Digital Skills Analysis

Developed for:

North Wales Regional Skills Partnership

Developed by:

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Contents

Executive summary

A digital skills analysis project was undertaken for the North Wales Regional Skills Partnership comprising primary and secondary research to address six digital skills research questions.

The primary research used an online survey tool to gather feedback from employer organisations in North Wales during November and December 2023. The survey received 68 responses by the closing date on the 19th of December 2023.

Secondary research was undertaken to identify the provision of digital skills short courses, qualifications, and apprenticeships in North Wales. The desk research also explored available datasets to provide insights into gender and ethnicity breakdown for digital roles in North Wales and to benchmark digital role salaries with the rest of the UK.

A summary of the main findings for the six research questions is provided below.

1. Basic Digital Skills in the Workplace

Survey feedback – This highlighted the importance of all basic digital skills to employers in North Wales. Greatest demand was for data fluency and security. Additional skills requirements were reported for application automation, network awareness, coding, and Power BI.

The main training methods used were coaching and mentoring, online learning, and self-directed development. The use of apprenticeships was evident but quite low.

Desk research – There is a good provision of basic digital skills training from FE and HE in North Wales. The main issue for employers is how to navigate these to understand the knowledge and skills delivered. The Digital Skills for Business apprenticeships at levels 2 and 3 provide workplace solutions to develop basic digital skills that can be aligned with employer needs.

2. Advanced Digital Skills in the Workplace

Survey feedback - The main requirements were for product/service delivery, data analysis, and programming, along with data and cloud engineering and cyber security. PowerBI development, digital leadership, and full-stack development were separately mentioned

The main training methods used were online learning, self-directed development, and coaching and mentoring. The use of apprenticeships was evident but quite low.

Some gaps were reported in the provision of training for advanced PowerBI, data programming, full DevOps delivery and tooling, and continuous integration/delivery.

Desk research - The desk research identified the courses and qualifications available in North Wales. The main issue is awareness of what's available and the content/learning outcomes.

3. Digital Tools and Technologies

Survey feedback – Respondents reported requirements in line with their own tech stacks. These include cloud (AWS, Azure), JavaScript, React and .Net libraries, HTML/CSS, SQL, programming languages (C#, .Net, and Python), version control (Git), and continuous delivery/deployment (CI/CD). DevOps and agile/scrum approaches were also mentioned.

For new entrants, a typical industry tech stack approach was wanted such as – AWS/Azure, PHP, HTML/CSS, JavaScript, SQL, C#, and Python / .Net, as well as proficient use of spreadsheets.

4. Diversity of the Workforce (gender, ethnicity etc)

Survey feedback - Most responses report that strategies and policies relating to diversity and inclusion have been implemented for digital roles. However, employers also report that there is a lack of representation of females and ethnic diversity in learners choosing digital courses and degrees, and attraction to these needs to improve through schools, colleges, and universities.

Desk research - The findings indicate a gender/ethnicity imbalance in the digital workforce in North Wales. Women represent 17% of established software, data, and infrastructure roles, with some roles such as data analyst, product owner, and UCD having a higher representation of women. There are low levels of ethnic diversity across all digital roles in North Wales.

5. Pathways into Digital Jobs

*Survey feedback - G*raduate recruitment was identified as the main pathway into digital roles, followed by vocational college qualifications. There was evidence of some collaboration between employers, FE, and HE, but this could be improved to better align provision to represent real-world skills needs. Apprenticeship usage could be improved, but there is a lack of awareness as to which apprenticeships are available or how they operate. There should be better employer support for digital teaching and career awareness provided by schools.

Desk research - The new Digital Technology GCSE and A level provide the opportunity to attract a broader variety of learners to pursue digital courses and careers. One of the issues for schools is their awareness of digital transformation, digital roles, and enabling technologies.

The different pathways from school into digital careers have been modelled to represent the entry and progression options for learners seeking a digital career entry point.

6. Future Digital Skills Needs

Survey feedback - The main requirement reported was around how AI can support digital transformation. Employers were also seeking to mature their capabilities with the digital technologies they were already using to maximise their proficiency in areas such as cloud, cyber security, and software development approaches. Most feedback was that respondents were unsure if there would be appropriate training available.

Desk research - Technology management helps organisations plan the integration of existing technologies and explore the potential of emerging technologies and associated skills. Having effective sources of technology intelligence to inform on industry best practices will help identify future digital technology needs and how these align with provision in North Wales.

Recommendations:

1. Produce clear promotion of apprenticeships to employers on the digital apprenticeship and degree apprenticeship frameworks available for basic and advanced digital skills, including embedded qualifications, and the provision and accessibility in North Wales.
2. Provide employers with guidance on the implementation and operation of digital apprenticeships and degree apprenticeships including how they can be used to provide funded training for both new recruits and current employees.
3. Create a mapping approach to linking tools, technologies, and digital processes highlighted by North Wales employers to the delivery of Further Education (FE) and Higher Education (HE) courses. Establish communities to enhance engagement between employers and educational providers, ensuring courses align with industry needs.
4. Develop signposting to basic and advanced digital skills courses and qualifications in North Wales, also identifying open-source online learning resources endorsed by employers.
5. Implement initiatives to champion widening participation aiming to raise the number and diversity of learners progressing into digital courses and careers. Encourage engagement with digital courses at school, college, and university, fostering inclusivity and broadening the scope of learners entering digital careers.
6. Promote awareness of the new digital technology GCSE and A level among learners and employers. Seek support from employers to enhance the delivery of these programs within school networks by establishing communities of practice.
7. Establish clear pathways into digital careers for learners in North Wales. Ensure comprehensive information is readily available, enabling learners to make informed decisions about their educational and career trajectories in the digital field.
8. Implement a proactive technology road mapping approach to identify emerging digital skills needs in North Wales to inform and align educational provision and short courses with the evolving demands of digital transformation.

1. Introduction

1.1 Overview

This report details the outcomes of a research project commissioned by The North Wales Regional Skills Partnership (NWRSP) to understand the digital skills needs of employers in North Wales.

The aim was to identify the current landscape within digital skills and show the likely direction of travel for the demand for digital skills in North Wales. The work has analysed the digital skills requirements across different sectors in North Wales that have digital skills needs. The report presents the findings to provide a current observation on needs, priorities, identify gaps against provision, and inform future digital skills planning.

The digital skills analysis focuses on providing insights into both basic digital skills and advanced digital skills requirements in North Wales.

The research project was undertaken during November and December 2023 to respond to six research questions on digital skills.

The six research questions were:

1. **Basic Digital Skills in the Workplace** – Offer insights into the demand for basic digital skills in the workplace for employers across North Wales. Provide information on the basic digital skills provision available to employees across key sectors in North Wales. Identify any gaps in provision, especially the availability of provision for females and those with protected characteristics.
2. **Advanced Digital Skills in the Workplace** – Offer insights into the demand for advanced digital skills in the workplace for employers across North Wales. Provide information on the digital skills required by employers to fill advanced digital roles and job vacancies in the region.
3. **Digital Tools and Technologies** - Provide information on what digital technologies or tools are being used in the workplace, including the digital skills sets and tools that new entrants need to be familiar with or be able to learn.
4. **Diversity of the Workforce (gender, ethnicity etc)** – Provide information about the workforce who work solely in digital roles in any sector in North Wales. Highlight whether there is a gender/ethnicity/etc imbalance, and if so, does it appear in notable areas such as seniority levels in job roles.
5. **Pathways into Digital Jobs** – Evaluate what pathways are available to individuals to pursue a digital job. Show which pathways are most popular among individuals i.e. apprenticeships, degree apprenticeships, college courses, degrees etc.
6. **Future Digital Skills Needs** – What specific skills are employers saying they need in their business to continue to be successful, productive and efficient? Is there provision to respond to these demands or will we need new provision?

1.2 Research methods

To answer the research questions above two research approaches were used:

- Primary research methods to explore employer and stakeholder insights to provide responses to the main research questions
- Secondary research to explore and identify the provision of courses and apprenticeships that contribute to entry-level pathways into digital careers. The desk research will also provide insights into labour market characteristics for digital roles in North Wales

Primary research

Following the naturalistic research paradigm, the primary research will be used to collect and analyse original data from employers and stakeholders in North Wales to provide qualitative research findings to inform responses to the research questions.

The data collection uses self-report survey instrument research methods.

The survey involves the collection, recording, and analysis of employer and stakeholder data related to basic digital skills, advanced digital skills, digital tools and technologies used in the workplace, and future digital skills needs. It also includes questions relating to organisational approaches to promoting diversity in the workforce.

Secondary research

The secondary research utilises desk research to review existing information on course and apprenticeship provision to focus on the research questions related to pathways into digital dobs as well as the diversity of the workforce in terms of labour market information.

1.3 Organisation of report

There are three main sections to the report. Firstly, the results of the primary research survey that was conducted across North Wales employers and stakeholders, Secondly the desk research findings., and thirdly the conclusions and recommendations.

2.Primary research - digital skills survey design

2.1 Survey design

The main aim of the survey is to collect the greatest amount of quality data that addresses the research questions on digital skills.

The survey design was undertaken to:

- Identify what data is needed to answer the research questions.
- Consider survey access.
- Communicate the questions and make provision for the responses.

The survey instrument used to host the survey questions was Microsoft Forms, which generated a web link for ease of distribution.

The survey used a combination of Likert scale questions, choice lists, and long and short-text answers. The main questions on basic digital skills and advanced digital skills provide the survey responder with lists of skills that they can assign a priority to ranging from not required through entry-level, routine use, and higher-level usage. Established frameworks for basic digital skills and advanced digital skills are used to populate the two main selections for basic digital skills and advanced digital skills. The survey questions are included in Appendix A.

The main source for basic digital skills and advanced digital skills are the National Occupational Standards (NOS) which include digital user skills and digital professional skills that underpin digital vocational qualifications in Wales. The digital user NOS provides a clear definition of basic digital skills that was also the basis of the UK essential digital skills framework (Skills for life / Skills in work). The digital professional NOS cover the main digital technology disciplines and is aligned with SFIA (Skills for the Information Age) v8 and the UK Government Digital and Data Profession Capability Framework. The survey questions are set out in Appendix A.

2.2 Survey distribution and completions

The survey was implemented in Microsoft Forms and translated into Welsh. The English and Welsh versions of the survey were distributed to a range of contact lists including those provided by the North Wales Regional Skills Partnership, as well as being promoted on social media channels.

Survey distribution commenced on 10th November 2023 with a closing date of 30th November. A total of 57 responses was received by close on the 30th of November, including several in Welsh.

Preliminary survey and desk research findings were presented to the North Wales RSP Board Meeting held on 6th December. It was suggested that the survey response period be extended by a few further weeks. Several further responses including some in Welsh were received resulting in a total of 68 responses received by close on the 19th of December.

The survey responses were analysed and are presented in the following section.

3. Survey results

This section describes the responses to the digital skills survey questions. The detailed responses from the survey are included in Appendix B with summary analysis of the findings presented below.

3.1 Overview of recipients

All respondents were in North Wales but 4 were from UK-wide organisations.

Most respondents were from digital, data or technology services organisations (37 %), followed by other types of organisations (16 %) and then health and social care (15%), local government (12%), and manufacturing (10%). The types of organisations reported as 'other' included consultancies, automotive software, merchanting/construction, food and drink, creative / gaming (2), National Government, public sector departments, and careers organisations.

The organisation size of the respondents was mostly large (37 %) but with a good representation of small (28 %) and micro (19 %) organisations with some medium (16 %).

The job titles provided by respondents show that they were mainly managers (talent manager, technical manager, innovation manager, business manager, L & D manager, area manager, project manager, software manager, etc.).

Where relevant, the survey results will also indicate sectoral differences in the responses using the sector grouping below :

- Digital products and services
- Engineering and manufacturing
- Financial services
- Health and social care
- Local Government
- Education
- Training
- Retail
- Creative and gaming
- Other

3.2 Basic digital skills results

3.2.1 Basic digital skills needs

The demand for basic digital skills was high across most of the range of basic digital skills. Handling data in Spreadsheets was joint highest with Maintaining data security and privacy. Other notable responses were 'creating and editing digital documents', producing data reports, and finding and managing digital information.

3.2.2 Additional basic digital skills not listed which are important

28 respondents provided additional information. Some of the main areas identified include automation of office packages, some coding/programming, network awareness, data fluency, and the use of business intelligence systems such as Power BI.

3.2.3 Provision of basic digital skills training to employees

Respondents identified coaching and mentoring, approved online learning, and employee self-directed development as the main workplace basic digital skills training approaches used. There was some usage of on-premises classroom training. Apprenticeship usage for basic digital skills training was evident but quite low.

3.2.4 Gaps in meeting basic digital skills training needs

32 respondents provided additional information. There were a range of gaps identified in providing basic digital skills training. The main feedback related to the need for practical applied courses to develop the skills. As well as how to automate basic systems to align with business processes. The use of appropriate online training is not dependent on location but can be difficult to find / trust.

3.2.5 Issues in providing basic digital skills training for females or those with protected characteristics

17 respondents provided additional information. There were some comments on lack of representation and male-led delivery being common and not every system is fully bilingual which provides language barriers.

3.2.6 Review of basic digital skills needs per sector

This section provides some key messages on digital skills per sector, showing how each sector that contributed feedback has responded regarding their basic digital skills needs.

Digital products and services –

The need for basic digital skills by digital organisations was high. Most stated that all the basic digital skills listed were required., but specifically creating and editing digital documents, handling data in spreadsheets, and creating data reports. The additional basic digital skills mentioned included a basic appreciation of the network/cloud environment and scripting to help automate spreadsheets and document management.

Employee training in basic digital skills was mainly facilitated using approved online training/courses, coaching and mentoring, and self-directed learning.

Local / National Government –

There was a strong need for basic digital skills among those who responded from the public sector (local and national government). There was high demand for all the basic digital skills listed, with a broader set including configuring and using digital devices, creating and editing digital documents, handling data in spreadsheets, creating data reports, finding and managing digital information and maintaining data security and privacy most prominent.

The additional basic digital skills mentioned included a focus on Business Intelligence software tooling. MS PowerBi was mentioned as being increasingly integrated into public sector organisations to provide a new set of interactive dashboards and Business Intelligence reports from data sources.

Employee training in basic digital skills was facilitated through a mixture of more traditional on-premises and off-premises training delivery along with approved online training/courses, coaching and mentoring, and self-directed learning. Here apprenticeships were also mentioned for delivering basic digital skills training.

Health and social care –

Basic digital skills are in strong demand across health and social care employers. Most stated that they required all the basic digital skills listed, with creating and editing digital documents, handling data in spreadsheets, creating data reports, finding and managing digital information and maintaining data security and privacy most prominent. A strong requirement was the

creation of detailed digital records.

The additional basic digital skills mentioned included a focus on collaborative cloud-based technologies such as those from Google.

Employee training in basic digital skills was facilitated mainly through on-premises training together with some more contemporary approved online training/courses, coaching and mentoring, and self-directed learning. Apprenticeships were mentioned for delivering basic digital skills training.

Engineering and manufacturing –

The feedback on basic digital skills needs from engineering and manufacturing organisations showed that all the basic digital skills were in demand by most employers. Creating and editing digital documents, handling data in spreadsheets, creating data reports, finding and managing digital information, and maintaining data security and privacy were the most prominent.

The additional basic digital skills mentioned included advanced spreadsheet skills to handle and process engineering and manufacturing data, and document management skills. Also mentioned was PowerBI skills.

There was a different focus on employee training delivery, facilitated mainly through on-premises training together with some off-premises training delivery with a few comments from employers using approved online training/courses, coaching and mentoring, and self-directed learning.

Financial services

The basic digital skills needed from financial services organisations showed that creating and editing digital documents, handling data in spreadsheets, creating data reports, finding and managing digital information, creating digital messages, and maintaining data security and privacy were the most prominent.

The additional basic digital skills required were focused on overall data fluency with financial data.

There were mixed training delivery methods equally across on-premises, vendor, off-premises, approved online training/courses, coaching and mentoring, and self-directed learning. Here apprenticeships were also mentioned for delivering basic digital skills training.

There was also a comment about the accountancy apprenticeship that stated that was focused on passing the AAT professional exams (computer-based) and not on developing work-based skills.

Creative and gaming

In addition to the standard responses regarding document production and data handling, configuring digital devices was more prominent.

All other responses covering property and construction and education sectors were focused on the standard responses of their need for creating and editing digital documents, handling data in spreadsheets, creating data reports, finding and managing digital information, and maintaining data security and privacy.

3.3 Advanced digital skills results

3.3.1 Requirements for advanced digital skills in the workplace

The most significant advanced digital skills requirements were for product/service delivery, data analysis, programming/coding, and IT project management.

Also in high demand were data engineering and cyber security operations, quality assurance/testing, and cloud engineering. Network engineering, AI/machine learning, and IT support were the least demanded advanced digital skills areas.

3.3.2 Additional advanced digital skills not listed which are important

25 respondents provided additional information. Some of the main areas identified include business intelligence (PowerBI), digital leadership, product ownership/management, software calibration and validation, full stack development/management, engineering databases, behaviour-driven development, and system architecture.

3.3.3 Provision of advanced digital skills training to employees

Respondents identified approved online learning, employee self-directed development and coaching and mentoring, as the main workplace advanced digital skills training approaches used. There was some usage of on-premises classroom training. However, apprenticeship usage for advanced digital skills training was evident but quite low.

> It is important to note that whilst IT professionals have generally adopted continuing professional development to maintain up-to-date digital skills, there has been a significant shift (possibly because of Covid) toward the use of employer-approved online learning.

3.3.4 Gaps in meeting advanced digital skills training

35 respondents provided additional information on a range of gaps in advanced digital skills provision.

Some of the main comments related to the general lack of applicants with advanced digital skills available and employee mobility. There was recognition of college and university degree provision, with several comments on the lack of availability outside those. There was specific reference to PowerBI, data programming (ETL, Python Pandas NumPy), full DevOps tooling, and continuous integration and continuous delivery/deployment (CI/CD).

> The gap identified around full DevOps tooling, continuous integration, and continuous delivery/deployment (CI/CD) needs to be explored further to ensure that these practices are fully embedded in relevant educational programmes.

3.3.5 Hard to fill roles or roles that have retention issues

42 respondents provided information on hard-to-fill digital roles or those with retention issues. There were general comments on the difficulty of recruiting into roles that require advanced digital skills. In terms of specific advanced digital skills, then computer game development/game programming, software engineering, testing and automation, and cloud engineering were commented on.

There were some comments on the interaction between colleges, universities, and employers. Also, data engineering, PowerBI, and DevOps were mentioned. There was a reference to digital skills for engineers including HMI and SCADA and embedded software.

There was a specific comment that the school curriculum does not provide an applied digital operations focus, and ideally would link to schools, colleges, and universities but difficult to attract graduates to small businesses.

3.3.6 The most important digital tools and technologies

65 respondents provided information about the most important digital tools used to support advanced digital skills.

In the ever-evolving digital technology landscape, full-stack development has emerged as a versatile approach to a system architecture for organisations. A full-stack approach sets out the tools and technologies used by an organisation to handle both front-end and back-end development, ensuring seamless end-to-end application creation. As well as tools that support code version control and configuration management. There are various popular full-stack stack approaches that employers adopt as well as bespoke configurations.

Some typical approaches include:

- Front-end Development: Acquaintance with HTML, CSS, JavaScript, and a frontend framework like React, Angular, or Vue.js.
- Back-end Development: A grasp of server-side programming languages such as Node.js, Python, Ruby, or Java.
- Databases: Basic understanding of databases, including SQL and NoSQL, and how they interact with backend services.

When employers in North Wales were asked about the most important digital tools and technologies, they typically provided the list of tools they use to support their stack implementations.

The most popular reported digital tools and technologies

- Front-end Development:
  - HTML/CSS
  - JavaScript
  - React
- Back-end Development (server-side programming languages):
  - Python
  - .Net
  - Java
  - C#
- Databases:
  - SQL
- Support tools for version control, configuration management, and CI/CD:
  - GitHub
  - Jenkins
- Development practices in full-stack:
  - Agile
  - DevOps
- Specialist libraries for working with data:
  - Pandas

- NumPy
- Scalable cloud solutions:
  - AWS
  - Azure

3.3.7 The digital tools and technologies required for new entrants

61 respondents provided information about the digital tools and technologies required of new entrants.

The most common requirements were for cloud (AWS, Azure), scripting (JavaScript), and database technologies, typically using industry standard technologies including AWS, PHP HTML/CSS Design, JavaScript , SQL, and Git (version control). In addition, programming languages include Python and C#. Also, proficient in the use of spreadsheets. Also, development and testing approaches were mentioned.

The typical digital tools and technologies reported for new entrants

- Scalable cloud solutions:
  - AWS
  - Azure
- Front-end Development:
  - JavaScript
- Back-end Development (server-side programming languages):
  - Python
  - C#
- Databases:
  - SQL
- Support tools for version control, configuration management, and CI/CD:
  - GitHub

3.3.8 Pathways used for recruiting into entry-level digital roles

Respondents identified graduates from degree courses as the main recruitment channel into digital roles (71 %), followed by college leavers with vocational qualifications (57 %), then school leavers (35%) and level 3 and 4 apprenticeships (32%) and degree apprenticeships (22%).

