

Data and AI Skills in Scotland:

Closing the Gap for a
Promising Economic Future

Contents

Foreword	3
Scotland's data and AI skills gap: An overview for 2025	4
Executive summary	5
1. The state of data and AI literacy in Scotland	7
1.1 A broad spectrum of skills	8
2. Understanding data and AI needs	10
2.1 The role of a data strategy	11
3. Data and AI responsibilities	12
4. Addressing data and AI skills gaps in Scotland	13
5. The need for training and upskilling in data and AI	15
6. The barriers to implementing data and AI training	16
7. Data and AI hiring criteria across organisations	18
8. Data and AI skills of the future	19
9. Preparing for future skills needs	20
9.1 Equality, Diversity & Inclusion	21
Conclusion	22
The Data Lab's Data and AI Skills Framework	23
Methodology	24

Foreword

Securing Scotland's future as a digital leader



Scotland has a strong heritage in technology and innovation. From “Silicon Glen” in the 1960s to today’s leadership in fintech, life sciences, and digital technologies, the country continues to adapt to the evolving digital landscape. As digital transformation gathers pace across all sectors, themes such as data privacy, ethics, and governance have become central to economic and societal progress.

The Data-Driven Innovation (DDI) initiative is driving Edinburgh’s ambition to become the data capital of Europe by using data to address major global challenges. Across the country, City Region Deals are seeing investment in skills to drive job creation and inclusive economic growth. Meanwhile, national strategies, including the UK Government’s focus on AI and automation, have led to rising demand for skills in areas like data analysis, cyber security, and data engineering.

In Scotland, organisations are also seeking skilled professionals to stay competitive in their respective markets. According to Skills Development Scotland, the highest concentrations of digital workers are in Glasgow, Edinburgh, and Fife. But across all regions, the need for advanced data and AI skills is growing. The World Economic Forum predicts that roles such as Big Data Specialists and AI Engineers will be among the fastest growing by 2030¹.

However, we must ensure that no-one is left behind. Foundational data and AI literacy is becoming essential across job roles in every sector. According to Statista, in 2024, the global volume of data created, captured, copied, and consumed is an incredible 149 zettabytes². Coupled with the International Monetary Fund’s (IMF) estimate that 60% of jobs in developed countries will be affected by AI³, it’s clear that these assets will present both challenges and opportunities worldwide.

At The Data Lab, Scotland’s Innovation Centre for data and AI, we are working to close this gap. Through skills programmes, leadership training, and industry collaboration, we are helping to develop a workforce equipped for a data-driven economy. However, our latest research shows that data literacy levels remain below what is needed to meet current and future demand.

We believe that data skills, including foundational AI awareness, are fundamental to both current and future workforce development. For Scotland to stay ahead of the curve, and to capitalise on the benefits that data and AI can bring to the Scottish economy and society, we need to address these underlying literacy and skills gaps urgently.

Anna Ashton-Scott, Head of Skills, The Data Lab

1 reports.weforum.org/docs/WEF_Future_of_Jobs_Report_2025.pdf

2 www.statista.com/statistics/871513/worldwide-data-created

3 www.imf.org/en/Publications/Staff-Discussion-Notes/Issues/2024/01/14/Gen-AI-Artificial-Intelligence-and-the-Future-of-Work-542379?cid=bl-com-SDNEA2024001

Scotland's data and AI skills gap: An Overview for 2025

Why it matters



149
zettabytes of
data created
globally in 2024
(Statista)



60%
of jobs in
developed
nations will be
affected by AI
(IMF)



£16.7bn
could be added
to Scotland's
GDP by AI
by 2030
(PwC)

Skills in demand



Today's most used skills

- Data Collection & Management
- Cloud Computing
- Data Analysis
- Data Governance



Skills needed tomorrow

- Cybersecurity
- Data Privacy & Ethics
- Machine Learning & AI
- AI Governance & Compliance

Current literacy levels

56% of organisations rate data & AI literacy moderate to low

30% of educators rate student data literacy as high

6% rate student AI literacy as high

The skills gap

The most common AI skills gaps identified by industry leaders are:



Applying AI concepts



Machine learning knowledge



Sector-specific AI skills

Training landscape



Most effective delivery:
In-person workshops



Most common delivery:
Online courses

Barriers:



Lack of time



Lack of budget

Equality, Diversity & Inclusion

20%

of private sector
orgs have EDI
initiatives

50%

in orgs with
data strategies

Top strategies:

- ★ flexible training
- ★ continuous learning culture
- ★ inclusive materials
- ★ scholarships

Recommendations

- ✓ Role- and sector-specific training
- ✓ Blended learning models
- ✓ Standardised success metrics
- ✓ Long-term, targeted, scalable funding
- ✓ Cross-sector collaboration
- ✓ Leadership capability building

Executive summary

For Scotland to thrive in the future digital economy, data and AI literacy levels need to improve. Currently, levels are low across the public and private sectors. Consequently, the country is experiencing skills gaps in these areas. If left unaddressed, these skills gaps will impact Scotland's ability to remain competitive on a global scale.

The Data Lab undertook research at the end of 2024 to better understand Scotland's data and AI literacy. We surveyed over 500 senior managers from organisations across Scotland and identified where skills gaps are most prominent, and what skills Scotland will need for the future.

This report presents our findings and proposes ways to overcome these skills gaps. Supported by extensive desk research and evidence from The Data Lab's 10-year portfolio of innovation, community engagement and skills building, this analysis identifies key themes, challenges, and training opportunities to help inform policy and enable Scottish organisations to thrive.

