Pearson

For Every Future:

Preparing Early-Career Skilled Trade, Technical and Service Talent for an AI-Infused World

AI is changing skilled work.
The imperative now is building expertise.

SEPTEMBER 2026

Contents

Foreword

For all the debate about AI and the future of work, we are still peering at the workplace through a very narrow lens.

Much of the public conversation has focused on the people affected most visibly by AI: software engineers, tech employees, knowledge workers, and administrative office personnel. That debate matters. But we're missing a much larger and more immediate reality.

Namely, AI is also reshaping occupations that are rarely at the center of the technology debate. Skilled trades. Public sector jobs. Service occupations. The people who maintain equipment, work in healthcare, keep civil infrastructure running, and deliver the essential work that economies and societies depend on every day.

At the same time, the demand for these skilled workers is growing and will keep growing as the world population ages and shrinks. Pearson believes strongly that it's time we put a sharper focus on the future of the world's skilled workers in the AI era.

In For Every Future, we've found that the remaking of skilled jobs and the rise in demand for these roles are on a collision course. Out of that, our research has revealed a new challenge for skilled and technical workers: a rapidly emerging triple capability gap.

The first gap is about new capability. Workers entering skilled trade, technical and service roles increasingly need to understand how to work with AI: when to use it, when to question it, and how to apply it safely and responsibly in real-world settings.

The second gap is a reaction to the first. As AI reshapes roles, it means workers must strengthen the distinctively human capabilities – like collaboration, communication and adaptability - that AI cannot replicate. These will become the primary source of value in an AI-augmented workplace.

The final gap is about institutional knowledge. These occupations have always depended on practice, observation, apprenticeships, and practical knowledge. People learn by doing, often from experienced colleagues. They learn how to spot the problem that is not in the manual or listen for the sound of broken machinery. As current workers retire or leave roles in record numbers, that practical knowledge is becoming harder to access at exactly the moment it is becoming more important.

Our research has found that what we have is not just an AI skills challenge. It is an expertise challenge: young workers who lack both old knowledge and new knowledge at the same time. So how do we skill people in an era that is AI rich, but may become experience poor?

Closing this triple capability gap requires three things at once: building role-specific AI literacy, sharpening those human capabilities like communication and collaboration that will define future success, while simultaneously increasing the opportunities for retiring workers to pass on institutional knowledge through effective mentoring and structured knowledge bases. Judgment. Ethical responsibility. Practical know-how. The capabilities that pass from one generation of workers to another.

Doing that takes a different focus on how we educate a new generation of workers. Our research found that AI is not replacing skilled workers. It is exposing how unprepared we are to train them for the workplace of the future. We've offered a series of recommendations that we believe can help.

Left unaddressed, this capability gap risks leaving a generation of skilled workers behind. We risk having undertrained workers in safety critical jobs, like healthcare. And we risk real economic damage if employers cannot find, develop and retain the skilled workers they need. But if we get this right, the opportunity is significant.

AI can help people learn faster, access knowledge more easily and solve problems in new ways. It can support workers, improve productivity and open new pathways into meaningful careers. But that will only happen if we are intentional about how expertise is built, how training evolves and how human judgment remains central to AI-enabled work.

At Pearson, we believe every positive scenario for the future of AI depends on human development. Human development depends on learning as the connective tissue between education, employment and lifelong capability.

That means employers, educators, policymakers, industry bodies and technology providers must work together to redesign pathways into skilled work for the AI era. We need training that reflects the reality of modern workplaces. We need stronger links between learning and practice. We need better ways to capture and pass along the knowledge of experienced workers before it is lost. And we need to ensure that every worker has the opportunity to build both the technical and human capabilities required to thrive.

The future of AI will not be determined by technology alone. It will be determined by whether people are prepared to use it well. This report is a call to act with urgency. To widen the AI conversation. To recognize the essential workers too often left out of it. And to ensure that as work changes, people are not left behind.

Sharon Hague

UK CEO, Pearson

A Workforce Revolution in the Making

Electricians. Nurses. Pharmacy technicians. Firefighters. Every day, millions of different skilled trade, technical and service workers keep our economies and societies moving. They are the people who keep the lights on, look after the elderly and infirm, keep us safe, and build our homes, cities, and workplaces.

The skilled trade, technical and service workforce is not only vital to our everyday lives but growing steadily, as a new generation of early-career graduates decides to take up the baton of work in sectors as diverse as manufacturing, healthcare, and service industries. Our research reveals the mounting demand for these skills, with the United States needing 2.2 million extra workers in these occupations by 2034, and China an additional 130 million by 2035. Even in economies and sectors where net growth is less spectacular, the need to replace retiring workers will further swell job openings across these occupations.

Enter Artificial Intelligence (AI). This technology is already beginning to transform how work is performed across a broad front of early-career skilled trade, technical and service occupations. It is helping workers diagnose problems, access information, manage workflows, and support decision-making. In some contexts, it is beginning to reshape how expertise develops and how work is learned. In many instances, this change is not arriving through a single moment of disruption. Instead, AI is becoming embedded within the tools, systems and technologies workers use every day.

The question facing employers, educators, and policymakers, therefore, is no longer whether AI will affect these occupations. It already is.

Instead, the key questions are now about how to effectively integrate AI into early-career skilled trade, technical and service work: how to adapt training and education systems, how to ensure responsible use, how to avoid loss of expertise and tacit knowledge.

Pearson's experience highlights the central role of education, training, and capability building in any workforce transition. Yet the research we conducted for this report shows that training and education systems are already struggling to keep up with the pace of AI adoption, leaving early-career entrants bereft of the skills and guidance they need to make productive and responsible use of AI. The result: a growing gap between how work is changing and how people are being prepared for it.

At Pearson, we believe this challenge demands renewed focus on how skilled trade, technical and service workers learn, develop expertise and build career readiness in the AI era.

The future of these occupations will depend not simply on technological innovation, but on how effectively employers, educators, policymakers, and industry leaders adapt the pathways that prepare people for them. This report is our contribution to that debate.

Our research reveals five overarching findings:

1. AI is rapidly reshaping occupations not typically associated with the AI conversation

Much of the AI conversation has focused on office-based knowledge work. But AI is also becoming part of how work gets done across skilled trade, technical and service occupations, changing tasks, workflows and expectations of competence.

2. Demand is rising for skilled trade, technical and service workers

Workforce demand is already high and rising at the same critical moment these jobs are being reshaped by AI. Much of that demand will be driven by people retiring or leaving skilled jobs. The challenge is not simply filling vacancies, but building expertise faster and transferring practical know-how to the next generation.

3. A new and distinctive triple capability gap is emerging

Skilled trade, technical and service workers must simultaneously develop: role-specific AI literacy and critical judgment, the human capabilities that set them apart from AI, and the institutional knowledge and practical know-how that retiring experts are taking with them.

4. Closing these gaps requires three things at once

Education, training and workplace learning must evolve to build role-specific AI literacy and critical judgment, strengthen durable human capabilities, and expand opportunities to develop practical know-how through mentoring, observation, feedback, simulation and hands-on experience.

5. The cost of inaction is significant

If these challenges are not addressed, we risk leaving workers behind, creating dangerous gaps in safety-critical occupations, and limiting employers' ability to find and develop the skilled workers they need.

Together, these findings show that preparing early-career workers for AI-enabled work in skilled trade, technical and service roles is now an urgent challenge. The defining question is how expertise is built in an AI-infused world. This report explores that challenge and sets out recommendations for employers, educators, policymakers and industry bodies to help address it.

Examining AI in Action

To understand how AI affects these roles in practice, we selected two occupations from the hundreds in our research scope for deeper investigation: pharmacy technicians and industrial machinery mechanics.

To read about the selection process that led to the choice of these two roles, see **Annex 1: Selecting our deep-dive roles.**

While this report examines pharmacy technicians and industrial machinery mechanics in detail, these roles are illustrative cases for dynamics we expect to recur across the skilled trade, technical and service sectors.

For example, the job of an industrial machinery mechanic relies on hands-on mechanical skills with some diagnostic and problem-solving work. Looking closely at this role helps to illuminate how AI may affect technical, equipment-based work. By contrast, the pharmacy technician role is less mechanical but more focused on people and coordination. Analysis of this role shows how AI may affect healthcare support work and daily workflow coordination.

Both roles are also economically significant from the standpoint of future growth in employment. Together, they offer detailed, real-life insights into how AI can reshape a wide range of practical, everyday work activities, helping us to assess broader implications and imperatives for future learning and expertise development.

Our research focuses on three labor markets: the United States, the United Kingdom, and China.

The evidence draws on several strands. We conducted multiple roundtables for each role: students and early-career workers spoke of their experiences of training and entering the workforce; and training providers and industry representatives discussed the evolution of hiring, training, and workforce capabilities. We also conducted an online survey to extend the early-career view to a wider sample. Finally, we held interviews with workforce experts, who provided commentary on the structural shifts that are reshaping skilled trade, technical and service roles.

Evidence from the ground

AI Impact on Pharmacy Technicians

A pharmacy technician prepares and supplies medicines under pharmacist supervision. They verify prescription requests, log patient data, and maintain medicine inventories and security. They also provide medicines advice and support to patients and the public. Accuracy, attention to detail and critical thinking are core to the role; US O*NET data[1] finds that 98 percent of surveyed pharmacy technicians rate being exact or accurate as "extremely important," and 44 percent judge the consequence of error as "extremely serious."

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What tasks could be augmented?

Respondents generally agreed that AI could be used to absorb routine but time-consuming tasks seen as core to the role such as dispensing, procurement, and inventory management (e.g. robotic ordering and dispensing; medication synchronization in the US).