The main pathway into digital roles remains focused on graduates from full-time digital-related degree courses. But college courses and school leavers are also important pipelines for new talent. There appears to be some work to further promote the benefits of apprenticeships to employers and learners as a means of developing digital skills in context.

3.3.9 Additional information on pathways

18 respondents provided additional information about the pathways for recruitment into digital roles.

There was evidence of some collaboration between employers and colleges and universities in North Wales but for other employers there were some barriers as some employers felt that universities and colleges do not teach the full range of applied skills required, and graduates have generally not been interested in some of the technical support roles on offer. Some employers look further afield and work with universities in Liverpool and Chester across the border in England.

Whilst there was evidence of apprenticeship usage, there was a lot of feedback that said they had low awareness of the apprenticeship options available, how they operate, or who provides them.

There were some comments that school leavers lack the applied digital appreciation, but can be trained in context, but need a strong appreciation for work ethics and that awareness of digital opportunities and careers starting in schools, better-aligned courses to the real world.

The main differences identified in feedback between degree provision in North Wales and that in England are based on the balance of applied content, approaches to assessment, and teaching pedagogy which can all vary across HEIs.

- For digital, for example, courses such as the University of Liverpool's Computer Science with Software Development BSc (Hons) have strong software programming paradigms, full-stack coverage as well as support tooling, integrated with relevant specific options (such as C# programming), and modern developments including AI, using configurable final-year option selections.
- The University of Chester offers Software Engineering with programming skills developed through all stages of delivery.
- The University of Liverpool offers Mechanical Engineering BEng (Hons) that embeds digital engineering, including programming, and they also offer a joint honours Computer Science and Electronic Engineering BEng (Hons) degree.

The degree provision in North Wales would appear to have a different balance of content with less specialisation.

Engaging employers in North Wales to provide guidance through communities of practice approaches would help inform universities and colleges in North Wales of changing employer needs that would complement their own industrial liaison strategies.

The courses available in North Wales are listed in section 4.8 – providing clearer mapping of content would improve employer awareness and recruitment into digital roles.

3.3.10 Awareness of the digital apprenticeships available in Wales

The level of awareness of the digital technology apprenticeships (levels 2, 3, and 4) in Wales shows that over a quarter of respondents were unaware (27 %), with 41 % having low awareness, 18 % having medium awareness, and only 7 % high awareness with 7% experience of using these apprenticeships.

3.3.11 Awareness of the digital degree apprenticeships available in Wales

The level of awareness of the digital technology degree apprenticeships (level 6) in Wales shows a similar pattern to the sub-degree apprenticeships. A quarter of respondents were unaware (25 %), with 32 % having low awareness, 30 % medium awareness, and only 6 % high awareness with 7% having experience of using these apprenticeships.

3.3.12 What would improve engagement with digital apprenticeships in Wales

44 respondents provided additional information about their awareness of digital apprenticeships and degree apprenticeships in North Wales.

The main points raised were that there was a lack of awareness and understanding of how apprenticeships work, which frameworks were available, who delivered them, what the content was, and what the route to attracting candidates to apprenticeship openings was. An overriding comment was that awareness information should be available in one place covering digital apprenticeships and degree apprenticeships.

In addition, it was not evident that apprenticeships and degree apprenticeship programmes could be used to develop staff already employed within an organisation. There was also a desire to develop stronger links with colleges, universities, and other apprenticeship training agencies. In terms of apprenticeship effectiveness, there was some feedback on the need to define the detailed content delivered through apprenticeships and better alignment of the skills to productivity. There was additional feedback that there was a need for stronger basic and advanced digital content in engineering apprenticeships.

There was also some evidence of gaps in apprenticeship provision (gaming, product manager, etc.).

Digital apprenticeships can be used to support two different training strategies for employers:

- To attract and develop new talent in their first digital occupation
- To develop the digital skills of existing employees to advance their knowledge and skills

It is important that employers are aware that they can utilise digital apprenticeships as part of their approach to existing employee CPD.

3.3.13 The main digital skills that employers identify they will need to develop to maintain their operational capability

64 respondents provided information about the digital tools and technologies required of new entrants.

The most common requirements were for awareness of AI and how it can support improving business processes. This was followed by cloud (AWS, Azure), scripting (JavaScript), and database technologies, typically using industry standard technologies including AWS, PHP HTML/CSS Design, JavaScript, SQL, and Git (version control). In addition, programming languages include Python and C#. Also, proficient in the use of spreadsheets. Also, development and testing approaches were mentioned.

3.3.14 Will training provision meet future digital skills needs

Most feedback was that respondents were unsure if there would be appropriate training available. There could be better technology road-mapping at a regional scale to provide guidance on emerging technologies and their adoption and to link university-led applied research to occupational areas relevant to share with employers. There would need to be clear agreed topics and signposting to learning provision for initial awareness raising and practitioner skills development.

3.3.15 Review of advanced digital skills needs per sector

This section provides some key messages on digital skills per sector, showing how each sector that contributed feedback has responded regarding their advanced digital skills needs.

Digital products and services –

The need for advanced digital skills by digital organisations was high, as would be expected. The

most prominent advanced digital skills required were cloud engineering, product/service delivery, software engineering, coding, data engineering, and data analysis.

The additional advanced digital skills mentioned included PowerBI programming, SQL reporting, data visualisation, and digital leadership.

Employee training in advanced digital skills was mainly facilitated using approved online training/courses, coaching and mentoring, and self-directed learning with some use of on-premises training.

Local / National Government **–**

There was a less strong need for advanced digital skills versus basic digital skills among those who responded from the public sector (local and national government). There was demand for network engineering, cyber security, data engineering, business analysis and data analysis.

The additional advanced digital skills mentioned included user research, service design, and product management.

Employee training in advanced digital skills was facilitated through a mixture of more traditional off-premises training delivery along with approved online training/courses, coaching and mentoring, and self-directed learning. Here apprenticeships were also mentioned for delivering advanced digital skills training.

Health and social care –

Advanced digital skills were reported as being less in demand across health and social care employers. The most prominent advanced digital skills stated were data engineering, data analysis, and network engineering, as well as product delivery and cyber security. A strong requirement was advanced data literacy.

Employee training in advanced digital skills was facilitated mainly through on-premises training together with approved online training/courses, coaching and mentoring, and self-directed learning. Apprenticeships were mentioned for delivering advanced digital skills training, in cyber security, and network engineering.

Engineering and manufacturing **–**

Feedback on advanced digital skills needs from engineering and manufacturing organisations showed that the advanced digital skills most in demand by employers were programming (not software engineering), testing, data engineering, data analysis, and network engineering.

The additional advanced digital skills mentioned included integration and interoperability.

There was a different focus on employee training delivery, facilitated mainly through on-premises training, with some off-premises training delivery. A few employers use approved online training/courses, coaching and mentoring, and self-directed learning.

A strong comment was the need to increasingly integrate digital / engineering skills, particularly around data management and embedded systems programming.

Financial services

The advanced digital skills needed by financial services organisations were unsurprisingly data engineering, data analysis, cyber security, and software engineering.

The additional advanced digital skills required were focused on digital transformation and delivery of digital services. In addition, there was the need to maintain legacy systems for secure back-office transactions integrating modern web front-end solutions.

There was a mixture of training delivery methods using on-premises, vendor, off-premises, approved online training/courses, coaching and mentoring, and self-directed learning. Here apprenticeships were also mentioned for delivering advanced digital skills training.

Creative and gaming

The advanced digital skills that were identified by creative and gaming development employers were a mixture of software development and specific creative / gaming development toolsets. These included programming and testing, UCD, AI, and data engineering.

The additional advanced digital skills required were focused on industry-specific gaming development tools including the Unity game engine and cross-platform IDE (Integrated Development Environment), and the Unreal 3D creation tool.

There was a mixture of training delivery methods using on-premises, approved online training/courses, coaching and mentoring, and self-directed learning. Here apprenticeships were also mentioned for delivering advanced digital skills training, but there was a gap for a creative / gaming-specific apprenticeship

3.3.16 Approaches to diversity, equity, and inclusion for digital roles

Most responses report that there are specific policies in place within organisations and awareness-raising strategies of the importance of diversity, equity, and inclusion for digital roles. The feedback also reports that organisations support initiatives to improve these.

3.3.17 Positive actions undertaken concerning diversity, equity, and inclusion

The feedback demonstrates that diversity and inclusion are for the most part positively planned into organisational strategies and policies. There is a focus on the ability to do the role regardless of gender, ethnicity, orientation, or disability.

3.3.18 Barriers to diversity, equity and inclusion for digital professionals

31 responses were provided. The main barriers identified include:

Representation at senior levels

- The underrepresentation of diverse individuals in senior positions highlights the need for increased visibility and role models, as well as addressing the pervasive subconscious bias within the male-dominated higher levels of digital occupations.

Recruitment

- Enhancing recruitment practices is important in making positions more appealing and expanding the talent pool to reach a more diverse range of applicants. Addressing unconscious biases in hiring and promotions that may disproportionately favour specific demographics is essential.

Culture and awareness

- Addressing cultural awareness and education regarding diversity and inclusion is crucial to combat the perpetuation of biased practices. It is important to implement comprehensive strategies that include education and training on bias and inclusion, foster an inclusive culture, and actively dismantle systemic barriers within the workforce.

Qualifications

- We should challenge the focus on traditional computer science degrees as the main route to digital careers and be more open to alternative pathways such as vocational

training and apprenticeships. The perception of the tech sector as exclusively geeky persists, hindering progress in improving attraction into digital careers.

Education

- The gender and ethnicity gap in digital tech education becomes evident before secondary school and persists due to programming education that systematically excludes non-academic minds, girls, and minority groups. The disparity in promoting a diverse range of individuals to pursue tech roles starts at school, leading to an ongoing lack of diversity in digital tech education at all academic levels.

3.3.19 Additional information related to digital skills and training

8 responses were provided. The main information provided included:

- Strengthen university-industry collaboration to enhance talent flow.
- Strategically advertise apprenticeship opportunities, linking candidates with companies.
- Provide transparent information on apprenticeship opportunities and associated costs.
- Systematically promote diverse digital technology careers, emphasising small firms' potential.
- Integrate appropriate digital skills into engineering courses, bridging the digital-engineering education gap to meet industry demands.
- Address digital recruitment challenges with apprenticeships.

4. Secondary, desk research to inform North Wales digital skills analysis

4.1 Overview

Desk research was undertaken to investigate digital pathways and learning. This provides supplementary information to inform the research questions. This includes digital technology qualifications taught in schools, courses, and qualifications to progress into digital careers, training courses for industry, and apprenticeships.

supporting digital skills development in North Wales. This section is organised as follows:

Schools

- School provision for digital technology

Apprenticeships

- Digital technology apprenticeships in Wales
- Digital technology degree apprenticeships in Wales
- Alignment of apprenticeships and degree apprenticeships in Wales with the UK Government's public sector Digital and Data Profession skills framework
- Digital apprenticeship provision in North Wales

Degree apprenticeships

- Digital degree apprenticeship provision in North Wales
- Engineering degree apprenticeship programmes available in North Wales

Education courses and qualifications

- Basic digital skills courses
- Advanced digital skills courses

Pathways into digital jobs

- Enhanced IT programmes in North Wales

Digital tools and technologies

- Analysis of digital tools data

Diversity of the digital workforce

- Gender and diversity insights
- Salary benchmarking

4.2 School provision for digital technology in Wales

The new Digital Technology GCSE was introduced to schools in Wales in September 2021 following Qualification Wales's review of ICT provision in Schools. The course is split into 3 units. The first cohort of pupils across Wales completed the qualification in Summer 2023.

The new GCE AS/A level Digital Technology qualification was introduced for first teaching in September 2022. The GCE A level course is split into 4 units, with the AS level comprising the first 2 units. The first cohort of pupils will complete the qualification in Summer 2024.

These digital technology qualifications replace the ICT GCSE and complement the Computer Science GCSE with a more contemporary qualification covering broad aspects of Digital Technology. The new GCSE and A level provide a distinctive route to support progression to college or university, to undertake full-time or vocational courses and apprenticeships that will support learner progression into digital careers.

A free CPD programme was designed to support secondary school teachers with the delivery of the Digital Technology GCSE in Wales funded by the Welsh Government. This is delivered through Technocamps - Digital technology - Technocamps.

4.2.1 GCSE in digital technology

The WJEC GCSE qualification in Digital Technology (GCSE Specification wjec.co.uk) is a broad-based qualification that allows learners to build on the digital skills, knowledge, and understanding that is used both in their school and everyday lives. The qualification is designed for learners who wish to begin their journey towards a career that utilises digital technologies or to progress onto advanced-level programmes of learning involving digital technologies.

The qualification will allow learners to develop their understanding of the range of digital technology systems used in everyday scenarios. It will also allow learners to explore the ever-evolving nature of digital technology systems and how these systems can be used productively, creatively, and safely.

Unit	Content
Unit 1: The digital world 40% of qualification	1.1 Data 1.2 Digital technology systems 1.3 Digital communications 1.4 Impact of digital systems on organisations and individuals 1.5 Securing data and systems 1.6 Changing digital technologies
Unit 2: Digital practices 40% of qualification	2.1 Data organisation 2.2 Data analytics 2.3 Planning digital products 2.4 Developing digital products 2.5 Evaluating completed digital products
Unit 3: Communicating in the digital world 40% of qualification	3.1 Forms of online marketing communications 3.2 Impact of online marketing communications 3.3 Creating digital assets 3.4 Planning digital communications

Table 1 – Structure of GCSE in Digital Technology

4.2.2 GCE AS / A level in digital technology

The GCE A level qualification in Digital Technology advances learners' understanding of the digital technologies used by individuals and organisations, including how they have developed and how they continue to change (GCE AS/A level Digital Technology Specification wjec.co.uk).

The qualification enables learners to develop a deep understanding of how innovations in digital technology, and the increasing levels of connectivity between them, impact the lives of those who use them and the wider society.

Learners will also develop practical skills in developing both creative digital products and digital solutions to problems faced by organisations, supporting their progression into employment in a career that utilises digital technologies or onto a programme of higher education involving digital technologies or relevant apprenticeships.

Unit	Content
Unit 1: Innovation in Digital Technology 20% of qualification	1.1 Connected digital systems and smart devices 1.2 The development of Artificial Intelligence 1.3 Digital technology development life cycles 1.4 User-centred design, user experience and human-computer interaction in digital systems development 1.5 Functions, purposes and uses of social media by individuals and organisations
Unit 2: Creative Digital Practices 20% of qualification	2.1 Investigating games 2.2 Planning games 2.3 Making informed design decisions 2.4 Creating games 2.5 Testing and developing games 2.6 Refining and reviewing games 2.7 Presenting outcomes
Unit 3: Connected Systems 30% of qualification	3.1 Contemporary practices involved in collecting, storing, analysing and using data 3.2 Cyber security 3.3 Digital technology networks
Unit 4: Digital solutions 30% of qualification	4.1 Investigating transactional websites 4.2 The design of transactional websites 4.3 The capture, storage and processing of data 4.4 The use of RDBMS database systems, scripting languages and SQL 4.5 Developing and reviewing transactional websites 4.6 Testing, refining and evaluating transactional websites 4.7 Presenting outcomes

Table 2 – Structure of GCE AS / A level in Digital Technology

Good practice for schools

The digital qualifications landscape in Schools in Wales has been updated with the introduction of the new GCSE and A level in Digital Technology.

This presents new opportunities for engaging with a wide variety of learners to promote digital careers to increase gender and ethnic diversity and overall volumes of those progressing into digital careers through progression to university and college and vocational routes including apprenticeships.

Teachers could be better assisted by the implementation of communities of practice that better inform teachers on the digital careers landscape, including the main occupations, the industry standard tools and technologies used, and the range of opportunities available in direct tech and more create and people-focused roles.

There is evidence of some good practice, for example in Flintshire where a new role of Digital Learning Officer is providing a useful resource to coordinate schools' digital teaching and inform on digital apprenticeships.

4.3 Digital technology apprenticeships in Wales

4.3.1 Digital apprenticeship frameworks

The digital technology apprenticeship frameworks for Wales were revised during 2022/3 and the updated frameworks were published in September 2023. These replace the previous versions, following a transition period until the end of December 2023.

The new digital technology apprenticeship frameworks are set out in Table 3 below:

Framework	***Framework Number***	***Level***	***Link***	***Awarding organisation***
Basic digital skills				
Digital Skills for Business	FR05083	Levels - 2, 3	View	Agored Cymru
Advanced digital skills				
Software Developer	FR05086	Levels - 3, 4	View	Agored Cymru
Data Analyst	FR05087	Levels - 4	View	Agored Cymru
Cyber Security Analyst	FR05089	Levels - 3, 4	View	Agored Cymru /
Digital Content Designer	FR05084	Levels - 3, 4	View	Agored Cymru
Digital Infrastructure Engineer	FR05085	Levels - 3, 4	View	Agored Cymru
Telecoms Professional	FR05088	Levels - 2, 3, 4	View	Pearson
User Centred Designer (UCD)	FR05082	Levels - 2, 3, 4	View	Agored Cymru

Table 3 – List of updated digital technology apprenticeship frameworks for Wales

Each new pathway framework document sets out an overview of the apprenticeship and specifies the approved vocational qualifications. The annex presented in each apprenticeship framework lists the qualification structure, including the mandatory and optional units that can be taken with links to the unit content.

Digital skills for business apprenticeship pathways at levels 2 and 3 -

The Digital Skills for Business apprenticeship framework incorporates two pathways for entry-level digital apprenticeship provision. This includes an apprenticeship for developing basic digital skills (digital skills for business apprenticeship) and an apprenticeship for developing entry-level advanced digital skills (digital application support apprenticeship).

The level 2 digital skills for business apprenticeship provides a route to develop and embed basic digital skills through on-the-job vocational learning to measurably improve individual and organisational digital capabilities.

This includes data management, sharing digital information, digital collaboration, spreadsheet techniques, word processing techniques, managing email in the workplace, security for business, digital problem solving, and health, safety and wellbeing. It also includes the ability to take options including specialist software, digital responsibility, digital information literacy, database applications, mail merge, project management and social media for business.

The combined qualification is 40 credits and includes 36 credits from mandatory units and a minimum 4 credits from the selection of optional units.

The level 3 digital skills for business apprenticeship provides a progression route to develop and embed higher level basic digital skills through on-the-job vocational learning to measurably improve individual and organisational digital capabilities.

This includes data management, digital communications, digital collaboration, spreadsheet software, word processing using advanced features, digital security for business, and data visualisation for business. It also includes the ability to take options including digital responsibility, digital information literacy, database software, presentation software, advanced data representation, project management, digital content design, data analysis and using mobile applications for business.

The combined qualification is 40 credits and includes 29 credits from mandatory units and a minimum 11 credits from the selection of optional units.

The level 2 digital application support apprenticeship provides a route to entry level digital roles to create a workforce that has the digital skills, capability and confidence to excel in the workplace.

This includes sharing digital information, system security, data processing, and project administration. It also includes the ability to take options including specialist and bespoke software, the potential of IT, developing personal and team effectiveness, designing and developing digital content solutions, data-driven applications, setting up digital systems, application support, undertaking an IT application project, data modelling, mobile applications, database applications, data analysis, macro programming, remote support, software design, software improvement.

The combined qualification is 64 credits and includes 26 credits from mandatory units and a minimum 38 credits from the selection of optional units.

The level 3 digital application support apprenticeship provides a progression route to higher level digital roles to create a workforce that has the digital skills, capability and confidence to excel in the workplace.

This includes digital network environments, system security, digital communications, information management, tools for online collaboration and IT application project management. It also includes the ability to take options including specialist and bespoke software, the potential of IT, developing personal and team effectiveness, designing and

developing digital content solutions, data-driven applications, setting up digital systems, application support, undertaking an IT application project, data modelling, mobile applications, database applications, data analysis, macro programming, remote support, software design, software improvement.

The combined qualification is 84 credits and includes 40 credits from mandatory units and a minimum 44 credits from the selection of optional units.

Software developer apprenticeship pathway at levels 3 and 4 –

The level 3 software developer apprenticeship introduces software development to support entry level software developer roles. This includes software design, principles of secure development, coding, software testing and software improvement. It also includes the ability to take options including requirements specification, database software, data-driven applications, application management, remote support, user centred development and DevOps.

The combined qualification is 79 credits and includes 67 credits from mandatory units and a minimum 12 credits from the selection of optional units

The level 4 software developer apprenticeship introduces software development to support junior software developer roles. This includes software design, principles of secure development, coding, software testing and software improvement. It also includes the ability to take options including requirements specification, database software, data-driven applications, application management, remote support, user centred development and DevOps.

The combined qualification is 79 credits and includes 67 credits from mandatory units and a minimum 12 credits from the selection of optional units.

Data analyst apprenticeship pathway at level 4 –

The level 4 data analyst apprenticeship provides a foundation in data analysis for those operating in junior data roles. It includes principles of data management infrastructure, data analysis tools and data science. It also includes the ability to take options including statistical analysis of data sets, programming for data analysis, data management infrastructure and data representation.

