"> <li>Key Trends: almost 90 percent of new jobs will require digital skills to some degree (2015)</li> <li>Identified Skill Gaps: particularly acute in digital engineering; also AI in two distinct ways: firstly the ability to understand, develop and deploy AI solutions; secondly is the ability of the existing workforce to work alongside artificial intelligence</li> <li>Opportunities: adoption of innovative digital technology will lead to higher-paid, higher-skilled jobs that "add value to society and positively offset the displacement of poor productivity and poorly paid jobs"; this will also address the UK's productivity puzzle, raising output per worker and the wealth of UK society.</li> <li>Challenges: Businesses face skill shortages, particularly in digital engineering capabilities. They are hindered by a fragmented skills system and a lack of systematic engagement between education and industry. The UK is not currently applying innovative digital technologies in a coordinated and strategic way in industrial settings. There is a lack of clear strategic vision and narrative, which means current and future workers may become unconvinced that they can secure high quality jobs in the UK. The UK is behind other advanced nations in overall productivity, which is in part due to lower levels of adoption of digital and automation technology</li> </ul>

# Literature Review – Ports and Logistics Sector

Document	Overarching Themes	Digital and Automation Themes
The Maritime 2050 Strategy	<ul style="list-style-type: none"> <li>Key trends: increasing steps towards environmental mitigation, digitalisation of ports and shipping and introduction of autonomous vehicles</li> <li>Drivers of change: maritime clean growth; retaining and enhancing UK competitive advantage</li> </ul>	<ul style="list-style-type: none"> <li>Skill gaps: lack of diversity in workforce that is skewed towards older men</li> <li>Opportunities: strengthen reputation for maritime innovation and maximise benefits from new maritime technology (autonomous vehicles, big data, digital cataloguing systems)</li> <li>Challenges: leveraging benefits of disruptive digital technologies whilst retaining global leadership status in areas like maritime safety and security</li> </ul>
Port Vision 2030 (Rotterdam)	<ul style="list-style-type: none"> <li>Key trends: growth in knowledge based employment in port operation; increased scale of transportation and integration of supply chains;</li> <li>Drivers of change: climate change and sustainability increasingly important to port functionality</li> </ul>	<ul style="list-style-type: none"> <li>Skill gaps: education in logistics, transportation or technology is insufficient given growth in port employment (demand outstripping supply)</li> <li>Challenges: unstable geopolitical landscape, particularly with respect to natural resources, has huge implications for ports – the hubs through which resources are frequently exported; vulnerability of ports to digital attacks and the need for strong ICT systems to maintain port security</li> </ul>
Logistics Performance Index, 2018	<ul style="list-style-type: none"> <li>Key trends: The quality of information and communications technology (ICT) is consistently rated higher than physical transportation infrastructure. The difference between highest and lowest performers is smallest in ICT, suggesting that developing countries may have been investing heavily in modern technologies</li> <li>Drivers of change: decarbonization of freight transport; potential for new modes of logistics in autonomous vehicles and drones</li> </ul>	<ul style="list-style-type: none"> <li>Key trends: automated submission is fast becoming the norm across all regions</li> <li>Specific skill requirements: in spite of increasing mechanization and automation in the sector, white collar administrative workers remain of utmost importance</li> <li>Skill gaps: managerial level, especially supply chain managers acquainted with information technology</li> <li>Opportunities: new and innovative modes of transportation driven by digital tech (e.g. drones) could significantly reduce costs and emissions</li> <li>Challenges: vulnerability of logistics to cyberattacks.</li> </ul>