Key findings:

- The majority of business leaders do not think their organisation has high levels of data and AI literacy, with most rating their organisation's levels as moderate to low.
- Many organisations across the private and public sectors do not offer any data or AI training, citing a lack of time, resources, budget, or funding as the main barriers.
- To prepare for future skills needs, leaders across both sectors say they would require government grants and external funding, alongside support in identifying skills development programmes, which are currently lacking.
- A lack of skilled personnel, budget constraints, and a lack of data infrastructure are the top barriers to using data and AI for policymaking.
- Overall, 30% of educators surveyed (across higher education, further education, training providers, skills development, and careers development) rate the current level of data literacy among their students/learners as very high or high. Whereas only 6% say the same about their students/learners' AI literacy.
- Over half of educators say their data and AI literacy courses are mostly aimed at intermediate and basic/awareness levels, which demonstrates a need for more advanced-level training.

Recommendations:

- ✓ Policymakers, educators, and industry leaders should act to implement practical, sector-specific training programmes that enable workers to engage with data and AI confidently.
- ✓ Effective training needs be tailored to specific roles and sectors to ensure organisations do not miss opportunities for innovation. Policymakers should prioritise role and sector-specific programmes that address the varying levels of data expertise in Scotland. Likewise, standardising success metrics will ensure training delivers measurable improvements in productivity and profitability.
- ✓ Data and AI training needs to address time and resource constraints. Policymakers should champion blended learning models that integrate ethics and compliance training to encourage responsible data and AI use.
- ✓ Policymakers should take the lead in encouraging partnerships between the private, public, third, and education sectors to ensure that funding and resources do not limit opportunities for upskilling.
- ✓ Funders and policymakers need to take a targeted approach to training directing funding where it will have the greatest impact. Funding should support both rural communities and high-employment regions such as Glasgow, Edinburgh, and Fife.
- ✓ Scotland needs to move away from temporary grants and invest in multi-year, scalable skills programmes. The Scottish Government and industry leaders should adopt a national data and AI skills framework that ensures long-term collaboration and funding.
- ✓ Policymakers should invest in leadership-level data and AI training to support the strategic understanding and effective implementation of these assets. In turn, this will help align digitalisation efforts across sectors and communities.

1 The state of data and AI literacy in Scotland

Data and AI literacy refers to a blend of technical, ethical, meta, and leadership skills that enable individuals to understand, use, and manage data and AI responsibly. It includes core technical competencies such as data analysis, visualisation, programming, machine learning, and cybersecurity.

Ethical understanding – covering bias, privacy, and governance – is central to responsible AI use. Whereas meta-skills⁴ like adaptability, communication, and problem-solving support ongoing learning and innovation.

Leadership skills ensure that digital transformation is aligned with strategy, culture, and inclusive practice. Together, these competencies form the foundation for confident and effective engagement with data and AI.

We surveyed over 500 leaders from public and private sector organisations across Scotland. We also surveyed 30+ educators. Overall, our findings reveal that respondents rate their organisations' data and AI literacy as moderate to low. These outcomes show a slight decline compared to the findings of our 2020 Data Skills for Work report⁵, which found that employers rated their data literacy as moderate to good, with nearly all expressing there was scope for improvement.

This difference in perceived literacy levels (despite a growing awareness of the importance of data and AI) could be because AI was still in the early adoption phase in 2020, and was mainly used by larger companies and the tech sector. Today, organisations are far more aware of AI for business use thanks to the availability of generative AI. However, many organisations struggle with its practical application.

Key findings:

- In the private sector, business leaders predominantly rate their organisations' data and AI literacy as "moderate to low" (56%).
- In the public and third sectors, organisation leaders most commonly rate data and AI literacy levels as "moderate" (41%).
- Among education sector respondents, 3 in 10 (67%) rate the current level of data literacy among their students as very high or high, whereas only 6% say the same about their students' AI literacy.

At a foundational level, data and AI literacy levels in Scotland need to improve to ensure people have a basic understanding of, and confidence in, using these assets. As such, there is a strong need for role-specific training to ensure the relevance and applicability of data and AI to various sectors.

⁴ www.skillsdevelopmentscotland.co.uk/what-we-do/scotlands-careers-services/education-team/meta-skills-toolkit/progression-framework

⁵ dataskillsforwork.com/news-database/developing-a-data-journey

A workforce that understands data-driven processes can help realise efficiency benefits and drive the implementation of ethical and inclusive innovations. On a national scale, data and AI literacy is pivotal to attracting investment, driving long-term economic resilience, and job creation.

According to a recent report from PWC⁶, AI alone is expected to increase Scotland's GDP between 8.4 and 9.8% by 2030 (totalling £16.7 billion at 8.4%). Similarly, a CBI Scotland study⁷ indicates that the adoption of new technologies, and the skills to use them, could add £25 billion to the Scottish economy over the next decade.

Data analytics, for example, supports effective decision making, enabling organisations to scale and create new employment opportunities. In the financial services sector, data analytics is used in risk assessment and fraud detection, which will expand job opportunities in Edinburgh's financial district and Glasgow's International Financial Services District (IFSD).

However, despite this potential, Scotland's data and AI adoption rates are lower than those of other OECD countries. A model to consider is The Fraunhofer-Gesellschaft in Germany, which has created a connection between academia and businesses across 76 institutes and research units⁸, guaranteeing that digital skills training is regionally focussed, based on industry need, and broadly available.