How is AI's impact on the role perceived?

AI was seen as subordinate to the technician–patient relationship and patient-centred care. The benefits of AI were framed in terms of operational or administrative efficiencies, potentially freeing time for patient counselling and more complex cases. The clearest risks raised were over-reliance or loss of human oversight that could compromise patient safety.

Is there a training gap?

AI is entering pharmacies faster than training is adapting. The vast majority of pharmacy technicians we heard from said AI was not explicitly covered in their training. Even newer training standards were noted as mandating tasks that AI automation is already removing in practice.

What skills remain most valued?

1. Patient communication

Particularly the ability to read between the lines and hear what the patient may not be saying.

A technician who has an above average knowledge and experience of the medications, and they've got really good soft people skills to communicate, they're going to be hearing what the patient is not saying about the medication's effectiveness."

Christine Cline-Dahlman, President, PharmTechForward LLC

2. Judgment

Caution, thoroughness and the knowledge, willingness, and confidence to challenge assumptions or conclusions.

Sometimes there are more complicated tasks that require human judgment, such as obtaining approvals for medications that are not commonly prescribed or helping with appeals. We need people who can handle these edge cases and keep things running when systems break down or experience downtime."

Scott Nelson, Associate Professor in Biomedical Informatics, Vanderbilt University

3. Pharmacy foundations

Clinical skills and knowledge of pharmaceutical preparations, drug properties, and interactions.

Pharmacy technicians will still need a strong foundation of core clinical skills and medicines knowledge. They will need to know how to critically appraise AI outputs and know when to override or escalate. They will need clear accountability through their scope of practice."

Gail Hall, Vice President, Association of Pharmacy Technicians UK

Evidence from the ground

AI Impact on Industrial Machinery Mechanics

An industrial machinery mechanic (also known as a maintenance machinist or industrial maintenance technician) installs, maintains, and repairs industrial production and processing equipment. Troubleshooting, mechanical knowledge, and hands-on problem-solving are essential skills; mechanics may need to diagnose, test, or adjust equipment malfunctions, and increasingly, work with computer-controlled machinery.

What tasks could be augmented?

The clearest opportunities for AI augmentation centered on problem diagnosis, troubleshooting, and testing, which emerged as the most likely AI scenarios in our survey of trainee and early-career industrial machinery mechanics. Documentation including standard operating procedures, maintenance records, or email admin was also seen as an area for augmentation, alongside faster access to knowledge during on-the-job problem-solving. Preserving knowledge was a distinct use case raised by employers, with a need to capture the institutional know-how of experienced workers before they retire.

How is AI's impact on the role perceived?

Where adoption is happening, it is still seen as experimental or innovative. AI was not seen as a job threat to Industrial Machinery Mechanics; the embodied, tacit knowledge seen as essential to real competence was thought difficult for AI to replace. Risks were noted both at the individual level (building an illusion of confidence before the knowledge and experience needed for genuine competence have been developed) and at the organizational level (cybersecurity, intellectual property concerns).

Is there a training gap?

Most trainees we surveyed expect they'll use AI on the job, but fewer than half indicated that they were even moderately confident that their training will prepare them to do so. Legacy equipment compounds this: new career entrants trained only on current technologies could arrive unprepared for older machines still in use. Taken together, this suggests readiness is less about the completeness of AI preparation in training, and more about ongoing learning embedded in day-to-day work.

What skills remain most valued?

1. Interpersonal skills

Collaboration and communication, cross-disciplinary working and resilience.

You've got to be able to get along with people and see the usefulness in each person, and realize there's something to learn here…You've got to communicate with your customers when you're face to face. You still have to be that face of the company for the customer, and good communication skills are never going to go out; that's almost an unspoken requirement for field service technicians."

Andrew Green, Hotline and Senior Field Service Specialist, Fairmont Machinery

2. Curiosity and metacognitive agility

Learning from failure, judgment under uncertainty, and a lifelong-learning orientation.

That broader ability to be able to problem solve, to think analytically, to engage on challenges, and to learn in the flow of work."

Mark Donnelly Head of Learning & Development, UK & International, BAE Systems

3. Technical and mechanical knowledge

Domain-specific machine knowledge and troubleshooting logic.

There's obviously the practical side of understanding that a mechanic needs… that hands-on understanding, and probably the underlying theory, because some parts of mechanical engineering haven't changed for many centuries."

Lydia Amarquaye-Booker, Education & Skills Policy Lead, Institute of Mechanical Engineers, Institution of Mechanical Engineers

Mapping Skilled Trade, Technical and Service Occupations

There are significant differences across the spectrum of skilled trade, technical and service work, and understanding those differences matters enormously for how AI will affect each occupation.

To map this diversity, we analyzed the full range of US entry-level occupations—those requiring up to an associate degree or equivalent vocational preparation—drawing on the US Department of Labor's O*NET database (see Annex 2 for the methodology).

Our analysis revealed four key dimensions of skilled trade, technical and service work:

Mechanical and hazardous physical work

Operating equipment in dynamic, often outdoor or hazardous environments.

Analytical and investigative work

Non-routine problem solving, diagnosis, and judgment.

Caring and empathetic work

Close proximity work with people who need help.

Coordination and supervision

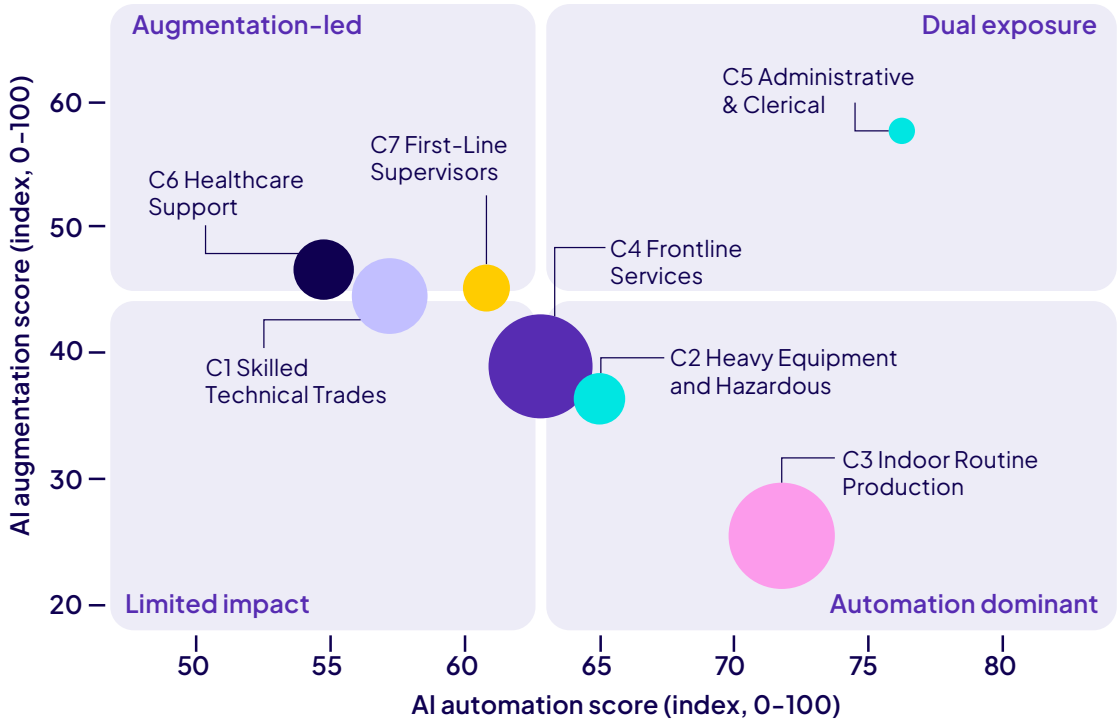
Directing, training, and organizing other people's work.

Grouping occupations by the similarity of their profiles across these different dimensions produces seven distinct clusters of skilled trade, technical and service work.

These include skilled technical trades and installers (carpenters, electricians, maintenance, etc.), heavy equipment and hazardous operations roles, front-line service workers (cashiers, personal care, etc.), healthcare support (nursing assistants, pharmacy technicians, etc.) and first-line supervisors and field coordinators. Together, the seven clusters cover 113.4 million US workers.

We then examined each cluster's AI exposure using a smaller set of 370 occupations that match those in the Faethm[2] database of automation and augmentation exposure (up to 2036). These data were used to create automation and augmentation indexes (on a range of 0–100) for each of the 370 occupations. The scores were then averaged for each of the seven clusters.

Figure 1 (below) maps the seven clusters on a 2-by-2 matrix to visualize their relative automation/augmentation exposure.



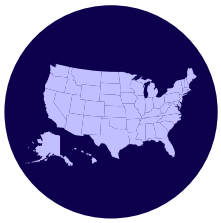
US entry-level clusters: AI automation vs augmentation (0–100 index), bubble size = 2024 employment of matched occupations. Quadrant lines at the median of the cluster means.

Each bubble represents one of the seven clusters, sized by 2024 US employment. The horizontal axis shows the AI automation score by 2036; the vertical axis shows the AI augmentation score, where AI assists rather than replaces. The dashed lines mark the median cluster on each axis.

Using augmentation and automation as the organizing frame, our analyses distinguish clusters where AI is likely to change how work is done from those where AI may replace the work altogether. Exposure falls unevenly: skilled technical trades, healthcare support and front-line supervisors lean toward augmentation; indoor routine production and heavy equipment operators are automation-dominant. Front-line service workers are close to the medians on both axes. The borderline administrative and clerical cluster falls squarely in the dual-exposure quadrant, although this finding is based on a small sample of occupations so should be treated with caution.

