HOW TO SOLVE THE DATA SCIENCE SKILLS SHORTAGE

CONTENTS

Executive summary

The challenge: sleepwalking into a crisis

UKI survey findings: part 1

UKI survey findings: part 2

Enough data talent for everyone

Appendix

FOREWORD

by Roderick Crawford, Senior Vice President Northern Europe, SAS and Mark Smith, General Manager, Microsoft Solutions, United Kingdom

AI and data analytics are some of the major driving forces of the Fourth Industrial Revolution. The innovation, new business models and revenue streams driven by these technologies dramatically drive up productivity. They are one of the few ways businesses and governments can fight inflation.

But the technology needs skilled people to apply it.

It has been recognised for some time now that there is a shortage of people with these data and AI skills. The UK Government estimates the potential supply of data scientists from universities is unlikely to be more than 10,000 per year – yet there are around 215,000 roles for hard data skills that need to be filled. The picture is similar globally. Research in 2021 by Gartner has shown IT executives see the talent shortage as the most significant adoption barrier to 64% of emerging technologies, compared with just 4% in 2020.

Furthermore, the challenges we're facing now are set to become even more acute. According to the US Bureau of Labor Statistics (2021), the data science and computer information research field is expected to grow by 22% from 2020–2030 which is triple the rate of the average profession.

The findings in this report shine a light on the challenges organisations are facing. It reveals what skills they need to exploit their existing analytics and AI technology, what is needed for the technology they plan to invest in, and how they plan to source the skills required.

EXECUTIVE SUMMARY

Artificial intelligence (AI) and machine learning (ML), along with data analytics, are widely seen as a way to tackle everything from daily inefficiencies and low productivity, to advancing healthcare and climate change mitigation. As more organisations look to leverage their data more effectively, demand for people with data capabilities is only going to grow.

The UK Government estimates the potential supply of data scientists from universities is unlikely to be more than 10,000 per year – yet there are around 215,000 roles for hard data skills[1] that need to be filled.' At the time of writing, there are over 38,000 data scientist jobs in the UK being advertised on LinkedIn, while in the US, there are more than 320,000.

Unless it's addressed urgently, this gap threatens productivity, innovation and growth at an organisational level – and the economic health and competitiveness of entire nations.

Just how much this skills gap is impacting organisations is evident in our study, the details of which are contained in this report.

As many as 63% of decision-makers don't have enough employees with AI and ML skills, even though 54% use these technologies already and 43-44% plan to do so over the next couple of years. Roughly half say they wouldn't need to hire as many people if the current workforce could use the tools more effectively.

The purpose of this report is not just to examine the extent of the skills crisis but to offer practical solutions – which can be distilled into three actions:

- Consolidate diverse AI and analytics tools around modern, open, multi-language tools to increase data science productivity, and empower end users to do basic analytics tasks, allowing data scientists to focus on core tasks.
- Grow the data science talent pool by reskilling existing staff and nurturing graduates with a diverse range of certifications including training courses from software solutions vendors.
- Create attractive data science employee networks, career structures and employment benefits.

[1] www.gov.uk/government/publications/quantifying-the-uk-data-skills-gap/quantifying-the-uk-data-skills-gap-full-report

THE CHALLENGE: SLEEPWALKING INTO A CRISIS

The ability to capture and process data, accurately and at speed, using data analytics, ML and AI, has become a prerequisite for any large organisation that wants to operate successfully in the modern world. These technologies are key to effective decision-making, which in turn increases productivity, efficiency, growth and competitiveness.

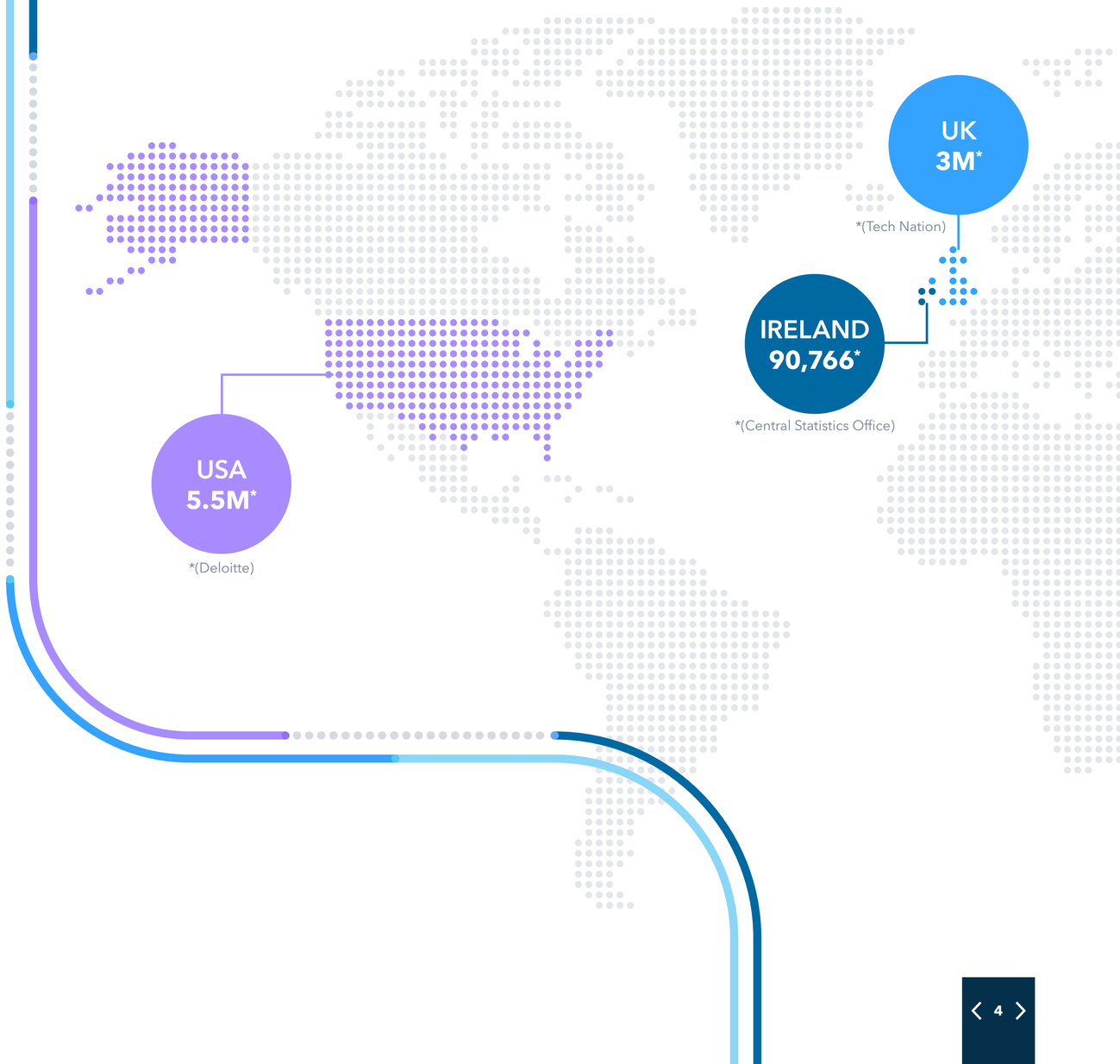
There's growing demand to use data for good too, in the fight against climate change, developing life-saving treatments and tackling financial crime.

Technology is creating more jobs than it's displacing – and the industry is a major employer across the UK & Ireland (UKI), US and globally. However, the pace of change is so fast that developing the data skills needed for the countless new roles now emerging is a struggle.

The UK is the leader in Europe for AI-empowered firms and investment, but unless the right skills are developed there's a risk that initiatives won't deliver value. Similarly, the US has also benefited from funding and a strong tech culture – but it's in danger of falling behind, partly due to higher education costs.[2]

Microsoft's DEGREE + DIGITAL report, which used LinkedIn data, found that data science competencies rank top for the biggest mismatch between skills supply and demand.

PEOPLE WORKING IN TECH TODAY



[2] www.analyticsinsight.net/artificial-intelligence-investment-by-top-10-countries

The report also showed that AI was the fourth most in-demand skills companies needed in 2020 yet it didn't even make the top nine in 2018.[3] Furthermore, university leaders know that equipping young people with digital skills is critical – but they feel their institution doesn't have the capabilities to do so, and they need help from tech industry partners.[4]

Whereas data science roles would traditionally have been filled by graduates, the numbers required now means that organisations need to look beyond academia to upskill and cross-skill people from a more diverse range of backgrounds.

Without the right skills and knowledge, growth and innovation are going to be limited and the repercussions will be felt, not just on businesses but on the wider economy.

One sector where demand for data skills has grown exponentially is in financial services, owing to the emergence of challenger banks and the digital transformation of existing ones.