The combined qualification is 72 credits and includes 52 credits from mandatory units and a minimum 20 credits from the selection of optional units.

Cyber security apprenticeship pathway at levels 3 and 4 –

The level 3 cyber security analyst apprenticeship – introduces cyber security to support entry level cyber security roles. This includes system security, information governance and assurance, risk assessment, incident management. It also includes the ability to take options including security testing, risk assessment, incident investigation, incident management, forensics, security audit, threat analysis and vulnerability assessment.

The combined qualification is 77 credits and includes 50 credits from mandatory units and a minimum 27 credits from the selection of optional units

The level 4 cyber security analyst apprenticeship – provides progression in cyber security to support junior cyber security roles. This includes carrying out cyber security risk assessments, incident management, system security and principles of information governance and assurance. It also includes the ability to take options including security testing, secure

development, risk assessment, incident investigation, incident management, forensics, security audit, threat analysis and vulnerability assessment.

The combined qualification is 95 credits and includes 68 credits from mandatory units and a minimum 27 credits from the selection of optional units

Digital content designer apprenticeship pathway at levels 3 and 4 –

The level 3 digital content designer apprenticeship – introduces digital content design to support entry level digital media roles. This includes audio software, video software, design and develop digital content solutions, create digital content, improve digital content delivery, it also includes the ability to take options including website software, web development, graphic design for social media and websites, and computer coding.

The combined qualification is 72 credits and includes 60 credits from mandatory units and a minimum 12 credits from the selection of optional units

The level 4 digital content designer apprenticeship – provides progression in digital content design to support junior digital media roles. This includes modeling and designing digital content, managing a digital content development project, developing interactive multimedia content, optimising digital content delivery, setting up secure payment for e-commerce, and developing digital content for social media channels. It also includes the ability to take options including web development, user centred development, data analysis, computer coding, software design and data analysis.

The combined qualification is 127 credits and includes 97 credits from mandatory units and a minimum 30 credits from the selection of optional units

Digital infrastructure engineer pathway at levels 3 and 4 –

The level 3 digital infrastructure engineer apprenticeship – introduces digital infrastructure implementation to support entry level digital infrastructure roles. This includes networking principles, digital network environments, and working with IT hardware and equipment. It also includes the ability to take options including testing IT systems, information security testing, system operation, remote support, system management, fault diagnosis, technical advice and guidance and computer coding.

The combined qualification is 69 credits and includes 53 credits from mandatory units and a minimum 16 credits from the selection of optional units

The level 4 digital infrastructure engineer apprenticeship – introduces digital infrastructure implementation to support junior level digital infrastructure roles. This includes working with IT hardware and software, principles of information governance and security, network environments and network principles .It also includes the ability to take options including data management, testing IT systems, information security testing, system operation, remote support, system management, fault diagnosis, technical advice and guidance and computer coding.

The combined qualification is 86 credits and includes 65 credits from mandatory units and a minimum 21 credits from the selection of optional units

Telecoms professional apprenticeship pathway at levels 2, 3 and 4 –

The level 2 telecoms professional apprenticeship – introduces telecoms infrastructure, cabling, and maintenance to support entry-level telecoms technician roles involved in the safe installation, commissioning, and maintenance of the telecom access network comprising optical fibre transmission cables, telecom system equipment and wiring.

This apprenticeship includes health and safety, introduction to fibre telecommunications and developing professional practice. It also includes the ability to take options including customer care, systems testing, fault diagnosis, working with IT hardware and software, customer apparatus and line installation, remote support, system security, software installation and upgrade, system operation, system management, technical advice and guidance, systems testing, presenting information, and using office software.

The competence qualification is 48 credits (including 11 mandatory unit credits and a minimum of 37 option unit credits). The apprenticeship also requires an approved level 2 knowledge qualification to be undertaken to completed.

The level 3 telecoms professional apprenticeship – provides a progression route to develop higher level technician skills in telecoms infrastructure, cabling and maintenance to support entry level telecoms technician roles involved in the safe installation, commissioning, testing and fault finding for telecoms installations.

This apprenticeship includes health and safety, fibre telecommunications techniques and developing professional practice. It also includes the ability to take options including customer care, systems testing, fault diagnosis, working with IT hardware and software, customer apparatus and line installation, remote support, system security, software installation and upgrade, system operation, system management, technical advice and guidance, systems testing, presenting information, and using office software.

The competence qualification is 72 credits (including 27 mandatory unit credits and a minimum of 45 option unit credits). The apprenticeship also requires an approved level 3 knowledge qualification to be undertaken to completed.

The level 4 telecoms professional apprenticeship – provides a progression route to develop higher level telecoms engineering skills in telecoms infrastructure, cabling and maintenance to support entry level telecoms engineering roles involved in the safe planning, installation, commissioning, testing, upgrading and fault finding for telecoms installations.

This apprenticeship includes health and safety, fibre telecommunications techniques and developing professional practice. It also includes the ability to take options including customer care, systems testing, fault diagnosis, working with IT hardware and software, customer apparatus and line installation, remote support, system security, software installation and upgrade, system operation, system management, technical advice and guidance, systems testing, presenting information, and using office software.

The competence qualification is 80 credits (including 30 mandatory unit credits and a minimum of 50 option unit credits). The apprenticeship also requires an approved level 4 knowledge qualification to be undertaken to completed.

User Centred Designer (UCD) apprenticeship pathway at levels 2, 3 and 4 –

The level 2 UCD apprenticeship – introduces user centred design to support entry level UCD roles. This includes sustainable development, digital accessibility, neurodiversity, ethical UCD, identifying and characterising users of digital services, interactive devices and interaction

design, content design, UCD, user research, and bilingualism in UCD. It also includes the ability to take options including bespoke and specialist software, the potential of IT, data processing, collating and reporting data, customer service, using office software, and project management.

The combined qualification is 42 credits and includes 37 credits from mandatory units and a minimum 5 credits from the selection of optional units.

The level 3 UCD apprenticeship – provides a progression route to develop higher level technician skills in UCD with project specialisation to align to UCD roles.

This apprenticeship includes contemporary systems development and UCD, the UCD landscape, bilingualism in user interactions, content design – activities and methods, interaction design – activities and methods, service design – activities and methods, user research – activities and methods, sustainable development, ethical principles in UCD, visual impairment and UCD, neurodiversity and UCD, and a UCD project. It also includes the ability to take options including inclusive facilitation, bespoke and specialist software, the potential of IT, spreadsheet software, data visualisation, coding, and gathering, analysing and interpreting customer feedback

The combined qualification is 84 credits and includes 74 credits from mandatory units and a minimum 10 credits from the selection of optional units.

The level 4 UCD apprenticeship – provides a progression route to develop higher level UCD professional skills with a significant UCD project to provide applied specialisation to align to UCD roles.

This apprenticeship includes UCD employability skills, bilingualism in user interactions, content design, interaction design, service design, user research, sustainable development, ethical principles in UCD, using UCD in an agile context, and the project to plan, deliver and manage a UCD research project. It also includes the ability to take options including business ethics, statistical analysis. spreadsheet software, data analysis, customer service delivery, creating data driven applications, modelling and designing digital content, bespoke and specialist software, the potential of IT, and gathering, analysing, and interpreting customer feedback

The combined qualification is 120 credits and includes 94 credits from mandatory units and a minimum of 26 credits from the selection of optional units

4.3.2 Digital apprenticeship provision in North Wales

Following the revisions to the digital apprenticeship frameworks at the end of 2023 as set out in section 4.1, the providers in North Wales are undergoing repositioning of their digital apprenticeship offerings and migrating to the new frameworks where relevant.

There are some challenges in getting some apprenticeships up and running and resourcing them with appropriately skilled work-based assessors.

Whilst the digital apprenticeship frameworks have been updated in line with industry practices, and to improve the qualifications, it is unclear which of these will be offered by providers in North Wales.

One limiting factor mentioned by providers in enabling the delivery of digital apprenticeships is attracting suitably qualified and experienced work-based assessors.

In addition to identifying and promoting new digital apprenticeship provision in North Wales, barriers to provision should be explored further to understand how they can be mitigated.

4.4 Digital technology degree apprenticeships in Wales

4.4.1 Digital Apprenticeship frameworks

The digital technology degree apprenticeship has three pathways:

- Pathway 1: Applied Software Engineering
- Pathway 2: Applied Data Science
- Pathway 3: Applied Cyber Security Management

The digital degree apprenticeship framework document published on ACW sets out the three pathways and the degree qualifications approved for delivery by HEFCW.

FR04381 - Digital Degree Apprenticeship (acwcerts.co.uk)

4.4.2 Digital degree apprenticeship provision in North Wales

The three digital degree apprenticeship pathways (software engineering, data science, and cyber security) are all delivered in North Wales. Table 4 below shows the digital degree apprenticeship delivery arrangements available in North Wales.

Degree Apprenticeship Qualifications	Providers in North Wales
Applied Software Engineering	
BSc (Hons) in Applied Software Engineering	•GLLM (delivers levels 4 and 5) •Coleg Cambria (delivers levels 4 and 5) •Bangor University (delivers level 6)
BSc (Hons) Computing	•Wrexham Glyndwr University
BSc (Hons) in Applied Software Engineering	•Open University
Applied Data Science	
BSc (Hons) Applied Data Science	•GLLM (delivers levels 4 and 5) •Coleg Cambria (delivers levels 4 and 5) •Bangor University (delivers level 6)
Applied Cyber Security	
BSc (Hons) Applied Cyber Security	•GLLM (delivers levels 4 and 5) •Coleg Cambria (delivers levels 4 and 5) •Bangor University (delivers level 6)
BSc (Hons) Cyber Security	•Wrexham Glyndwr University

Table 4 – digital degree apprenticeship delivery in North Wales

The curriculum varies across the different delivery organisations. A summary is provided in Tables 5, 6 and 7 below.

4.4.3 Structure of North Wales software engineering degree apprenticeship

	Bangor University	**Wrexham Glyndŵr University**	**Open University**
Title	**Applied Software engineering**	**Computing**	**Applied Software Engineering**
Level 4	• Data Modelling • Computer Systems • Create/Manage Accessible Websites • Database Design and Management • Designing Accessible Websites • Employability Based Learning 1 • Introduction to Programming • Research and Study Skills	• Computer Systems • Managing Data • Problem Solving with Programming • Web Design and Development • Design Methodologies • Governance	• Career development and employability • Introduction to computing technologies • Introduction to computing and IT
Level 5	• Cybersecurity & Future Technologies • Object Oriented Programming • Developing Mobile Technology • Introduction to Middleware • Project Management for Comp Prof • Research Methods & Study Skill	• Databases and Web-Based Information Systems • User Experience Design • Internet & Mobile Applications Development • Secure software design • Data Structures and Algorithms • Work based project	• Web technologies • Object-oriented Java programming • Change, strategy and projects at work • Managing IT: the why, the what and the how
Level 6	• Software Prototyping Study • Business & Enterprise Programming • User Experience (UX) & HCI • Computer & Network Security • Production Software Development • Software Engineering • Business & Enterprise Programming	• IT Project Management • Distributed Data and Data Analytics • Advanced Mobile Development • Future Technologies • Project	• Software engineering • Advanced work-based learning • Interaction design and the user experience • Web, mobile and cloud technologies • The computing and IT project

Table 5 – Comparison of digital degree apprenticeship content for software engineering

4.4.4 Structure of North Wales data science degree apprenticeship

	Bangor University
Title	**Applied Data Science**
Level 4	• Computer Systems • Database Design and Management • Digital Graphics • Employability Based Learning 1 • Introduction to Programming • Mathematics for Computing
Level 5	• Data Ethics • Data Structures & Algorithms • Intro to Data Analytics • Introduction to Middleware • Project Management for Comp Prof • Research Methods & Study Skill
Level 6	• WBP-Data Processing & AI • WBP-Design & Implementation Visualisation • Information Visualisation • Computer & Network Security • Advanced Data Management • Principles Machine Learning

Table 6 – Digital degree apprenticeship content for data science

4.4.5 Structure of North Wales cyber security degree apprenticeship programmes

	Bangor University	**Wrexham Glyndŵr University**
Title	**Applied Cyber Security**	**Cyber Security**
Year 1	• Employability Based Learning 1 • Introduction to Networks • Introduction to Programming • Research and Study Skills • Local Area Network Essentials • Security & Data Ethics (UNIX) • Web Technologies	• Computer Systems • Managing Data • Problem Solving with Programming • Discrete Computational Methods • Fundamentals of Information Security • Governance
Year 2	• Enterprise Networking & Security • Introduction to Middleware • Network Security • Project Management for Comp Prof • Research Methods & Study Skill • Web Servers & Authentication	• Server Technology • Data Structures and Algorithms • Cybersecurity and Forensics • Secure software design • Securing networks and Infrastructure • Work based project
Year 3	• WBP-PESTLE (inc. GDPR) • Business & Enterprise Programming • Mathematics for Cryptography • Penetration Testing • WBP-Advanced Security Solution • Software Engineering	• IT Project Management • Network Security • Ethical Hacking • Future Technologies • Project

Table 7 – Comparison of digital degree apprenticeship content for cyber security

4.5 Alignment of apprenticeships and degree apprenticeships in Wales with the UK Government public sector Digital and Data Profession skills framework.

The UK public sector uses a common approach to defining digital and data capabilities and skills. This is the UK Government Digital and Data Profession Capability Framework. This framework is used across Government Departments and increasingly local authorities. The framework consists of seven job families:

- Architecture roles
- Data roles
- IT operations roles
- Product and delivery roles
- Quality assurance testing (QAT) roles
- Software development roles
- User-centred design roles

The framework is used to:

- learn what the different digital and data roles do in government
- understand what skills are needed at each role level
- identify skills that digital and data professionals can develop
- assess current skill levels
- identify skill gaps in teams and opportunities for development
- inform development goals
- forecast workforce needs
- create effective and consistent job adverts
- assess the suitability of a candidate during interview

The digital apprenticeships and degree apprenticeships in Wales have been aligned to the Digital and Data Profession Capability Framework job families as set out in Table 8 below.

Occupational map of Digital Apprenticeship Standards in Wales aligned to the Digital and Data Profession Capability Framework

DDaT Job Family	Data	Software Development	Architecture	QAT	IT Operations		Product and Delivery	User Centred Design
Apprenticeship Level	**Data Analytics and Data Management** Creating and maintaining data systems and analysing data	**Software Engineering** Designing, building and deploying software solutions and services	**Cyber Security** Protecting Systems and data from cyber threats and responding to security incidents	**Quality and Testing** Testing and quality assuring software and services	**IT Support** Providing helpdesk, service support and digital learning and development	**Network and cloud infrastructure** Designing, installing, supporting and maintaining on-premises and cloud systems	**Business analysis & product delivery** Analyse and understand business problems and take responsibility for the quality of products	**UCD** Investigate, analyse and design user driven experiences and content that inform services
Level 7 (MSc)								
Level 6 (Degree)	Applied Data Science Government analyst	Applied software engineering	Applied cyber security					User centred design
Level 4	Data analyst	Software developer	Cyber security analyst			Digital infrastructure engineer		User centred design
						Telecoms professional		Digital content designer
Level 3		Software developer	Cyber security analyst		Digital application support	Digital infrastructure engineer	Digital skills for business	User centred design
						Telecoms professional		Digital content designer
Level 2					Digital application support	Telecoms professional	Digital skills for business	User centred design

Table 8 – Alignment of apprenticeships in Wales with the UK Government Digital and Data Professions

4.6 Engineering degree apprenticeship programmes available in North Wales

There are seven engineering degree apprenticeship programmes available in North Wales. These are delivered by Bangor University (in partnership with local colleges), Coleg Cambria and Wrexham Glyndŵr University and are listed in Table 9 below.

Institution	Qualification	Degree apprenticeship link
Bangor University	BSc (Hons) Applied Mechanical Engineering Systems	Applied Mechanical Engineering Systems • GLLM (delivers levels 4 and 5) • Coleg Cambria (delivers levels 4 and 5) • Bangor University (delivers level 6)
Bangor University	BSc (Hons) Applied Electrical / Electronic Engineering Systems	Applied Electrical/Electronic Engineering Systems • GLLM (delivers levels 4 and 5) • Coleg Cambria (delivers levels 4 and 5) • Bangor University (delivers level 6)
Wrexham Glyndŵr University	BEng (Hons) Production Engineering	Production Engineering
Wrexham Glyndŵr University	BEng (Hons) Industrial Engineering Design (Mechanical)	Industrial Engineering Design (Mechanical)
Wrexham Glyndŵr University	BEng (Hons) Industrial Engineering Design (Electrical)	Industrial Engineering Design (Electrical)
Coleg Cambria / Swansea University[1]	BEng (Hons) Advanced Manufacturing Engineering	Advanced Manufacturing Engineering
Coleg Cambria / Swansea University[1]	BEng (Hons) Aeronautical and Manufacturing Eng.	Aeronautical and Manufacturing Eng.

Table 9 – Engineering degree apprenticeship programmes available in North Wales

[1] The Swansea University awarded BEng degree is delivered as a partnership between Swansea University, Coleg Cambria and the employer companies. The degrees are awarded by Swansea University and delivered by Coleg Cambria.

4.6.1 Structure of engineering degree apprenticeship programmes in North Wales

	Bangor University		Wrexham Glyndŵr University			Coleg Cambria	
Title	**Applied Mechanical Engineering Systems**	**Applied Electrical/Electronic Engineering Systems**	**Production Engineering**	**Industrial Engineering Design (mech)**	**Industrial Engineering Design (elec)**	**Aeronautical Manufacturing Engineering**	**Advanced Manufacturing Engineering**
Level 4	• Electrical/Electronic Engineering Principles • Engineering Materials • Engineering Mathematics • Health and Safety in Engineering • Engineering Design • Mechanical Engineering Principles • Research and Study Skills		• Analytical Engineering Techniques • Electrical Engineering • Mechanical Engineering • Work Based Learning • Business Operations Management • Design and Computer-Aided Design (CAD)			• Work Based Learning • Engineering Analysis 1 • Business, Management and Quality • Engineering Manufacture • Electrical and Electronic Principles • Engineering Science • Professional Engineering Practice	
Level 5	• Engineering Management Techniques • Automation and Robotics • Engineering Maintenance • Professional Reflection and Development • Mathematical Methods & Linear Systems		• Industrial Project • Analytical Control Techniques • Modern Manufacture, Sustainability & Industry 4.0 • Materials & Processes			• Project • Engineering Analysis 2 • Advanced Manufacture, CAM and NDT • Stress Analysis and Dynamics • Computer Aided Engineering • Engineering Materials	
	• Computer Aided Design & Anal • Adv Comp Aided Manufacture	• Electrical Machines • Data Systems, Management, Ethics	• / Industrial Automation & PLC • Mechatronics Application & Mfg. Systems	• Computer-Aided Engineering • Mechanical System Design	• Instrumentation & Conditioning Monitoring • Power, Dist & System Design	• Flight Mechanics	• Electrical Circuits, Control, and Instrumentation
Level 6	• Research Methods • Sustainable Manufacture Management • Engineering Project • Power Engineering • Sustainable Renewable Energy		• Project • Managing Workforce, Engagement & Commitment • Maintenance & Safety System • Industrial Communication System / Product Design			• Research Project • Engineering Management • Advanced Engineering Design • Mfg. Optimisation and Automation • Systems Engineering • Advanced Engineering Materials • Digital Manufacturing	
	• Industrial Engineering or • Apps of CNC Machines	• Control Systems	• Machine & Production Systems • Modelling and Simulation	• Modelling and Simulation	• Electrical and Electronic Engineering	• Aerodynamics • Finite Element Analysis • Airframe Structures	• Design for Reliability • Finite Element Analysis / Power Systems • Industry 4.0

Table 10 – Comparison of Engineering Degree Apprenticeship Content

4.7 Enhanced IT practitioner programmes

Enhanced programmes are available at levels 2 and 3 in Information Technology. The main aim of enhanced programmes is to prepare learners for entry into employment via the apprenticeship programme where they will work towards an apprenticeship framework. Enhanced programmes increase the standard number of hours of learning delivered by Further Education Institutions (FEIs) from a minimum of 16 hours per week up to a maximum of 30 hours per week to cover a set curriculum to meet the needs of employers; deliver qualifications to learners that will meet identified employer needs within the region; and utilise direct employer engagement through the work placement element of the learning programmes.

FE institutions are expected to work with employers to provide placements, which provide meaningful and hands-on work experience for learners. Each learner must have a minimum of 5 weeks of work placement (up to a maximum of 12 weeks) or the equivalent in individual days.

4.7.1 North Wales enhanced IT programme delivery

Enhanced IT delivery programmes are delivered in North Wales, through Coleg Cambria and Grŵp Llandrillo Menai.

Each of the programmes has pathways that result in a level 3 qualification and prepare learners to progress to digital technology apprenticeships, work or further study.

Enhanced IT programme – Coleg Cambria

- Welsh Baccalaureate at level 3
- Level 3 Extended Diploma (either level 3 Computing or Information Technology)

Enhanced IT programme – Grŵp Llandrillo Menai.