Likewise, Estonia has embedded digital literacy at a national level in education and lifelong learning⁹, ensuring a high baseline competency in AI and data across sectors. Whereas Scotland's fragmented training landscape and inconsistent SME engagement (due to a lack of standardisation) have resulted in a slower uptake of data and AI training programmes.

As such, addressing Scotland's low levels of data and AI literacy requires a cohesive policy with an underlying strategy that links industry, education, and government funding initiatives.

1.1 A broad spectrum of skills

Organisations across Scotland are drawing on a wide variety of data and AI-related skills. Cloud computing and data management are among the most commonly used, particularly in medium and large businesses. These skills reflect a focus on core infrastructure and operational needs. In contrast, education and training providers report an emphasis on more future-focused areas such as data ethics, cyber security, and meta-skills.

This contrast suggests a potential gap in future readiness. Addressing the gap will require stronger collaboration between industry and education to ensure skill development keeps pace with both current demands and emerging priorities.

6 www.pwc.co.uk/economic-services/assets/ai-uk-report-v2.pdf

7 www.gov.scot/publications/a-changing-nation-how-scotland-will-thrive-in-a-digital-world/pages/digital-education-and-skills

8 www.fraunhofer.de/en/for-customers-and-partners/digital-economy.html

9 digital-skills-jobs.europa.eu/en/actions/national-initiatives/national-strategies/estonia-education-strategy-2021-2035

“As someone transitioning from Academia to Industry, I believe hands-on training on Data and AI projects that are industry-relevant and cloud-based will help my career development.”

Survey respondent

Key findings:

- Cloud computing (23%), and data collection and management (22%) are the data and AI-related skills used most frequently across all private sector business sizes. Medium and large businesses are using them significantly more than smaller businesses.
- Data collection and management (37%), and cloud computing skills (29%) are the data and AI skills used most frequently across the public sector.
- Of the education and training providers surveyed, 70% reported offering data visualisation training, and 67% reported offering data ethics, cyber security, and meta-skills training.

Targeted initiatives that integrate more future-focused data and AI skills in the workplace would help strike a balance between meeting Scotland’s current skills demand and preparing for its future needs. Likewise, initiatives that focus on upskilling in meta-skills (like adaptability, critical thinking, and emotional intelligence) would be equally as beneficial to organisations as technical expertise.

2 Understanding data and AI needs

The Data Lab's research reveals that leaders have a greater awareness of data needs (25%) over AI needs (13%), which suggests that some larger organisations have reached a point where data is recognised as a critical asset. AI, however, remains less understood. This may be due to the general perception that AI is more complex or requires specialist expertise.

According to the Scottish Businesses and Artificial Intelligence report (drawn from the Business Insights and Conditions Survey (BICS) from 2023), just 16% of businesses in Scotland are using AI¹⁰. Its use was predominantly in large language models for text generation and machine learning for data processing. Although improving business operations was a driver for future AI use, the vast majority of businesses that responded to that survey did not plan to incorporate any AI into their business in the next three months.

As global demand for data and AI skills grows, knowledge gaps in Scotland's private sector will inevitably limit productivity and innovation. Public sector services will face similar challenges, where a lack of data and AI integration will impact resource planning, increase operational costs, and restrict the personalisation of public services.

Understanding Scotland's data and AI needs at a foundational level is therefore key to training the future workforce and developing a talent pipeline that can meet these needs. Critically, however, these needs must first be understood at a leadership level, with management allocating time for staff to undertake training.

Key findings:

- When asked about data and AI as separate assets, 25% of business leaders say they understand their organisation's data needs "very well", compared to only 13% who say the same about their organisation's AI needs. Specifically, those in larger companies are more likely to understand their AI needs compared to smaller businesses.
- In the public and third sectors, 13% of participants think their organisation understands its data needs "very well", compared to 7% who say the same about AI needs.

The gap in AI awareness among smaller Scottish businesses highlights the need for targeted support programmes that include training, advisory services, and funding to help them understand and leverage data and AI effectively.

In view of the public sector having less understanding of both its data and AI needs, we might assume that the sector is at an earlier stage of data maturity compared to the private sector. This highlights a need for targeted data literacy initiatives that align with data maturity levels across public and third sector organisations to help bridge the knowledge gap.

10 www.scottish-enterprise.com/learning-zone/research-evaluation-and-insight/2023/scottish-businesses-and-artificial-intelligence

2.1 The role of a data strategy

Artificial intelligence is at the stage where it can be used by businesses daily because of two factors: data and processing power. A data strategy is a structured plan that outlines how an organisation collects, manages, analyses, and uses data to drive decision-making. It ensures that data is treated as an asset, aligning data management practices with organisational goals, creating an essential foundation for enabling AI adoption.

For Scottish organisations, a strong data strategy will support growth by identifying new business opportunities, and developing a data culture where employees at all levels recognise the value of data and how to use it responsibly.

Key findings:

- Less than a quarter of business leaders in the private sector (22%) say their organisation has a data strategy. However, this varies significantly by business size (13% of micro and small businesses and 59% of medium to large businesses).
- 46% of public sector leaders say their organisation has a data strategy.
- Medium and large organisations in the public sector are two times more likely to have a data strategy compared to micro and smaller organisations.

Given that larger public sector organisations are twice as likely to have a data strategy as their smaller counterparts, we see a need for improved funding and policy efforts to support digital transformation. Indeed, smaller organisations are more likely to face budgetary constraints and have limited access to the skills required to develop a data strategy.