As the authors of the Skills for Future Success report put it, closing the skills gap in financial, professional, and business services (FPBS) would provide 'an unprecedented opportunity to grow the sector, create high-quality jobs, and support levelling-up across the regions and nations.' They conclude that skills, along with automation, could generate an additional £38billion per year.[5]

There's a significant 'cost of opportunity' if companies in this sector are unable to close the gap, and one that will be mirrored in manufacturing, logistics, retail, life sciences and others.

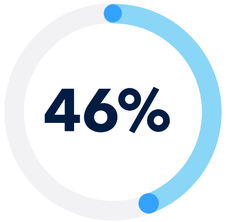
MOST AND LEAST IN-DEMAND JOBS BY 2025, ACCORDING TO THE WORLD ECONOMIC FORUM

Data entry clerks and administration

Data analyst and scientist*

*(World Economic Forum)

A GROWING GAP



Proportion of companies that have struggled to recruit for roles that require data skills*

*(UK government)

Organisations today are locked in a 'merry-go-round' of poaching data science talent, forced to offer ever-increasing salaries for someone who may only stay for two years or less.

They're stuck in a vicious cycle – taking on people who don't have the full skill-set yet reluctant to train them, partly because of time constraints but also because of fears about them leaving soon afterwards.

Lack of resourcing in any team adversely affects innovation and service, as well as morale, making resignations more likely and the cost of hiring even more expensive.

[3] https://news.microsoft.com/en-gb/2021/11/17/universities-we-cant-solve-the-uks-digital-skills-gap-on-our-own/
[4] *Ibid*
[5] https://wp.financialservicesskills.org/wp-content/uploads/2021/06/Skills-for-Future-Success-2021-vF2-Single.pdf

UKI SURVEY FINDINGS: PART 1

A skills gap that could stunt business growth

There's no doubt that organisations in the UKI are facing a skills crisis – but it's important to understand the extent of it, and the impact it's having on both day-to-day operations and business strategies before suggesting a way forward.

To that end, we commissioned a survey of key decision-makers in 39 major organisations with an average of 27,000 employees. These covered nine sectors, including banking, insurance, government and retail.

It will come as no surprise to learn that the respondents see a gulf between where they want to be and the skills and resources available, and one that has widened during the pandemic.

They're hungry for more data analytics, data curation, data visualisation, AI and ML within their organisation – and they know they'll need to hire or reskill more people if they're to achieve their business goals.

SUMMARY

BUSINESS PRIORITIES

Against a backdrop of the Great Resignation and soaring inflation, reducing costs is a top priority for respondents. Solving the perennial productivity challenge also features highly, as does increasing agility, launching new products from R&D and expanding into new markets.

USE OF TECHNOLOGY

A reassuringly-high proportion are either using or planning to use data analytics, big data, data curation and data visualisation. While the use of AI and ML is currently lower, most plan to start using it soon. According to the study, over half already have the solutions in place but many don't have the skills to use them effectively.

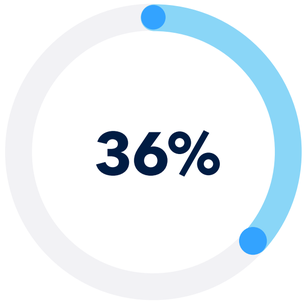
SKILLS GAP

Companies are more confident they know where the skills gap for data analytics and data visualisation lies, compared to big data, data curation, AI and ML. That said, many only have a 'partial' understanding of this gap, putting them at risk of not hiring the right people and paying the price.

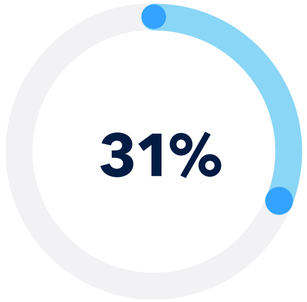
WORKFORCE CAPACITY

As well as skills, organisations are also facing workforce capacity issues – they simply don't have enough people to meet their data science needs. This makes it difficult to plan ahead, and there is an ongoing worry that their best staff will move elsewhere.

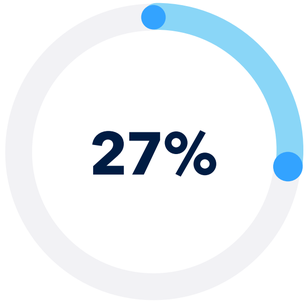
Top priorities for organisations



Reducing costs



Improving workforce productivity
Increasing business agility
New products from R&D
Expanding into new markets



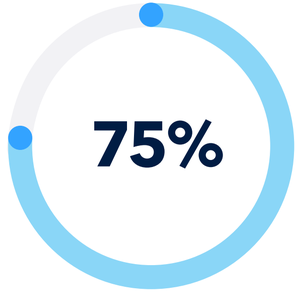
Improving innovation

INSIGHT

Recent inflationary pressures seem to have strengthened organisations' resolve to reduce costs – and technology is critical for ensuring that staff can work efficiently and make better decisions. They're also determined to tackle productivity challenges, and increase agility so they can respond quickly to market changes. The focus on innovation and expansion gives us reasons to feel optimistic about the economy but lack of skills could stifle their ambitions.

The impact of too few staff

say they're unable to meet customer demands



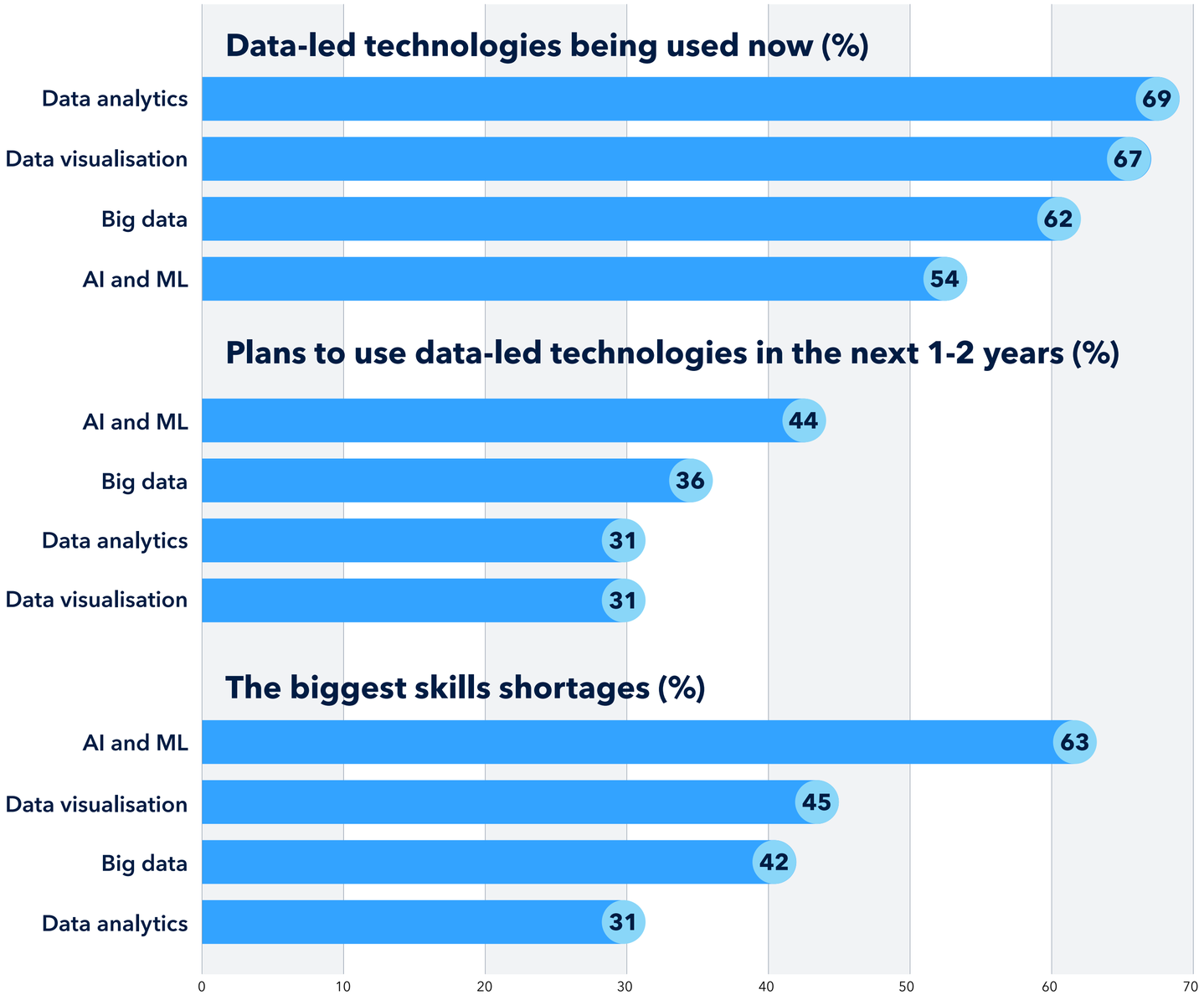
say staff morale is lower

say they're unable to grow the business

say they're unable to win new customers

INSIGHT

Business performance is already being compromised by a lack of staff and it's only going to get worse unless more people are equipped with the right data skills. The costs of recruiting and retaining staff will continue to rise, while productivity and innovation will be stifled, meaning organisations won't achieve the priorities they set out.