- Welsh Baccalaureate at level 3
- Level 3 Enhanced Digital Skills for IT, Networking and Software Development

4.8 Digital skills training and courses in North Wales

Basic and advanced digital skills education courses and qualifications, and courses for industry are delivered by colleges and universities in North Wales. These are listed and linked in the following sections.

4.8.1 Basic digital skills courses

Coleg Cambria

Coleg Cambria offer the BCS (British Computer Society International Computer Driving Licence (ICDL), (formerly ECDL), as an off-the-shelf training solution providing accredited basic digital skills qualifications.

There are three levels of ICDL.

BCS LEVEL 1 ICDL AWARD IN IT USER SKILLS **-** Level 1 ICDL Course Detail < Coleg Cambria

The Level 1 ICDL consists of the following three units -

- IT Fundamentals & Security
- Using a Computer & Managing Files
- Web Browsing & Using Email

BCS L2 ICDL CERTIFICATE IN IT USER SKILLS - Level 2 ICDL course Detail < Coleg Cambria

The Level 2 ICDL consists of the following four units -

- Improving Productivity Using IT
- Word Processing
- Spreadsheets
- Presentations

BCS ICDL Advanced certificates are for single units.

The ICDL Advanced consists of the following units -

- Word Processing - Word processing course Detail < Coleg Cambria
- Databases - Database course Detail < Coleg Cambria
- Spreadsheets - Spreadsheet course Detail < Coleg Cambria
- Presentations - Presentations course Detail < Coleg Cambria
- Improving Productivity – Improving Productivity course Detail < Coleg Cambria

(only available once the others have been completed)

Coleg Cambria also offers short day/half day digital courses covering:

- Excel essentials/extra/advanced
- GDPR essentials
- PowerPoint essentials
- Access essentials
- Power BI essentials
- Introduction to cybersecurity

These are published here - Digital Courses for Adults < Coleg Cambria

Grŵp Llandrillo Menai (GLLM)

GLLM offer a range of computing & digital skills courses and basic digital skills qualifications:

- Computing & Digital Skills - Beginners (using a computer or device, staying safe online, digital footprint, interacting with others online, using security features on devices, managing digital information, creating /using an email account to communicate with others and to sign up to online services).
- Computing & Digital Skills - Improvers (advanced search techniques, evaluating the authenticity of information found online, email, storage, files and folders and the online office tools.
- Computing & Digital Skills for the Office (Word Processing, Spreadsheets, Presentation Software, & Desk Top Publishing)

Open University

The Open University (OU) in Wales offers a range of basic digital skills courses through the Open University OpenLearn and FutureLearn learning partner platforms.

Open University short courses in basic digital skills

- An introduction to computers and computer systems | OpenLearn - Open University
- Introducing computing and IT | OpenLearn - Open University
- Hybrid working: skills for digital transformation | OpenLearn - Open University
  (This course is also available in Welsh.)
- Hybrid working: digital communication and collaboration | OpenLearn - Open University
- Digital skills: succeeding in a digital world | OpenLearn - Open University
- Digital thinking tools for better decision making | OpenLearn - Open University
- An introduction to computers and computer systems | OpenLearn - Open University
- Learn to code for data analysis | OpenLearn - Open University
- Internet of everything | OpenLearn - Open University
- Introduction to cyber security: stay safe online | OpenLearn - Open University
- Presenting information | OpenLearn - Open University
- Simple coding | OpenLearn - Open University

FutureLearn short courses in basic digital skills

- Digital Skills for Work and Life - Online Course - FutureLearn

4.8.2 North Wales advanced digital skills courses

A range of advanced digital skills training courses are offered by colleges and universities in North Wales.

Coleg Cambria

Part-time courses:

HNC COMPUTING (Level 4 –)

This course is delivered over two years and learners will study the following units -

- Networking
- Database Design & Development
- Managing a Successful Computing Project
- Website Design & Development
- Programming
- Professional Practice
- Security
- Data Analytic

Full-time courses:

- Level 2 Diploma in Applied STEM for Digital Engineering (Industry 4.0)
- Level 2 Extended Certificate in Information and Creative Technology
- Level 2 Extended Certificate in Information and Creative Technology
- Level 3 Diploma in Computer Science (Software Engineering/Digital Technology)
- Level 3 Diploma in Games Development and IT
- Level 3 National Diploma in Digital Technologies and IT (Digital Careers Pathway)

Short courses:

Coleg Cambria offers the following specialist advanced digital skills short courses:

- Cisco Cyber Security Introduction & Cyber Security Essentials
- Cisco IT Essentials v8.0
- Introduction to Python Coding
- Social Media and Digital Marketing
- AI Fundamentals (with Python)
- Amazon Web Services (AWS) Academy Cloud Foundations
- Amazon Web Services (AWS) Academy Cloud Foundations - Boot Camp
- Computer Game Creation using Unreal Engine 5

Grŵp Llandrillo Menai (GLLM)

Full-time courses:

- Digital Design Skills for Web, Games and Media - Level 1
- Diploma in Digital Media: 3D Animation and Games Development - Level 3
- Foundation Degree (FdSc) 3D Animation and Games Development
- Foundation Degree (FdSc) Computing (Software Development)
- Information and Creative Technology Level 2
- Information Technology Level 3

Short courses:

GLLM offer the following specialist advanced digital skills short courses:

- Certified Ethical Hacker (CEH) Training
- Cisco CCNA
- CompTIA CASP+
- CompTIA CySA+
- CompTIA Network+
- CompTIA Security+
- ITIL® 4 Foundation - eLearning / ITIL® 4 Foundation - Virtual Classroom
- MCSA Windows Server and Microsoft Certified Technology Specialist Modules

Bangor University

Undergraduate

- BSc Computer Science (bangor.ac.uk)
- Computer Science (bangor.ac.uk)
- Computer Science with Game Design (bangor.ac.uk)
- Computer Science with Foundation Year (bangor.ac.uk)
- Data Science and Artificial Intelligence (bangor.ac.uk)
- Data Science and Visualisation (bangor.ac.uk)
- Computer Systems Engineering BEng (Hons) | Bangor University
- Creative Technologies (bangor.ac.uk)
- Computer Information Systems (bangor.ac.uk)
- Computer Information Systems for Business (bangor.ac.uk)
- Artificial Intelligence Machine Learning and Advanced Computing | Bangor University
- Computing | Bangor University
- Computing for Data Science | Bangor University

Postgraduate

- Computing | Bangor University
- Computing for Data Science | Bangor University

Wrexham University

Undergraduate

- BSc (Hons) Computer Game Design & Enterprise
- BSc (Hons) Computer Game Development
- BSc (Hons) Computer Science
- BSc (Hons) Computing
- BSc (Hons) Cyber Security
- BSc (Hons) Software Engineering

Postgraduate

- MSc Computer Game Development
- MSc Computer Networking
- MSc Computer Science
- MSc Computer Science with Big Data Analytics
- MSc Computer Science with Cyber Security
- MSc Computer Science with Networking
- MSc Computer Science with Software Engineering
- MSc Computing
- MSc Cyber Security
- MSc Data Science and Big Data Analytics

- MBA Big Data Analytics
- MBA Cyber Security

Short courses

- CISCO Networking Academy
- Computing Summer School
- (Short Course) Games Access: Concept Art
- (Short Course) Introduction to Cyber Security
- (Short Course) Introduction to Programming
- (Short Course) IT Fundamentals
- (Short Course) Introduction to Web Design
- Computing Summer School – privacy, GDPR and cyber security (4-week summer course)

Open University

The Open University (OU) in Wales offers a range of computing & digital skills courses and short courses on digital skills learning and qualifications. This is both through the main Open University digital / computing offerings as well as the OpenLearn platform. Individual modules can be selected and taken on their own through the OU learning platform.

Certificates of higher education

Certificate of Higher Education in Computing and IT

- This certificate introduces a range of IT related topics, plus options in mathematics, as a starting point for a career in computing and IT.

Certificate of Higher Education in Computing & IT and a second subject

- This certificate lets you combine studying the fundamentals of computing and IT with business, design, mathematics, psychology or statistics.

Certificate of Higher Education in Data Analysis

- This certificate introduces the basic skills needed to explore and analyse complex data sets and solve practical problems using maths, statistics and computing.

Certificate of Higher Education Open

- Build your qualification from a wide choice of subjects and modules, creating a certificate unique to you.

Diplomas of Higher Education

Diploma of Higher Education in Computing and IT Practice

- This is a unique work-based qualification that builds on skills you already have to provide you with a broad-based foundation in computing and IT.

Diploma of Higher Education in Design and Innovation

- Practical and creative, you'll use online design studios, social networking and study materials to develop your creative design thinking and build a portfolio.

Diploma of Higher Education in Data Analysis

- Build a foundation on which to continue to a degree in data science or employment by developing skills in exploring and analysing complex data sets.

Foundation degrees

Foundation Degree in Computing and IT Practice

- This foundation degree is for those working in engineering-related employment; you'll learn engineering fundamentals and apply them within your workplace.

Part time degrees

BSc (Honours) Computing and IT

- Specialist pathways to a degree in Computing & IT include; digital technologies, software development, solutions development, networking or professional practice.

BSc (Honours) Computing & IT and a second subject

- With this flexible joint honours degree, you can combine computing and IT with a second subject: business, design, mathematics, psychology or statistics.

BSc (Honours) Data Science

- This degree develops your ability to explore and analyse complex data sets while giving you employable skills and expertise in a range of appropriate software.

BSc (Honours) Cyber Security

- Our cyber security degree combines three sought after streams of computing: networking, cyber security and digital forensics.

BA/BSc (Honours) Open degree

- This flexible qualification offers a wide choice of subjects and modules.

Postgraduate certificates

Postgraduate Certificate in Computing

- This one-year qualification is the first step towards achieving a computing MSc and offers a range of options.

Postgraduate Certificate in Advanced Networking (CCNP Enterprise)

- This postgraduate certificate fully incorporates the Cisco CCNP Enterprise discipline (Cisco Certified Network Professional).

Postgraduate diplomas

Postgraduate Diploma in Cyber Security

- Designed to address a growing demand for cyber security professionals, this postgraduate diploma will enable you to develop industry-relevant skills.

Postgraduate Diploma in Computing

- Specialise by studying recommended modules or put together your own study route from a range of computing modules – stand out from the IT crowd.

Master's degrees

MSc in Computing

- This MSc provides the opportunity to specialise in computing disciplines including cyber security, networking, or software engineering.

MSc in Cyber Security

- Topics include information security and digital forensics, with a research project.

MA/MSc Open

- This innovative master's degree allows learners to create a personalised course of study.

Open University short courses in advanced digital skills:

Digital transformation

- Introduction to digital transformation
- Digital transformation foundations
- Digital transformation readiness
- Digital transformation performance
- Digital transformation design thinking
- Data in digital transformation
- Innovation for digital transformation

FutureLearn micro-credential courses in advanced digital skills

- AWS: Machine Learning Foundations - Machine Learning Course - FutureLearn
- AWS: Solutions Architect - Cloud Infrastructure Course - FutureLearn
- Cisco: CCNA Introduction to Networks - Networking course - FutureLearn
- Cisco: DevOps using DevNet - Coding Skills - FutureLearn
- Cisco: Python Programming - Python Programming Course - FutureLearn
- Cybersecurity with Cisco - Online Microcredential - FutureLearn

OpenLearn courses in advanced digital skills

- An introduction to interaction design | OpenLearn - Open University
- An introduction to web applications architecture | OpenLearn - Open University
- Visualisation: of data and information | OpenLearn - Open University
- Exploring communications technology | OpenLearn - Open University
- Learning from major cyber security incidents | OpenLearn - Open University
- Digital forensics | OpenLearn - Open University
- Successful IT systems | OpenLearn - Open University
- Information security | OpenLearn - Open University
- Network security | OpenLearn - Open University
- An introduction to software development | OpenLearn - Open University
- Managing complexity: A systems approach – introduction | OpenLearn - Open University

Digital leadership

- Hybrid working and digital transformation toolkit | OpenLearn - Open University
- Hybrid working: digital communication and collaboration | OpenLearn - Open University
- Hybrid working: skills for digital transformation | OpenLearn - Open University
- Hybrid working: skills for leadership | OpenLearn - Open University
- Hybrid working: change management | OpenLearn - Open University
- Hybrid working: planning for the future | OpenLearn - Open University
- Hybrid working: wellbeing and inclusion | OpenLearn - Open University
- Hybrid working: organisational development | OpenLearn - Open University

4.8.3 Other advanced digital skills courses

Online provision

The is a large range of online advanced digital skills courses and learning assets. These include free and paid-for learning from system vendors, training organisations, and other providers. They cover the digital technology disciplines. Recent projects in North Wales have highlighted

- Udemy has a range of low-cost learning units Online IT & Software Courses | Udemy
- In addition, there are several open-source (free) courses and learning resources available to support learners undertaking programming.
- Open Education and Development Group (OpenEDG), provide free learning in C, C++, Python and Java, through its educational, assessment and certification programs. Study Resources (openedg.org).

Emerging skills project learning mapped to Industry 4.0

The Emerging Skills Project (ESP) was a Department for Education (DfE) funded programme developed by the High Value Manufacturing Catapult (HVMC). The resulting ESP website provides access to the Industry 4.0 training content generated during the project which was completed at the end of March 2022. This material is made available under an Open Government License (OGL).

The 22 ESP units developed are aligned to the nine Industry 4.0 tops, some of which have primary digital content covering topics such as cloud computing, cyber security, data analysis, AI, and machine learning. The ESP units were developed to deliver learning over 2 days per unit. The learning comprises a mixture of e-learning, face-to-face PowerPoint content, embedded videos, and varying degrees of assessment.

The ESP units were designed to be facilitated so do not provide the same levels of accessibility and self-paced online learning as the OU OpenLearn, short course, and modules. But they do offer some useful detailed content that may be useful for curriculum development, and which could be adapted for employer CPD and student teaching and learning in North Wales.

Course title	Course Code	Level
1. Additive manufacturing		
Requirements Capture for Additive Manufacture	ADD301	3
Design for Additive Manufacture	ADD302	3
What is Additive Manufacture	ADD303	3
Health and Safety for Additive Manufacture	ADD304	3
Powder Handing	ADD305	3
Manufacture	ADD306	3
Post Processing in Additive Manufacture	ADD307	3
2. Immersive technologies		
Immersive Technologies in Manufacturing	IDT405	4
3. Robotics and automation		
Introduction to Robotics & Automation	IDT301	3

Design for Digital Automation and Connectivity for Manufacturing Process	IDT501	5
4. Big data, analytics and AI		
Awareness of data analysis Tools, ML & AI	IDT305	3
Introduction to Data Analysis and Machine Learning	IDT403	4
Introduction to Deep Learning and AI	IDT404	4
5. Cloud computing		
Some coverage embedded in IDT303 and	IDT504	
6. Cyber security		
Data Science and Cyber Security	IDT503	5
7. Industrial internet of things (IIOT)		
Digital Infrastructure & data acquisition	IDT303	3
8. Data and system integration		
Connected systems for inventory and asset management	IDT304	3
Digital Transformation & Connectivity	IDT401	4
Industry 4.0 and Factory of the Future	IDT504	5
9. Simulation		
Emerging Technologies for Smart Manufacturing	IDT402	4
Smart Manufacturing and Industry 4.0	IDT502	5

Table 11 – Alignment of HVMC Emerging Skills Project learning to industry 4.0 topics

4.9 Digital tools and technologies

The digital tools used for producing and operating software and data-driven services are usually defined as part of an organisation's technology stack (tech stack). This is the combination of technologies used to develop, test and run software applications. These technologies include software tools, programming languages, databases, frameworks, and libraries etc.

Tech stacks consist of both front-end and back-end components. These layers would expand depending on the needs of specific development scenarios. Overall, these technologies aim to work together to support an organisations digital service delivery needs and define their digital skills needs. Combining complementary technologies provides a structured and organised way to build and maintain software, ensuring efficiency and scalability.

The survey has reported the technology combinations that employers are using in North Wales.

A desk analysis was also undertaken using IT Jobswatch to review the available categories of digital tools and technologies that appeared in digital role job adverts in North Wales in the last 6-month period. The results were as follows.

Digital tools and technologies category	Top three for North Wales
Programming languages	C#
	JavaScript
	SQL
Cloud services	Azure
	AWS
	Microsoft 365
Applications	Microsoft Excel
	Microsoft PowerPoint
	Microsoft Office
Databases	Power BI
	MS Access
	SQL Server
Development applications	Postman
	Jira
	Jenkins
Libraries and frameworks	.NET
	Node.js
	React
Processes and methodologies	Agile
	Continuous improvement
	Business intelligence
System management	Progress chef
	Microsoft Intune
	Terraform
Vendors	Microsoft
	Citrix
	VMware

Digital tools and technologies aligned to provision

Whilst it is evident that some of the main tools and technologies are taught through colleges/universities, it is difficult to determine the exact nature of provision with access to detailed module guides across the provision. It is normal for FE/He to educate learners using example technologies – rather than train them in the specific range of tools and technologies required by employers.

It would require a detailed mapping of the range of tools and technologies taught against employer needs to assess this further and determine if this is disjointed.

As has been suggested elsewhere communities of practice would help to better link employer needs to the provision of courses by colleges/universities.

4.10 Diversity of the workforce

The statistics for women in digital tech are well documented:

- 19% of women are in the Tech Industry (UK)
- 22% of women are Directors (UK)
- Only 9.5% of students taking computer science A-level courses are female
- 17% of university students undertaking a digital/computing or related subject are female

The figures for women in IT have been static at 14-17% for the last 20 years.

According to Girls Who Code, nearly 3 in 4 young girls express interest in computing / digital tech at the school level. Yet, when it comes to the number pursuing a career in tech at degree level, the number drops to just 17%.

Biases can start early in schooling meaning closing the gender gap must start in primary school with digital /computing initiatives, curriculums, age-appropriate resources, and with programmes aimed at promoting digital technology appropriately to girls and raising awareness of the opportunities of tech careers with positive female role models.

By engaging girls at a younger age and creating a culture that fosters inclusivity, schools can help get more girls interested in joining tech, STEM and digital careers.

There are already several programmes doing valuable and innovative work to help more women into tech. These include:

- Girls in Technology (accenture.com)
- Coding Kickstarter classes | Learn to Code for Free with CFG (codefirstgirls.com)
- TechHer - Microsoft UK

The UK Government Policy paper on digital skills and inclusion (updated Sept 2023) provides some useful background.

Digital skills and inclusion - giving everyone access to the digital skills they need - GOV.UK (www.gov.uk)

However, there are some positive signs, including an upturn in women undertaking computing at university with record numbers of women starting computing degrees in September 2023.

'Record numbers' of women to start computing degrees in 2023 - National Technology

At degree level the Techskills Tech Industry gold degrees have been in operation for over fifteen years (Degrees - TechSkills**).**

This programme positively impacts inclusive recruitment to tech degrees, and adopts an employer centric collaborative approach where:

1. Employers collaborate to define priority industry skills needs for tech & digital careers and collaborate with learning providers to create, support and promote programmes which are highly valued by industry
2. Programme delivery focuses on the holistic integration of skills based on their real-world application
3. Assessment is quality assured to ensure appropriateness and consistency
4. Commitment to diversity and inclusion is a key requirement

4.10.1 Digital technology gender and ethnicity insights

A study was undertaken in December 2023 to explore gender and ethnicity breakdowns for North Wales using the representative list of advanced digital technology roles used in the survey. Diversity is challenging to both track and present simply and accurately. Horsefly Analytics provides the most accurate diversity benchmarking analytics available.

An example of a software engineer is shown below. The data shows the gender split, ethnicity breakdown, and levels of experience at 0-3 years, 4-7 years, and 8+ years. As can be seen, the gender split for roles such as software engineer aligns with national averages for the tech industry where women make up only 17% of the workforce.[2] The ethnicity breakdown shows very low levels of ethnicity diversity across digital roles in North Wales.

There are some roles where the ratio of women is more highly represented such as data analysis, machine learning, UCD, and product owner.