# Literature Review – Ports and Logistics Sector

Document	Overarching Themes	Digital and Automation Themes
Rail Sector Deal, Industrial Strategy 2018	<ul style="list-style-type: none"><li>Key trends: rail usage is achieving unprecedented levels, both in terms of passengers and freight. Increasing investment in infrastructure and train procurement - HS2 approved by current administration Feb 2020</li><li>Drivers of change: railways in the UK to be the 'backbone' of future low carbon transport system</li></ul>	<ul style="list-style-type: none"><li>Key trends: digital signalling and traffic management systems now core components for resolving capacity problems</li><li>Specific skill requirements: digital signalling and traffic management</li><li>Skill gaps: digital skills identified as in need of 'upgrading' across the sector</li><li>Opportunities: five key areas of technology highlighted for UK international competitiveness - advanced control; energy management; high value rolling stock systems; whole life asset optimisation</li><li>Challenges: there is currently not enough capacity to enable freight growth; some existing signalling is close to expiry, creating reliability problems</li></ul>

# Literature Review – Digital and Creative Sector

Document	Overarching Themes	Digital and Automation Themes
UKCES, Sector Insights: Skills and Performance Challenges in the digital and creative Sector (2015)	<ul style="list-style-type: none"> <li>Key trends: Further growth in demand for digital content and services is expected to drive expansion of the digital and creative sector. There are concerns about ability of education system to supply quantity and quality of digital roles; technological trends will be the most important influence on the future development of the sector.</li> </ul>	<ul style="list-style-type: none"> <li>Key trends: strong growth in technology demand - growing importance of cyber security; convergence of content across platforms; mobile and cloud computing; big data and analytics; automation of routine tasks; new applications of social media; new business models and collaborative platforms.</li> <li>Identified skill gaps: merging of digital and creative roles means employers are seeking a fusion of technical expertise, creativity and softer skills; stronger people management skills may be needed as older workers retiring later will be working alongside young 'digital natives' with different skills.</li> <li>Opportunities: ageing population will create new opportunities in healthcare technologies; workforces will become more diverse (including mix of older workers and 'digital natives'); globalisation presents opportunities to sell into new markets</li> <li>Challenges: progress in hiring workers with specialist knowledge of digital technologies may be offset by reduced demand for those with skills in older technologies</li> </ul>
Creative and Cultural Skills, Building a Creative Nation: The Next Decade	<ul style="list-style-type: none"> <li>Key trends: Globalisation has also driven change, making work increasingly competitive across Britain. Graduates and young people emerging into the labour market are now in competition with Europe and the rest of the world; oversupply of graduates breaks into the sector; increasing need to improve education sector's engagement and understanding of the creative sector routes.</li> <li>Drivers of change: rise of self-employment - mix of freelancers and portfolio workers; public sector funding - severe budget cuts threatens education sector and gov spending on art; drive towards a digital future – presence of an online world in everyday life</li> </ul>	<ul style="list-style-type: none"> <li>Key trends: automation of jobs and resilience of the creative industries – while the digital and creative industry remains quite low risk, there are support occupations within the sector which may be impacted by the shift in automation</li> <li>Specific skill requirements: growing need to have creative, digital, STEAM and business skills; most in demand skills are technical in nature – demanding coding and developer skills; demand for leadership and management skills; higher level technical skills</li> <li>Identified skill gaps: 70% of business leaders feel that there is a shortage of programmers, which are the hardest to recruit in the sector; need to rely on freelance workforce and use of interns to address staff shortages.</li> <li>Challenges: 69% of businesses surveyed felt that they were either fairly or very concerned with the need to adopt to new technology and new ways of working in the next 2-5 years – means businesses will need to hire or upskill staff, and identify future digital attributes</li> </ul>
Skill Needs Assessment for the Creative and Cultural Sector	<ul style="list-style-type: none"> <li>Challenges: creative and cultural industries have been slow to adapt to globalisation and advancements in technology; the sector is characterised by low levels of pay and lack of training incentives which makes it difficult to attract / retain staff; development of leadership and management skills is an ongoing issue.</li> <li>Drivers of change: apprenticeships are perceived to be key in addressing skill gaps; educating future generations to aspire to careers in the sector will ensure there is a good pipeline of talent with appropriate skills</li> </ul>	<ul style="list-style-type: none"> <li>Key trends: technological change will be important for the future visibility of the business, but over a third of leaders lack confidence in ability to lead this change; it is expected that demand for digital skills will increase in the future; national survey results show that most businesses feel that technology advancements will have a positive impact on their business (81%) and 59% felt that automation of jobs will have no impact</li> <li>Identified skill gaps: currently, generic transferable business skill gaps are more common than gaps in specialist digital/creative skills</li> <li>Opportunities: A digitally-literate workforce is needed to capitalise on opportunities from rapid advancement in digital technologies</li> <li>Challenges: lack of digital capacity in leadership and processes within the sector which is resulting in more intense skill gaps</li> </ul>