INSIGHT

The use of data-based technologies is already high among UK organisations, which will stand them in good stead for achieving their business goals, and there's a strong appetite for further innovation over the coming two years.

The problem is not so much whether they want to adopt these technologies – more that they are limited by the availability of skills.

Where organisations have invested in tools for AI, data analytics and so on, they're finding that staff don't have the skills to use them effectively. Our analysis also found that 54% say they wouldn't need to hire as many people if existing staff could use the tools and technology

Decision-makers are well-aware that they need these skills right now, as one respondent points out:

> "I don't have that expertise in house. We're not looking for junior people to grow and train. You want an expert walking into it. So it's difficult."

It's not just skills but lack of workforce capacity that's causing a headache for organisations – and around a fifth believe it's got worse during the pandemic.

UKI SURVEY FINDINGS: PART 2

Addressing the skills gap

Those who took part in our survey know they have their work cut out for them if they're to plug the widening skills gap.

Employers seem to be resigned to the fact that people with the most in-demand skills won't stay in their role for long – just 18 months to two years. This can make them understandably reluctant to invest heavily in training yet the skills deficit will only get worse if they don't.

A highly-competitive jobs market means that candidates can follow the money but that's not their only motivation: they also want to test out the latest technologies to enhance their CV and experience. HR sometimes find it difficult to convince senior leaders that the data science market has changed and 'being a good company' isn't enough for candidates to stay.

SUMMARY

WAYS TO ADDRESS THE SKILLS GAP

Upskilling current staff is the preferred option for increasing skills in the workforce, followed by recruitment and employing contractors.

TRAINING AND UPSKILLING BARRIERS

Respondents report a lack of commitment to training from the senior leadership team who're no doubt aware that people will go elsewhere once they've completed it. There's also a lack of motivation for training among some employees.

HIRING CHALLENGES

Organisations value general skills more than specific ones because they can get them up to speed when they're in their role – although it's important to bear in mind they face barriers to training.

PARTNERSHIPS WITH ACADEMIC INSTITUTIONS

There's a real interest in working with academic institutions to recruit data science talent directly although that won't be enough to meet demand. Our study found that hiring managers are more likely to assess a candidate based on whether they've completed a relevant course, rather than whether they have a degree.

Current methods of plugging the skills gap

INSIGHT

Training and upskilling may prove more cost-effective compared to hiring and using contractors – but our study highlights a number of barriers. Two-fifths say that senior management is reluctant to invest in training, ostensibly because they're worried people will leave soon afterwards. Around a quarter said there's a lack of motivation from staff and a fifth cited lack of time. Mentoring is not always possible either due to the resources required.

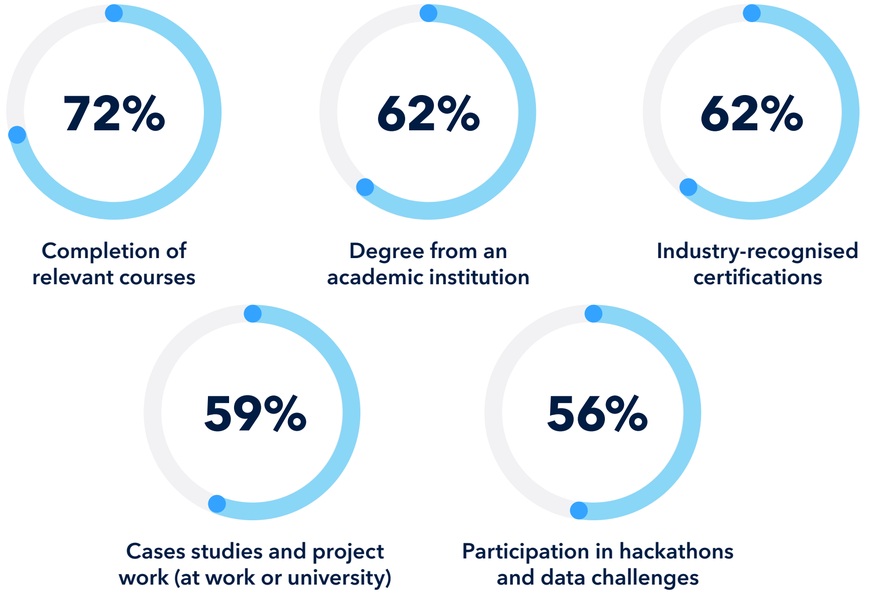
Furthermore, while 'hard' data science skills are easily quantifiable and measurable, organisations also value 'softer' skills such as communication, being a team player, adaptability, learning and working in high-pressure environments. The general consensus is summed up by one respondent:

"I would say the skill set would definitely be kind of like curiosity, analytical. Often I find the soft skills are what's more important, just being able to communicate."

In the fierce war for talent, the cost of new hires is another issue. Organisations may have little choice but to pay ever-higher salaries, and recruitment and contractor costs to secure the skills they need. But with the average data scientist salary jumping by 31% between 2018 and 2020 to £60,000,[6] continued wage inflation is unsustainable.

One respondent said trying to convince the leadership of the need to recruit can be difficult, as they may not be directly involved in analytics and so don't always understand the value of it.

Not just degrees: Methods used to evaluate potential employees



INSIGHT

There's an appetite among respondents to work with academic institutions to recruit data talent directly – but relying on graduates alone won't fill vacancies fast enough.

Fortunately, our respondents recognise this, and the balance is tipping decisively away from degrees towards training and experience. It's a trend that's already gathering momentum in the US[7] and it seems the UK is taking the same approach. A further 56% assess candidates based on their participation in hackathons and data challenges, a sign of how much they value 'real-world' problem solving and team work.

[6] https://technation.io/jobs-and-skills-report-2021/#tech-roles
[7] www.computerworld.com/article/3660493/no-degree-no-problem-tech-firms-move-away-from-college-requirement-for-new-hires.html?utm_campaign=Computerworld%20UK%20First%20Look

CONCLUSION:
ENOUGH DATA TALENT FOR EVERYONE

“Businesses cannot rely solely on graduates or continue the poaching merry-go-round. The good news is, employers have already begun to recognise the value of on-the-job training and other certifications as stated in the report.

“There is no single approach – but a combination of expanding mid-career training including to those currently in non-technology roles, equipping people with the right tools for the job and growing the data science community will start to see that skills gap narrow. Together, they could significantly increase the supply of talent, and create good quality satisfying jobs that benefit individuals, organisations and the wider economy.

“Complementing this must be a broadened focus on STEAM (Science, Technology, Engineering, the Arts, and Maths) learning approaches which place an equal value on skills such as emotional intelligence, empathy, curiosity, problem solving and communication. These help give people enhanced agility to change both depth and diversity of experience and thinking. Today we need both the creative confidence to (re)imagine the future and the data science and technology skills to help actualise it.

“Building data science capabilities doesn’t happen overnight but with the right learning pathways, and investment in modern analytics tools, it’s getting easier to upskill and reskill people, from both a tech and non-tech background. This can help build a pipeline of talent that’s going to be so vital to the UK and Ireland.”

DR SALLY EAVES, AI EXPERT, AUTHOR AND SPEAKER

The US and UK are now at an inflection point – a continuing drive to innovate means they rank first and third place respectively in the world for VC investment in tech companies in 2020.[8]

This drive to innovate is being felt in larger organisations too, including government, insurance and finance, as they press ahead with their digital transformation strategies. However, left unaddressed, the current dearth of data science talent represents a major barrier to success.

While there’s always more work to be done to encourage young people, including those from traditionally under-represented groups, to study STEM subjects, employers cannot afford to wait a generation for data scientists to enter the jobs market. With the type of skills required changing all the time, they need easy-to-implement and effective solutions to fill current and future roles, and ensure that new hires are engaged and deliver value.

There is no single approach to the challenge – but a combination of the steps outlined below could significantly increase the supply of talent, and create good quality jobs that benefit individuals, organisations and the wider economy.

[8] https://technation.io/report2021/#key-statistics

1 CONSOLIDATE DIVERSE AI AND ANALYTICS TOOLS

Many large organisations have amassed numerous AI and analytics tools over the years, making the task of using and training people on them unnecessarily complex. The first step is to consolidate these around modern, open, multi-language tools so that data scientists can focus on core tasks, while end-users are empowered to undertake basic analytics.