Software Engineer

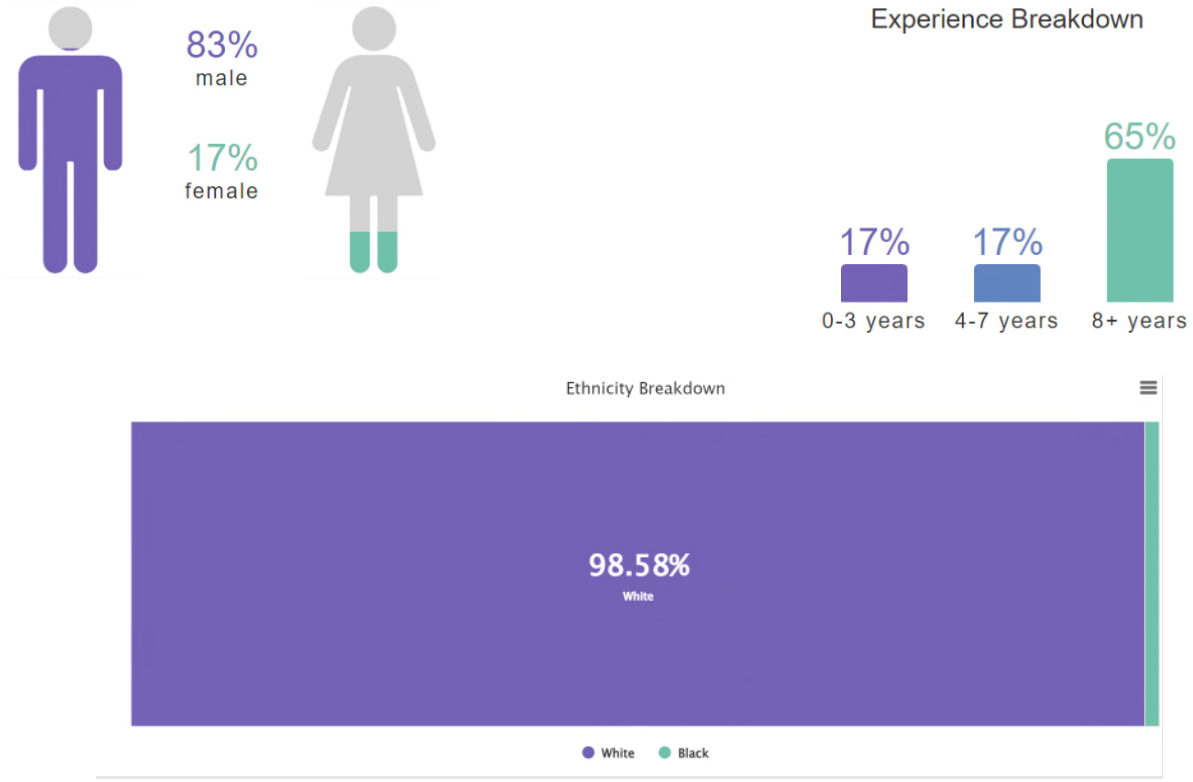


Figure 1 – Gender and ethnicity breakdown of representative digital roles in North Wales

Table 12 below shows a representative comparison between North Wales, Wales, and the UK.

[2] https://www.techuk.org/shaping-policy/jobs-and-skills/pathways-into-digital-careers.html

Role	North Wales			Wales			UK		
	Male %	Female %	Ethnicity breakdown	Male %	Female %	Ethnicity breakdown	Male %	Female %	Ethnicity breakdown
Software engineer	83	17	White 98.6% Black 1.4%	88	12	White 70% Asian 17% Mixed 10% Black 1%	85	15	White 54% Asian 29% Black 3.5%
Software tester	80	20	White 95.5% Asian 4.5%	87	13	White 79% Asian 18% Other 3%	84	16	White 43% Asian 34% Mixed 16% Black 5%
DevOps engineer	85	15	White 94% Black 6%	81	19	White 94% Other 6%	90	10	White 69% Asian 16% Mixed 11%
Data engineer	83	17	White 99% Asian 1%	88	12	White 88% Asian 8% Black 3%	86	14	White 71% Asian 17% Mixed 6% Black 4%
Data analyst	57	43	White 98.5% Asian 1.5%	63	37	White 87% Asian 10% Black 1%	63	37	White 71% Asian 16% Black 5%
Business insights analyst	69	31	White 97% Asian 3%	67	33	White 80% Asian 20%	66	34	White 77% Asian 12% Mixed 6% Black 3%
Network engineer	82	18	White 95% Asian 4% Other 1%	85	15	White 88% Asian 8% Black 3%	87	13	White 58% Asian 24% Black 10% Mixed 3%
Cloud engineer	76	24	White 98% Black 1%	91	9	White 73% Mixed 21% Asian 3% Black 1%	88	12	White 63% Asian 20% Mixed 12% Black 3%
User Centred Designer	67	33	White 99% Other 1%	71	29	White 96% Asian 3%	62	38	White 80% Asian 10% Mixed 5% Black 4%
Cyber security analyst	94	6	White 100%	88	12	White 90% Asian 5% Black 5%	80	20	White 75% Asian 13% Black 6% Mixed 4%
Business analyst	69	31	White 98% Asian 1.5% Black 0.5%	69	31	White 90% Asian 7% Black 2%	67	33	White 71% Asian 16% Mixed 6% Black 5%
Product manager	57	43	White 99% Other 1%	70	30	White 95% Asian 4%	66	34	White 81% Asian 10% Mixed 5% Black 2%

Table 12 – Insights into available labour pool for digital roles in North Wales

4.10.2 Digital role salary benchmarking

A high-level analysis of salary levels for a range of digital roles was undertaken in December 2023. This is not filtered on specific technologies, skills or levels (junior / practitioner / lead etc.) but acts as an indicator comparing the median advertised salary levels for the same role search terms for North Wales, Wales and UK. This has been undertaken using IT Jobswatch and Horsefly Analytics. The data consistently shows that the advertised salary levels are less in North Wales than the average for Wales and further reduced than the UK average. The levels of difference are not consistent and vary across role types.

Role	North Wales	All Wales	UK
Software engineer	£52,500	£55,000	£67,500
Programmer / developer	£38,750	£40,897	£46,630
Software test engineer	£41,578	£43,350	£50,608
DevOps engineer	£52,930	£58,500	£67,500
Agile methods (scrum master)	£59,780	£62,500	£65,000
Data engineer	£43,889	£48,030	£53,175
Data analyst	£47,557	£56,283	£65,000
Machine learning engineer	£47,395	£51,696	£56,428
Business intelligence	£34,473	£37,258	£42,860
Network engineer	£38,750	£41,688	£50,000
Cloud engineer	£47,500	£50,092	£56,912
User-Centred Designer (UCD)	£37,987	£39,169	£46,496
Cyber security analyst	£47,879	£51,074	£60,743
Business analyst	£37,608	£45,730	£47,059
Product owner	£42,873	£45,304	£51,134
Service desk analyst	£25,106	£26,114	£29,592
IT project manager	£40,000	£40,471	£47,784
Immersive environment	£33,430	£36,005	£38,073

Table 13 – General comparison of advertised salary levels for digital roles for North Wales, Wales and the UK

4.11 Progression pathways into digital careers in North Wales

The diagram below illustrates the different learner routes and progression pathways into digital careers covering school, college, and university at levels 2, 3, 4 and 6, 7, and 8 and the opportunity for apprenticeships and degree apprenticeships to support progression into digital roles.

Progression Pathways into digital careers in North Wales

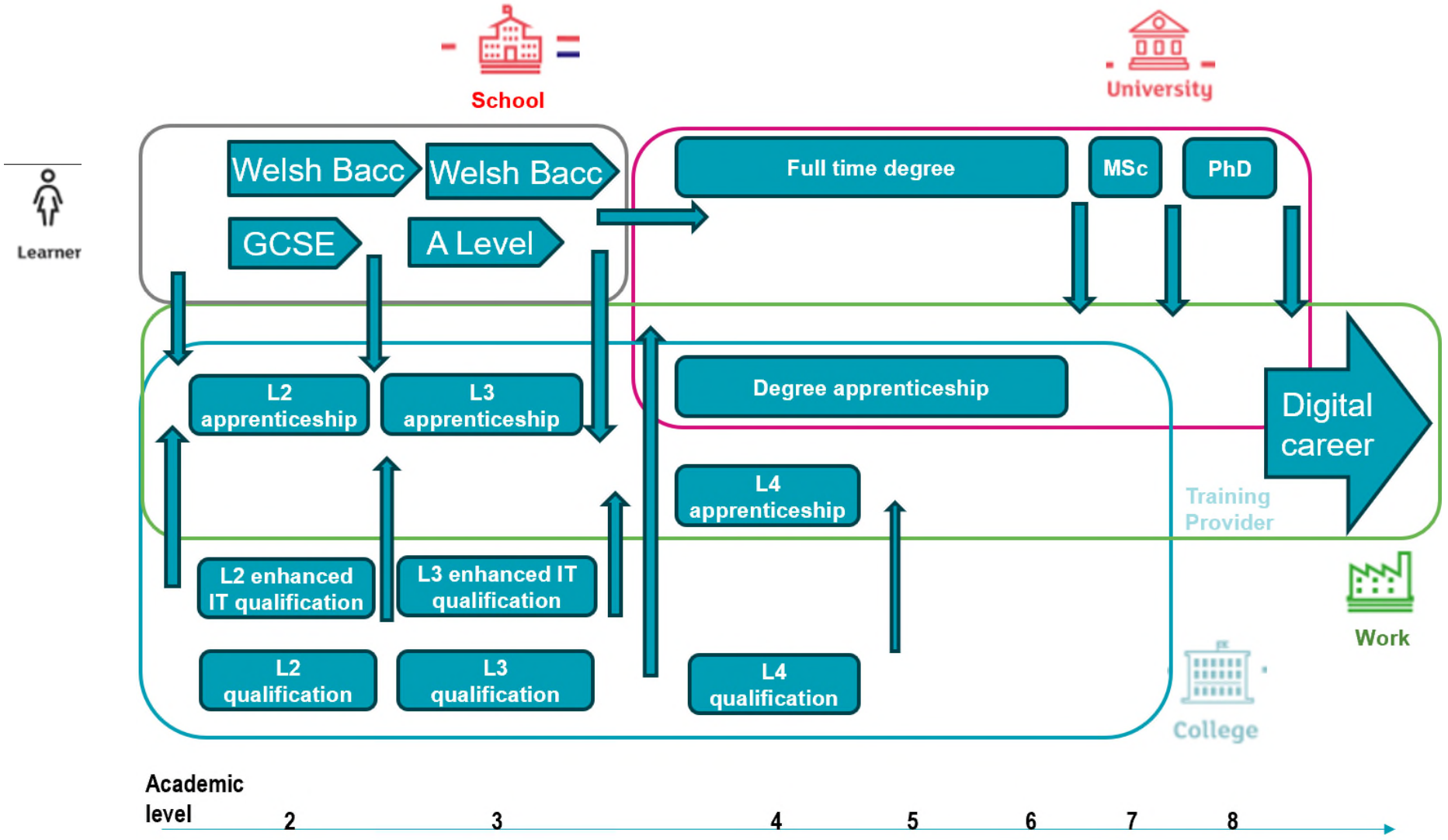


Figure 2 – Progression pathways into digital careers in North Wales

4.12 Future digital skills needs

Digital technologies lie at the heart of information processing for any organisation whether used in making or supporting digital services.

Successfully assimilating existing technologies into the organisation and anticipating the impact of emerging new technologies are critically important tasks for organisations undergoing digital transformation to deliver improved services aligned to user needs more quickly and efficiently.

Technology management implements processes and practices for identifying, selecting, acquiring, exploiting, and protecting digital technology for organisational benefit. Some of the key techniques include technology foresight, technology intelligence, technology evaluation, and technology roadmapping.

Investing in the right digital skills places great demands on management and decision processes. Technology planning, including understanding technology trends and breakthroughs, sourcing technologies, and assessing their value to the organisation become important processes more so than the technologies themselves.

Technology road mapping

The technology road mapping method is an agile strategic planning technique that enables the development and communication of strategy and innovation and helps to identify the role of technologies and their associated skills to plan future service delivery technology requirements, bring clarity to complex problems, and align the adoption of technology resources. It helps identify technology alignment to organisational strategy.

Technology intelligence

The quality of a technology strategy is largely dependent on the quality of the knowledge and information available. Intelligence helps to shape the technology strategy of an organisation, influencing areas such as technology selection and acquisition.

For North Wales stimulating technology management practises at a regional level through collaboration with universities and employers should help to identify and align future technologies and digital skills needs.

Organisations such as Digital Catapult (digicatapult.org.uk) - the UK authority on advanced digital technology can be good sources of new insights into digital technologies and skills. Keeping up to date with industry best practices and collaborating across universities should ensure the planned provision of sources of best practice, learning and skills in advanced digital technologies that can be disseminated across employers in North Wales as part of a digital innovation strategy.

Stay updated with technology trends

As digital technology evolves rapidly organisations need to keep up to date with the latest trends and advancements in technologies and working practices, particularly when working with tech stacks. Having a well-defined technology management approach will help organisations to identify what works, and ensure that their tech stack remains relevant, scalable, and efficient.

5. Conclusions / recommendations

The primary survey research and secondary desk research provide useful insights into the digital skills paradigms for North Wales.

5.1 Basic digital skills in the workplace

Survey feedback

The survey responses showed that demand for basic digital skills was high across most of the defined skills topics. 'Handling data in Spreadsheets' was joint highest with Maintaining data security and privacy'. Other notable responses were 'creating and editing digital documents', producing data reports, and finding and managing digital information.

The additional basic digital skills demand identified included automation of office packages, coding/programming, network awareness, data fluency, and use of business intelligence systems such as Power BI.

Respondents identified coaching and mentoring, approved online learning, and employee self-directed development as the main workplace basic digital skills training approaches used. There was some usage of on-premises classroom training. Apprenticeship usage for basic digital skills training was evident but quite low.

There were a range of gaps identified in providing basic digital skills training. Some of the main comments related to the need for practical applied courses to develop skills. As well as how to automate basic systems to align with business processes. The use of appropriate online training is not dependent on location but can be difficult to find / trust.

Regarding the availability of provision for females and those with protected characteristics there was feedback that instructor-led training had a lack of balanced representation and male-led delivery was common, additionally not every learning approach is fully bilingual which provides language barriers.

Desk research

The desk research has identified the published basic digital skills courses and certifications across FE and HE providers in North Wales and delivered both face-to-face and online. These cover some of the areas identified as in demand such as privacy and security and working with data in spreadsheets. These could be of interest to employers, but the issue is getting to the details of coverage to map and signpost content to aid employer awareness.

The Digital Skills for Business apprenticeship at levels 2 and 3 covers workplace basic digital skills development not aligned to a specific occupational area. This includes a range of units that cover the content required, are configurable, and develop those skills in the workplace context. There is also the Digital Application Support apprenticeship at levels 2 and 3 that introduces more technical content including the network environment, system security, and options including databases and applications.

5.2 Advanced digital skills in the workplace

Survey feedback

The most significant advanced digital skills requirements were for product/service delivery, data analysis, programming/coding, and IT project management.

Also in high demand were data engineering and cyber security operations, quality assurance/testing, and cloud engineering. Network engineering, AI/machine learning, and IT support were the least demanded advanced digital skills areas.

Some of the additional advanced digital skill demands identified include business intelligence

(PowerBI), digital leadership, product ownership/management, full stack development/management, engineering databases, behaviour-driven development, and system architecture.

Respondents identified approved online learning, employee self-directed development, and coaching and mentoring, as the main workplace advanced digital skills training approaches used. There was some usage of on-premises classroom training. However, apprenticeship usage for advanced digital skills training was evident but quite low.

There were several gaps identified in providing advanced digital skills provision. Some of the main comments related to the general lack of applicants with advanced digital skills available and employee mobility.

There was recognition of the range of college and university degree education provisions, but there was some confusion and lack of awareness as to the range of employer-focused short courses available and how they aligned with employer needs at the right levels of detail.

There was a specific reference to the tooling required for full DevOps implementation, continuous integration, and continuous delivery/deployment (CI/CD)

There was also a reference to the need for more detailed approaches to data programming (ETL, Python Pandas NumPy, etc.) and PowerBI development programming.

There was feedback on the difficulty of recruiting into roles that require advanced digital skills with computer game development, software engineering, testing and automation, and cloud engineering commented on. There were some comments on the need to improve the interaction between colleges, universities, and employers.

There was a specific comment that the school curriculum does not provide an applied digital operations focus, and ideally would link to schools, colleges, and universities but difficult to attract to small businesses.

Desk research

The desk research has identified the range of short courses, and certificated qualifications available to develop advanced digital skills in North Wales. There is a lot of provision covering a wide range of technical digital topics. One of the comments from the feedback was the need for digital leadership skills and there is a suite of hybrid working courses from the Open University on the OpenLearn platform that are available also in Welsh.

5.3 Digital tools and technologies

Survey feedback

The highest ranking was cloud (AWS, Azure), scripting (JavaScript) and the React JavaScript library, HTML/CSS, database and data extensions (SQL, Pandas NumPy), general programming languages (Python. .Net and C, C++) as well as for gaming (Unity) and version control (Git) and continuous delivery/deployment (CI/CD). Also, DevOps and agile/scrum approaches were mentioned.

Regarding the digital tools and technologies required of new entrants, the most common requirements were for cloud (AWS, Azure), scripting (JavaScript), and database technologies, using industry-standard technologies – AWS/Azure, PHP, HTML/CSS Design, JavaScript , SQL and Git (version control). In addition, programming languages including Python and C# and testing approaches were mentioned. Also, proficient in use of spreadsheets.

5.4 Diversity of the workforce (gender, ethnicity etc)

Survey feedback

Most responses suggest that there are awareness-raising strategies of the importance of diversity, equity, and inclusion for digital roles and that organisations support initiatives to improve these.

The feedback demonstrates that diversity and inclusion are for the most part positively planned into organisational strategies and policies. There is a focus on the ability to do the role regardless of gender, ethnicity, orientation, or disability.

However, there needs to be improved attraction to improve the diversity of new entrants into digital careers through schools, colleges, and universities.

Desk research

The desk research has highlighted that the diversity of the workforce in digital roles in North Wales indicates a significant gender/ethnicity imbalance. A study was undertaken to review the gender and ethnicity breakdown of digital roles in North Wales. This shows that the gender split follows UK trends for 17% of women in digital tech roles for the main roles in software engineering, data engineering and network engineering. There are some roles where the ratio of women is more highly represented such as data analysis (43 %), machine learning (33 %), UCD (33 %) and product owner (43 %). The ethnicity breakdown shows very low levels of ethnic diversity across digital roles in North Wales at 0 - 7%.

5.5 Pathways into digital careers

Survey feedback

The survey feedback showed how employers recruit into digital roles as well as their awareness of the apprenticeship programmes available.

Respondents identified graduates from degree courses as the main recruitment channel into digital roles (71 %), followed by college leavers with vocational qualifications (57 %), then school leavers (35%) and level 3 and 4 apprenticeships (32%) and degree apprenticeships (22%).

Whilst there was some evidence of collaboration between employers and colleges and universities in North Wales for some employers who had developed links. Other employers felt there were some barriers. These were that:

- The level of digital stills employers need can be very high, and the alignment of provision does not always match that need.
- They were unsure how to develop links, and not aware how or who to contact for general enquiries.
- Some who have tried engaging with colleges and universities find they have not been responsive.
- Competing for the best graduates is challenging
- There is increasingly a crossover with engineering education, for appropriate digital skills that is not catered for.
- College/universities don't deliver the full real-world skills profiles to build upon.

Some employers stated that felt that colleges/universities do not teach the skills required and graduates have generally not been attracted to some of the technical roles on offer. Some employers look further afield and work with universities in Liverpool and Chester across the border in England to achieve the right mix of content for their needs.

There is evidence of some apprenticeship usage, but a lot cited a lack of awareness as to how

apprenticeships operate or what is available.

There were some comments that school leavers lacked an applied appreciation of digital technologies and needed a strong appreciation for work ethics. There needed to be stronger awareness of digital opportunities and careers starting in schools, with better-aligned courses to real-world problems.

Employers commented that they valued a range of progression routes encompassing educational, vocational, apprenticeships, and self-taught. Learners should be more aware of the skill sets, tools and technologies, work ethic, and behaviours required by employers.

The level of awareness of the digital technology apprenticeships (levels 2, 3, and 4) in Wales shows that over a quarter of respondents were unaware (27 %), with 41 % having low awareness, 18 % having medium awareness, and only 7 % high awareness with 7% experience of using these apprenticeships.

Desk research

The desk research has identified the implementation and content of the new GCSE and A levels in Digital technology that are available for teaching in schools across Wales. These innovative new qualifications provide the opportunity to attract a wide variety of learners (including girls and those with diverse ethnicities) to digital technology courses and careers.

There is a strong opportunity to link schools, employers and FE / HE to support digital technology communities of practice as an integrative approach for the benefit of learners, educators, and employers around some of the key digital topics including the data-driven economy, the role of enabling technologies, cybersecurity and AI.

The different pathways from school into digital careers have been modelled and little know programmes such as the enhanced IT FE provision as pathways into apprenticeships identified.

In addition to apprenticeships, there are also other funded routes including the enhanced IT and engineering pathways as well as Personal Learning Accounts (PLA) that are delivered by the colleges in North Wales:

- Personal learning accounts - Personal Learning Accounts | Careers Wales (gov.wales)
- Enhanced IT programme – Programmes Directory (gov.wales)

5.6 Future digital skills needs

Survey feedback

The most common requirements were for awareness of AI and how it can support improving business processes. This was followed by cloud (AWS, Azure), scripting (JavaScript), and database technologies, typically using industry standard technologies including AWS, PHP HTML/CSS Design, JavaScript , SQL and Git (version control). In addition, programming languages including Python and C#. Also, proficient in use of spreadsheets. Also, development and testing approaches were mentioned.

Most feedback was that respondents were unsure if there would be appropriate training available. There could be better technology roadmapping to provide additional confidence.