# Literature Review – Energy Sector

Document	Overarching Themes	Digital and Automation Themes
UKCES, Sector Insights: Skills and Performance Challenges in the energy Sector (2015)	<ul style="list-style-type: none"> <li>Key trends: skill shortages caused by – strong competition for skills between sub-sectors, uptake of STEM qualifications not meeting employer demand, poor visibility of the energy sector as a career option for young people/new entrants, ageing workforce; occupational standards ad qualifications will need to keep up with rapid sector developments to ensure that workforce has the right skills – workforce is becoming increasingly mobile and short term contracts is affecting formal training/upskilling of staff;</li> <li>Drivers of Change: policy change, the emergence of new technologies and the transition to a low carbon economy</li> </ul>	<ul style="list-style-type: none"> <li>Key trends: future employers are more likely to demand technical skills (e.g. data analytics) as well as knowledge of new emerging technologies</li> <li>Specific skill requirements: employers expect purchasing to evolve due to greater use of digital interfaces – IT skills are becoming more important for managerial roles.</li> </ul>
Taylor Hopkinson, Tackling Skill Shortages in the Renewable energy Sector by 2020, 2017	<ul style="list-style-type: none"> <li>Key trends: 80% of hiring managers highlight skill shortages as a key challenge in the renewable energy industry which will worsen in the future if graduates from the sector do not increase</li> </ul>	<ul style="list-style-type: none"> <li>Key trends: McKinsey research shows that digital optimisation can boost profitability by 20-30% for utilities – via smart meters and smart grid, digital productivity tools for employees and automation of back office processes</li> <li>Specific skill requirements: the types of jobs which are required in the sector are diversifying into digital and IT jobs – more IT jobs are expected to be created in the future</li> </ul>
ERP, Investigation into High-Level Skill Shortages in the energy Sector, 2014	<ul style="list-style-type: none"> <li>Challenges: long term decline in the number of 'next generation' scientists and engineers available to support the sector and academia – linked to falling STEM students; skill shortages are causing recruitment issues in the sector; shrinking graduates are a bigger concern than the quality of them; more organisations are looking abroad for skilled resource due to recruitment issues; poor image of sector among young people (however this is expected to change soon)</li> <li>Opportunities: good sector retention – skilled labour tends to stay within the sector</li> </ul>	<ul style="list-style-type: none"> <li>Key trends: technology innovation and commercialisation are key to achieving national energy policy goals (supply, infrastructure, asset renewal) and climate change mitigation/adaption</li> <li>Specific skill requirements: technical skills are in short supply – this is currently an early stage issue, but it is expected to worsen to a severe skill shortage in the sector (related to cost/time to implement energy innovation infrastructure replacements); 'specialist engineering skills' were found to be shortest in supply following by 'engineering/technology skills'</li> <li>Identified skill gaps: environmental engineers, bio scientists, skills for deployment of protection systems on electrical networks</li> </ul>
Energy and Utilities Skills Partnership, Many Skills One Vision: 2020, 2017	<ul style="list-style-type: none"> <li>Key trends: over a third (36%) of employers report challenges with hard-to-fill vacancies; 85% of hard-to-fill vacancies are challenging because of skills issues</li> <li>Drivers of change: decarbonisation agenda means that the energy supply mix is shifting to provide flexible electricity generation and heating</li> </ul>	<ul style="list-style-type: none"> <li>Key trends: diversification of technologies and gas sources have resulted in shortage of expertise in 'big data analytics' due to increasingly intelligent networks, improved modelling and customer compliance monitoring capabilities; greater focus on customer experience is driven by digital technology; technology is lowering barriers to entry and creating a new generation of energy brands</li> <li>Specific skill requirements: technical skills for example R&amp;D and engineering skills; knowledge of smart grid technologies; data analytics; telecommunications; digitisation</li> <li>Challenges: high demand for electrical engineering skills against low STEM subject uptake at advanced levels</li> </ul>