The benefits of new solutions to maximise scarce skills have been documented in a report by Forrester, which looked at the Total Economic Impact™ (TEI) of deploying SAS® Viya®. On average, companies using the software reported:

- $3.9m from faster, better decisions due to increased productivity for business analysts
- $1.2m from faster, better decisions due to increased productivity for employees supporting model building and management
- $1.3m infrastructure savings from retiring on-premise environment.[9]

A head of analytics in banking, whose comments feature in the report, said that the platform enables them to use open source coding, so new starters can 'contribute directly to our work' even if they're not trained in SAS.

Data analytics tools also help to 'democratise' data science practices within the workforce. The UK Government recognises that not everyone will become a data scientist but 'everyone will need 'a basic level of data literacy to operate and thrive in increasingly 'data-rich' environments.'[10] Fortunately, modern tools allow end-users to do basic analysis of their data to gain quite deep insights.

But, as our research highlights, any investment in new technology must be matched by effective training, otherwise it won't deliver ROI.

[9] www.sas.com/sk_sk/whitepapers/forrester-tei-sas-viya-on-azure-112937.html
[10] www.gov.uk/government/publications/quantifying-the-uk-data-skills-gap/quantifying-the-uk-data-skills-gap

2 TRAIN MORE DATA SCIENTISTS

Our survey suggests employers are more likely to look for skills from relevant courses over a degree. This means more upskilling and cross-skilling of the existing workforce is needed, including people from non-technical backgrounds.

Any organisation, whether large or small, can create environments to train data scientists. This can include anything from allowing employees to take time out to complete online training courses to setting up in-house data science academies to ensure a continuous supply of talent. A good-quality technology vendor, with a focus on education, can support organisations with all of these training approaches.

The SAS STEP programme was launched during the pandemic to help 10,000 job seekers across UKI develop in-demand data skills, with opportunities to work on real business challenges and connect with employers. It now has a dedicated data science pathway, covering programming, data engineering and manipulation, applied mathematics, statistics, data science innovation, data ethics and data privacy.

> “I am delighted to see how the SAS STEP Programme is supporting people to access crucial data skills for free, so they can progress into good jobs.
>
> “It is vital that everyone has the opportunity to learn the skills they need to succeed in rewarding careers, and that employers have access to the high-quality talent pipeline they need for the future, and to fill the skills gaps in key sectors.”
>
> **ALEX BURGHART MP, MINISTER FOR SKILLS (2021-2022).**

But this is just the tip of the iceberg. There are many more in-work training programmes available for people to develop new skills at every stage in their career.

The authors of the Skills for Future Success report, which relates to financial, professional and business services, point out that as retirement ages and life expectancies rise, most of the future workforce is already in employment. They conclude that more mid-career training is needed to ‘upskill existing staff to meet emerging skills gaps and to equip them for roles that may not yet exist.’[11]

Our research highlights the barriers organisations face to data skills training, including the lack of commitment from senior managers and low motivation among employees.

The flight risk is a legitimate concern – but equipping people with the right skills is non-negotiable if organisations want to survive. Failing to invest in training in itself may cause them to leave, if they believe their progression is limited. The collective efforts of employers to increase the overall talent supply through training could even reduce the ferocity of the war for talent.

Microsoft’s DEGREE + DIGITAL report points out that partnerships between technology companies and academic institutions are critical[12] – and the same applies to employers. Where time and in-house expertise are limited, accredited courses from technology companies can deliver training in an efficient and engaging way.

[11] https://wp.financialservicesskills.org/wp-content/uploads/2021/06/Skills-for-Future-Success-2021-vF2-Single.pdf

[12] https://news.microsoft.com/en-gb/2021/11/17/universities-we-cant-solve-the-uks-digital-skills-gap-on-our-own/

3 INVEST IN WORKPLACE CULTURE AND NETWORKS

Creating a learning environment where employees can grow their skills and knowledge is often equally or more important to staff retention than salary, quality offices and flexible working.

Another powerful indicator of a positive workplace culture is a commitment to learning, through training courses, hackathons and pairing. Working with advanced technologies, people need to be empowered to find solutions to problems and drive progress, as one director of artificial intelligence puts it:

"Our data science team's work is constantly evolving. There will be problems whose solutions you can't Google. There will always be the need for team members to challenge themselves to learn, to continuously improve."[13]

Another technology leader in banking said that people aren't driven by salary alone:

"The data scientists of this world are typically motivated by challenges – if we're able to give them new challenges and new ways to think about things, and put the support in place to help them, it's a big motivator. It's also essential that they develop soft skills, like the ability to communicate techy stuff to a non-techy person."

He added:

"We're looking at competencies rather than degree titles. Previously, you had to have a maths or statistics degree but now we're looking at social sciences, engineering, traditional sciences – there's a level of competency around BSc. At a [junior] level, we're looking for people we can train up and retain.

"You could get a group of data scientists who can do everything. The most important thing is where you want to be in five years' time – companies now looking at a 12-month ROI won't get it because it'll take that long to sort their data out. This is why it's important to have trust in your people and to have someone who's not just visionary but who can adapt."

[13] www.sas.com/en_gb/training/campaigns/building-tech-skills-2021.html

We'll help you achieve your goals.

To find out how SAS can support individuals and teams to develop the right skills to enhance your data and AI capabilities.

CLICK HERE

APPENDIX

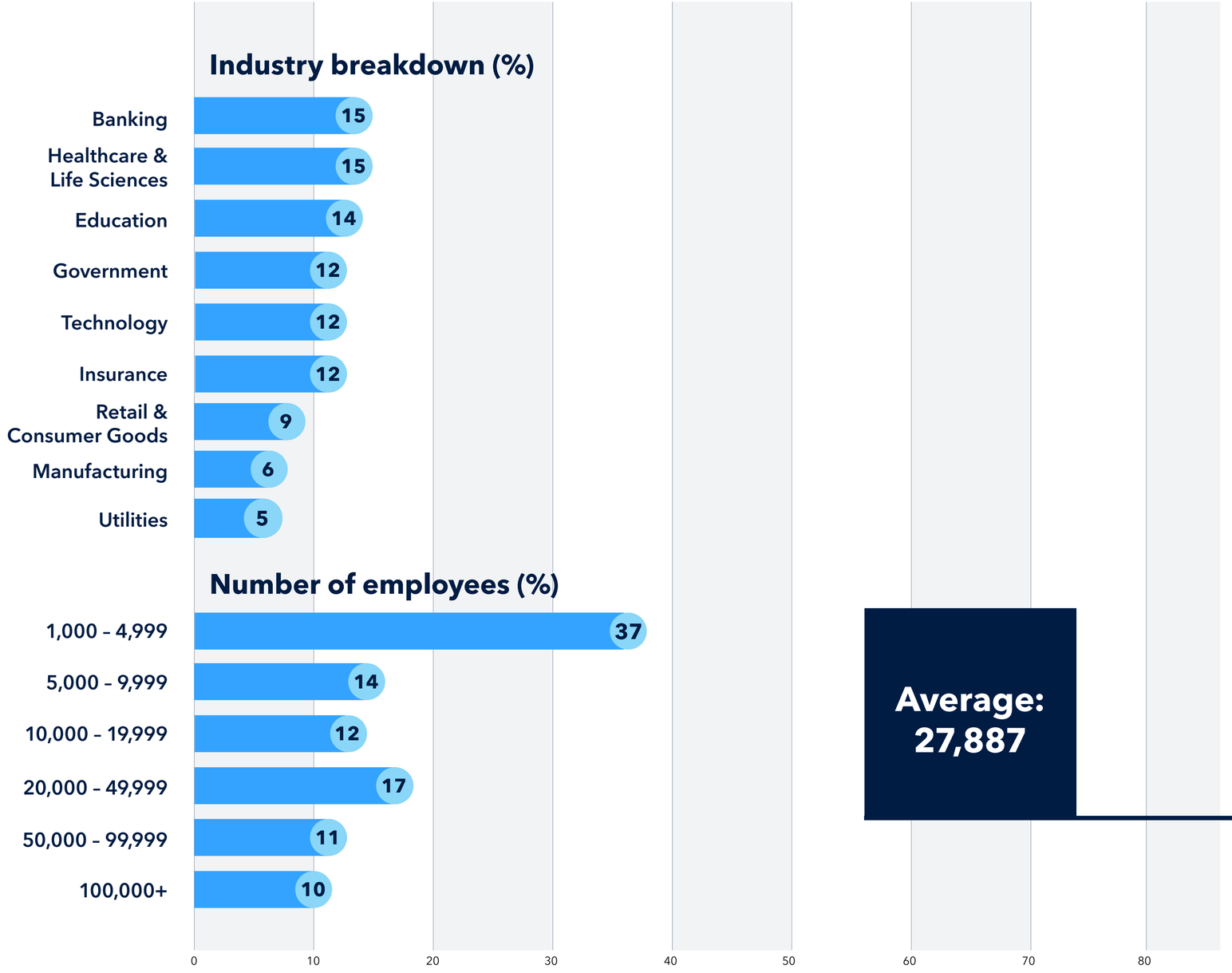
Methodology

SAS commissioned Coleman Parkes Research to look at how the data skills shortage is currently impacting their organisation, and the steps they're taking to address it. We surveyed them on their business priorities, as well as the technologies they're currently using and what they plan to implement.