Desk research

Technology management helps organisations plan the role of technologies and their associated skills for organisations. Having effective sources of technology intelligence to inform

on industry best practice tools and techniques, emerging technologies, and skills will help identify future digital technology needs and map these to provision in North Wales.

Recommendations

There are 8 recommendations evolving from the digital skills analysis study for North Wales:

1. Produce clear promotion of apprenticeships to employers on the digital apprenticeship and degree apprenticeship frameworks available for basic and advanced digital skills, including embedded qualifications, and the provision and accessibility in North Wales.
2. Provide employers with guidance on the implementation and operation of digital apprenticeships and degree apprenticeships including how they can be used to provide funded training for both new recruits and current employees.
3. Create a mapping approach to linking tools, technologies, and digital processes highlighted by North Wales employers to the delivery of Further Education (FE) and Higher Education (HE) courses. Establish communities to enhance engagement between employers and educational providers, ensuring courses align with industry needs.
4. Develop signposting to basic and advanced digital skills courses and qualifications in North Wales, also identifying open-source online learning resources endorsed by employers.
5. Implement initiatives to champion widening participation aiming to raise the number and diversity of learners progressing into digital courses and careers. Encourage engagement with digital courses at school, college, and university, fostering inclusivity and broadening the scope of learners entering digital careers.
6. Promote awareness of the new digital technology GCSE and A level among learners and employers. Seek support from employers to enhance the delivery of these programs within school networks by establishing communities of practice.
7. Establish clear pathways into digital careers for learners in North Wales. Ensure comprehensive information is readily available, enabling learners to make informed decisions about their educational and career trajectories in the digital field.
8. Implement a proactive technology road mapping approach to identify emerging digital skills needs in North Wales to inform and align educational provision and short courses with the evolving demands of digital transformation.

Appendix A – Digital skills survey questions

This appendix provides the list of questions that were asked as part of the online survey.

Question number	Question text	Answer type
Section 1 - About you and your organisation		
Question 1	Where is your organisation located?	Choice from: • North Wales • Rest of Wales • England • Other
Question 2	Which industry / sector does your organisation operate in?	Choice from: • Digital, data or technology services • Manufacturing • Financial services • Health and social care • Local government • Education School, college or university • Training provider • Retail • Other
Question 3	What is the approximate size of your organisation?	Likert scale: • Micro (<10) • Small (<50) • Medium (<250) • Large (>250)
Question 4	What is your job title?	Text short answer
Section 2 - About your organisation's requirements for basic digital skills		
Question 5	What is your organisations requirement for basic digital skills in the workplace?	Likert scale: • Configuring and using digital devices • Creating and editing digital documents • Handling data in spreadsheets • Producing data reports • Finding and managing digital information • Creating and editing digital media • Producing presentations • Using digital messaging • Maintaining data security and privacy • Using online services securely • Health, safety and wellbeing
Question 6	Are there any additional basic digital skills not listed which are important to your organisation, or do you want to elaborate on any of the above basic digital skills?	Text long answer
Question 7	How do you provide workplace basic digital skills training to employees?	Likert scale: • On-premises classroom training • Off-premises training provider • Vendor training • Approved online learning • Coaching and mentoring • Employee self-directed development • Apprenticeships • Other
Question 8	Are there any gaps in meeting your basic digital skills training needs in North Wales?	Text long answer

Question 9	Are there any issues in providing basic digital skills training for females or those with protected characteristics?	Text long answer
Section 3 - About your organisation's requirements for advanced digital skills		
Question 10	What is your organisations requirement for advanced digital skills in the workplace?	Likert scale: • Software engineering • Programming / coding • Quality assurance / testing • DevOps • Agile methods • Data engineering • Data analysis • AI / machine learning • Business intelligence • Network engineering • Cloud engineering • User-Centred Design (UCD) • Cyber security operations • Business analysis • Product / service delivery • Servicedesk / IT support • IT project management • AR / VR / XR
Question 11	Are there any additional advanced digital skills not listed which are important to your organisation, or do you want to elaborate on any of the above advanced digital skills?	Text long answer
Question 12	How do you provide advanced digital skills training to employees?	Likert scale: • On-premises classroom training • Off-premises training provider • Vendor training • Approved online learning • Coaching and mentoring • Employee self-directed development • Apprenticeships • Other
Question 13	Are there any gaps or issues in meeting your advanced digital skills training needs in North Wales?	Text long answer
Question 14	Do you experience any hard to fill roles that require advanced digital skills or have retention issues?	Text long answer
Section 4 - Digital tools and technologies		
Question 15	What are the most important digital tools and technologies used by your organisation?	Text long answer
Question 16	What are the digital tools and technologies that you require of new entrants to your organisation?	Text long answer
Section 5 - Pathways into digital jobs		
Question 17	Which pathways do you use for recruiting into entry level digital roles?	Likert scale: • Apprenticeships level 3 - level 4 • Degree apprenticeships • Graduates from degree courses • From sandwich degree placements • College leavers with vocational qualifications • School leavers (GCSEs) • School leavers (A-levels) • Traineeships • Other
Question 18	Please elaborate on your above answer if required?	Text long answer

Question 19	What is your level of awareness of the digital technology apprenticeships available in Wales	Likert scale: • None • Low • Medium • High • Experience using them
Question 20	What is your level of awareness of the digital technology degree apprenticeships available in Wales	Likert scale: • None • Low • Medium • High • Experience using them
Question 21	What would improve your engagement with apprenticeships and degree apprenticeships in North Wales?	Text long answer
Section 6 - Future digital skills needs		
Question 22	What are the main digital skills that you forecast your organisation will need to develop or acquire to maintain its operational capability?	Text long answer
Question 23	Do you envisage that there is training provision to meet your future digital skills needs?	Text long answer
Section 7 - Diversity, equity and inclusion of the digital workforce		
Question 24	Approaches to diversity, equity and inclusion for digital roles	Level of agreement with the following statements: • Diverse perspectives are encouraged and valued • Diversity is promoted during the recruitment process • Our organisation is transparent to everyone regarding pay, promotions, and opportunities • There are no differences in pay related to gender, race, age, ethnicity, or sexual identity • There are no barriers or inequities regarding access to training opportunities based on gender, race, age, ethnicity, or sexual identity • An inclusive working environment is promoted where employees have a strong sense of belonging
Question 25	What positive actions does your organisation undertake in its approach to diversity, equity and inclusion for digital professionals?	Text long answer
Question 26	Are there any barriers to diversity, equity and inclusion for digital professionals?	Text long answer
Section 8 - Any additional information		
Question 27	Please provide any additional information related to digital skills and training	Text long answer

Appendix B – Digital skills survey results

This appendix provides the results of the survey questions and is organised by each of the seven sections of the survey.

The materials for this study can be subdivided into five different types:

1. Section 1 - About you and your organisation

2. Section 2 - About your organisations requirements for basic digital skills

3. Section 3 - About your organisations requirements for advanced digital skills

4. Section 4 - Digital tools and technologies

5. Section 5 - Pathways into digital jobs

6. Section 6 - Future digital skills needs

7. Section 7 - Diversity, equity and inclusion of the digital workforce

8. Section 8 - Any additional information

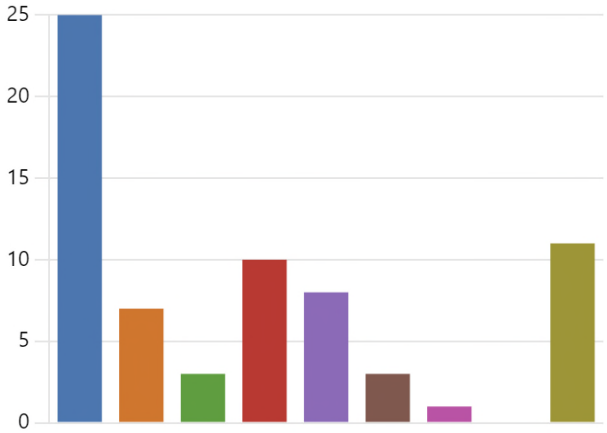
Section 1 - About you and your organisation

1. Where is your organisation located?

North Wales	64
Rest of Wales	0
England	0
Other	4

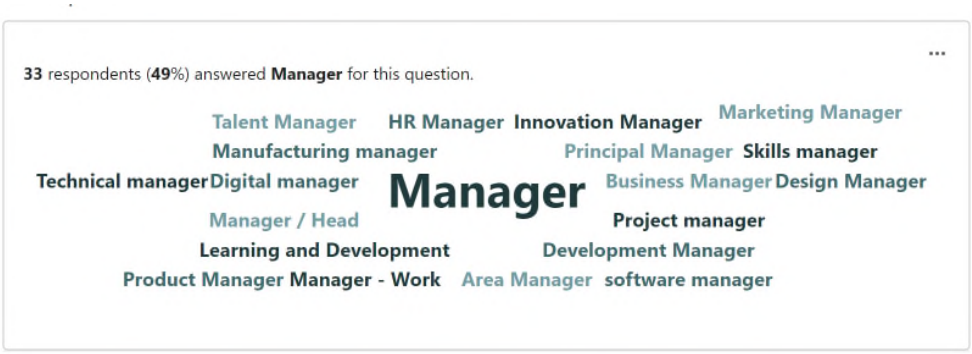
2. Which industry / sector does your organisation operate in?

Digital, data or technology servi...	25
Manufacturing	7
Financial services	3
Health and social care	10
Local government	8
Education School, college or uni...	3
Training provider	1
Retail	0
Other	11



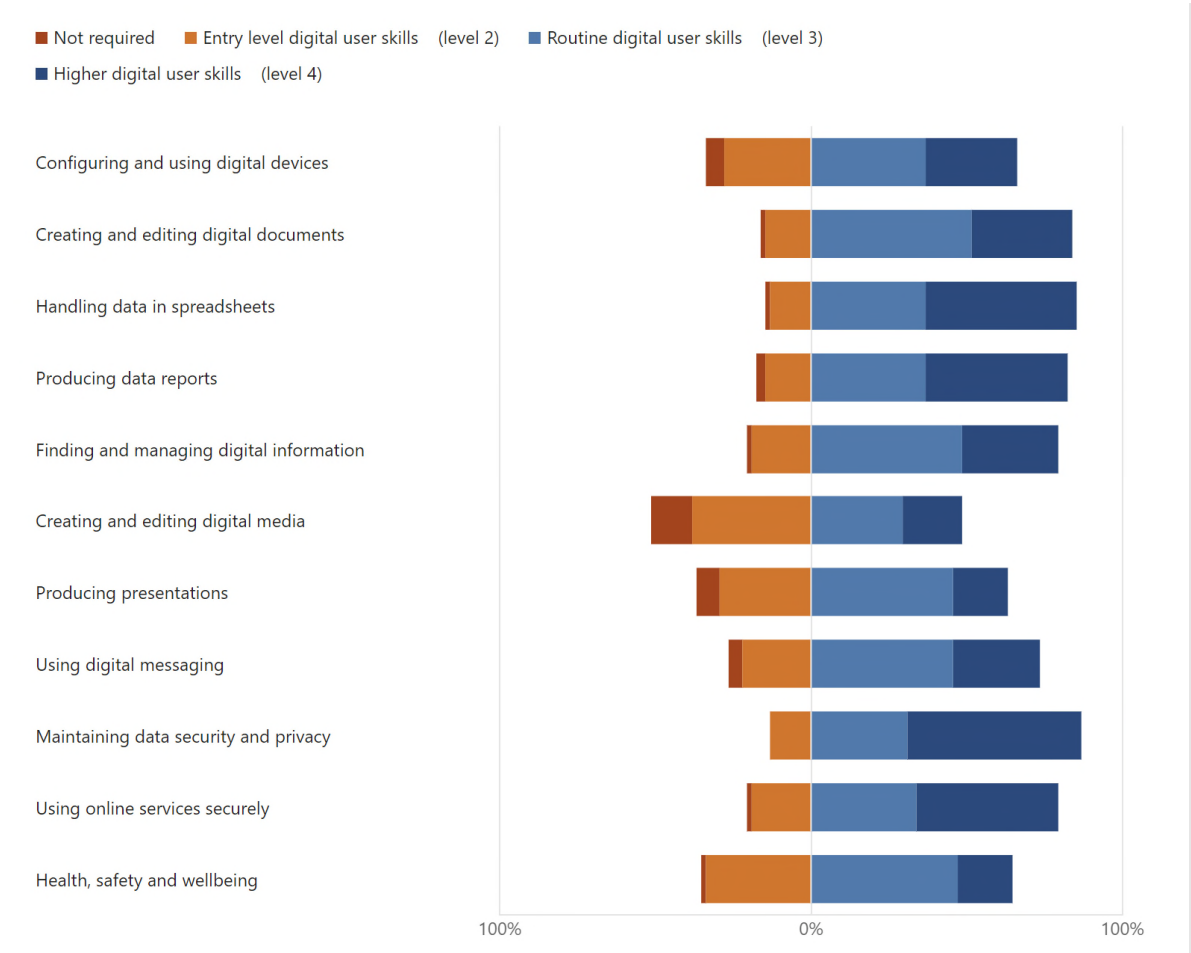
3. What is the approximate size of your organisation?

4. What is your job title?


33 respondents (49%) answered Manager for this question.
Talent Manager
HR Manager
Innovation Manager
Marketing Manager
Manufacturing manager
Principal Manager
Skills manager
Technical manager
Digital manager
Manager
Business Manager
Design Manager
Manager / Head
Project manager
Learning and Development
Development Manager
Product Manager
Manager - Work
Area Manager
software manager

Section 2 - About your organisations requirements for basic digital skills

5. What is your organisations requirement for basic digital skills in the workplace?

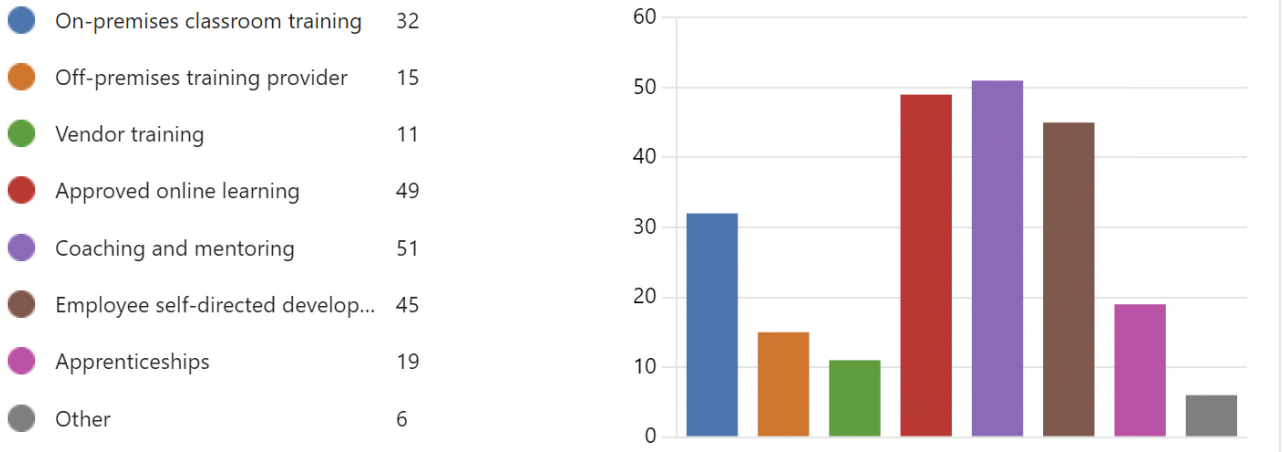


6. Are there any additional basic digital skills not listed which are important?

1	Within my organisation skills in games engines and digital art software is a must.
2	Utilising efficiency tools in AI etc.
3	As things move on staff will be required to do more recording and completing of digital records. This will become an issue due to skills of individuals.
4	Understanding of computer networking, basic coding.
5	Code writing. Software engineering. Digital sales and digital business leadership
6	Programming
7	Designing and developing digital products (software) Using Cloud Services Supporting Software products
8	This can range from very basis entry requirements to someone that will need to work on various digital platforms and packages on a daily basis.
9	Health systems, Office 365
10	Cyber security and data protection are particularly important
11	We would like to have the ability to incorporate EDCL skills into our recruitment process.
12	Accountancy packages such as Sage and NetSuite ERP
13	Automation
14	Data fluency is becoming essential across roles
15	Understanding digitally enabled processes, automation of MS office

16	Higher level Excel programming and automation. Assembly and drawing systems. Document management. Auditability and traceability.
17	We require integrated basic and some advanced digital skills as a manufacturing component supplier
18	PowerBI
19	Microsoft Dynamics CRM, PowerBI, MS Office coding
20	Digital CRM, MS Office integration/automation/programming, Google collaboration tools
21	Scripting / coding
22	Basic network environment and cloud systems
23	Collaboration tools, planning and scheduling
24	Healthcare applications, data driven decision making
25	PowerBI
26	Improving the digital skills of the inductees is core to unlocking opportunities and I think that digital cultures is missing and essential
27	Digital application maintenance, enhancements, testing, implementation, training and support, business continuity and disaster recovery, back up, performance testing.
28	Troubleshooting methodologies

7. How do you provide workplace basic digital skills training to employees?



8. Are there any gaps in meeting your basic digital skills training needs?

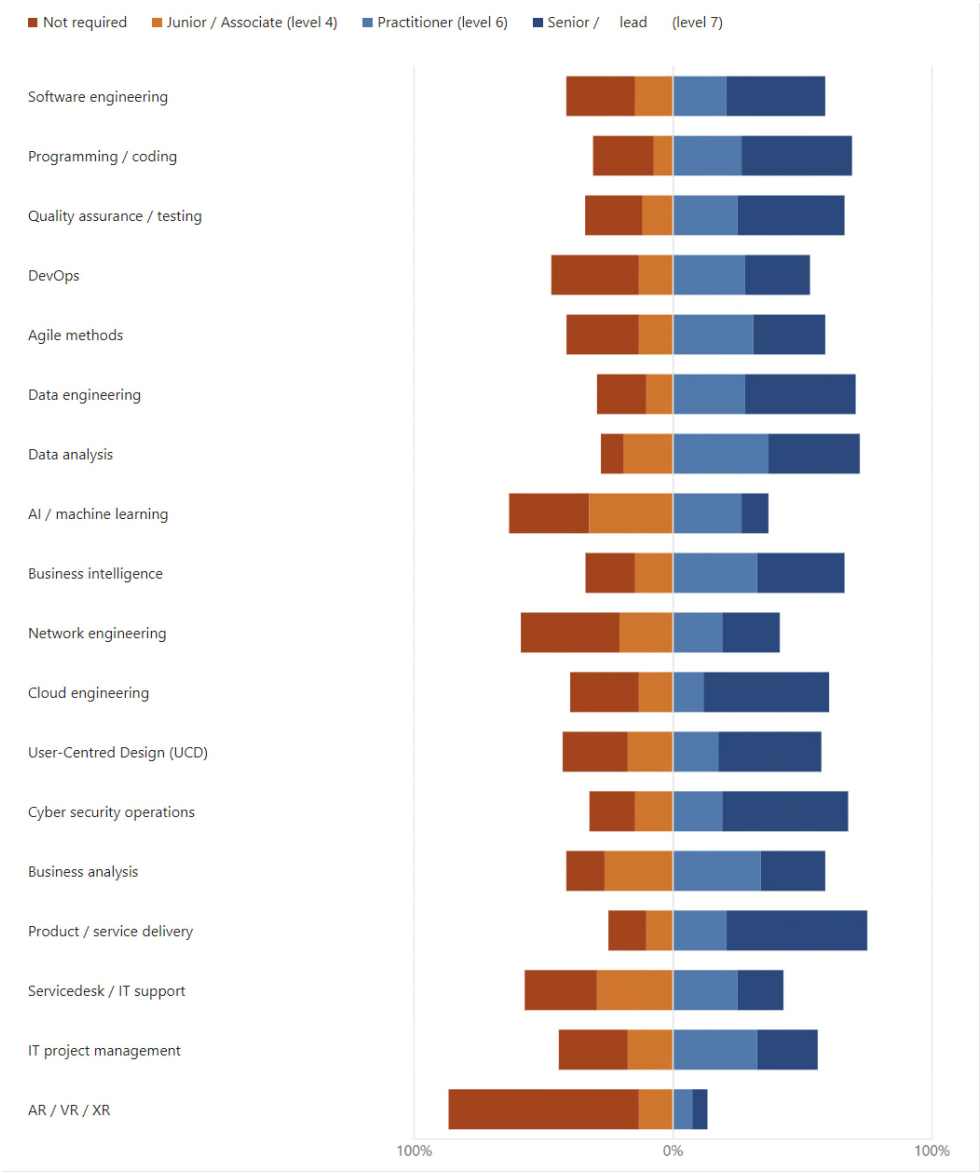
1	Not many people at all in North Wales have the digital skills to develop VR and AR applications.
2	People do not come with the training that I need. I have to give it to them and some of it is fairly basic programming stuff.
3	As we become more digital this will highlight more gaps
4	understanding basic coding
5	Confidence
6	Not enough new talent with higher level digital skills coming though and staying in the area.
7	Not looked for digital skills training in N Wales (assumed non existent).
8	Short bite sized workshops to cover specific topics. Online resources for self-directed learning in a structured way.
9	Staff feel left behind in the digital age. We need basic collaboration training, along with social media awareness, cyber security and AI training
10	Gaps will vary from each employer and partner.
11	Available courses
12	Microsoft 365 - Teams Sharing files/share point/Excel
13	The accountancy apprenticeships are focussed on AAT end exams and do not support apprentices to develop work-based skills
14	Applied skills rather than theory Automation
15	Getting applied foundations to build upon
16	Delivering applied real world data literacy
17	Automation of processes, PowerBI
18	We look mainly to online training that can be sped up / slowed down and timed to meet needs. We undertake a culture of structured self-development.
19	Advanced excel for engineers, using office packages to provide engineering specification and documentation
20	We require competent IT literate engineers and support staff. Much work is documentation, operating procedures etc, with embedded visuals. Develop process flows through documentation and spreadsheet scripting and using and MRP database.
21	Blend of high level basic with advanced digital skills
22	Linking digital systems cohesively to support needs
23	Healthcare staff needs vary significantly
24	Collaboration technologies
25	Certainly, a medium resource requirement can help many organisations
28	I don't confine sourcing training to within north Wales. Training providers are often national and international especially for recognised qualifications such as BCS, Microsoft certifications, ITIL, ISTQB etc
30	Mainly with older employees who have or do not use digital skills elsewhere
31	Online training is from national / international sources
32	Lack of budget for specialist training by external training providers