# Literature Review – Food Sector

Document	Overarching Themes	Digital and Automation Themes
Food and Drink Sector: Opportunities and Challenges for Growth (2014)	<ul style="list-style-type: none"> <li>Key trends: availability of skilled employees and demographic change are major challenges facing the sector; improving image of farming and food manufacturing – increasingly seen as places to work and have career opportunities; more courses are being designed and delivered to reflect demand</li> <li>Drivers of change: an educated workforce and the most flexible in Europe – apprenticeship participation has increased, UK has the 10<sup>th</sup> most flexible labour market in the world;</li> </ul>	<ul style="list-style-type: none"> <li>Opportunities: innovation and new product development</li> <li>Challenges: agriculture productivity is low – linked to low adoption of new technologies</li> </ul>
Food manufacturing Industry Challenges, ERP Article (2019)	<ul style="list-style-type: none"> <li>Key trends: growing need for workers with new skills as workforce is ageing</li> <li>Drivers of change: rise of technological advancement; Brexit uncertainty – may impact ability to find skilled labour; Ageing workforce; changing consumer demands (shift towards healthy eating, vegan etc)</li> </ul>	<ul style="list-style-type: none"> <li>Key trends: Industry 4.0 – ensures smart, interconnected factories with greater automation, AI and machine learning</li> <li>Specific skill requirements: greater emphasis is placed on computer-literacy, data and number crunching to operate new technology; data analytics</li> <li>Opportunities: Industry 4.0 technologies will mean companies can become more efficient, automate manual tasks and integrate diverse systems; greater organisation flexibility; greater investment in equipment and other tools via the drive to increase tech efficiency</li> <li>Challenges: difficult to convince technology-adverse staff to adapt to change; funding of transformative technology; image of sector being low skilled and low paid</li> </ul>
IGD, Bridging the Skills Gap: Developing Talent Across the food and Grocery Industry (2017)	<ul style="list-style-type: none"> <li>Key trends: awareness issue with the food sector among young people; STEM roles are hard for the sector to recruit but perceptions are starting to change (particularly engineering); finding talent with entrepreneurial mindset, resilience and analytical skills are challenging</li> </ul>	<ul style="list-style-type: none"> <li>Key trends: companies recognise the increasing role of technology and importance of having a tech-savvy workforce – digital skill requirements vary across all businesses; young, tech savvy people still lack skills required by employers</li> <li>Specific skill requirements: there will be a need for people who can use current and new technologies – more about digital mindset rather than specific digital skills</li> <li>Skill gaps: hardest to recruit areas are engineering, technology, food production, technical and quality and science.</li> <li>Challenges: demand for STEM roles is expected to increase as the industry becomes more automated and digitalised – making it highly competitive</li> </ul>

# Literature Review – Food Sector

Document	Overarching Themes	Digital and Automation Themes
Food and Drink Sector Council, Preparing for a Changing Workforce: a Food and Drink Supply Chain Approach to Skills	<ul style="list-style-type: none"><li>Key trends: business report difficulties in recruiting new staff, different skill gaps reported across supply chain but most were sector-specific and required technical skills; issues around the availability of high quality training providers for agriculture and manufacturing</li><li>Drivers of change: Brexit, digitalisation, ageing population – recognised as making labour more difficult to find in the future</li></ul>	<ul style="list-style-type: none"><li>Key trends: technology has allowed the sector to see productivity improvements over recent years; T Levels and graduate training schemes are expected to provide pipeline of young people ready to enter sector; as the sector adapts more technology and automates processes, there will be more demand for workers to have digital skills which could push wages</li><li>Opportunities: embracing transformative technologies will improve productivity and deliver higher skilled jobs</li><li>Challenges: lack of management and leadership skills remains a barrier to adopting technology and best practice</li></ul>