This pattern suggests that across several clusters, the likely near-term effect of AI exposure is roles reshaped by AI rather than eliminated entirely. Next, our analysis turned to where these jobs will be, and how growth and replacement demand could play out across the US, UK, and China.

Where the Jobs Will Be – Future Growth and Replacement Demand



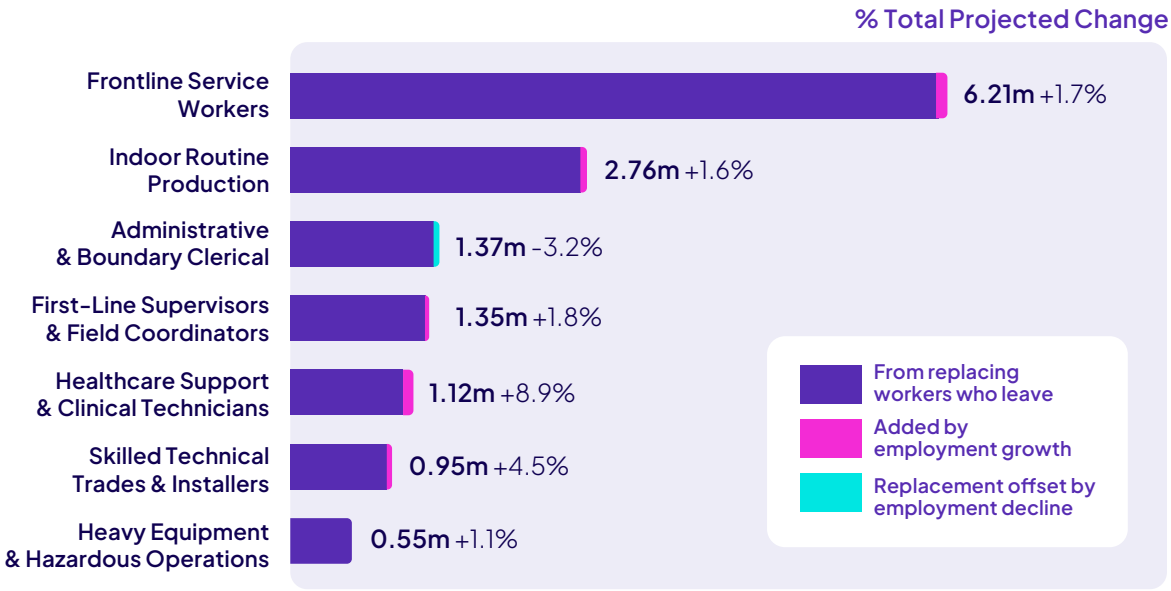
United States:

Employment grows but most job openings come from turnover

Our analysis finds that six of the seven clusters we identified are projected to grow between 2024 and 2034, with total employment across the 113.4 million workers covered increasing by 2.2 million (+1.9 percent). Healthcare Support & Clinical Technicians grows fastest (+8.9 percent), followed by Skilled Technical Trades & Installers (+4.5 percent); only Administrative & Boundary Clerical declines (–3.2 percent).[3]

But employment growth is the smaller half of the story. These roles generate around 14.3 million job openings every year, and about 14.1 million of them—98.5 percent—come from replacing workers who retire, change occupation, or leave the labor force altogether (see Figure 2).

Figure 2: US – Average annual hiring requirement by cluster, 2024–2034



United Kingdom:

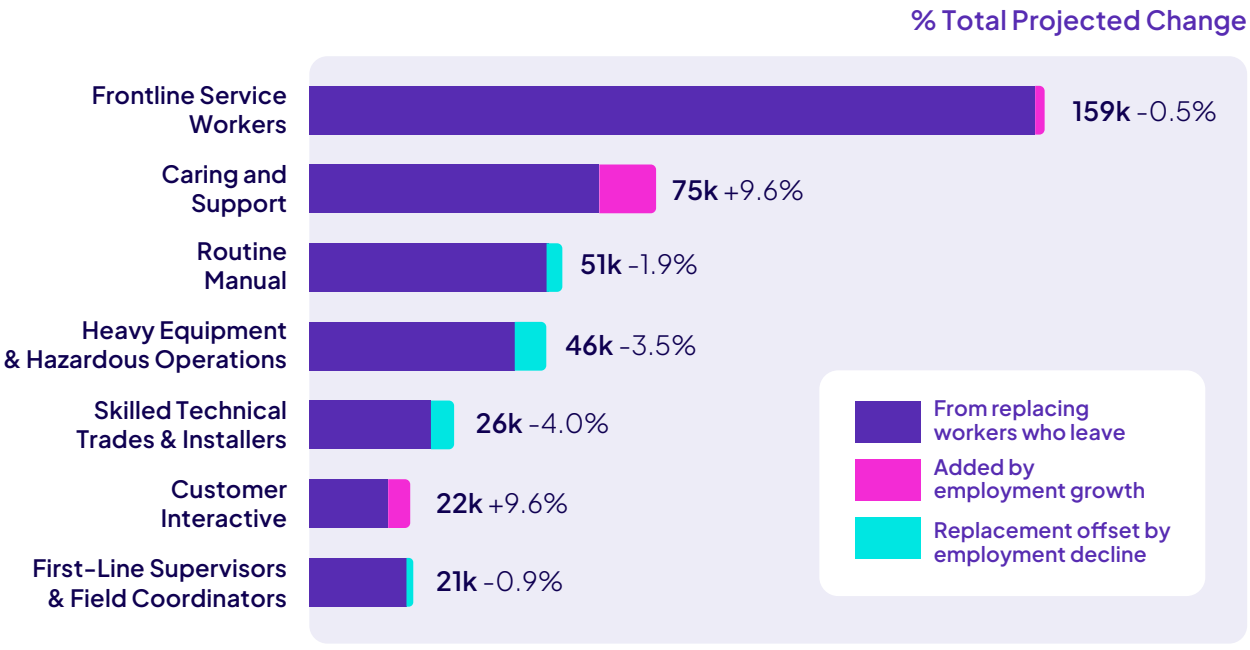
Worker exits create openings despite flat employment

In the UK, employment is projected to stay essentially flat to 2035 (see Annex 2 for details of the methodology). Across UK skilled trade, technical and service work, net employment change is just +26,000.[4]

However, this masks a significant reallocation away from heavy equipment and hazardous occupations, towards caring and support occupations. The occupations projected to grow share a common feature: human contact at the heart of the work. For example, Caring and Support adds 147,000 jobs over the decade, up 9.6 percent in net employment terms, and needs to fill around 75,000 openings per year mostly to replace leavers.

In addition, the UK still has massive hiring needs that stem from replacement demand. This is expected to total just over 4 million over the decade, equivalent to 99 percent of all openings and more than 150 times larger than the net employment change. Even shrinking occupations keep hiring: sales and retail assistants decline about 5 percent in net employment terms over the decade yet still generate over 24,000 openings a year through turnover alone.[5]

Figure 3: UK – Average annual hiring requirement by cluster, 2025–2035

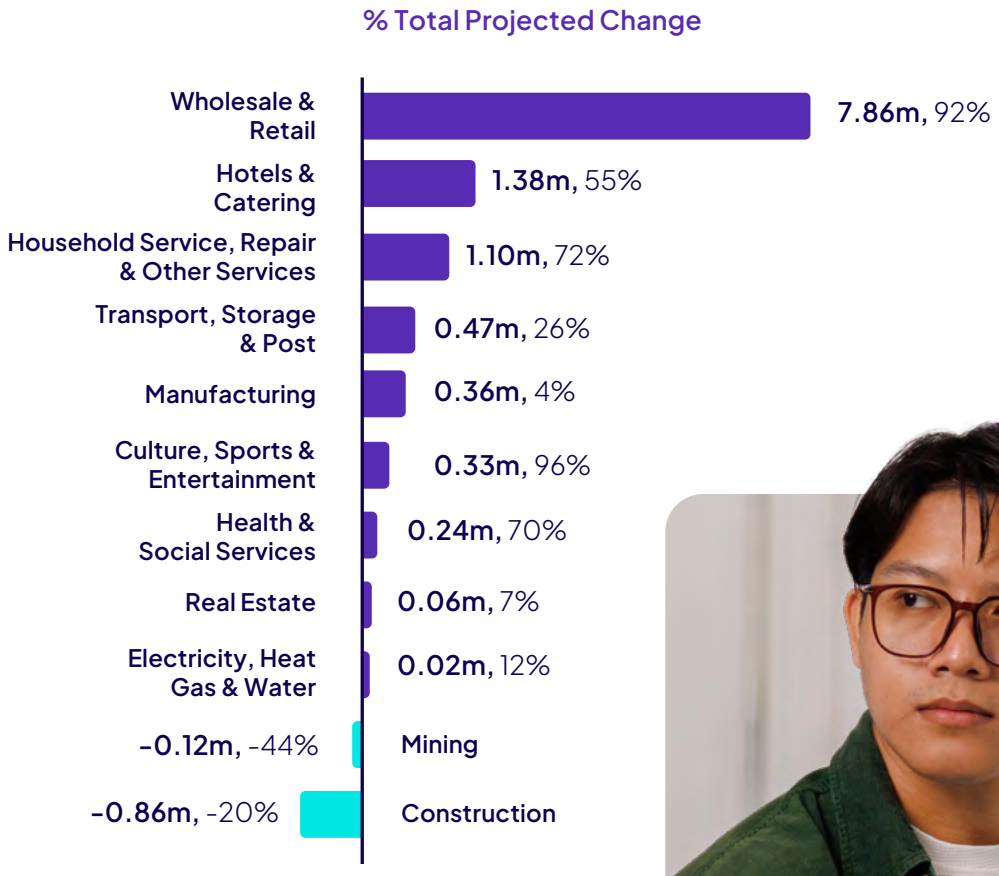


China:

Demographic challenges create a shortfall of workers

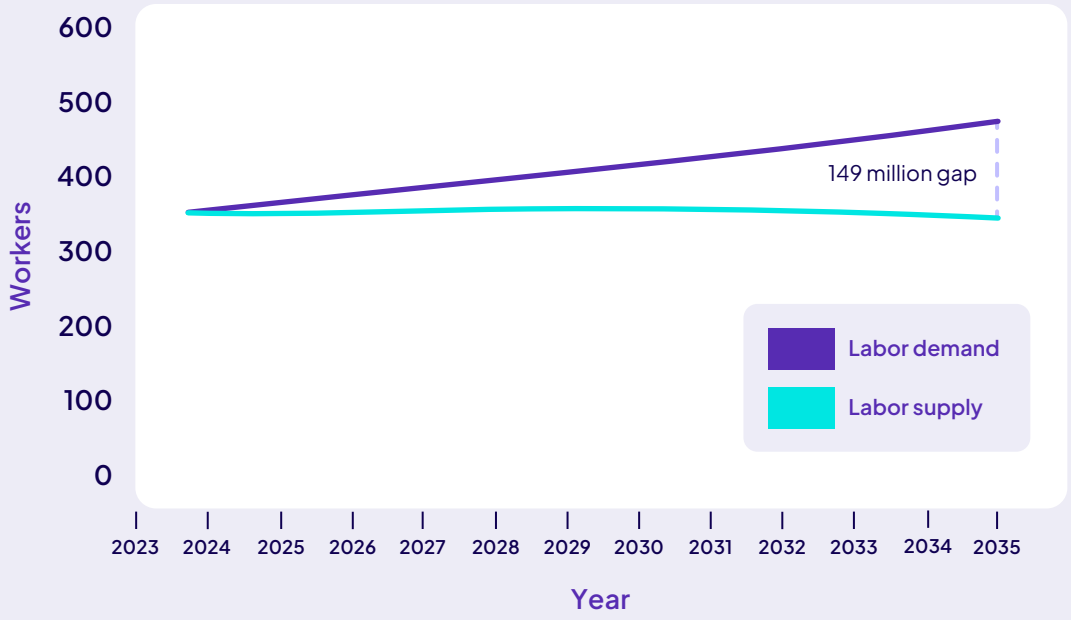
For China, although data on labor demand does not allow us to distinguish between projected growth and replacement demand, we can see that the occupations most driving this upward trend are within Wholesale and Retail (projected to increase by 92%) and Culture, Sports and Entertainment, where hiring requirements are expected to double (see Figure 4).

Figure 4: China – Average annual hiring requirement by cluster, 2023–2035



After reflecting on the demand trends, we added another layer to our analysis to account for the country's demographic challenges and particularly a large aging population. Our demand projections for skilled trade, technical and service workers indicate that it will rise from around 347 million workers in 2023 to around 477 million by 2035, while the working-age population peaks and thus the supply of such workers falls to around 328 million. The result is a structural shortfall of roughly 149 million (see Figure 5).

Figure 5: China – Skilled trade, technical and service demand and supply, 2023–2035 (millions)



Our scenario modeling shows that even with the most optimistic combination of workforce measures, ranging from higher participation rates in the labor market to a greater number of graduates taking up skilled trades, technical and service jobs, the gap cannot be closed completely.

The remainder must come from making each worker more productive, and AI has a significant role to play toward boosting worker productivity.

The Speed of Change and the Case for Action

Our research points toward the need for new thinking and action on career pathways for skilled trades, and for technical and service workers.

A distinguishing feature of many of these professions is the importance of workplace-based learning. While formal education provides foundational knowledge, much of the expertise required for early-career roles in these sectors is developed through supervised practice, observation, mentoring, and hands-on experience.

Learners gradually move from understanding processes and procedures to developing the situational judgment, adaptability and tacit knowledge required to operate effectively in real-world environments.

Historically, occupational requirements have evolved gradually. Learners acquire a defined set of skills and knowledge before entering the workforce, while qualifications and training programs are periodically updated to reflect changing industry requirements. But with the entrance of AI, workplace practices are evolving faster than traditional qualification and training review cycles. This places increasing pressure on education and training systems to become more responsive.

All stakeholders—early-career workers, employers, and education and training organizations—must act on three fronts at once: building role-specific AI literacy, strengthening the human capabilities that AI can't replace like communication and collaboration, and ensuring new entrants have the hands-on, practical opportunities to absorb the institutional knowledge that fast-retiring experts are taking with them. All three are needed to succeed in a world in which AI is becoming integral to work.

Rethinking Early-Career Pathways for the AI Era

The adoption of any new technology often begins with a bang: the promises and hopes are high, no one wants to be left behind, and big questions are left to be resolved later.

This scenario is very much the case for the way AI is affecting early-career workers in skilled trades, and in technical and service settings. Our research points us to four critical questions central to the education, development, and career pathways of these workers:

Trust & Responsibility

Who is responsible for AI outcomes (and what happens when things go wrong)?

Education, Training & Capability-Building

Are education and training programs ready to prepare people to use this technology effectively and safely?

Transfer of Experience & Tacit Knowledge

As use of AI increases, what will happen to the expertise and tacit knowledge that comes from workers with significant experience?

The Human Advantage

How can we nurture the distinctly human capabilities that will only grow in importance during the era ahead?

We describe these four questions, or challenges, in greater detail, and offer recommendations based on our research and experience to help workers, educators, employers, and policymakers accelerate progress in this new world.

Challenge 1

Trust and Responsibility

Who "owns" AI in the workplace — who decides how it gets used, how it is diffused, what kinds of outcomes are expected, what happens when it goes right, or when it goes wrong? The answers are not yet clear, and they are especially thorny where workers may be asked to use AI before they have much training or experience with it. In occupations where errors can mean an incorrect prescription or a mechanical failure on the factory floor, the stakes of getting this wrong are immediate and tangible.

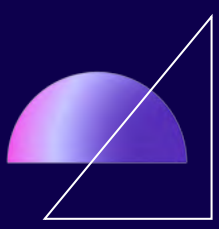
Emily Cook, a psychologist at Top Employers Institute, a global leader in HR strategy, used a medical setting to describe the range of people to consider when identifying accountability: "the junior nurse who doesn't understand how the AI works, the IT team that deployed the AI system, the patient who signed the form…" In a world where AI pilots are being rolled out in a "test and see" environment, it's crucial to begin by clarifying ownership and accountability. As she warns: "The risks are huge. Who owns that risk? Who answers when it all goes wrong?" We need to consider and assign these roles before things go wrong.

Meanwhile, our research reveals how AI continues to seep into everyday work in an unstructured way; through the software that workers use, through the machines that they operate, or through the ad-hoc use of AI by workers themselves and the public they interact with.

People are still feeling their way on these issues. Some roundtable participants believe they will be held responsible "for anything that goes wrong;" others say it is up to employers to ensure the creation of a "safety culture." These tensions echo what research on responsible AI-human interaction terms the 'moral crumple zone'.[6] Just as a car's crumple zone absorbs the force of a collision, the worker nearest the point of failure risks bearing the weight of a wider system malfunction. Avoiding this outcome cannot be the worker's responsibility alone; education providers and regulators have important roles to play too. As institutions grapple with the issues surrounding AI, we see three essential areas for immediate action.

Key actions to meet the challenge:

Define decision-making boundaries



Train for the edge cases

Build ethical governance

Key action | Trust and responsibility

Define decision-making boundaries

In the context of unknown—and unknowable—risks, it is vital to locate the boundaries between what a worker decides for themselves and when they are acting on AI outputs.

These boundaries will partly be defined bottom-up, as employees feel out what tasks and decisions can and can't be devolved to AI, and partly top-down, as employers develop rules based on what is proven to be effective and responsible for their context. In both cases, the imperative is to reinforce the human-in-the-loop at these evolving boundaries, and to ensure that employees are being trained to understand where their decision-making responsibilities lie.

For early-career workers in skilled, technical, and service occupations, figuring out these boundaries will happen at the same time as they are learning to do the job.

The more AI-literate they arrive, the faster they get up to speed on using AI effectively at work. Zhisheng Gao is General Manager at Zhengzhou Jiean Hi-tech Co., Ltd, which specializes in simulation-based training solutions for complex industries such as aviation and rail transit.

He describes the essential process of

> **AI trust calibration: the ability... to assess when to accept AI recommendations, when to supplement them with field verification, and when to override them with human judgment."**

As these early-career workers learn to solve problems, their judgment, expertise and resilience will grow. AI models will improve too, as feedback from worker experience improves the tools. This feedback loop between workers and AI must be encouraged by employers, to accelerate the learning and productivity outcomes of AI investments.

Employers should track, assess, formalize, and disseminate lessons about worker-AI boundaries and decision spaces. Underpinning all of this is culture, as these mechanisms are only valuable if workers feel encouraged to report when AI gets it wrong, and able to question rather than defer to the technology. As use cases prove valuable, they should be incorporated into training for wider adoption. And as adoption grows and roles evolve, an organization-wide view will become crucial to ensure strategic and operational alignment. Employers should also look outside their own organizations to share experiences and lessons that can accelerate the effective and responsible deployment of AI, industry wide.