However, small and micro-organisations still need data visibility and the opportunity to develop a data strategy, even if advanced data and AI skills aren't business critical. While certification programmes are typically suited to large enterprises, smaller organisations could benefit from funding towards short, modular courses, focused on practical data use.

Unlike medium and large organisations that can allocate budget to long-term data strategies, smaller businesses need low-risk funding options. Grants, micro-loans, or tax incentives for adopting AI and data-driven approaches can encourage uptake without financial strain.

[A data strategy] ensures that data is treated as an asset, aligning data management practices with organisational goals, creating an essential foundation for enabling AI adoption.

3 Data and AI responsibilities

The roles that are deemed responsible for identifying data and AI needs directly influence how their respective strategies are defined and implemented. One department's approach would inevitably see different outcomes than the approach of another. Clearly defined responsibility therefore ensures that data and AI investments deliver measurable value and meet underlying objectives.

Key findings:

- Overall, senior management (32%) is most likely to be responsible for identifying data and AI needs. However, in larger businesses, the responsibility typically lies with the IT department (55%).
- In the public sector, findings are similar. However, the data team also plays an important role in identifying digital needs (22%).

We might conclude that senior management's leading role points to the fact that businesses are likely to view data and AI as strategic issues that are linked to company objectives.

In contrast, larger businesses may treat data and AI strategies as a more technical, operational matter, delegating responsibility to IT departments that have the required expertise and resources.

Certainly, larger businesses are more likely to have a dedicated IT department with the expertise to identify AI-related opportunities. This division of responsibility reflects a higher level of maturity in terms of data and AI integration. Smaller businesses, on the other hand, may lack the expertise to identify data and AI opportunities, therefore placing the responsibility under senior management's oversight.

These findings demonstrate a need for knowledge-sharing networks where data and AI 'champions' from smaller organisations can connect with larger enterprises with more advanced expertise. This would enable smaller companies to gain access to practical use cases, best practices, and technical advice.

4

Addressing data and AI skills gaps in Scotland

Unless Scotland's data and AI skills gaps are addressed, organisations will be slower to adopt emerging technologies than other countries, and will struggle to compete in international markets. AI will create millions of new jobs, but it will also change millions of existing jobs, which highlights how a lack of workplace upskilling could lead to growing inequalities and job insecurity.

It comes as no surprise that Data Analyst is the top data role recruited across both private and public sectors. Employing data analysts ensures organisations can process and interpret large volumes of data to support strategic outcomes.

When we look at the skills that are lacking in Scotland, we see that organisations struggle with applying AI concepts, have limited knowledge of machine learning, and lack sector-specific applications. This implies that the AI training being offered across Scotland has not scaled to meet the practical needs of employers.

Our findings for Scotland are comparable to the UK as a whole. Around a quarter of businesses in the UK¹¹ say that their sectors have insufficient data skills in machine learning (25%), programming (22%), knowledge of emerging technologies and solutions (23%), and advanced statistics (22%).

Despite similar skills gaps across the private and public sectors, the impact is felt more strongly across the public sector.

Key findings:

- Data analyst (16%) is the most common data or AI role that organisations currently employ, particularly among companies with high data and AI literacy and data strategies.
- In the private sector, the main AI skills currently lacking are difficulties in applying AI concepts (26%), limited knowledge of machine learning (ML) algorithms (26%), and of sector-specific applications (26%).
- These skills gaps are similar in the public sector, with inadequate programming skills (36%) also listed in the top three.
- Only a small number of the organisations in the private sector that have data and AI skills gaps say the impact is critical (4%) or significant (9%).
- In the public sector, skills gaps have a more significant impact on medium and large organisations, (32%) compared to micro and small sized organisations (6%).
- Educators say that more collaboration with industry (85%), and increased funding (79%) will help improve upskilling and reskilling efforts.

11 www.gov.uk/government/publications/quantifying-the-uk-data-skills-gap/quantifying-the-uk-data-skills-gap-full-report

Indeed, smaller organisations are more likely to be impacted by skills gaps due to funding constraints. Whereas large organisations may have the financial means to upskill their existing workforce (or to outsource their skills needs), smaller organisations often lack the capital to invest in training initiatives.

Our findings show that in the public sector, while data is frequently used to make policy decisions, the sector is slower to adopt AI. Public safety, education and health services are the areas where respondents see the most value from using data and AI for policymaking. As such, skills are urgently needed in these areas.

To increase the level of data and AI literacy across public sector organisations, more funding and resources are needed, as well as clearer guidelines and ethical frameworks on how to use data and AI for policymaking.

The deployment of AI in particular, is becoming progressively concentrated among large organisations, placing SMEs at a disadvantage. IBM's AI Transition in Skills and Jobs report¹² emphasises that SMEs require targeted investment, explicit AI training directives, and access to industry networks to remain competitive. Policymakers in Scotland must therefore ensure that SMEs are not marginalised in the development of the AI workforce.

This sentiment is echoed in the Scottish Technology Industry Survey 2024¹³, which found that respondents with a more pessimistic outlook cite challenges in recruitment, economic concerns, buyer behaviour changes, and funding constraints as the top reasons for their pessimism.

The public sector in particular, would benefit from increased collaboration with private businesses. The UK AI Opportunities Plan cites several use cases driving tangible benefits across the private and public sectors, including initiatives that accelerate document production, enhance threat detection, improve medical diagnostics, and increase assessment accuracy in education¹⁴.

To remain competitive, policymakers in Scotland's public sector must encourage collaboration with the private sector, while cultivating AI literacy to facilitate these reforms and to improve service delivery.