# Literature Review – Visitor Economy Sector

Document	Overarching Themes	Digital and Automation Themes
LGA (Work Local), Supplying Skills for the Local visitor economy	<ul style="list-style-type: none"> <li>Key trends: recruitment challenges and high staff turnover are preventing the visitor economy from achieving its potential; industry is low paid and predominately low skilled with limited career progression; businesses are less likely to engage in training and suffer from low productivity</li> <li>Challenges: staff retention, employee turnover and churn; Brexit and shortage of EU workers; recruitment and perceptions of the sector</li> </ul>	<ul style="list-style-type: none"> <li>Key trends: there is an increasing need for individuals to have multiple skill sets to meet business needs, especially small businesses – digital skills are more needed; technological advances are expected to put pressures on workforce to adapt/change</li> <li>Identified skill gaps: operational IT/digital skill gaps – handling orders, bookings</li> <li>Challenges: there is a rise in demand for digital skills in a range of roles e.g. front of house, kitchen staff and HR.</li> </ul>
Economic Insight, Hospitality and Tourism Workforce Landscape	<ul style="list-style-type: none"> <li>Key trends: there are a high number of vacancies in this sector but a lower proportion of vacancies are hard to fill due to skill shortages compared to other sectors; the sector has a high internal skills deficit – meaning more current staff are not proficient in their role (particularly operational, management, leadership skills)</li> </ul>	<ul style="list-style-type: none"> <li>Key trends: evidence shows that the sector does a higher than average proportion of their training online which could indicate that employers have more advanced digital skills than other sectors; greater use of technology will mean increased training on importance of digital and IT skill areas; digital skills are expected to increase with younger workers; employers didn't think that automation would have a huge impact</li> <li>Specific skill requirements: in the next 5-10 years, digital skills, social and emotional skills and foreign language skills were seen as important – important that as demand for digital skills increases, the interpersonal skills don't suffer</li> <li>Challenges: travel and tourism was noted as a subsector which could be more affected by AI and autonomous vehicles</li> </ul>
UKCES, Sector Skills Insights: Tourism (2012)	<ul style="list-style-type: none"> <li>Key trends: workers in the sector are less qualified than average and largely part-time and temporary employment; greater proportion for females and young people; sector suffers from high labour turnover; demand for management skills and customer service skills; demand &gt; supply</li> <li>Challenges: growing international competition; changes in technology and consumer demand; labour turnover (need to develop progressive routes)</li> </ul>	<ul style="list-style-type: none"> <li>Key trends: technological change means that the workforce will need to adapt and ensure customer service; better management skills can improve performance by employing new technology</li> <li>Specific skill requirements: specific skill needs for technology professionals and technical staff as technological developments lead to new ways for businesses to interact with customers</li> <li>Identified skill gaps: areas to likely impact sector include online booking and mobile technology; CRM; online social networking; data security; enhancing the customer experience (smart card technology)</li> </ul>

# Literature Review – Visitor Economy Sector

Document	Overarching Themes	Digital and Automation Themes
Visit Britain, The UK Tourism Productivity Gap (2019)	<ul style="list-style-type: none"> <li>• Key trends: lack of investment in capital and infrastructure is restricting productivity growth in the tourism sector</li> <li>• Challenges: tourism workforce tends to be transient, temporary, low skilled, young and migrant; high labour turnover is a major dampener on tourism productivity</li> </ul>	<ul style="list-style-type: none"> <li>• Key trends: emerging automation and AI capabilities are considered to help increase productivity but lack of investment means this is still in the very early stages; sector is changing by digital revolution e.g. growth of online platforms, social media; diffusion of robotics and AI as tourism is growing</li> <li>• Opportunities: increased accessibility to data can generate insights from data analytics and data driven innovation, potential to increase long term productivity; a policy focus on improving access to big/open data will encourage more businesses in the sector to use data to increase productivity – better understanding of consumers and markets</li> <li>• Challenges: rise of digital platforms and gig economy has led to increased non-standard work; infrastructural weaknesses are barriers to digital innovation; lack of high quality internet and mobile access is restricting opportunities for growth of small tourism businesses in rural areas; SMEs may struggle to invest in new technology- might be difficult to match relevant skill sets for IT related job tasks or data analytics (integrating new technology with existing digital infrastructure is key)</li> </ul>