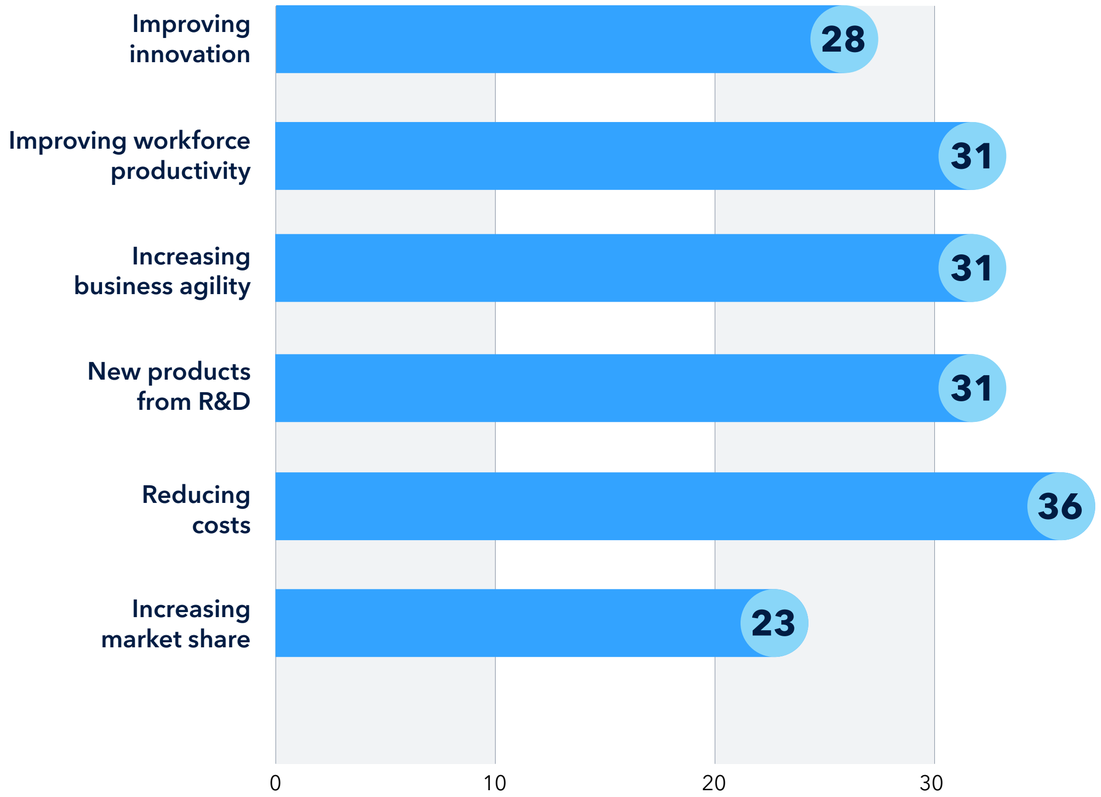
The research was conducted in line with the standards of the British Market Research Society.

The survey was sent to key decision-makers in 111 major organisations across the US and UKI, spanning nine sectors, including banking, insurance, government and retail.

While the sample size might seem relatively small, it's important to point out that each respondent works for organisations with more than 1,000 employees, and some had in excess of 100,000. The vast majority are in technical roles, including data science and data analytics, and just under a quarter are in HR and talent management.



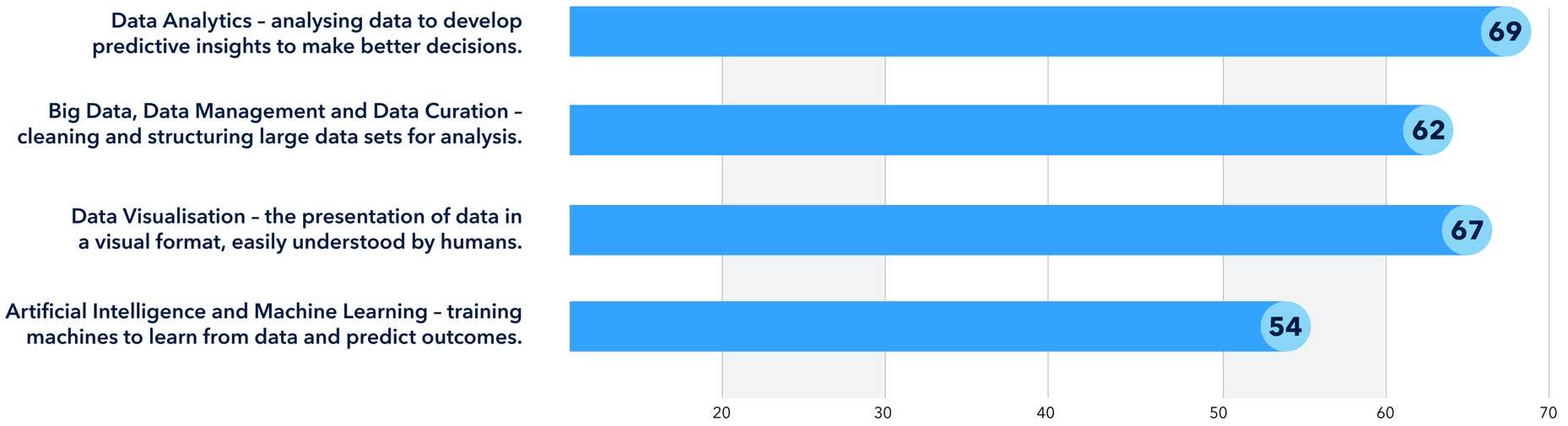
Top 3 strategic business priorities (%)



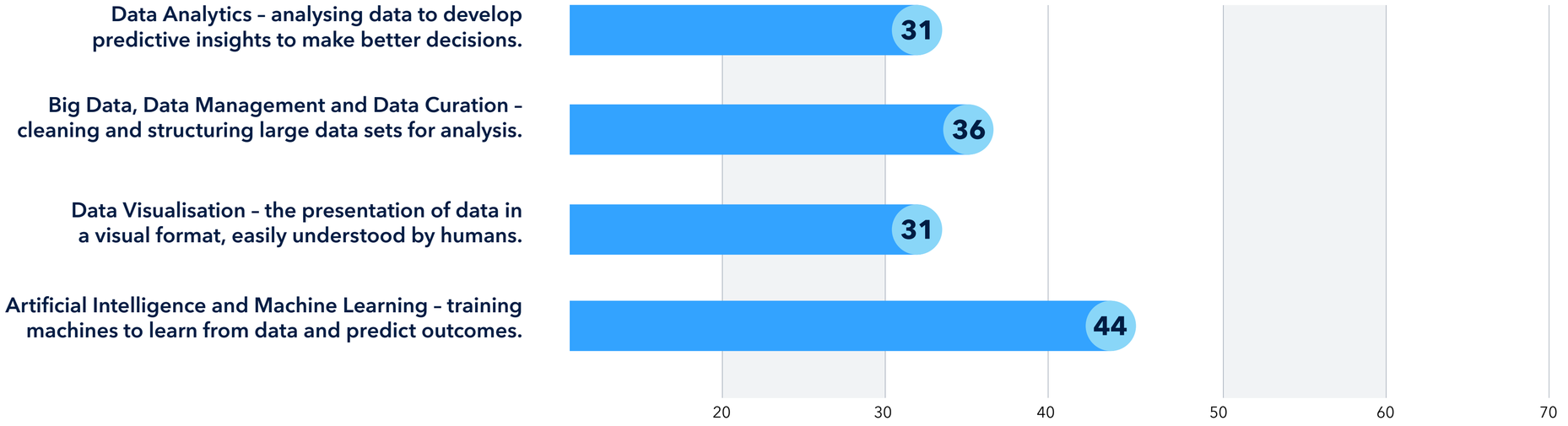
Top 3 strategic business priorities (%) (continued)

Technologies used/planned to use

Yes – we currently use this (%)