Public safety, education, and health services are the areas where respondents see the most value from using data and AI for policymaking. As such, skills are urgently needed in these areas.

12 uk.newsroom.ibm.com/Addressing-the-AI-Transition-in-Skills-and-Jobs-A-Strategic-Report-for-the-Future-of-Education-and-Training

13 www.scotlandis.com/wp-content/uploads/2024/03/24-0318-STIS-2024.pdf

14 www.gov.uk/government/publications/ai-opportunities-action-plan/ai-opportunities-action-plan

5 The need for training and upskilling in data and AI

The Data Lab's research reveals a significant need for data and AI training and upskilling. A strong talent base across these assets can help secure Scotland's economic, technological, and social future.

However, to achieve this level of security, targeted training is required to improve the country's digital literacy and to bridge its skills gaps. Likewise, smaller companies and those in the public sector need access to the tools and insights that will improve their digital capabilities.

Key findings:

- Online courses are most commonly used to deliver data and AI training in both the private (27%) and public sectors (49%).
- In-person workshops (44%) are the most effective type of training, according to organisation leaders in the public and third sectors.
- In the private sector, online self-paced training is deemed most effective overall (30%). However organisations with a data strategy think in-person workshops are more effective (43%).
- In the Scottish private sector, upskilling (14%) and recruitment (11%) are top ways to fill data and AI roles. Organisations with a data strategy place recruitment top, ahead of upskilling (34% vs 26% respectively).

In 2020, The Data Lab's Data Skills for Work report found that blended learning (56%) and online learning (31%) were the most preferred training methods. Today, online courses are the most commonly used, despite in-person workshops being rated more effective. This indicates a shift in training preferences, with a growing emphasis on interactive, hands-on learning.

Certainly, the COVID-19 pandemic forced organisations to rely heavily on virtual learning, in many cases, leading to "Zoom fatigue" and disengagement. This shift towards in-person interactions can be seen as a break away from screen-based learning.

Organisations that prioritise employee engagement and workplace culture would do well to use in-person workshops as a tool for team alignment. However, SMEs in particular, continue to be inadequately served by data and AI data training opportunities, despite being a substantial segment of Scotland's economic activity.

Addressing these problems requires a customised strategy that accommodates SME requirements, offering adaptable training alternatives, and facilitating access to government-supported AI and data skills initiatives.

6 The barriers to implementing data and AI training

When it comes to integrating data and AI training into operations, organisations across Scotland face several barriers. These obstacles are hindering training progress and limiting employee participation. Acknowledging and addressing these barriers are key to developing individual careers and preparing organisations for the workplace of the future.

Key findings:

- In the private sector, lack of time (31%) and budget (23%) are the top barriers to training and upskilling. Difficulty in measuring training effectiveness features in the top three among higher data and AI literate organisations (19%) and larger businesses (26%).
- In the public and third sectors, lack of budget (59%) and time (49%) are also the top barriers to training and upskilling. Whereas access to training programmes features in the top three among organisations with a data strategy and medium and large organisations.

These findings indicate a clear need for funding to help organisations provide the level of data and AI training required to close Scotland's skills gaps. However, the lack of time that many organisations highlight as a barrier also indicates a need for organisations to adopt a longer-term view of training.

Rather than perceiving training and upskilling as immediate expenses with short-term returns, taking a longer-term view can help organisations see training as an investment in future growth. A focus on short-term expenses indicates that organisations are struggling to balance immediate demands with strategic activities like workforce development.

Likewise, the difficulty that organisations face in measuring the effectiveness of training demonstrates the need for pre-defined performance metrics. Without clear benchmarks, assessing improvements in employee skills, and measuring returns on investments become all the more challenging.

“Training is either too focused on students and their potential as entrepreneurs, or has no link to the commercial world and how things are done in the real world.”

Survey respondent

In comparison to the Data Skills for Work report in 2020, which also found that the main barriers to implementing training were a lack of time and funding, the same barriers remain in 2025. These findings suggest that previous efforts to remove data and AI training barriers have been insufficient.

These obstacles to implementing data and AI training in Scotland mirror broader barriers in the UK manufacturing sector. The Data Lab's survey results correspond with findings from the Smart Manufacturing Data Hub (SMDH) project¹⁵, which found that numerous SMEs fail to acknowledge the necessity of data and AI technologies.

UK SMEs encounter cultural opposition, as such, they favour immediate cost-saving measures over long-term digital transformation initiatives. Overcoming these obstacles requires continuous financial commitment and organised workforce development initiatives.

In Scotland, these obstacles can be overcome in large part, by public funding investment on a national level. However, the withdrawal in recent years of the Flexible Workforce Development Fund and the Upskilling Fund has meant that employers are struggling to find budget to pay for staff training. This only widens gaps across the country. More money needs to be invested into similar programmes to enable organisations, and especially SMEs, to access data and AI training.

[UK SMEs] favour immediate cost-saving measures over long term digital transformation initiatives. Overcoming these obstacles requires continuous financial commitment and organised workforce development initiatives.

15 smdh.uk

7 Data and AI hiring criteria across organisations

Hiring the right data and AI expertise ensures organisations can deliver meaningful results. Overall, Scottish organisations need a balance of technical proficiency and future-focused strategy to secure their future in global industries. For this reason, candidates that can help drive transformation through data-driven insights and AI applications have become highly sought after.