Industry bodies and regulators also have a role in establishing responsibilities and ownership. For example, they can act as a repository of leading practices, and they need to help decide and communicate the "red lines" for AI deployment, making it clear when augmentation and automation can be detrimental or counterproductive.

Key action | Trust and responsibility

Train for the edge cases

For an AI tool to be effective, it must absorb the knowledge required for its work context. But such knowledge often sits deep in the minds of expert workers.

This includes knowledge about how to spot, understand and handle the "edge cases" (the exceptions that go beyond what AI has been trained on), and to recognize when AI is hallucinating, offering bad advice, or simply missing the bigger picture.

Edge cases can indicate a risk or an opportunity. For example, an outlier result may suggest that calculations or process steps along the way have gone awry. Conversely, an edge case may be positive; such as revealing a new way of approaching a complex maintenance problem that had not been considered before. In either scenario, employers and managers must be available and prepared to address the questions that early-career workers escalate to them, and in many cases, to develop effective processes for such escalation in the first place.

Junior employees should be trained and encouraged to look beyond what the system tells them. Detecting and handling anomalies is a minimum.

The real value can come from a combination of using knowledge that the AI doesn't hold, understanding its biases and using their own creativity to unearth opportunities.

The pharmacy technicians we spoke to frequently described a key obstacle to fully trusting AI was its inability to reliably identify the full range of risks, from incorrect labeling to complex patient histories. Even if that trust in AI builds over time, the questioning must continue. It will always be up to the human to detect the edge, and to explore the risk or value it can bring.

Key action | Trust and responsibility

Build ethical governance

> **An organization has to build the proper taskforces that involve HR, involve legal experts, involve IT experts, to have these collaborative conversations before the AI is deployed."**
>
> Emily Cook,
> Psychologist at Top Employers Institute

Just as clear responsibilities and ownership are crucial to manage the risks of working with AI, so is the governance of AI deployment.

At the Top Employers Institute, they recommend that organizations pull together cross-disciplinary teams to practice ethical AI deployment.

But the composition of any governance taskforce in the skilled trade, technical and service sectors must also include frontline practitioners. In these occupations, the people best placed to notice an AI failure, whether that's a pharmacy technician checking a dispensed prescription, or the mechanic overriding a faulty system, are not always in the room where deployment decisions are made. Those we spoke with shared how in many instances, the practitioner's own judgment is the safeguard the system relies on to catch errors. Design and implementation of deployment solutions must then also be inclusive of those roles.

This raises a further complication. Detecting AI errors at the frontline depends exactly on the expertise our findings show is thinnest. It requires the understanding to evaluate AI outputs, which early-career entrants are least prepared for, and the tacit, embodied knowledge that experienced workers take with them on retirement. This shortfall means that building and sustaining the capability to use AI safely and effectively must be a shared responsibility within the governance models deploying the systems. It is here that the case for guiding principles at industry and national levels becomes harder to ignore.

Challenge 2

Education, Training and Capability-Building

Issues related to trust and responsibility might be clearer if AI education and training for skilled trade, technical, and service jobs were more established. But AI technologies are outpacing the speed at which curricula, competency frameworks and qualifications can be developed.

For example, in a survey we conducted of 63 early career and trainee industrial machine mechanics, only 45 percent were moderately or very confident that their training would prepare them to use AI in their job.

The problem is compounded by the fact that many instructors and mentors often lack AI familiarity themselves. This lag is not evenly felt: access to AI-ready instructors, up-to-date technology and high-quality workplace learning varies considerably, and without action, some learners and workers stand to benefit from AI far more than others.

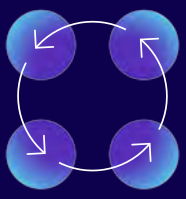
Consider how long it takes to create standards that can be used broadly. A roundtable participant from the UK pharmacy industry told us that it takes two to three years to revise education and training standards for pharmacy technicians. And as Sam Nicholas, Education and Skills Policy Advisor at the Royal Academy of Engineering, said,

> **"I think you're looking at maybe 10, 15 years before AI gets into engineering courses as a mainstay of what is taught."**

Key actions to meet the challenge:

Design for role-specific, applied AI literacy

Move beyond static learning and qualification models



Tighten Work-learning feedback loops

Key action

Education, training and capability-building

Design for role-specific, applied AI literacy

AI education and training should combine a common foundation in AI literacy that transfers across occupations, with role-specific applied literacy sitting on top.

This will manifest differently across occupations. For example, on a construction site, an AI application may be used to detect missing hard hats or blocked walkways. In a retail store, it may be used to predict products that will run out soon, supporting restocking schedules. Unlike most knowledge-based roles, where the range of tools and workflows tends to be more general-purpose and portable across jobs, this role-specificity matters more in skilled trade, technical and service work.

If the technology is different, the workflows are different, and the way workers interact with the AI is different, then the first step toward preparing workers for an AI-infused workplace must be a diagnosis of how specific work roles will change, and how skills and learning must adapt—and this step must be repeated as AI tools continue to advance.

Rather than applying generic approaches to AI readiness, employers, educators, regulators, and industry bodies should work together to identify which tasks could be augmented and automated, which continue to require human oversight and decision-making and what new capabilities are emerging within particular roles. This diagnostic process should inform subsequent decisions about curriculum, training, and assessment.

In these occupations, AI applications are far more tied to the physical task and setting, so what AI literacy looks like in practice may vary greatly from one role to the next.

Key action | Education, training and capability-building

Move beyond static learning and qualification models

Early-career workers in skilled trade, technical and service roles need more flexible curricula and qualification models. And those models will need to allow for more regular updates through controlled, quality-assured mechanisms.

Occupational standards and qualifications should be designed around enduring work-based competencies, critical thinking, ethical practice, and the effective use of AI-enabled technologies, reducing reliance on specific tools and minimizing the need for wholesale redesign. Curriculum can be updated by industry practice, and its currency demonstrated through qualifications and assessments written to respond to emerging technologies. More responsive models must also protect coherence and allow sufficient time for instructor development, assessment changes, and effective implementation.

Action on this front requires collaboration across the institutions that develop qualifications and those who define the standards underpinning those qualifications.

Identifying the required action is one thing; orchestrating a collaborative effort across established institutions is another. Policymakers can be instrumental in supporting this orchestration.

The difficulty of the challenge is matched by the size of the prize: accelerated curriculum updates will allow emerging technologies, processes, and practices to be incorporated between more significant programs of reform, without requiring entire qualification redesign. Without this built-in adaptability, change will remain reactive and inconsistent.

None of this can happen without the active involvement of instructors, who must be prepared to deal with AI-led change. One experienced pharmacy technician and instructor expressed concern about guiding new joiners to relevant and reliable learning resources when she herself feels unprepared for AI. Many of the experts we spoke to noted the importance of changing mindsets and behaviors among training providers and instructors. Laurent Da Dalto, CEO and founder of Mimbus, a tech-driven vocational training company, explained it this way:

> **Nothing works if [the instructors] are not trained; if they're not convinced that they need the proper training and certification to become an 'AI power teacher'."**

Key action | Education, training and capability-building

Tighten work-learning feedback loops

Training programs need deep, durable connections to the workplace.

Erik Leiden of the Burning Glass Institute, which focuses on the future of work, emphasizes that "training programs need to be tightly tied to employers". And not just in the short term. He notes

> **For multi-year training pathways, it's really important that there are ongoing touchpoints, through work shadowing or direct attachments, to regularly see how work actually looks on the job."**

Sometimes these linkages can be directly integrated into course design. Rohan Sandhu, director of the Reimagining the Economy project at Harvard University, points to cases where firms have worked with community colleges to design programs based on known workplace needs. These can be structured as non-credit courses or sometimes as hybrid apprenticeship/associate degree programs.

Whatever the model, education and training providers need better mechanisms to track and anticipate how occupations are evolving in practice.

Closer and more continuous collaboration between employers, technology providers, training organizations, and regulators can help ensure that emerging changes in the workplace are identified and translated earlier and faster into curriculum design and delivery.

AI can help: as noted in a recent OECD report,[7] many other countries now use AI tools to assist with tasks such as labor-market analysis, mapping competencies, qualifications and curricula, and generally accelerating vocational education training cycles. One example is the Skills Compass developed by Skills England,[8] which uses natural language processing to distill key occupational trends from labor-market data, signals that can be used to inform occupational training standards and curriculum content.

Challenge 3

Transfer of Experience and Tacit Knowledge

Early-career workers, especially in skilled trades, have always relied on the deep knowledge of colleagues with decades of hard-won experience; what works, what doesn't, and how to figure that out.

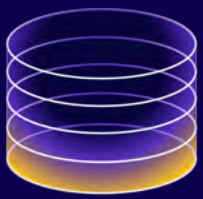
But that knowledge is now at risk. The root of this risk is that much of this knowledge base is undocumented, and the retirement of skilled workers turns that vulnerability into actual loss. As experienced workers leave, they take their expertise with them, as there is no record of it anywhere else. The ambition is to rapidly transfer this knowledge to junior colleagues and, where relevant, to do this through AI systems. But consider that AI requires documented, structured knowledge bases to function. In skilled trade, technical and service occupations, this is scarce—especially in contrast to the "knowledge economy" and office jobs where documentation is part of the role.

And then, there's information that can't even be captured digitally. How do we treat tacit knowledge: expertise that is largely made up of subconscious pattern recognition that can't necessarily ever be fully distilled or explained? In these professions, experts are often celebrated for their ability to "just know" how to do things.