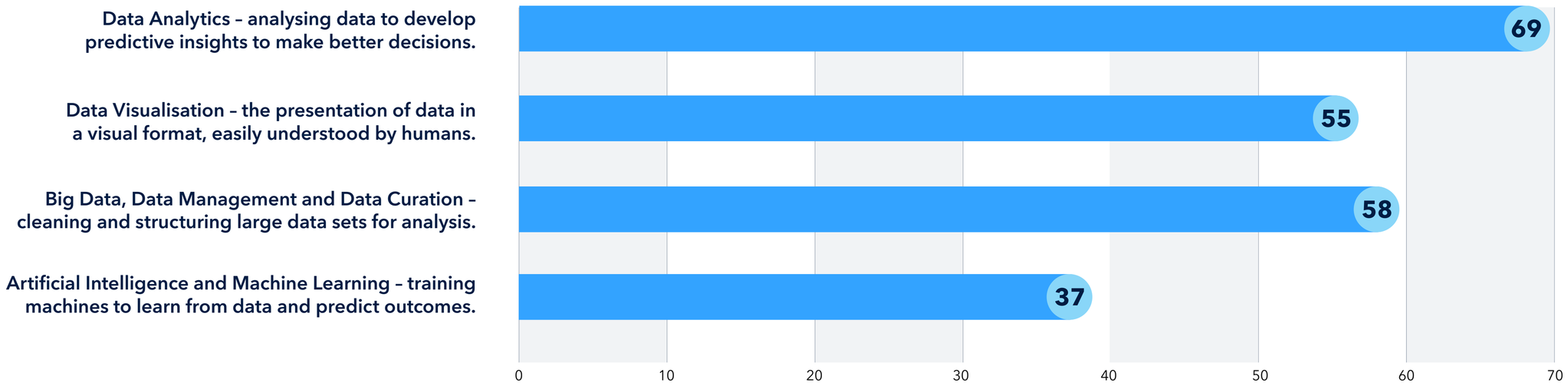


Yes – we plan to start using this in the next 1-2 years (%)

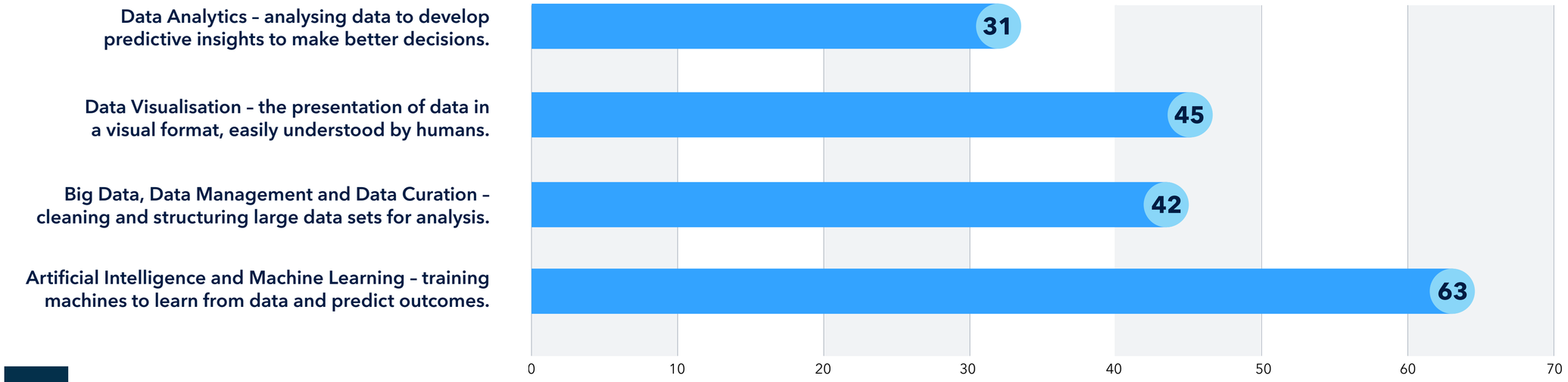


Skills to effectively use each technology

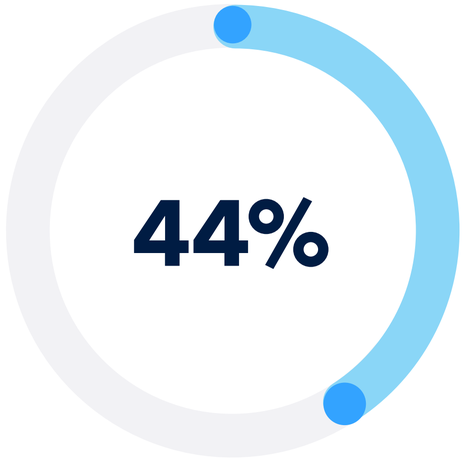
Skills sufficient (%)



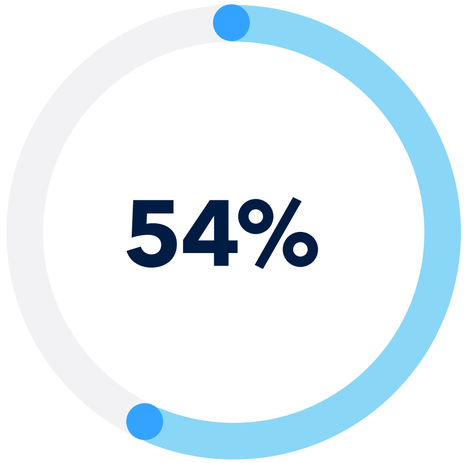
Skills insufficient (%)



Attitude statements



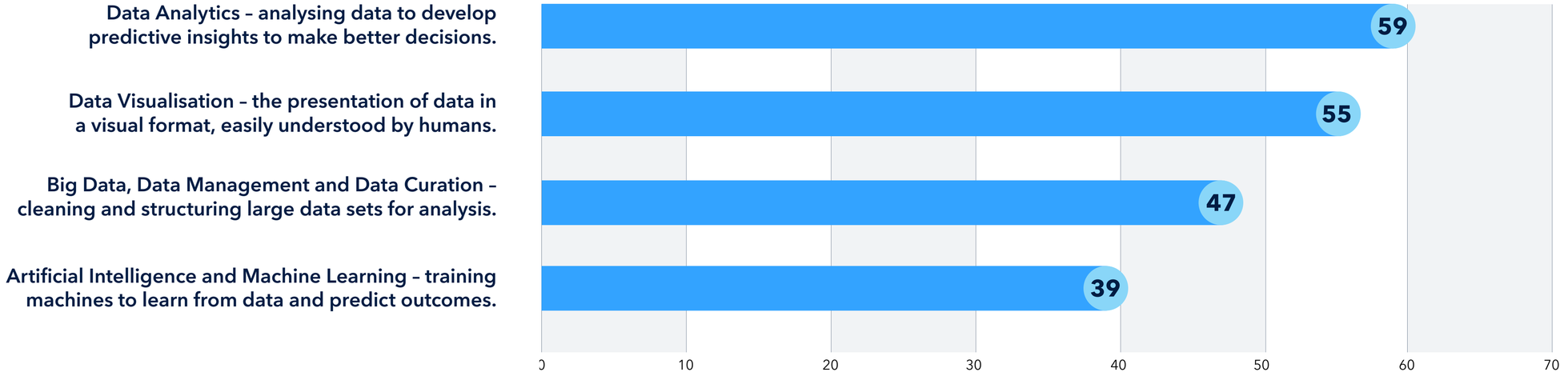
We have suitable digital tools available for staff to use for their day-to-day work, but they do not use them as effectively as they could



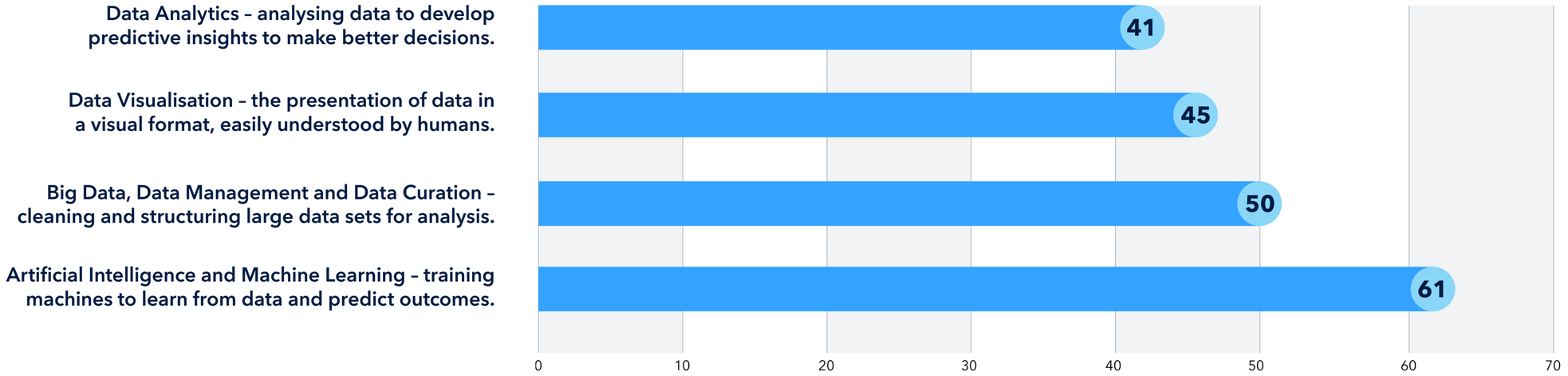
We would need to hire less new talent if our existing staff used the digital tools/technology they already have available more effectively