Key findings:

- Three in ten organisations indicate that certification for data and AI skills is important when employing someone. This rises to six in ten among larger organisations.
- Data analysis (18%), programming skills (12%), and cloud experience (12%) are key technical skills organisations are looking for. For more data and AI literate organisations and those with a data strategy, data visualisation skills are also key.
- For meta skills, adaptability and willingness to learn (22%) is the most important skill when hiring for data and AI roles.

The fact that larger organisations appear to value qualifications more than smaller companies suggests that bigger businesses have a more precise idea of what data and AI skills they are looking for. Larger organisations also typically have larger talent pools to choose from, and can therefore prioritise candidates that are already qualified in the skills the company needs.

Our findings indicate that organisations are currently looking for specific technical skills over strategy-based skills, suggesting a shorter-term focus on data and AI objectives. This also highlights a need for strategic leadership, where organisations seek out candidates who can advocate for, and implement data-driven strategies effectively.

Indeed, AI is no longer confined to the tech sector. OECD research¹⁶ shows that the finance, insurance, and energy industries now lead in AI hiring, reflecting the technology's expansion across all 20 major UK industries.

In Scotland, the integration of AI varies across different industry sectors. Recent research from Scottish Enterprise¹⁷ finds that the Information and Communication sector leads with a 57% adoption rate. However, other sectors exhibit significantly lower levels of AI integration, for example: Accommodation and Food (6%); Construction (8%); Transport and Storage (13%); and Manufacturing (16%).

Policymakers must therefore ensure that AI training in particular is accessible across diverse sectors, not just ICT, to meet future demand.

16 www.oecd.org/en/publications/measuring-the-demand-for-ai-skills-in-the-united-kingdom_1d6474ef-en.html

17 www.scottish-enterprise.com/learning-zone/research-evaluation-and-insight/2023/scottish-businesses-and-artificial-intelligence

8 Data and AI skills of the future

Developing a national workforce with data and AI expertise is becoming a fundamental requirement. Organisations with access to these skills can bridge the gap between raw data and strategy, creating a forward-looking culture that can meet shifting market demands.

Key findings:

- In the private sector, cybersecurity (31%) is anticipated to be the most important data or AI skill in the next 5 years, followed by data privacy (23%). Our findings are similar in the public sector.
- Across both private and public sectors, data literate organisations, and those with a data strategy are more likely to name a specific future skill than those with lower literacy levels, or no strategy.
- 7 in 10 educators say machine learning, data privacy and ethics, AI governance and regulatory compliance, AI ethics, and prompting will be needed the most in the next 5 years.

Overall, The Data Lab's research finds that organisations are uncertain about the data and AI skills they will need for the future. However, it does appear that data literate organisations have a better understanding of their future skills needs.

Increased digitalisation across all sectors, combined with an increase in remote and hybrid working, sees cybersecurity top the list as the most anticipated data and AI skill of the future. Indeed, cybersecurity is an essential skill for everyone, not just those within organisations. This focus on security is echoed in the 2024 ISC2 Cybersecurity Workforce Study¹⁸, which revealed that 90% of organisations have skills gaps within their security teams.

Likewise, organisations are increasingly handling vast amounts of sensitive data, ensuring privacy and ethics have also become a top priority. With stricter regulations in the UK, such as GDPR and rising consumer expectations for secure data handling, expertise in data privacy is a valuable skill.

Our 2020 Data Skills for Work report revealed that employers were uncertain about which data and AI skills would be needed in the future. In 2025, organisations still lack clarity on what skills will be needed. However, cybersecurity and data privacy are emerging priorities. These findings demonstrate that a lack of future skills planning persists.

18 www.isc2.org/Insights/2024/10/ISC2-2024-Cybersecurity-Workforce-Study

Preparing for future skills needs

Preparing for future skills needs is about building a workforce that can innovate and navigate change with confidence. Organisations that understand their current and future support needs are better positioned to respond to industry shifts and regulatory changes.

Key findings:

- In the private sector, skills development programmes (31%), government grants (27%), and external funding (18%) are the most useful types of support, with similar results in the public sector.
- However, for larger businesses in the private sector, access to talent pools is the third most useful type of support (35%), significantly more useful than for smaller businesses (11%).

We might assume that skills development programmes are the most useful type of support because organisations prefer to retain control over the type and quality of training they offer. Grants, on the other hand, may come with restrictions that do not directly address specific skill gaps.

Additionally, employees are more likely to stay engaged and committed to organisations that invest in their development. Retention is a challenge across all organisations, and prioritising skills programmes signals an emphasis on career growth, which can improve overall job satisfaction.

The fact that larger organisations in Scotland say that access to talent pools is useful, more so than smaller businesses, could be reflective of bigger businesses having more complex hiring needs. Larger companies typically need a continuous supply of skilled employees, and a well-developed talent pool helps ensure they can meet their evolving data and AI needs without disruptions.

Indeed, taking a skills-based approach to workforce planning is a proven method for talent development and employee retention¹⁹. Gigged.AI's 2025 report, The AI Talent Crisis²⁰, reveals that 73% of enterprises consider skills-tracking software effective. However, a mere 37% have completely adopted skills-based hiring methodologies.

¹⁹ www.mckinsey.com/capabilities/people-and-organizational-performance/our-insights/taking-a-skills-based-approach-to-building-the-future-workforce

²⁰ gigged.ai/the-ai-talent-crisis

9.1 Equality, Diversity and Inclusion

Equality, Diversity and Inclusion (EDI) is an integral part of The Data Lab's work. The Data Skills for Work programme, as part of the Data Skills Gateway, was established so that everyone can benefit from the opportunities of the new economy.