In some jobs, tacit knowledge can be a sensory phenomenon. Laurent Da Dalto told us about how when he "started a welding simulator 20 years ago, the expert people were telling me, 'I know if it's good or not just by listening to the sound of the welding.' A young trainee will not hear the difference." This aspect of the capability gap can only be closed by strengthening the opportunities for early-career workers to acquire this expertise through practical, hands-on experience.

Key actions to meet the challenge:

Capture knowledge



Practice and simulate

Equip both sides of the mentoring relationship

Key action

Transfer of experience and tacit knowledge

Capture knowledge

Capturing knowledge in a structured and useable way is the first step. One example comes from an organization where the potential loss of tacit expertise carries a high cost.

At NASA, there is a focused, formalized effort to identify, capture and transmit knowledge and expertise. The organization operates a network of Chief Knowledge Officers at both mission and center levels.[9]

The ambition of the complex program is simple: to ensure the agency's workforce can "access and apply essential insights and lessons learned when they're needed most."

NASA operates at a large scale, but there's a clear lesson for organizations of every size: make knowledge capture and dissemination a cultural norm.

Another example can be found in the automotive industry: Toyota's UK manufacturing facility in Burnaston has applied knowledge-capture techniques directly to workforce transitions.[10] The company converts knowledge and expertise from experienced workers into structured training packs for new starters. As of late 2025, this expanded into a formal, hybrid training partnership with Rockwell Automation, with a two-year classroom plus two-year shop-floor apprenticeship model.

The development of explicit structures, programs, and processes to capture knowledge is critical. It's also necessary to develop appropriate incentives—for experts to gather and share their knowledge and for new entrants to seek out opportunities for learning and expertise development.

Key action | Transfer of experience and tacit knowledge

Practice and simulate

Capturing the knowledge of experts is extremely valuable. But new employees need opportunities to develop their own expertise through hands-on experience.

Jack Chorowsky of Train America notes the importance of practical learning in real work environments:

> **"At the end of the day, these are hands-on jobs that require hands-on practice and feedback."**

Employers and supervisors must carve out opportunities for junior colleagues to conduct low-stakes practice of complex tasks, with spaced repetition and an intentionally crafted learning journey.

Simulation-based learning approaches offer the closest proxy to the "practice and feedback" that happens on the job. Zhisheng Gao touts the value of "high-fidelity virtual environments that replicate real working conditions." Such immersive simulations—when designed and implemented well—allow people to "exercise decision-making at zero risk."

Pengyang Wu, a Senior Research Specialist at Tencent Research Institute, a public strategy research body, provided a current example from China, where "skills training programmes led by local trade unions in Jiaxing (Zhejiang) and Jinzhou (Liaoning) introduce genuine corporate equipment and live production scenarios directly into training. Unlike the error-free demonstration versions used for teaching, trainees engage with a 'production-grade AI' that requires human judgment for ambiguous or fallible outputs. This approach effectively builds practical capabilities for AI deployment."

An increased focus on simulation-based training also means that early-career workers in remote regions need not be left out. And this will prove crucial in accelerating the fulfilment of employment gaps for skilled trade, technical and service workers.

Key action

Transfer of experience and tacit knowledge

Equip both sides of the mentoring relationship

Not everything can be simulated. In an actual work environment, the ability to effectively give and receive feedback is vital. For these reasons, effective mentoring is fundamental to success in skilled trade, technical and service roles.

The arrival of AI puts new emphasis on equipping mentors to teach in a more complex and faster-evolving work context, with their role now including teaching the things that AI cannot. As Wes Smith, Executive Director of the Manufacturing Skills Institute states,

> **"The supervisor or mentor role will become more important, not less. AI may help guide tasks, answer questions, and suggest troubleshooting steps, but someone still has to teach judgment, safety, and when not to trust the tool. Mentors will need to help workers connect what AI says with what is actually happening on the floor, especially when dealing with equipment failures, production pressure, or unusual situations."**

AI poses new demands of both mentors and workers. Mentors need the knowledge and skills to pass on the judgment and safety steps Smith describes. Early career workers need the skillset to apply effective learning approaches on the job, including how to use AI to learn productively. As Lindsay Reel, Vice President of Pharmacy Practice and Specialty Solutions at pharmacy and patient support service provider EVERSANA, notes, doing the job well is all about

> **"paying attention, listening to feedback, being open-minded, learning from your mistakes and taking feedback."**

Good teaching and learning are skills in their own right, not automatic by-products of experience of being taught. Employers must build both sides deliberately. High-quality feedback is strongly associated with better learning outcomes, and its direct costs are low.[11] A small investment in teaching supervisors effective feedback techniques can generate a significant improvement in capability-building and an acceleration in the attainment of expertise among new workers. On-the-job training can be more intentionally structured to include simple review points within the workflow, to give feedback and reinforce lessons they have just experienced.

Challenge 4

The Human Advantage

Expertise and tacit knowledge make up, in part, what it means to be human. They are why people know how to get things done. But other uniquely human capabilities increasingly matter in an AI world. This includes durable and transferable skills, such as adaptability, communication, decision-making ability, creativity, and the ability to interact with others – capabilities that are often emphasized as important for knowledge workers, but are just as essential for skilled trade, technical and service workers.

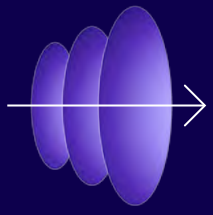
Kathy Miller, who held executive roles in aerospace, automotive, and industrial manufacturing before founding the leadership consultancy MORE 4 Leaders, explains that employers are looking for "some level of aptitude, whether it's electrical training, mechanical training." But they also need "people who just understand why it's important to come to work and how to interface with other people, how to have difficult or honest conversations."

The pharmacy technicians we spoke to consistently identified human judgment, patient communication, and critical evaluation of AI outputs as the human value of the pharmacy technician role going forward. Industrial Machinery Mechanics emphasized interpersonal skills like collaboration and cross-disciplinary working, as well as cognitive skills like curiosity, learning from failure, and an orientation toward lifelong learning. But experts noted these same capabilities are simultaneously the least developed in the current workforce, the hardest to assess within existing qualification frameworks, and the least present in current training standards.

"Human consciousness, ethical judgment, and moral responsibility will remain essential for the effective and responsible use of AI technologies," says Nader Imani, Vice President of Global Education at Festo Didactic.

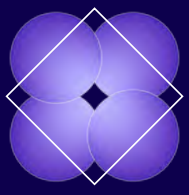
But where is the vocational course that touches on these capabilities?

Key actions to meet the challenge:



Motivate learning

Elevate emotional intelligence



Integrate human skills in training

Key action | The human advantage

Motivate learning

The previous section discussed the skills of teaching and learning. But skills only matter if people are motivated to use them. Both the ability to learn efficiently and effectively, and the motivation to do so, are among the most sought-after and cited capabilities in debates about the future of work.

And yet, few education systems explicitly nurture these capabilities, at any age. This is all the more extraordinary when we know that, like giving effective feedback, learning-to-learn generates a very high impact for a very low cost.[12]

Motivated learners tend to also build adaptability, resilience and grit, and what Professor Carol Dweck notably labelled a "growth mindset."[13] The traits that characterize individuals with a growth mindset, such as persistence in the face of obstacles, are precisely those named as most desirable by employers.

Mike Buchli of Dassault Systèmes, a pioneering software company in design, simulation and manufacturing, told us that his general principles on hiring have not changed because of AI:

> **"I wanted people that would come in and say, 'Hey, I was thinking about this over the weekend, and I had this idea and we need to do that.' Were they the best welders on the planet? No, not when they started. But did they have the right mindset to learn and grow and try new things? Absolutely."**

The primary onus is on policymakers and education systems to develop both effective learning-to-learn skills and growth mindsets among future generations of workers. But policymakers can also craft incentives to motivate today's workers: Pengyang Wu from Tencent confirmed that recent reforms to China's skilled-worker grading system have converted a one-time credential into an ongoing incentive, by linking promotion and compensation to demonstrated proficiency and continued learning. This encourages workers to keep learning, rather than treating certification as a career endpoint.

In the meantime, as employers see how AI impacts different roles, they should consider how to preserve the engagement and enthusiasm of their workers, through motivation-boosting approaches like well-structured learning-linked incentives. And on a day-to-day basis, supervisors and mentors play a fundamental role in creating an environment that encourages and nurtures a love of learning.

Key action | The human advantage

Elevate emotional intelligence

Our research reveals the undervalued role that fundamentally human skills, like emotional intelligence, play in many skilled trade, technical and service occupations. When it comes to customer-facing roles, the absence of emotional intelligence can damage customer trust and brand value.

As Dr Tao Wen, CEO of Neutech points out,

> “the real-time perception of a customer's emotions—human situational judgment—remains irreplaceable.”

> “In the classroom, we talk about feelings and soft skills too. However, interpersonal competencies are difficult to assess…Understanding how to answer questions about behavior in certain situations on an exam is vastly different from demonstrating those skills in practice.”

The pharmacy technicians we spoke to described this as the ability to read between the lines and even interpret non-verbal cues while interacting with a patient.

A voluntary member of a board that provides oversight for a pharmacy technician certification, and a pharmacy technician instructor described the non-technical training they aim to provide:

As AI enters skilled trade, technical and service workplaces and more human skills such as discernment and communication rise in importance, person-to-person interactions will become a greater source of the value generated by workers. Emotional intelligence underpins much of this. That’s why it is critical for young people to develop, build—and demonstrate evidence of—these skills. A first step would be for organizations to form a more complete view of the full range of skills at play in these roles, and for training systems and credential systems to reflect their growing value.

Key action | The human advantage

Integrate human skills in training

Given the increasing importance of definitively human skills, education and training must create authentic opportunities to develop and demonstrate relevant transferable capabilities, using proportionate assessment where this supports the purpose of the program.