Sufficient workforce size to meet business needs

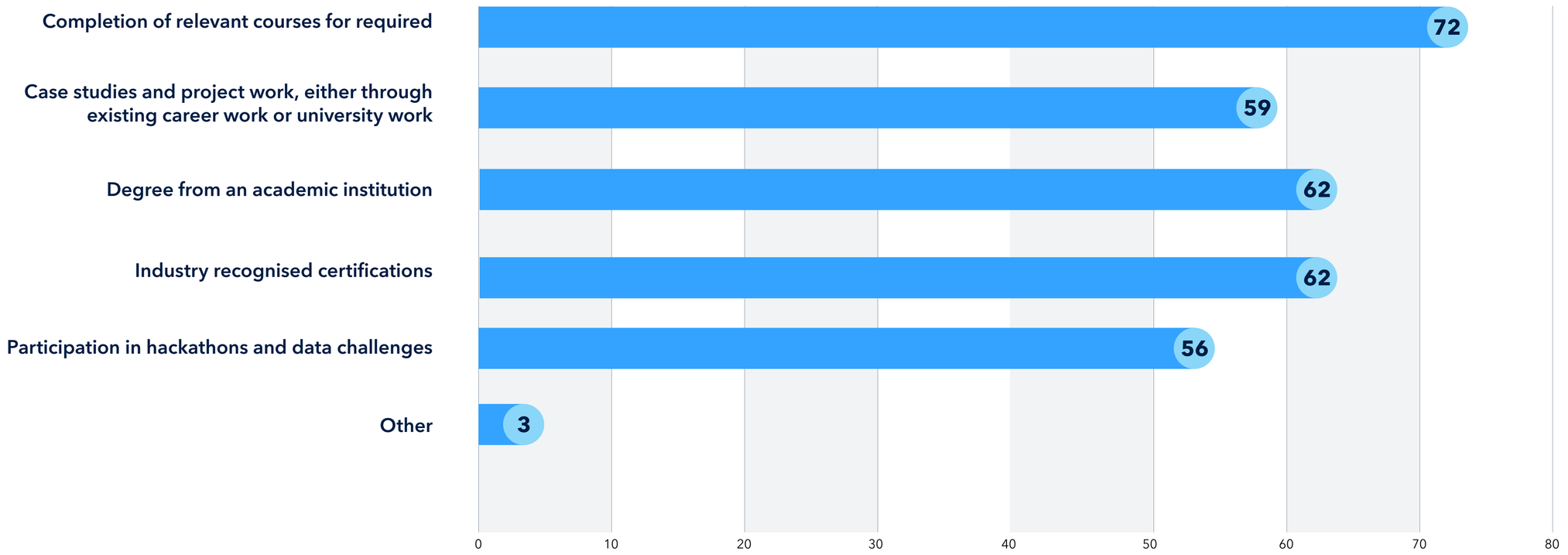
Yes – we have enough people (%)



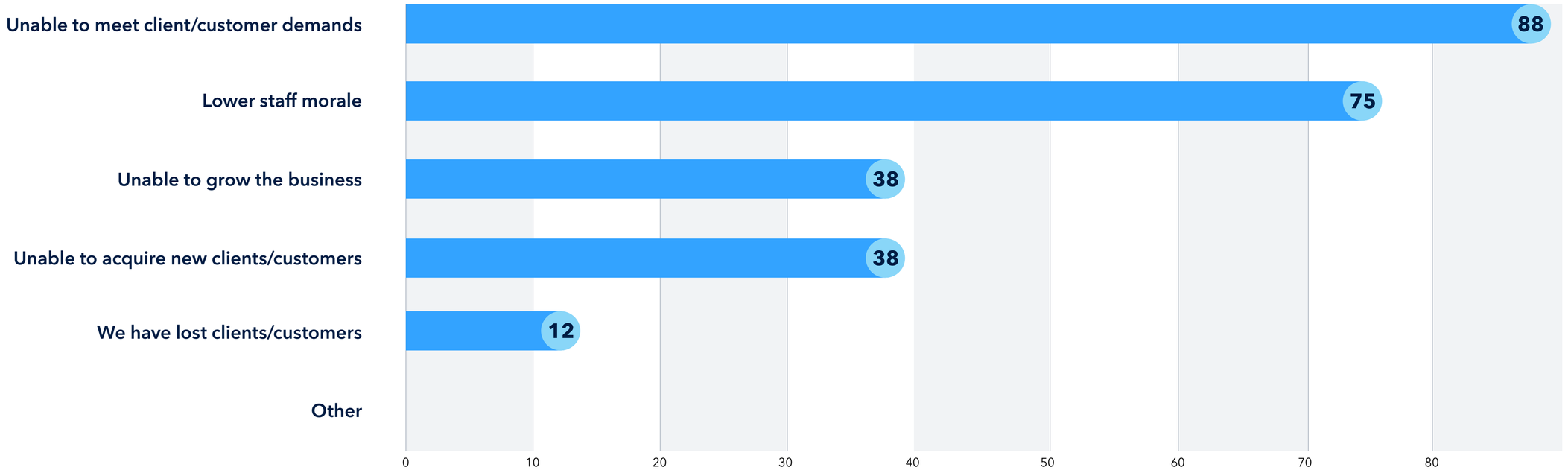
No – we do not have enough people (%)



Methods used to evaluate potential employees (%)

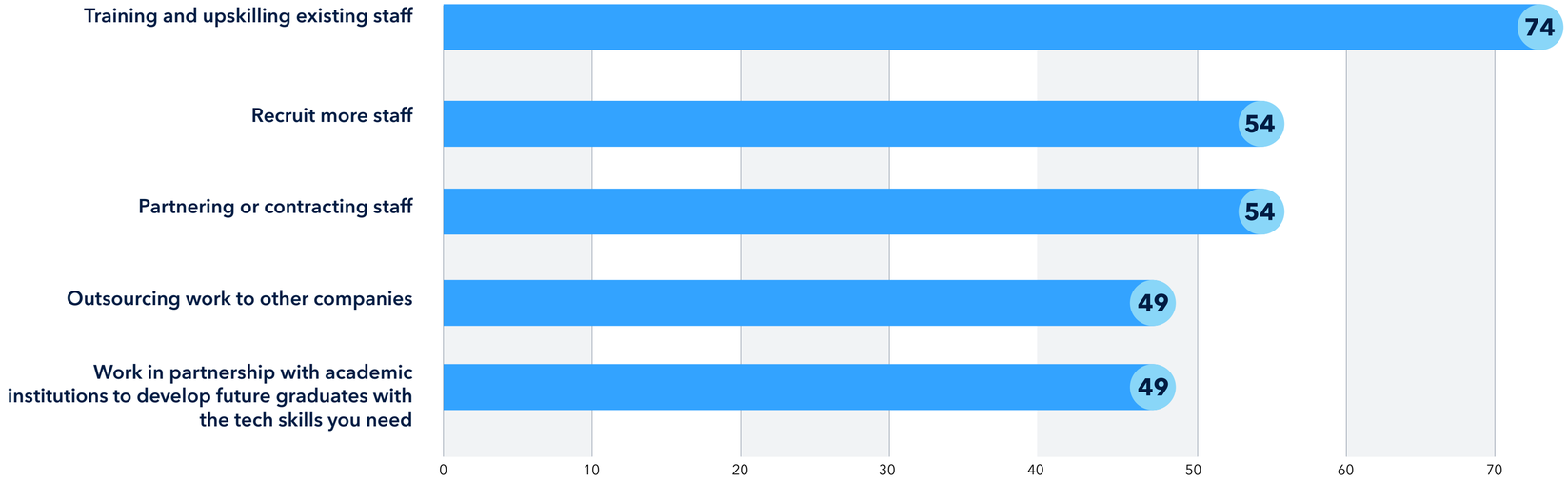


The impact of having too few staff (%)