The UK Parliament's Data Science Skills in the UK Workforce report emphasises the importance of a diverse workforce to mitigate bias in AI and algorithms. A lack of diversity in organisations working with AI can exacerbate existing inequalities and prejudices, leading to algorithmic bias where automated systems produce systematically biased outcomes²¹.

Key findings:

- Overall, only a fifth (20%) of organisations in the private sector have initiatives in place to address diversity and inclusion in training and hiring for data and AI roles. However, this rises to half (50%) for organisations with a data strategy.
- In the public sector, medium and larger organisations (61%) are significantly more likely to have initiatives in place to address diversity and inclusion in data training and hiring compared to micro and small organisations (41%).
- For those that think marginalised groups do face challenges, the most effective ways to improve diversity are through flexible training schedules and formats (37%), by encouraging continuous learning and feedback (37%).

The fact that organisations with a data strategy are more likely to have EDI training and hiring initiatives suggests that they are more aware of the risks associated with biased data and algorithms. Certainly, organisations that prioritise diverse perspectives are better equipped to develop data and AI systems that are fair, ethical, and reflective of a wide range of users and stakeholders.

In 2020, our Data Skills for Work programme identified a data and AI gender and diversity gap. Today, EDI initiatives that exist to address this are recognised and focused on accessibility, inclusive training, and mentorship for marginalised groups. The Data Skills Gateway Programme aims to ensure that everyone has the opportunity to learn data and AI skills, regardless of their background. Initiatives like The DataKirk, Equate Scotland, and Code First Girls, have EDI at their core.

Practical implementation strategies are needed. Partnership working between policymakers, universities, and businesses can help create a coordinated approach that supports equitable access to opportunities.

21 researchbriefings.files.parliament.uk/documents/POST-PN-0697/POST-PN-0697.pdf

Conclusion

Scotland's data and AI literacy is not yet at the level required to meet the country's future skills needs. If left unresolved, Scotland's ability to keep pace with the global technology landscape will be significantly hindered.

There is a strong need for targeted initiatives that encourage a more even distribution of data and AI skills across Scotland's private and public sectors. Likewise, cross-sector collaboration, funding, and better allocation of resources are required to help organisations provide the level of data and AI training that can close Scotland's skills gaps.

Addressing our data and AI skills gaps is crucial for strengthening the country's economic future. As industries place greater emphasis on data-driven insights and automation, a highly skilled workforce is necessary to sustain competitiveness and boost productivity.

By investing in skills development, the Scottish Government can position Scotland as a leader in the digital economy, attracting high-value jobs, supporting business growth, and ensuring long-term resilience in the digital landscape.

Closing the skills gap will not only benefit businesses and workers, but contribute to wider economic stability and growth. A well-prepared workforce will enable Scotland to capitalise on emerging technologies, drive sustainable development, and build a more adaptable, future-focused economy.

Cross-sector collaboration, funding, and better allocation of resources are required to help organisations provide the level of data and AI training that can close Scotland's skills gaps.

The Data Lab's Data and AI Skills Framework

Informed by our research programme and to support the policy recommendations set out in this report, The Data Lab's Data and AI Skills Framework reflects Scotland's current data and AI skills needs. The Framework builds on an original piece of work commissioned in 2020 to support the Data Skills for Work programme. It focuses on bridging skills gaps and providing flexible pathways for improving data literacy and AI understanding. It helps organisations to assess workforce capabilities, identify training needs, and align skills development with industry demands.

Covering four key personas: Data & AI Citizen; Data & AI Worker; Data & AI Professional; and Data & AI Leader, the Framework offers a consistent skills progression across foundational, intermediate, and advanced levels, ensuring clear pathways for growth. Key competencies identified through our research are further defined by corresponding knowledge and skills, making it easy to understand and assess differences and gaps in literacy levels.

Technical skills are central, including data analysis, data visualisation, programming, machine learning (ML) and AI, data management, data quality, data storytelling and cybersecurity. These skills are essential across all personas and ensure that individuals are equipped to handle the technical demands of the field.

The framework emphasises the importance of Data and AI ethics and governance. Understanding bias, privacy, ethical and legal implications is crucial for responsible AI deployment and effective data management.

Meta-skills, including communication, critical thinking, adaptability to rapid changes in technology and problem-solving, are integrated across all personas to enhance an individual's ability to adapt and innovate, providing a solid foundation for lifelong learning.

Leadership skills are important because digital transformation is not just about technology – it's about people, processes, and culture. Strong leadership ensures that digitalisation efforts are strategically aligned, well-executed, and embraced across an organisation and within societies.

In an educational and employability context, this framework can be applied to create targeted training pathways including sector-specific pathways to address unique industry needs in Scotland, such as public health, finance, and renewable energy.