9. Are there any issues in providing basic digital skills training for females or those with protected characteristics?

1	No issues, but lack of representation within the industry.
2	You have to be careful if you put a man in charge of it. They will teach from their perspective, the male perspective is a key reason many women are put off the industry.
3	Not accessible for those with dyslexia or similar, in particular SCW have offered no further support or accessible information on registration to these groups.
4	A lot of training is now being delivered in virtual classrooms rather than in-person due to the challenges of having to travel to a venue, but this may not suit some people with a neuro-divergent learning style or disability.
5	From a programming perspective, all that stops you going forward is your imagination.
6	Age related reluctance to learn new things
7	English and online courses can be difficult or seen as a barrier for overseas workers
8	Challenges with those in caring roles and older workforce in terms of access to devices and using systems. Not every system is fully bilingual which provides language barriers.
9	Some training lacks female empathy
10	Professional applied skills
11	Need management level strategy for inclusive development
12	Stereotypes in training delivery
13	Classroom courses tend to be male led and fast paced, we are moving towards more experiential learning where skills can be developed and applied in the working context.
14	Age related engagement
15	Financial services apprenticeships lack required digital skills
16	M-SParc's annual research shows a gap in the sector , a pay gap. No training needs.
17	I would like to see more training to get different people into digital careers

Section 3 - About your organisations requirements for advanced digital skills

10. What are your organisations requirements for advanced digital skills in the workplace?

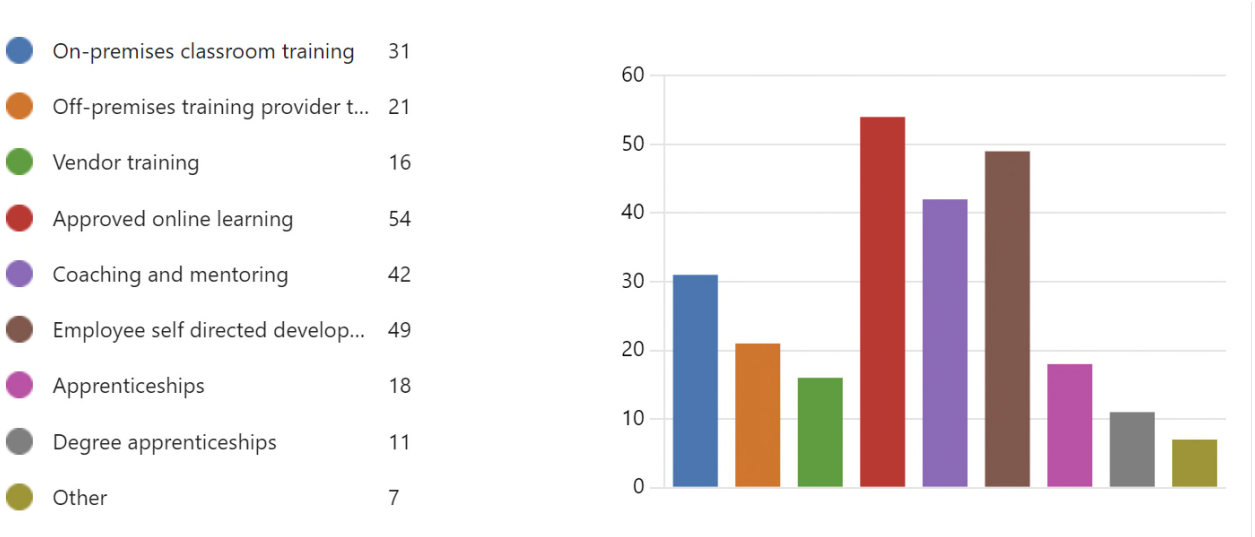


11. Are there any additional advanced digital skills not listed which are important?

1	CRM/Business management tools
2	The pace of change is very rapid so skills requirements are changing fast. It seems likely that we will soon need skills in AI and machine learning at a higher level. Managers in this field need to be able to keep abreast of emerging technology and have support in considering how it can be used for the benefit of the organisation.
3	Sensor data and IOt. Spatial data and visualisation tools.
4	IoT & Lora Wan, Mobile application and management (MDM)
5	Game development / testing in context
6	Engineering databases including MRP, ERP, inventory management
7	Full Stack Software Engineer

8	SharePoint / PowerBI
9	UX, Service Design, Product Management
10	We need a balance of basic and advanced digital skills in an engineering context. We run SAP ERP, inventory management and control systems that are migrating to cloud, We need programming, and understand data structures as engineers not IT people.
11	We don't produce software we produce components, but need software skills to support the processes. Tech leadership. Industry 4,.0 Additive manufacturing
12	Industrial automation Software design for reliability Algorithms
13	Digital leadership, product management
14	SQL reporting, PowerBI programming, MS Dynamics CRM
15	Data visualisation, PowerBI
16	Software design / architecture
17	Digital leadership
18	Test driven development, digital leadership, design principles OOD, SOLID and patterns
19	Senior level appreciation of digital, Fintech, product management
20	We outsource this work to our tenants.
21	Technical architects, product owners, project or programme managers, trainers
22	System design/architecture
23	model-based Matlab / Simulink, software calibration, software validation using HIL, SIL
24	automating web browsers, behaviour driven -development
25	Change management, DBA, Microsoft365

12. How do you provide advanced digital skills training to employees?



13. Are there any gaps or issues in meeting your advanced digital skills training needs?

1	Lack of digital skills in the area.
2	Knowledge gaps
3	We have no one on site that is IT qualified we have IT providers
4	People with these skills do not hang around in Wales, and the wages are comparably lower to the cities.
5	care plans and medications to being planned to be all online. Internet can also be an issue at times
6	Very little after initiation support from academia for college or degree apprenticeships.
7	Yes, lots! There isn't enough provision for advanced level skills outside degrees and college courses.
8	Had never considered looking for specific digital skills training in north Wales
9	There needs to be more mini-hacks, more community programs and a chance to bring people together. More talks by professionals would be great to see + a chance to encourage others.
10	There are no computer game developer apprenticeships
11	Available courses
12	Local providers offer the degree level apprenticeship which we access
13	Basic outlook skills e.g. excel
14	Practical use of engineering solutions and advanced spreadsheets for engineering
15	Proficient software engineering and product delivery
16	PowerBI programming
17	ETL, Python Pandas NumPy
18	Attracting the right calibre staff in North Wales
19	In some areas such as UX / service design and product management
20	The overall progression pipeline needs to attract and support learners in North Wales into tech careers
21	Experienced staff will self-develop, but need new entrants with good grounding first
22	Vocational learning of integrated tech with projects to embed skills
23	Again, we look mainly to online training that can be sped up / slowed down and timed to meet needs. We undertake a culture of structured self-development.
24	Digital systems for engineers - ERP data handling, input, governance, and some programming. Also, from earlier embedded Excel programming to get engineering processes and systems digitised.
25	Manufacturing digital programming C#, CNC programming. CAD programming and modelling. MRP.
26	HMI and SCADA
27	PowerBI, CI/CD
28	Delivery models different for new hires / existing staff
29	Having the courses fairly local should help in terms of costs
30	As previously, it is appropriate to seek training expertise nationally and globally, not confined only to north Wales

31	Microsoft training - Azure, M365
32	Cloud platforms
33	We blend online and self-study with coaching and mentoring to achieve the skills needed for different projects
34	Yes, full DevOps tooling and development
35	Lack of budget for specialist training by external training providers

14. Do you experience any hard to fill roles or have retention issues?

1	3D artists and developers that work with games engines.
2	Yes, due to public sector pay limits
3	Some difficulty providing skilled workers/brain drain
4	If I want them to be Welsh...yes. If I employ further afield no problem.
5	Yes, Recruitment in the advanced digital skills is very difficult. We use the apprenticeship degree programmes to develop those skills in house.
6	affordable software engineering skills
7	Yes, there is intense competition for high level skills. There is significant movement of talent between companies in the region, especially around tech hub areas.
8	Very difficult to fill experienced/senior roles
9	Software Developers e.g. Java developers and automation testing engineering skills. Data analytics.
10	Yes.
11	Lots of our clients have older tech, which is over 5 years old. Most people coming in at senior level do not have enough basic skills to cover older tech.
12	There is little or no active interaction between colleges and universities in North Wales. We have tried and it is pointless. Generally positive feedback, no activity, not a priority.
13	Yes, hard to attract all skills we require for some roles.
14	Yes, severs, losing people due to pay and public sector partners
15	Experienced user driven developers
16	Software, DevOps, Business Analysis, Cyber
17	PowerBI developer
18	Data engineering / data programmer
19	Yes, well rounded technology aware product delivery with a customer focus
20	Finding experienced digital tech staff is difficult, recruiting from school / college is a longer process but the school curriculum does not provide an applied digital operations focus
21	Work ethics, salaries can't compete with other areas in Wales / UK
22	Business focussed tech people and technology focussed business managers
23	Often there are challenges if the need is urgent (staff leave and need replacing). Need to balance with growing skills - but they may leave. Not enough new talent to flow into advanced digital skills roles and then remain medium term or longer.
24	There is a challenge across most higher-level roles. We proactively look for available talent.

25	Digital engineers
26	Engineering problem solvers with strong digital skills.
27	software developers for HMI and SCADA
28	Experience develops, data pipeline engineers
29	Power BI developers
30	Business focussed tech roles
31	It depends on those available at our times of need to recruit, ideally would link to schools, colleges, universities but difficult to attract to small business.
32	Game programmer
33	Tech roles in general
34	Difficult to recruit IT staff at lower and higher level.
35	It has been difficult because of the language requirements and we see apprenticeships as the best way forward
36	Quality for senior roles is challenging
37	Qualified Microsoft specialist technicians
38	Cloud engineering
39	Motivated self-adapting professionals across tech stack
40	Experienced embedded software engineers
41	DevOps engineers, product owners / managers
42	Digital roles are harder to fill than technical roles. The requirement to communicate bilingually is essential for our jobs

Section 4 - Digital tools and technologies

15. What are the most important digital tools and technologies for your organisation?

1	Unity and unreal games engines, blender, 3ds max, photoshop, Substance painter and designer, Web GL, VR, AR, Mixed reality
2	Public facing web enabled technologies as well as those used to deliver operational services via digital devices
3	Microsoft 365 Trello Outlook Teams
4	Basic Desktops, Laptops and tablets as well as smart phones
5	AWS, Git, PHP & JavaScript.
6	Cloud management, cyber security
7	care plans online medication planned to be
8	Computer programming, managed network, RFID technologies, scanners data capture devices
10	Care planning and digital care notes software
11	Handheld devices including tablets and smart phones Laptops Desktops Variety of software including rota systems, care plans, phone apps, accounting systems, data trackers, marketing trackers
12	Cloud platforms and data science tools. Various programming languages stacks.
13	ASP.NET/C#, JavaScript, PostgreSQL, Cloud Services (Azure, AWS, Google), HTML/CSS, Java Some Python/R
14	Microsoft packages – Word, Excel, Power Point, Outlook Custom databases built in Microsoft Dynamics Online research and critical thinking about online sources of information Cyber security Data protection and UK-GDPR Communicating with customers on digital platforms especially Teams Collaboration using Teams, One Drive, Engage Document filing and organizing.
15	Google business apps Design tools - figma Code and deployment tools Customer support tools CRM's and management software
16	C#, Angular, Azure and AWS Cloud
17	Google Drive and One File plus Teams and Zoom
18	GoLang, VueJS, PostGRES, AWS, Google Cloud, InfluxDB, Flink, Parquet, Firehose, PostGIS, Leaflet, Openlayers.
19	Digital Dashboards , Learner Record Systems , Educational software
20	C, C++, Unity
21	Ipads, laptops, smartphones and some other health and social care devices and packages.
22	Health systems, Office 365
23	Robotic interfaces, digital forms development platform, SQL, Microsoft 365
24	Microsoft office and Cisco Jabber.
25	As above MRP, ERP, inventory management, spreadsheets
26	Acquaint CRM, AgentPro, MS Office Word and Excel
27	Microsoft office emails accounting software
28	Microsoft Dynamics 365 Power Platform Azure CI/CD Patterns and Pipelines

29	SQL, Zscaler, GitHub, Terraform and AWS Copilot
30	Microsoft 365 Excel PowerBI Trello
31	ETL, Python Pandas NumPy, SQL
32	AWS SQL JavaScript PHP GitHub
33	Agile cloud development
34	.Net Core MVC Azure, React.JS SQL
35	C#, ASP.NET MVC SQL HTML, CSS JavaScript Entity Framework
36	Microsoft Azure Cloud, SQL, Git, Java, Python
37	SQL Azure cloud AWS cloud JavaScript ASP.Net
38	The office packages, Word, Excel fully applied. SAP ERP SAP Inventory management 2D and 3D SolidWorks
39	SolidWorks Inventor MRP Microsoft Office eco-system Additive manufacturing
40	HMI, SCADA programming, C/C++, Java, Python, Siemens TIA, algorithms
41	Power BI, SQL Server, SSAS, SSIS, Azure Data Factory, Azure Synapse.
42	MS Office, PowerBI, SQL reporting
43	MS Office, Azure, PowerBI, Python, SQL, Java, Google collaboration
44	Programming C#, Python, MS Azure, SQL, JS
45	AWS, SQL, C++, JavaScript, Git
46	Office, Excel, reporting, planning and scheduling
47	.Net, C#, Azure, MVC, RESTful, SQL, Solid
48	Interactive devices, Office, data reporting and visualisation, security
49	Agile / SCRUM, JavaScript, HTML, CSS, SQL, CI/CD, software design methods
50	.Net Core, ASP.Net, C#, MVC, Azure, React.JS, MS SQL, CI/CD, HTML
51	Providing a connection to the web, providing Wi-Fi, providing a podcast studio, providing marker spaces.
52	PC, iPad, iPhone, IT software
53	Microsoft software as a whole
54	Cloud technology, IT security and strong project management are in high demand
55	MS Teams, BI, ERP
56	Azure IaaS, Microsoft Defender / 365 security products
57	Basic document and spreadsheet skills. We are Google Workspace based.
58	Cloud platforms and infrastructure, AWS, MS Azure, SQL
59	Cloud data / infrastructure and cloud applications
60	Databases, IoT, tracking, parts, coding
61	developing software for engineering control systems embedded C
62	CI/CD, Scripting & DevOps tools Selenium web automation Continuous Integration tools (Jenkins & TeamCity) Working in agile teams with JIRA release planning and tracking Behaviour-based development and testing for Java applications using JBehave, Cucumber and SpecFlow
63	.NET 7, MVC, C# and SQL Server JavaScript, React, Vue.js, TypeScript, Azure, AWS, Agile, TDD, BDD

64	Microsoft365 platform used by 2,850 workforce, platform configuration a significant task for Digital Service In-house development (team of 22) using a range of languages - mainly C#.NET but more recent move to PowerApp Platform, especially Sharepoint. Python, JavaScript, HTML are still widely used. One example of historical use of COBOL still exists!!CISCO network technology is the main technology for the network side OS platforms
65	C# Java Python Git/GitLab SQL

16. What digital tools and technologies do you require for new entrants?

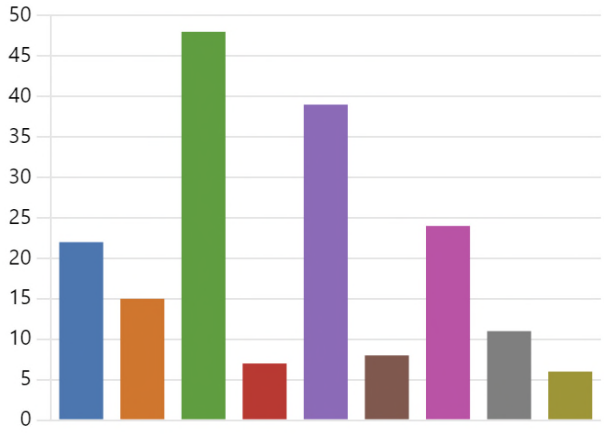
1	Unity and 3d modelling software.
2	This is dependent on role and varies from use of iPad/iPhone with internal apps to full digital skills from L4 upwards to those in enabling roles using Microsoft 365
3	AWS, Git, PHP & JavaScript.
4	All employees need basic skills and in more technical roles they need advanced skills
5	Microsoft
6	Good use of it, spreadsheets, trackers
7	Unsure as there are a number of roles that do not require digital skills
8	SQL, C#, Java, Python, Cloud Platform Tooling, Git, Containerisation. The list is quite extensive in the ideal case.
9	Developers - Senior ASP.NET/C#, JS, HTML/CSS Design - UI/UX Operations - Security/Cloud
10	Microsoft Teams, Dynamics, Word, Excel, Power BI, Power Point.
11	All google business apps
12	C#, HTML, CSS, TypeScript and SQL
13	basic digital literacy
14	We are looking for an attitude/approach and general experience in OOP, JavaScript, Cloud. It would be hopeless for us to expect new entrants to have a perfect skill set.
15	Educational software
16	C, C++, Adobe substance 3D, Unity
17	Laptops, emails, eLearning, smartphones and ipads.
18	Basic understanding Office 365
19	Laptops and MS 365
20	Use of MS office.
21	Spreadsheets MRP / ERP
22	Word and Excel
23	Office skills and data handling
24	SQL server C#
25	SQL AWS
26	Excel + macro-Programming
27	Python, R or other similar programming languages SQL
28	SQL JavaScript

29	Cloud technologies, Azure / AWS, appreciation of full stack iterative development
30	ASP .Net C# Java script SQL Azure basics
31	SQL ASP.NET JavaScript
32	Microsoft Azure Cloud, SQL, Git, Java, Python
33	JavaScript ASP.Net SQL
34	Excel / Word - scripting ERP 2D / 3D Programming
35	3D CAD CAM CNC Database Microsoft Office eco-system
36	Programming proficiency in at least one language (C/C++, Java or Python) preferably more PLC programming
37	SQL Server, Excel, PowerBI, MS Azure
38	Advanced MS Office configuration, PowerBI fundamentals, SQL
39	MS Office (advanced Excel), PowerBI, SQL, Java
40	SQL, Python, Cloud awareness, JS
41	Motivation and to have digital awareness across the usual tools Office, Python JavaScript, SQL, AWS
42	Office, project planning, problem solving
43	.Net, C#, Azure, SQL
44	Digital literacy
45	SQL, JavaScript, HTML, scripting
46	.Net, Azure, SQL, HTML
47	Laptop
48	PC, iPad, iPhone, IT software
49	Technology blindness is important
50	Cloud, AI, infrastructure awareness, business awareness, project processes such as PRINCE2, testing and quality assurance techniques
51	Basic use of a computer
52	Azure IaaS, Windows Server infrastructure management, Security services
53	Basic understanding of terminology and editing and creating documents
54	Cloud technologies, cloud databases, SQL
55	Basic development and testing. ability to handle data / model data, cloud awareness
56	Sound data handling in spreadsheets and databases, good understanding of networks and cloud hosted applications, some macro / script coding and testing
57	c programming for engineering environments
58	Java coding, CI/CD, automated testing, Agile and DevOps concepts
59	.NERT, SQL Server, JavaScript, Cloud
60	CISCO, Microsoft365, C#.Net
61	C# Java Python SQL Version control

Section 5 - Pathways into digital jobs

17. Which pathways do you use for recruiting into entry level digital roles?

Apprenticeships level 3 - level 4	22
Degree apprenticeships	15
Graduates from degree courses	48
From sandwich degree placeme...	7
College leavers with vocational ...	39
School leavers (GCSEs)	8
School leavers (A-levels)	24
Traineeships	11
Other	6

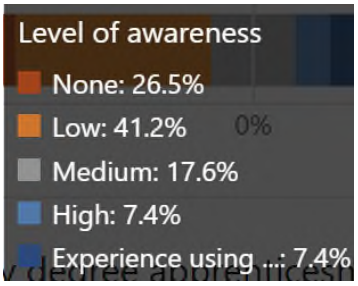


18. Please elaborate on your above answer if required?

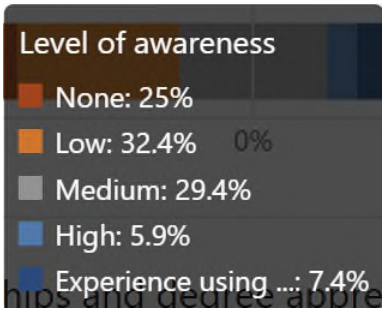
1	Link with Bangor uni and Menai Llandrillo, Glyndwr uni. however, I do look for portfolio and work ethic before anything else, drive and passion for new technologies is what I'm looking for, the rest can be taught on the job.
2	The level of digital stills we need is very high. Self-Taught to a very high level or graduates are the most common we find to be at the right level. Degree Apprenticeships are an option too for the right candidate now that our team has the skills and capacity to mentor them.
3	We haven't had much turnover in entry level IT roles. We did recruit one person through work experience set up through our links with a prison, who then secured a job with us on release and did an apprenticeship in the role.
4	Unsure as this would be dealt with by other departments
5	We haven't recruited higher level apprentices, we upskill internally
6	School leavers lack the applied software appreciation, but can be trained in context, but need a strong appreciation for work ethics
7	We try and recruit local at any level with the right attitude and mindset and a digital tech aptitude
8	We require a passion for digital technology, an inquisitive mind, and problem solving. Competing for the best graduates is challenging when we recruit as the lure of the big-name graduate development programmes seems to win. But we do see bright individuals who seek a different and perhaps more rewarding journey with greater responsibility and ability to adapt as we continue to change to meet customer needs.
9	There is a crossover with engineering education, apprenticeships and training.
10	Engineering / Computer science graduates
11	Awareness of digital opportunities and careers starting in schools, better aligned courses to real world

12	It varies from job to job.
13	We've tried engaging with colleges who do not teach the skills required. Graduates have generally not been interested in technical support services
14	This does not apply to our organisation
15	College / universities don't deliver the full real-world skills profiles to build upon. graduates are more prepared but are difficult to attract
16	We require experience developing software for engineering applications. This is sometimes seen as hybrid / crossover skills and not fully catered for in college and university courses.
17	We look beyond North Wales to Chester, Liverpool etc to find the right candidates with the right education
18	There is more of a shift towards degree apprentices recently rather than employing students on their year out in industry. A project is underway to make school visits to promote digital careers and Gwynedd Council as a digital employer.