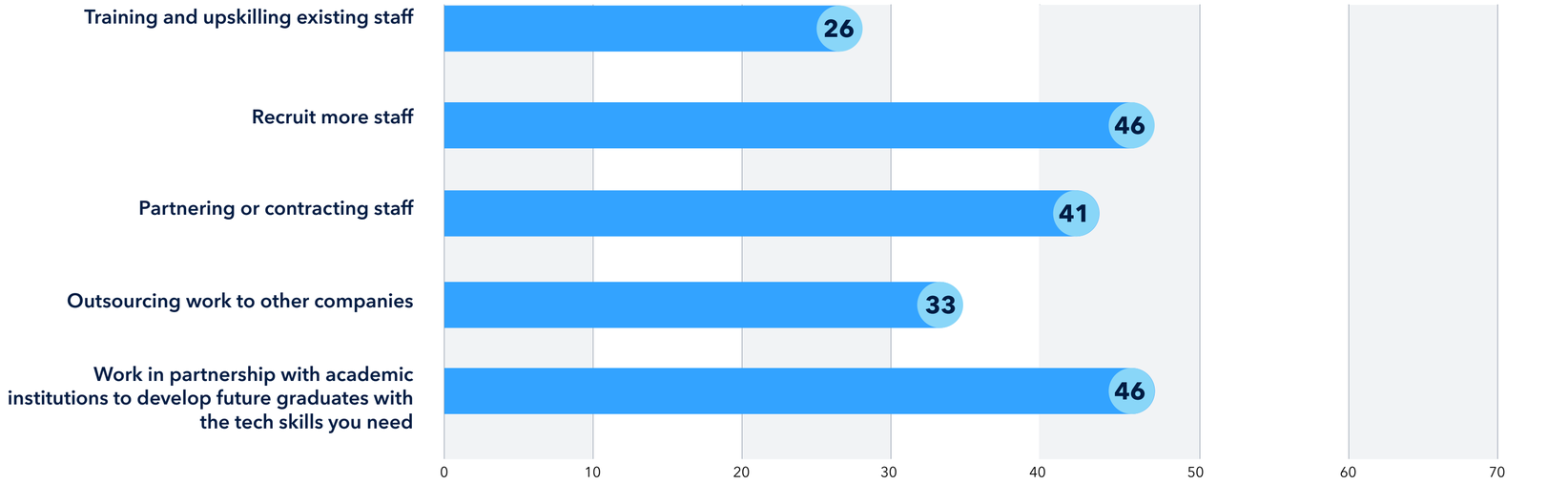


Methods to bridge the gaps in staff levels/skills

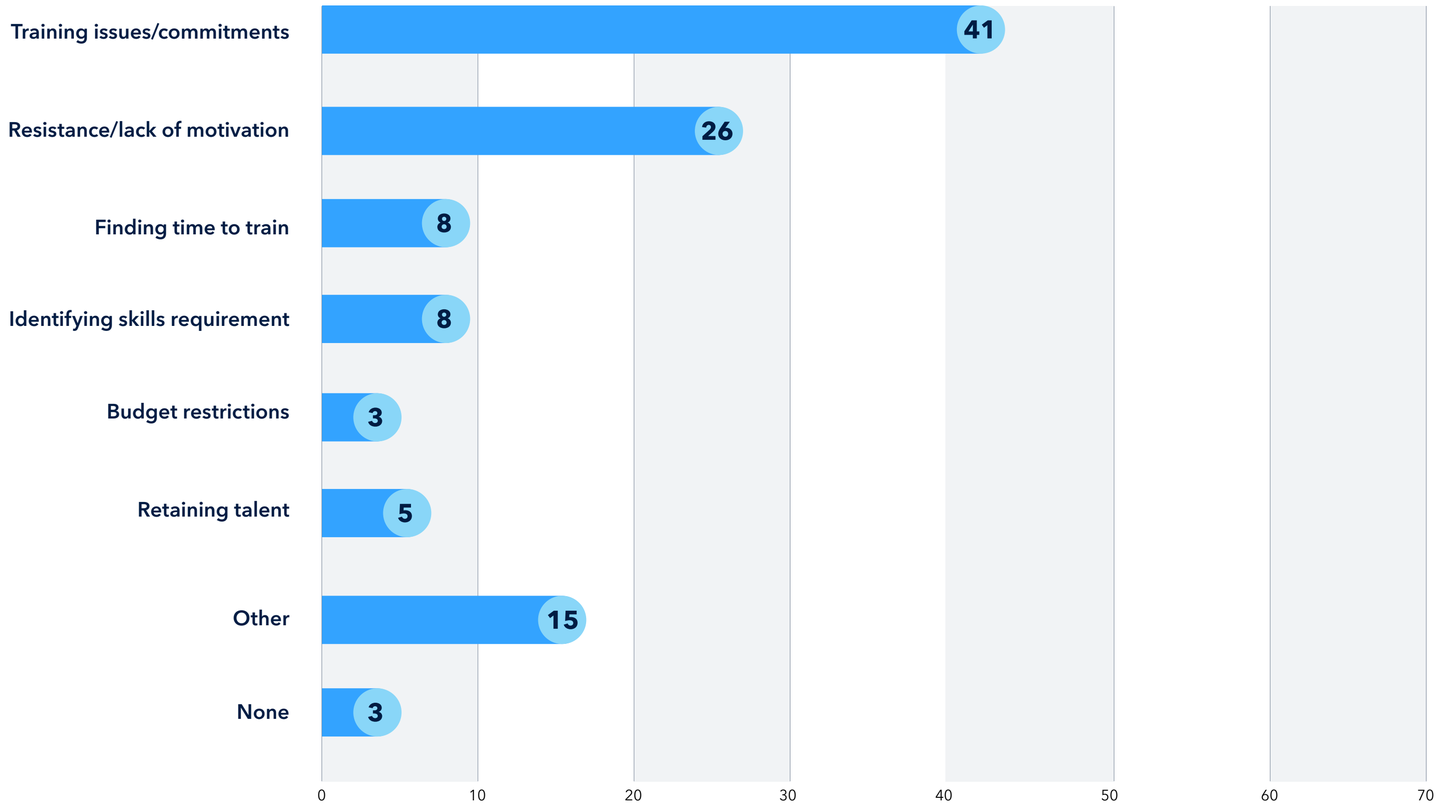
Yes – we currently use this (%)



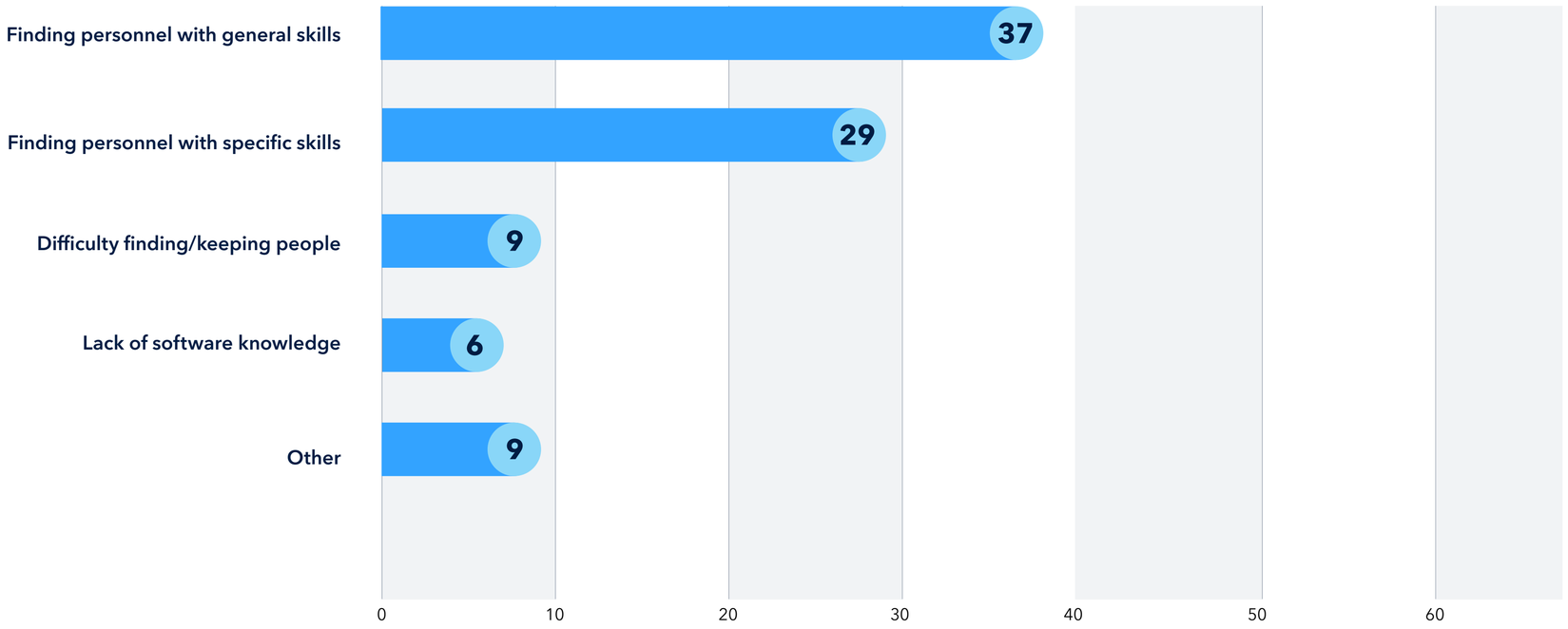
Yes – we have plans to do this in the next 12 months (%)



Key challenges with training/upskilling staff (%)



Needs when it comes to hiring new talent (%)



Take the next step

To find out how SAS can support individuals and teams to develop the right skills to enhance your data and AI capabilities.

sas.com/talentdevelopment

SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries.
®indicates USA registration. Other brand and product names are trademarks of their respective companies.
Copyright © 2022, SAS Institute Inc. All rights reserved. 113039_G229351.0822