Access The Data and AI Skills Framework

→ thedatalab.com/professional-development/skills-framework

Methodology

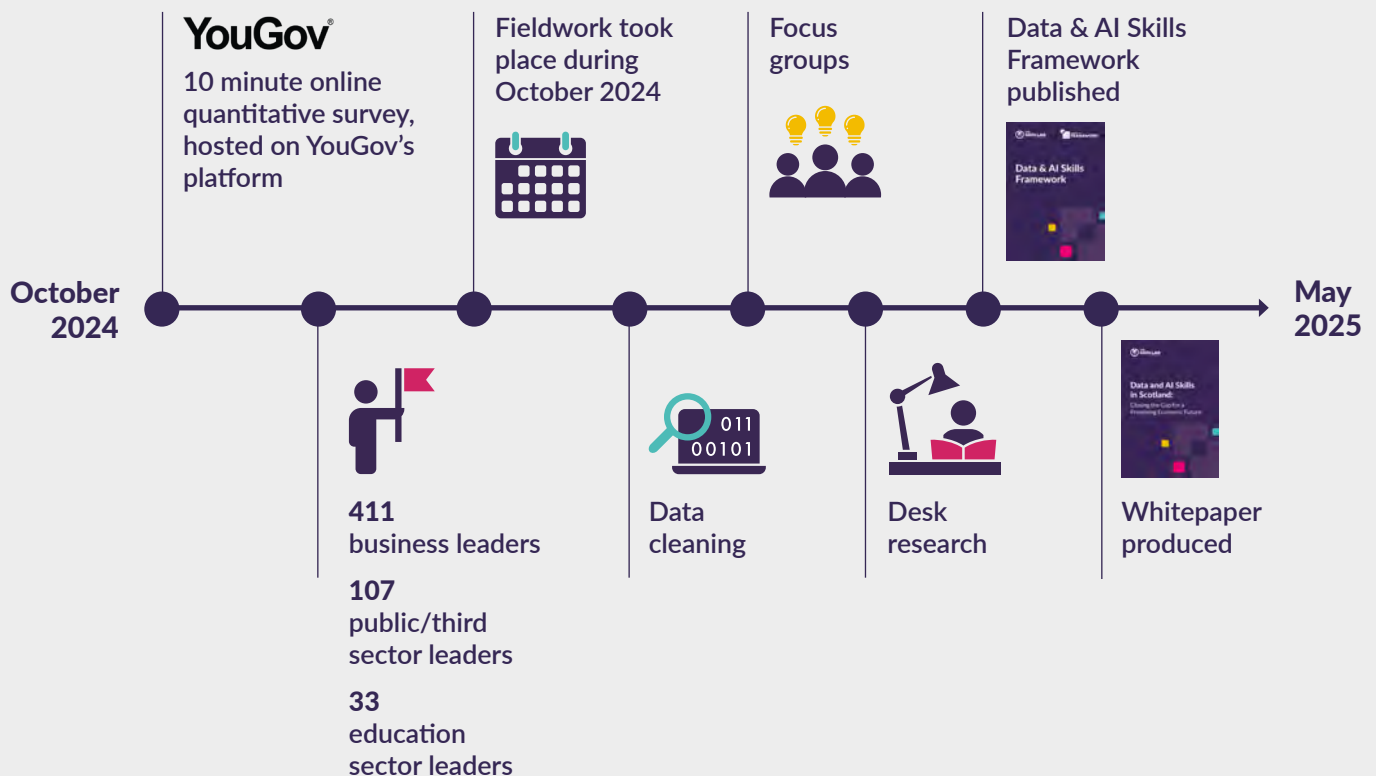
In developing this report, The Data Lab created an online quantitative survey, hosted on YouGov's platform. Overall, more than 500 organisation leaders from the private, public, third, and education sectors in Scotland were recruited via YouGov's panel. This fieldwork took place during October 2024.

Once all survey results were received, data cleaning took place, which involved removing participants who work for companies outside of Scotland, and those who did not provide business size information. We then removed any participants who provided inadequate responses in the open-ends and selected 'none of these' for all questions.

The Data Lab conducted focus groups with private, public, and education sector participants to gather further insights.

We also conducted desk research, which included exploring resources and literature relevant to Scotland's data and AI skills gaps. Several key insights and outputs emerged from this research, which was used to support the development of our recommendations and The 2025 Data and AI Skills Framework.

Given its sample size, the methodology has its limitations. More research is therefore required to understand the skills required for Scotland's digital economy in more detail. Likewise, industry-specific data would help ensure that training programmes meet the needs of employers.



About The Data Lab

www.thedatalab.com

Founded in 2014, The Data Lab is Scotland's innovation centre for data and AI, hosted by the University of Edinburgh and part of the National Innovation Centre Programme funded by the Scottish Funding Council.

Our vision is to foster a more prosperous and equitable society where the responsible use of data and AI empowers everyone to thrive. Through hubs in Edinburgh, Glasgow, and Aberdeen, we foster innovation through collaboration, building skills, growing talent, and championing Scotland's data and AI community.

We help drive innovations and promote connections across all sectors, connecting industry, non-profits, the public sector, universities, and colleges. To date, we have funded over 1,000 MSc scholarships, providing industry placements for over half. We have created and safeguarded over 1,500 jobs, and generated £212 million additional revenue through collaborations with academia and industry. The Data Lab is central to Scotland's data and AI ecosystem, connecting individuals and organisations through events and our digital community, which has over 6,500 members globally.



About Data Skills for Work

The Data Skills for Work project is part of the Edinburgh & South East Scotland City Region Deal Data Skills Gateway Programme, funded by the Scottish and UK Governments. The Data Skills Gateway brings together industry, universities, colleges, schools and other organisation to provide routes into data or digital careers. The ambition of Data Skills for Work is to ensure that our wider workforce has a broader set of skills. We strive to help people develop a foundational understanding of AI, and to solve problems using data.



Scottish Government
Riaghaltas na h-Alba
gov.scot





This document was published in June 2025.

© The Data Lab, all rights reserved.

Should you have any questions about this document please contact us:

skills@thedatalab.com

Copywriting: Jamie Thomson, Brand New Copy