# Digital Technology Sector Definition

SIC	Description
26.11	Manufacture of electronic components
26.12	Manufacture of loaded electronic boards
26.2	Manufacture of computers and peripheral equipment
26.3	Manufacture of communication equipment
26.4	Manufacture of consumer electronics
27.32	Manufacture of other electronic and electric wires and cables
58	Publishing activities
59	Motion picture, video and television programme production, sound recording and music publishing activities
60	Programming and broadcasting activities
61	Telecommunications
62	Computer programming, consultancy and related activities
63	Information service activities
95.1	Repair of computers and communication equipment

# Probability of Automation across all Industries in the Humber (Standard Industrial Classifications 1 - 25)

Industry	Employment	Employment Share	Probability of Automation
01 : Crop and animal production, hunting + related services	8,000	2%	57%
02 : Forestry and logging	100	0%	42%
03 : Fishing and aquaculture	450	0%	51%
05 : Mining of coal and lignite	0	0%	-
06 : Extraction of crude petroleum and natural gas	150	0%	28%
07 : Mining of metal ores	0	0%	-
08 : Other mining and quarrying	350	0%	46%
09 : Mining support service activities	150	0%	35%
10 : Manufacture of food products	16,000	4%	53%
11 : Manufacture of beverages	175	0%	44%
12 : Manufacture of tobacco products	0	0%	39%
13 : Manufacture of textiles	400	0%	52%
14 : Manufacture of wearing apparel	100	0%	54%
15 : Manufacture of leather and related products	75	0%	44%
16 : Manufacture of wood and of products of wood except furniture; manuf. of articles of straw and plaiting	3,000	1%	49%
17 : Manufacture of paper and paper products	1,500	0%	52%
18 : Printing and reproduction of recorded media	2,000	0%	48%
19 : Manufacture of coke and refined petroleum products	1,250	0%	38%
20 : Manufacture of chemicals and chemical products	4,000	1%	45%
21 : Manufacture of pharmaceutical products and preparations	1,750	0%	37%
22 : Manufacture of rubber and plastic products	5,000	1%	52%
23 : Manufacture of other non-metallic mineral products	2,500	1%	50%
24 : Manufacture of basic metals	4,000	1%	50%
25 : Manufacture of fabricated metal products, except machinery and equipment	9,000	2%	49%

Source: ONS – Business Register and Employment Survey (2018) and Probability of Automation in England (2017)

# Probability of Automation across all Industries in the Humber (Standard Industrial Classifications 26 - 50)

Industry	Employment	Employment Share	Probability of Automation
26 : Manufacture of computer, electronic and optical products	350	0%	41%
27 : Manufacture of electrical equipment	700	0%	44%
28 : Manufacture of machinery and equipment n.e.c.	3,000	1%	48%
29 : Manufacture of motor vehicles, trailers and semi-trailers	4,000	1%	49%
30 : Manufacture of other transport equipment	900	0%	42%
31 : Manufacture of furniture	5,000	1%	51%
32 : Other manufacturing	900	0%	44%
33 : Repair and installation of machinery and equipment	2,250	1%	47%
35 : Electricity, gas, steam and air conditioning supply	1,000	0%	41%
36 : Water collection, treatment and supply	225	0%	41%
37 : Sewerage	250	0%	43%
38 : Waste collection, treatment and disposal; materials recovery	3,000	1%	53%
39 : Remediation and other waste management	225	0%	44%
41 : Construction of buildings	4,000	1%	45%
42 : Civil engineering	2,250	1%	40%
43 : Specialised construction activities	13,000	3%	50%
45 : Wholesale and retail; repair of motor vehicles	8,000	2%	58%
46 : Wholesale trade, except of motor vehicles and motorcycles	14,000	3%	54%
47 : Retail trade, except of motor vehicles and motorcycles	39,000	10%	58%
49 : Land transport and transport via pipelines	12,000	3%	52%
50 : Water transport	250	0%	42%