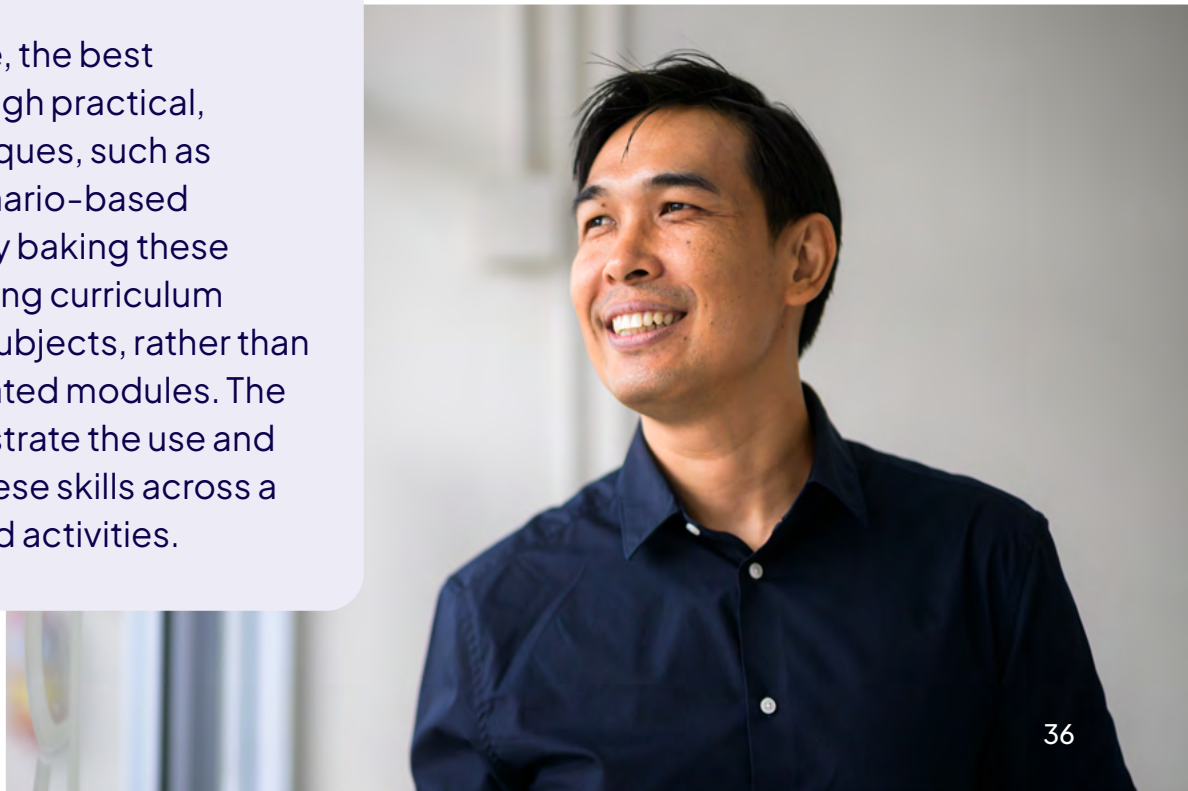
Standards for practice must also be updated to include these skills, for example, by changing job descriptions and minimum requirements to include human skills, and by redesigning assessments for certification. By definition, this will motivate learners to develop these skills, as well as stimulate curriculum change at earlier stages of education to better prepare trainees for their learning paths ahead.

AI can also play a valuable role in improving the development of human skills, especially by supporting effective practice and simulation. For example, one UK roundtable participant, who works as a lead pharmacy technician for education and training, described to us the potential for an AI-driven counseling simulation tool to help early-career workers and trainees better understand how to give proper guidance to patients on their medications. The tool would provide a safe space for people to make and learn from mistakes. This specific example points to the broader set of AI-powered simulation solutions that are based on scenarios that allow learners to test and improve behavioral, social, and emotional skills. Virtual reality tools are particularly suited to developing these types of human skills, as immersion allows learners to fully engage their social and personal sensibilities and instinctive reactions.

For policymakers, employers, education, and training providers, now is the moment to invest in building these must-have skills that are guaranteed to increase in importance.

How do people acquire these skills?

Given their nature, the best approach is through practical, hands-on techniques, such as roleplay and scenario-based simulation, and by baking these lessons into existing curriculum content, across subjects, rather than designing dedicated modules. The idea is to demonstrate the use and importance of these skills across a range of tasks and activities.



Stakeholder Priorities for Action

Helping early career workers in skilled trade, technical and service industries to thrive in an AI-infused world will require action across education, industry, and policy.

While implications vary across sectors and occupations, all stakeholders have a role to play in ensuring pathways keep pace with changing roles.

The actions below highlight where policymakers, employers, education and training providers and industry bodies can have the greatest impact.

For policymakers

Policymakers can help create the conditions for responsible AI adoption and more responsive education and training systems. **They should:**

- **Establish clear expectations for responsible AI use, including accountability, governance, and industry-specific guidance.**
- **Build flexibility into occupational standards, curricula, and qualification models so they can evolve with changing technologies and workplace practices.**
- **Address gaps in access to AI-ready teaching, appropriate technology and high-quality practical learning, so the transition does not widen existing inequalities.**
- **Support stronger systems for knowledge transfer, mentoring, and the development of durable human capabilities across education and training systems.**

For employers

Employers have a critical role in shaping how AI is adopted on the job, how early career workers build expertise alongside it, and who they hire for the workforce of the future.
They should:

- Define clear boundaries for AI use with input from the workers who will apply them, and ensure workers understand when to trust, question or escalate AI-supported outputs.
- Design and embed role-specific AI learning into workplace development, apprenticeships, and on-the-job training, so workers learn with the technologies they will use in practice.
- Capture and share the expertise of experienced workers while creating structured opportunities for practice, feedback, and mentoring, and support for early career workers to learn effectively on the job.
- Foster workplace cultures that encourage continuous learning, adaptability, and the durable human capabilities that remain critical in AI-enabled work.
- Recruit early career workers with the combination of technical and human skills needed to ethically and productively deploy AI at work.
- Work with training and education providers to ensure programs are designed to prepare people for the reality of an AI-augmented workplace.

For education and training providers

Education and training providers must ensure pathways remain aligned as roles change, while continuing to build strong technical foundations. **They should:**

- **Combine a common foundation in AI literacy with role and industry-specific applied AI literacy relevant to different occupations.**
- **Regularly review and refresh curricula, standards and assessment through responsive, quality-assured mechanisms that protect coherence and validity.**
- **Strengthen connections between learning and work, so programs reflect changing occupational practice and emerging expectations of competence.**
- **Develop technical capability, practical experience, and durable human capabilities as equal priorities, through authentic learning and proportionate assessment.**

For industry and sector bodies

Industry bodies can help occupations respond to change by developing shared standards, guidance, and examples of effective practice. **They should:**

- Develop and maintain sector-specific responsible AI principles and applied AI literacy standards.
- Help define acceptable uses of AI and communicate clear expectations around accountability, governance, and ethical deployment.
- Track how occupations are changing and translate those shifts into standards, training, and assessment guidance.
- Promote effective approaches to knowledge capture, mentoring, and the development of transferable human capabilities across the sector.

Preparing Tomorrow's Workforce

Early-career workers, and those on the cusp of moving from education to employment, face a radically altered landscape of skilled trade, technical and service work from just a few years ago.

Mostly this is a picture of significant opportunity for young people taking up these occupations. As our research has shown, demographic and economic changes are spurring demand for these occupations in the US, UK, and China at a time when AI is suppressing demand for certain types of entry-level office workers, a finding mirrored in recent research from Stanford.[13]

For early-career workers in these occupations, AI tools offer much promise: faster mastery of tasks; more opportunities to take on and solve stimulating challenges; and - as AI takes on more of the routine work - the time freed to connect more effectively and deeply with colleagues, clients, and customers.

But, as our research demonstrates, AI is also changing what is required of workers in these fields, and education and training systems are not currently designed to keep pace with the needs of an AI-equipped workforce.

The blistering speed of AI development leaves no time for delay. Pearson believes that concerted action by all stakeholders must encompass three crucial dimensions:

Responsible AI practice based on clear ownership and accountability for AI-augmented tasks, strong governance for ethical use, and workers capable of exercising good judgment regarding AI outputs.

Education and training systems that prepare early career entrants to have long, fulfilling careers, with learning experiences tailor-made to develop durable skills alongside technical capabilities.

Preserving the human element in such work, through mechanisms to capture and cascade tacit knowledge across the generations, and training that elevates the role of emotional intelligence and judgment.

It is now time for educators, leaders of training programs, employers, regulators, and industry groups to take control of the opportunity and risks presented by AI. Millions of early-career workers are ready and waiting.

Annex 1: Selecting our deep-dive roles

Context for role selection

This research looks at how AI may change learning pathways for early-career workers entering skilled trade, technical and service fields. Because AI can affect jobs in diverse ways, we first needed to choose a small number of roles that both offer a strong labor-market opportunity and are likely to experience meaningful AI-related change.

What we looked for in the roles

- Accessible to early-career workers, with no prior work experience or education beyond high school required.
- Relevant to skilled trade, technical or service industries.
- Large enough and fast-growing enough to matter in the labor market.
- Likely to be affected by AI, either through augmentation or automation.

Data used

We combined two main types of information:

- AI impact data from Pearson Faethm, including estimates of how much each role may be augmented or automated by AI, by 2036.
- Labor-market data from the Bureau of Labor Statistics, including current employment, projected openings, expected growth, and typical education or experience requirements.