19. What is your level of awareness of the digital apprenticeships available in Wales



20. What is your level of awareness of the digital degree apprenticeships available in Wales



21. What would improve your engagement with digital apprenticeships?

1	my engagement would be improved with potential apprentices getting in touch.
2	A wider level of digital apprenticeships available including Business Analyst

3	Greater links between industry and education
4	Awareness
5	The cost to reward ratio can be tricky for a small business.
6	More information, stronger links with colleges and universities - other training agencies
7	It's not something we need in our sector
8	we have a Grow Your Own apprenticeship scheme
9	There is a significant need to make sure companies understand what is needed from them to ensure the success of the apprenticeship. There is also a need to match the right candidates to the right environment. A 17 year old coming from high school is a VERY different prospect to a candidate with some college or industry experience. Career changers are very different to youngsters. Those that have started with college or self-taught are also very different to those completely new to the subject.
10	More information sent through via email updates, or an online open day
11	Awareness
12	People on degrees and other programs need to be a part of digital communities and be active and engage in those communities. It's not good enough to just have a qualification.
13	Making employers aware that they don't have to employ new staff as apprenticeships. They can utilise the funding to upskill existing staff for succession planning to create future apprenticeship vacancies
14	Colleges and Universities that respond to reasonable and properly motivated attempts to work with them to place undergraduates and other level 4 students into their locally based company. We have wasted several days with a north Wales college and three universities to absolutely no avail.
15	Awareness of gaming context
16	Greater offer and if the offer is available, a greater awareness and information sharing from N. Wales providers
17	Simple guide
18	We have not used these apprenticeships only the accounting ones, but data is increasingly important and knowing who delivers what and some simple awareness information would help
19	better awareness and linkages through schools, colleges and universities
20	Awareness in one place
21	Having the right candidates to progress through apprenticeships
22	Headcount availability for entry staff, better appreciation of not only tech skills but how these are supported in the workplace
23	Apprenticeships present an overhead in resources and time - what would help is better alignment of the skills to productivity.
24	There is an overhead in mentoring and supporting apprentices, and it is mainly about timing. Sometimes our new entrants want to develop at a faster pace and in different ways than the more systematic degree apprenticeships cater for.
25	Accessible information - when we have looked the access to information is limited and hard to navigate and not easy to determine who delivers what.
26	Central source of information - each college / university / training provider has different ways of presenting information to different degrees of detail.

27	A better blend of engineering and digital - ideally providing some digital modules on engineering programmes. the fit of content doesn't work for us.
28	Better fit of apprenticeship content to reflect up to date practices
29	What is available
30	Provider flexibility and awareness of solutions
31	Better national and regional apprenticeship navigation for employers to signpost to providers
32	There are no apprenticeships for game developer
33	Better understanding of the courses available, what they really deliver and how that aligns to roles
34	Contact with an Apprenticeship specialist - in all sectors
35	Being able to get more applicants especially women
36	Research and contacts within local colleges
37	Colleges engaging with us. Have been unsuccessful several times
38	if they were actually aimed at users rather than technicians/engineers.
39	Some enquiries, but not delivering the right content
40	Contact with colleges / universities
41	Better promotion / signposting of apprenticeships across technical disciplines - digital, data, engineering
42	Improved awareness, what they actually deliver, and who delivers them
43	The right content/skills being developed in applied holistic ways
44	Additional budget to offer career path

Section 6 - Future digital skills needs

22. What are the main digital skills that you forecast your organisation will need to develop or acquire to maintain its operational capability?

1	AI and automation to improve workflow.
2	AI, increased understanding and capability of understanding hybrid technology and advances in self-driving vehicles
3	Generative AI demystifying data ethics and IoT and SMART Building technologies
4	Cyber Security skills and to keep pace with new technology.
5	AI...but we can't get the people who are skilled in current technologies. It's one thing to be competent with AI, but if you can't build the software around it you are not much use to a small business.
6	AI
7	staff to be able to access and complete online records and reporting within data protection laws
8	Greater software engineering capacity, blockchain and AI
9	Systems thinking comparable tech
10	The visits of good digital skills for an office environment
11	Unsure as I do not know what each service requires
12	Cyber security, data science, operations research, very high-level computer programming, UX/UI, systems engineering.
13	Dynamics 365 PowerApps PowerAutomate Interacting with customers on digital platforms Data analytics Website design Video editing Agile project management Dev Ops Collaboration using digital tools Creating digital resources
14	Ai. Data analysis Iot and sensors. Spatial awareness
15	Web development is key. Mobile development is very important. UI/UX design. Business consultancy capabilities: Digital aspects are very important, but we need people can talk and engage with others who are not in tech.
16	The use of AI in work-based assessment
17	Software development, data analytics, technical support.
18	Automation
19	Coding, agile, cloud
20	Basic digital skills but also a mentor/buddy to support overseas workers and other new staff joining the sector. May also need to help with patients and residents and showing them how to use digital devices.
21	All listed above plus dev ops
22	Robotics, Automation, Data Ethics, AI
23	The ability to have new staff who are well-versed in MS office technology.
24	IOT, cloud, AI
25	Cloud based systems, advanced office, spatial data
26	next generation accountancy systems
27	Automation

28	Cloud, DevOps, agile
29	Automation, generative AI
30	Automation, NoSQL, PowerBI
31	Full stack Automation AI
32	Automated development, AI, full-stack
33	ReactJS Azure Devops REST API Development and Implementation
34	Responsiveness to markets, agile, automated development, blockchain and AI
35	We need to develop multi-skilled tech savvy data driven experts, who can deliver solutions that resonate with user needs. Deeper data skills, linking cloud-based solutions driven by Ux and service design.
36	Cloud expansion, deep data, AI/ML, automation, Ux
37	Cloud based engineering solutions, IoT, AI
38	Cloud based engineering and digital systems. IOT Advanced scripting for MS Office Integration AI Additive manufacturing
39	AI, algorithms, automation, IIoT, Industry 4
40	Full BI stack, MSAzure, AI
41	Higher MS Office integartion, full stack Power BI
42	AI, PowerBI, data visualisation and reporting,
43	UX / UI, software automation, AI
44	Cloud integration, SQL, programming, foresight, digital leaadsership
45	PowerBI, data reporting
46	.Net, C#, Azure, MVC, RESTful, SQL, Solid
47	Digital literacy, data, security, collaboration, new systems and health IoT
48	AI, automation, UI/UX
49	Azure cloud, SQL, C#, JS, automation
50	AI without a doubt, but maybe not as AI Developers but as people who discover it and come up with the ideas for it.
51	AI, Cyber security plus more
52	Analysing and creating data software
53	Skills across project lifecycle, awareness of emerging trends, cloud technology
54	AI, Data analysis
55	Security, SASE, IaaS, networking and some AI but targeted use cases for SME / SMB
56	Software is now available to manage the support we deliver to our individuals, there are also emerging devices which we have yet to look into.
57	Cloud migration, hybrid cloud infrastructure, cloud architecture, cloud troubleshooting
58	Digital technology developments, coding , data -driven, role of AI
59	Cloud data, AI, cyber security, leadership
60	Innovation, AI support for embedded systems development
61	DevOps automation, container orchestration platforms like Kubernetes, implementation of microservices architecture AI in automated development

62	automated code development and testing, Generative AI to support fast code development
63	There is already a movement towards Artificial Intelligence, the Internet of Things and the data side (scientists and visuals), but core skills will still be dependent on the main aspects needed today.
64	C#, CI/CD, automation, AI

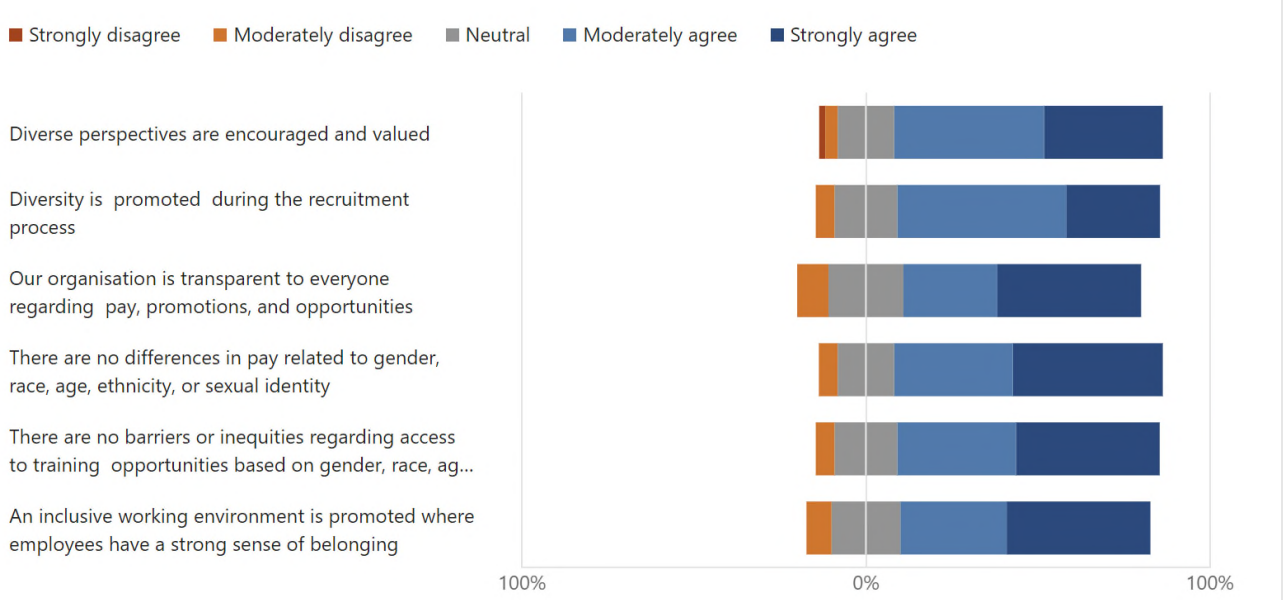
23. Do you envisage there is training provision to meet your future digital skills needs?

1	Not sure
2	There needs to be training provision, but nothing planned
3	Cyber Security
4	Probably not
5	hopefully
6	Unlikely on a larger scale
7	Yes
8	NA
9	unsure
10	Yes, by working closely with the local Universities and making use of high-level online
11	A wider variety of higher level and degree apprenticeships would help to meet digital
12	Not sure
13	Not at present. We tend to be reactive rather than proactive
14	There is - from our perspective - no training provision in North Wales.
15	We would self-plan learning - and seek graduates with those skills
16	Ongoing training as and when and will need to make use out of the existing resources
17	Yes, it is available
18	We are not aware of the full offer from local colleges
19	No. My understanding is that schools no longer teach MS office systems.
20	No
21	Some
22	For experienced staff but not necessarily early talent career progression
23	Not currently
24	Unsure
25	As above the right candidates with the right applied learning
26	Unsure
27	Unlikely
28	It's a balance of content and the right candidates lining up
29	We follow developments and consider as a learning organisation identify the right
30	We will find and assess what we need when we need it.
31	Unsure since we last explored this.
32	Not the balanced approach
33	No
34	Not sure what is available currently

35	Some
36	Some
37	Yes, but needs to be delivered accessibly
38	I believe that there is good provision - but that people may not understand it.
39	I do not know
40	Good quality training at cost effective prices is essential
41	only partially
42	Not easy to map training to needs / timings
43	No
44	Not in North Wales, but we do some work with Universities in Liverpool / Chester
45	Partly

Section 7 - Diversity, equity and inclusion of the digital workforce

24. Approaches to diversity, equity and inclusion for digital roles



25. What positive actions does your organisation undertake in its approach to diversity, equity and inclusion for digital professionals?

1	Inclusive hiring practices, ongoing training, and development programs. being a part of the LGBTQ+ community and a woman myself, I do get people coming out for the first time to me, I like to think I am someone people feel conferrable sharing things with and foster a supportive working environment. I have a lot of people asking me questions on LGBTQ+ matters in the workplace, so educating in things like Non-Binary and helping the team to understand also has helped our Non-binary work experience member feel welcomed by the team with the team using their correct pronouns, this goes a long way. I would in the future like to offer support for employees in terms of help with transitioning as the NHS has a huge backlog and waiting list in this area and is something I've seen US based companies do which encourages trans people to go work for them. I also keep strong ties with the LGBTQ+ Games developers community.
2	We have a 3 year D&I plan, are exploring diverse recruitment routes and are a member of the Apprenticeship Champions Diversity Network sharing and learning from best practice
3	Positive discrimination
4	None
5	35 hour working weeks without overtime, flexible hours, 30 days + bank holidays leave - these things make it easier for people to look after themselves and make us a more appealing place for the neurodiverse, parents etc. Training and awareness amongst staff of the issues of diversity in the sector.
6	For customers we have all front line staff trained in digital skills and train the trainer courses. We also have a higher level of digital volunteers who can help customers on a one to one basis to improve their skills. At recruitment we interview anyone who meets the essential criteria and have a disability.
7	not at this time

8	Open to all applicants, any provision or additional needs considered.
9	Training
10	We are not digital professionals, this survey does not apply.
11	I don't within the digital teams so i would not know
12	Our culture is very open with a leadership that makes a point of giving everyone an opportunity.
13	N/A
14	Working with Pen Coed prison to take a prisoner on work experience. Blind shortlisting for all posts. Interview panels have a gender balance and questions are given 24 hours in advance. Fully agile working has enabled us to recruit more ethnically diverse people who live in England and Scotland. We offer flexible working which tends to be popular with women and those with caring responsibilities.
15	We see human beings with skills, treating everyone with respect. The only difference we care about is what skills a person brings to the table.
16	The same as for any other staff member. All have equal opportunities in the workplace for training, promotion, etc
17	Trying to promote the sector to overseas workers and encourage them to be part of the teams. Support them into the workplace and help with any barriers the come across.
18	Equality tam and policies
19	Opportunities are open and transparent. A review of recruitment practices has also been undertaken
20	N/A - outside my area of expertise.
21	Diversity training
22	Not aware of any
23	Diversity and inclusion strategy
24	D and I plans
25	None
26	Culture of appreciation
27	Promotes D&I awareness and training
28	What is important is mindset, work ethics and willingness to adjust to a customer focused development environment regardless of gender, ethnicity, disability needs.
29	We recruit and develop the best people we can to contribute to our goals regardless of gender, race disability or any other basis.
30	Awareness and open culture
31	promotes awareness, and inclusivity
32	Proactive policies and awareness
33	equal treatment - just the ability to do the role
34	Cultural awareness promoted
35	Diverse workforce, strong ethics and policies
36	Clear strategies and policies are in place
37	We use role models to promote jobs and careers, engage with youth and young people and show the interesting variety of jobs available.

38	We are a Welsh language organisation, therefore attracting more Welsh first language people. But language is not a barrier to work here. Like Wales we tend to be white, so the organization needs to work on employing a workforce with more ethnic diversity in order to create a better place of 'belonging'
39	Strong policies
40	Ongoing training coupled with robust processes and procedures. Transparency and appropriate escalation or grievance processes
41	Awareness training, policies
42	Positive culture, recruit and promote the best talent regardless of gender, ethnicity etc

26. Are there any barriers to diversity, equity and inclusion for digital professionals?.

1	We are still in a world where most CEOs are men, Unconscious biases during the hiring and promotion process may favour certain demographics, hindering a diverse workforce. Limited representation of certain groups in leadership roles and decision-making positions can also discourage diversity. Limited awareness and education about the importance of diversity and inclusion can contribute to the perpetuation of biased practices. A workplace culture that is not inclusive or does not value diversity can create an unwelcoming environment for digital professionals from underrepresented groups. To address these barriers, organizations need to implement comprehensive diversity and inclusion strategies, provide education and training on bias and inclusion, foster an inclusive culture, and actively work to break down systemic barriers that may exist.
2	Accessing the talent pool through recruitment
3	More visibility for less represented people is required.
4	None
5	The system is rigged against you if you have not done a computer science degree...even though CS graduates can be just as useless (often more so) than self taught / code camp graduates. Even now, computing as seen as a 'boys' vocation at primary school, the gender gap in computers is clear before IT begins at secondary school and it just carries on from there. There are numerous studies suggesting the way we teach programming systematically excludes none academic minds, women and minority groups. Excluding over 50% of the population does not seem particularly intelligent considering the staff shortages the industry faces.
6	limited IT skills as care workforce
7	No
8	We are not digital professionals, this survey does not apply.
9	Unsure
10	The tech sector is still seen by those not in it as a geeky place to work. This does not help and these days we should be well past this. In my experience this stigma is bigger than any gender or race bias.
11	We do not get many job applicants from ethnically diverse backgrounds.
12	I think there is a misunderstanding that anyone can program. After programming for 31 years, not everyone can program. I think too much focus is put on being inclusive in that "everyone can do this". I think what we need is more of a rugby mentality. Everyone is important, and everyone can do something to help move us forward, but everyone does not need to play in the same position.
13	None
14	English language

15	Currently looking at our workforce strategy to ensure no barriers
16	Not to our knowledge
17	N/A - outside my area of expertise.
18	n/a
19	We don't have digital professionals except the support engineer
20	Less representation in senior levels
21	broader cultural awareness
22	The gap in promoting and teaching a broad range of entrants to progress into tech roles, seems to start at school
23	No
24	There seems to remain a lack of diversity in those progressing into tech education through school, college / university.
25	Higher levels are male dominated, so there are no role models for gender, race etc
26	No
27	Very difficult to find women very often according to our research getting less pay than men,
28	No. But where jobs are advertised is a big factor with recruitment - an organization needs to expand the places it recruits.
29	No
30	Too many men in senior positions and subconscious bias is rife in IT
31	No

Section 8 – Any additional information

27. Please provide any additional information related to digital skills and training

1	There needs to be much more interaction between the Universities (not just the colleges) and industry across the board. There are too many barriers and silos between what for high tech companies is the primary source of relevant talent.
2	Where are roles advertised for recruitment. And where are candidates who have consented training made aware or sign posted to companies
3	Understanding what is available simply and clearly, are there costs
4	The rewarding potential of digital technology enabled careers needs to systematically be promoted through school, college and university to give a greater credibility, and those that are attracted need awareness of the career potential of small firms as well as those they are familiar with, but don't necessarily understand the roles.
5	We have engineering defined roles that apply the digital skills in context. Engineering courses don't embedd sufficiently the basic digital skills, and IT courses don't cater well for engineers.
6	Engineering / digital blend
7	Problems recruiting IT staff - adverts not attracting enough applicants. Employing an apprentice can help solve this problem.
8	Having to outsource all Microsoft training and recruiting from outside Wales and UK

The End