Source: ONS – Business Register and Employment Survey (2018) and Probability of Automation in England (2017)

# Probability of Automation across all Industries in the Humber (Standard Industrial Classifications 51 - 75)

Industry	Employment	Employment Share	Probability of Automation
51 : Air transport	300	0%	41%
52 : Warehousing and support activities for transportation	11,000	3%	51%
53 : Postal and courier activities	1,750	0%	56%
55 : Accommodation	4,000	1%	60%
56 : Food and beverage service activities	24,000	6%	63%
58 : Publishing activities	350	0%	34%
59 : Video and television programme production; sound recording, music publishing	450	0%	37%
60 : Programming and broadcasting activities	225	0%	32%
61 : Telecommunications	1,000	0%	36%
62 : Computer programming, consultancy and related activities	4,000	1%	31%
63 : Information service activities	800	0%	36%
64 : Financial service activities, except insurance and pensions	2,000	0%	39%
65 : Insurance, reinsurance and pension funding, except social security	75	0%	42%
66 : Activities auxiliary to financial services and insurance	1,500	0%	37%
68 : Real estate activities	6,000	1%	42%
69 : Legal and accounting activities	6,000	1%	39%
70 : Activities of head offices; management consultancy	6,000	1%	34%
71 : Architectural and engineering; technical testing and analysis	5,000	1%	34%
72 : Scientific research and development	225	0%	28%
73 : Advertising and market research	1,500	0%	34%
74 : Other professional, scientific and technical activities	900	0%	36%
75 : Veterinary activities	700	0%	45%

Source: ONS – Business Register and Employment Survey (2018) and Probability of Automation in England (2017)

# Probability of Automation across all Industries in the Humber (Standard Industrial Classifications 77 – 99\*)

Industry	Employment	Employment Share	Probability of Automation
77 : Rental and leasing activities	1,750	0%	47%
78 : Employment activities	18,000	4%	43%
79 : Travel agency, tour operator and other reservation service	500	0%	44%
80 : Security and investigation activities	1,500	0%	52%
81 : Services to buildings and landscape activities	7,000	2%	54%
82 : Office admin, office support and other business support	7,000	2%	48%
84 : Public admin + defence; compulsory social security	18,000	4%	36%
85 : Education	35,000	9%	34%
86 : Human health activities	29,000	7%	34%
87 : Residential care activities	11,000	3%	50%
88 : Social work activities without accommodation	13,000	3%	40%
90 : Creative, arts and entertainment activities	600	0%	41%
91 : Libraries, archives, museums and other cultural activities	900	0%	40%
92 : Gambling and betting activities	1,250	0%	44%
93 : Sports activities and amusement and recreation activities	5,000	1%	49%
94 : Activities of membership organisations	1,500	0%	37%
95 : Repair of computers and personal and household goods	125	0%	49%
96 : Other personal service activities	3,000	1%	54%
97: Activities of households as employers of domestic personnel	0	0%	52%
98 : Undifferentiated goods- and services-producing activities of private households for own use	0	0%	55%
99 : Activities of extraterritorial organisations and bodies	0	0%	38%
Total	407,000	100%	-

\*There is no SIC 76 in the Business Register and Employment Survey

Source: ONS – Business Register and Employment Survey (2018) and Probability of Automation in England (2017)