To make fair comparisons across roles, the team converted the main measures into percentile scores within each work category before combining them.

How roles were narrowed down

1. Screen for fit

We removed roles that were not considered skilled trade, technical or service roles, or that were not realistic entry points for early-career workers.

2. Score each role

We created simplified composite scores for employment opportunity, AI augmentation, and AI automation.

3. Combine the scores

We gave more weight to employment opportunity than total AI exposure, because we needed to identify jobs relevant to many people.

4. Check robustness

We tested whether the top roles stayed mostly consistent when the score weights changed. The results were generally stable.

5. Identify complementary roles

We compared top roles across four dimensions (mechanical, analytical, caring, and coordination) to choose two final roles that showed different profiles from one another.

What the scoring surfaced

The highest-priority healthcare support and frontline service roles included occupations like Medical Assistants, Dental Hygienists, Preschool Teachers, and Pharmacy Technicians. The highest-priority skilled technical, heavy equipment, and hazardous operations roles included occupations like Construction Laborers, Electricians, HVAC Installers and Repairers, and Industrial Machinery Mechanics.

Final role pair selected

Industrial Machinery Mechanics

Strongly hands-on and mechanical, with some diagnostic and problem-solving work. This role helps the study examine how AI may affect technical, equipment-based work.

Pharmacy Technicians

Less mechanical and more people- and coordination-oriented. This role helps the study examine how AI may affect healthcare-support work and daily workflow coordination.

Other roles with similar profiles

Medical Assistants had a similar technical profile to Pharmacy Technicians. HVAC Installers and Repairers had a similar skilled trade profile to Industrial Machinery Mechanics. Roles with similar profiles to the focal roles selected for this research are expected to experience similar disruptions at work and corresponding shifts in their learning pathways.

Annex 2: Methodology for PCA and Labor-Market Analysis

Principal Component Analysis

Our starting point is the way O*NET describes each occupation: 246 variables spanning Abilities, Knowledge, Interests, Skills, Work Activities, Work Context, Work Styles and Technology, across 544 occupations in Job Zones 2 and 3. These Job Zones were chosen as they align most closely with the level of preparation required from skilled trade, technical and service workers.

Given the large number of variables per occupation, the data are too high-dimensional to read directly. Principal Component Analysis (PCA) is a statistical technique that compresses such high-dimensional data into a small number of underlying dimensions that capture most of the meaningful variation, letting the data—not imposed categories—define the structure, rather than us presuming or defining the structure.

One way to think about these PCA dimensions is as role ingredients; and to think of an occupation as the recipe that brings a selection of those ingredients together in varying quantities. An electrician isn't just mechanical — they're also doing diagnostic thinking and coordinating apprentices on site.

A pharmacy technician isn't just caring — they're also analytical (reading prescriptions, spotting interactions) and coordinating (managing inventory, scheduling collections). Every occupation is a mix of those dimensions.

This gave us a set of rotated components, or dimensions, each capturing a bundle of skills and activities on which roles vary together. We focus on the four dimensions that cover the wide-ranging aspects of skilled trade, technical and service work: mechanical and hazardous-physical work; analytical and investigative work; caring and empathetic work; and coordination and supervision.

As each occupation gets a score on every dimension, we group them based on the similarity of those scores, producing seven occupational clusters.

We then carry forward those occupational clusters that emerge from the PCA and map them to employment projections for each of the three countries analyzed.

Labor-Market Analysis

United States

We mapped each occupation and each cluster to the employment projections from the Bureau of Labor Statistics so we could look at 2024 employment and projected 2034 employment, net change, and annual openings split into growth and replacement demand. We chose 2034 for the end of the projection period as this is latest date for which BLS projections are available.

United Kingdom

For the UK, we followed a similar approach as with the US, using ONS Annual Population Survey data (October 2024–September 2025) for base employment at the 4-digit SOC 2020 level, and the NFER UK Occupation Employment Projections 2025-2035 for net employment change and replacement demand. The NFER projections were last revised in 2023, so we adjusted these to allow for the fact that actual employment in 2025 was somewhat lower than forecast in the NFER projections for that year.

Because the occupational typology was built on US data, each of the 178 UK SOC 2020 unit groups in Major Groups 5–9 was mapped to the typology via the NFER UK SOC 2020 to O*NET crosswalk. We chose 2035 for the end-projection period to align with the NFER UK Occupation Employment Projections (2-digit SOC 2020).

China

China required an additional level of analysis to account for its demographic challenges. We projected China's demand for skilled trade, technical and service workers from 2023 to 2035, sector by sector, and compared it with two independent projections of the supply of such workers. The approach is tailored to China because its situation is unique among the markets in this research: a shrinking working-age population set against still-rising demand for the occupations being examined.

The analysis covers eleven sectors—from manufacturing, construction, and mining through to retail, hospitality, transport, and health and social care—drawn from China's 4th and 5th National Economic Censuses (end-2018 and end-2023). These sectors employed about 456 million people in total at end-2023.

We identify skilled trade, technical and service workers using education as a proxy: workers whose highest qualification is senior secondary school or below. Educational attainment is a proxy for occupational type. On our central definition, the eleven sectors contained roughly 347 million such workers in 2023 (note: this figure excludes agricultural occupations). Because the result depends on where the education ceiling is set, we test two alternatives: a narrower definition, counting only workers with junior secondary school or below, which gives 257 million; a broader one, including junior college (but not university), which gives 410 million. We use the central figure throughout and the broader one as a sensitivity.

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References

[1] National Center for O*NET Development (n.d.) 29-2052.00 - Pharmacy Technicians. ONET OnLine. Available at: https://www.onetonline.org/link/summary/29-2052.00 [Accessed: 20 August 2026].

[2] Faethm by Pearson is an AI analytics platform that maps the impact of technology on work tasks. Pearson (n.d.) Faethm by Pearson. Available at: https://www.faethm.ai/ [Accessed: 20 August 2026].

[3] 2034 was chosen for the end of the projection period for the US data, as this is the latest date for which Bureau of Labor Statistics employment projections are available. U.S. Bureau of Labor Statistics (2025) Employment Projections, 2024-2034. U.S. Department of Labor. Available at: https://www.bls.gov/emp/ [Accessed: 20 August 2026].

[4] 2035 was chosen for the end of the projection period for the UK, in line with the National Foundation for Educational Research (NFER) UK Occupation Employment Projections 2025-2035 (2-digit SOC 2020). Dickerson, A. and Rossi, G. (2024) An analysis of the demand for skills in the labour market in 2035 - Revised projections. Working Paper 3b. Slough: NFER. Available at: https://www.nfer.ac.uk/media/2p5lkqim/an-analysis-of-the-demand-for-skills_revised-projections.pdf [Accessed: 20 August 2026].

[5] Our UK modelling is based in part on two sources: the NFER UK Occupation Employment Projections 2025-2035 (Ibid.), which gives projections to 2035 for UK net growth in employment and replacement demand at the 4-digit level; and the Office for National Statistics (ONS) Annual Population Survey, October 2024-September 2025, which we used to derive estimates of occupational employment at the 4-digit level. Office for National Statistics (2026) Annual Population Survey, October 2024-September 2025. Nomis. Available at: https://www.nomisweb.co.uk/datasets/apsnew [Accessed: 20 August 2026].

[6] Elish, M.C. (2019) Moral Crumple Zones: Cautionary Tales in Human-Robot Interaction. Engaging Science, Technology, and Society, 5, pp. 40-60. Available at: https://doi.org/10.17351/ests2019.260 [Accessed: 20 August 2026].

[7] OECD (2026) Developing Vocational Education and Training with Artificial Intelligence. OECD Reviews of Vocational Education and Training, OECD Publishing, Paris. Available at: https://doi.org/10.1787/e9f76b4e-en [Accessed: 20 August 2026].

[8] Ibid.

[9] National Aeronautics and Space Administration (NASA) (n.d.) APPEL Knowledge Services. National Aeronautics and Space Administration. Available at: https://www.nasa.gov/learning-resources/for-professionals/appel/ [Accessed: 20 August 2026].

[10] Ozsevim, I. (2025) Toyota's Burnaston academy redefines industrial training with Rockwell. Automotive Manufacturing Solutions, 9 October. Available at: https://www.automotivemanufacturingsolutions.com/editors-pick/toyotas-burnaston-academy-redefines-industrial-training-with-rockwell/1244103 [Accessed: 20 August 2026].

[11] Education Endowment Foundation (n.d.) Feedback. Teaching and Learning Toolkit. Available at: https://educationendowmentfoundation.org.uk/education-evidence/teaching-learning-toolkit/feedback [Accessed: 20 August 2026].

[12] Education Endowment Foundation (n.d.) Metacognition and Self-Regulation. Teaching and Learning Toolkit. Available at: https://educationendowmentfoundation.org.uk/education-evidence/teaching-learning-toolkit/metacognition-and-self-regulation [Accessed: 20 August 2026].

[13] Stanford Teaching Commons (n.d.) Growth Mindset and Enhanced Learning. Foundations of Course Design, Stanford University. Available at: https://teachingcommons.stanford.edu/teaching-guides/foundations-course-design/learning-activities/growth-mindset-and-enhanced-learning [Accessed: 20 August 2026].

[14] Brynjolfsson, E., Chandar, B. and Chen, R. (2026) Canaries in the coal mine? Six facts about the recent employment effects of artificial intelligence. Stanford Digital Economy Lab. Available at: https://digitaleconomy.stanford.edu/app/uploads/2026/08/Canaries_August2026.pdf [Accessed: 20 August 2026].

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