# Broad SOC Occupation Definitions

SOC	Occupation	Description
1	Managers, directors and senior officials	Occupations whose tasks consist of planning, directing and coordinating resources to achieve the efficient functioning of organisations and businesses.
2	Professional occupations	Occupations whose main tasks require a high level of knowledge and experience in the natural sciences, engineering, life sciences, social sciences, humanities and related fields.
3	Associate professional and technical occupations	Occupations whose main tasks require experience and knowledge of principles and practices necessary to assume operational responsibility and to give technical support to Professionals and to Managers, Directors and Senior Officials.
4	Administrative and secretarial occupations	Occupations within this major group undertake general administrative, clerical and secretarial work, and perform a variety of specialist client-orientated administrative duties.
5	Skilled trades occupations	Occupations whose tasks involve the performance of complex physical duties that normally require a degree of initiative, manual dexterity and other practical skills.
6	Caring, leisure and other service occupations	Occupations whose tasks involve the provision of a service to customers, whether in a public protective or personal care capacity.
7	Sales and customer service occupations	Occupations whose tasks require the knowledge and experience necessary to sell goods and services, accept payment in respect of sales, replenish stocks of goods in stores, provide information to potential clients and additional services to customers after the point of sale.
8	Process, plant and machine operatives	Occupations whose main tasks require the knowledge and experience necessary to operate and monitor industrial plant and equipment; to assemble products from component parts according to strict rules and procedures and to subject assembled parts to routine tests; and to drive and assist in the operation of various transport vehicles and other mobile machinery.
9	Accommodation and food service activities	Occupations which require the knowledge and experience necessary to perform mostly routine tasks, often involving the use of simple hand-held tools and, in some cases, requiring a degree of physical effort.

# Broad SIC Industry Definitions

SIC	Industry	Description
A	Agriculture, forestry and fishing	The exploitation of vegetable and animal natural resources, comprising the activities of growing crops, raising and breeding animals, harvesting timber and other plants, animals or animal products from a farm or their natural habitats.
B	Mining and quarrying	The extraction of minerals occurring naturally as solids (coal and ores), liquids (petroleum) or gases (natural gas).
C	Manufacturing	The physical or chemical transformation of materials, substances, or components into new products.
D	Electricity, gas, steam and air conditioning supply	The activity of providing electric power, natural gas, steam, hot water through a permanent infrastructure (network) of lines, mains and pipes.
E	Water supply; sewerage, waste management and remediation activities	Activities related to the management (including collection, treatment and disposal) of various forms of waste, such as solid or non-solid industrial or household waste, as well as contaminated sites.
F	Construction	General construction and specialised construction activities for buildings and civil engineering works.
G	Wholesale and retail trade; repair of motor vehicles and motorcycles	Wholesale and retail sale (i.e. sale without transformation) of any type of goods, and the supply of services incidental to the sale of merchandise.
H	Transportation and storage	The provision of passenger or freight transport, whether scheduled or not, by rail, pipeline, road, water or air and associated activities such as terminal and parking facilities, cargo handling, storage etc.
I	Accommodation and food service activities	The provision of short-stay accommodation for visitors and other travellers and the provision of complete meals and drinks fit for immediate consumption.
J	Information and communication	The production and distribution of information and cultural products, the provision of the means to transmit or distribute these products, as well as data or communications, information technology activities and the processing of data and other information service activities.
K	Financial and insurance activities	Financial service activities, including insurance, reinsurance and pension funding activities, and activities to support financial services.
L	Real estate activities	Acting as lessors, agents and/or brokers in one or more of the following: selling or buying real estate, renting real estate, providing other real estate services such as appraising real estate or acting as real estate escrow agents
M	Professional, scientific and technical services	Specialised professional, scientific and technical activities. These activities require a high degree of training, and make specialised knowledge and skills available to users.
N	Administrative and support service activities	A variety of activities that support general business operations.
O	Public administration and defence	Activities of a governmental nature, normally carried out by the public administration.
P	Education	Education at any level or for any profession.
Q	Human health and social work activities	the provision of health and social work activities. It covers a wide range of activities, from health care provided by trained medical professionals in hospitals and other facilities, to residential care activities.
R	Arts, entertainment and recreation	A wide range of activities catering for various cultural, entertainment and recreational interests of the general public, including live performances, operation of museum sites, gambling, sports and recreation activities.
S	Other service activities	The activities of membership organisations, the repair of computers and personal and household goods and a variety of personal service activities not covered elsewhere in the classification.

Definition source: ONS UK Standard Industrial Classification (SIC) Hierarchy, 2020



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