

CompTIA®

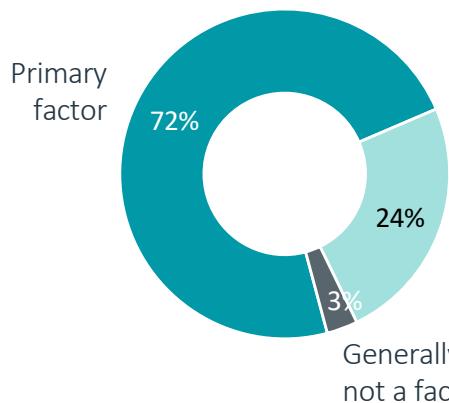


Business Technology Adoption and Skills Trends

Australia, Germany, Japan, Netherlands, Singapore, United Kingdom, and United States

The Business of Technology

Technology's role in meeting business objectives

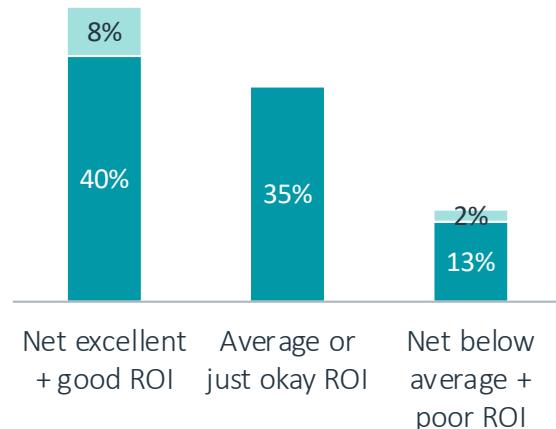


- Technology continues to be critically important for the success of all types of businesses. Across all seven countries CompTIA studied, nearly three-quarters of technology and business professionals rate technology as a primary factor in reaching business objectives (72%).
- Perhaps unsurprisingly, the larger the company size, the greater the reliance on technology for achieving business outcomes.
- However, there is some level of disconnect as 1 in 4 think their firm's current spending on tech is too low (24% net).

Top business priorities



Overall perception of ROI from firm's tech investments



57% Tech outsourced services utilization

According to the data, more than half of businesses report using outsourced tech firms frequently or regularly (57%), plus another 29% doing so occasionally.

Nearly 1 in 4 indicate using a managed service provider for ongoing IT operations management. Firms that outsource more often report higher perceptions of ROI.

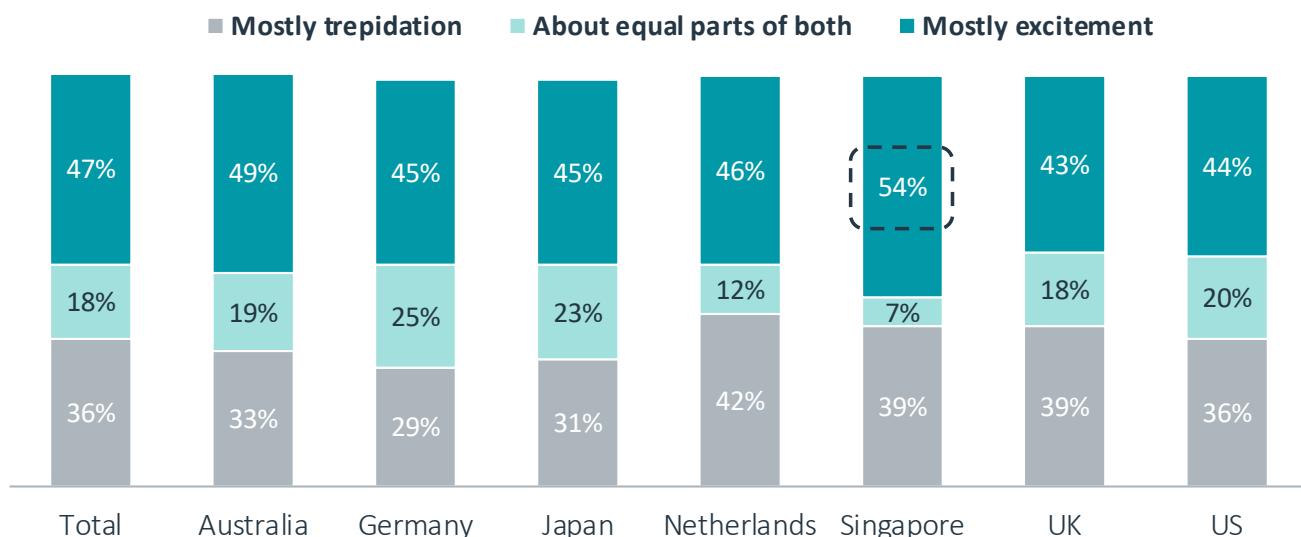
Top reported uses of outsourced technology services include: 1). Tech consulting, 2). Cloud related, 3). Cybersecurity, 4). Software, web or app development, and 5). Troubleshooting, repair or maintenance related.

- Top reasons cited for perceptions of below average or disappointing ROI of technology investments include:
 - Ongoing maintenance costs / support fees (39%)
 - Staff time requirements to operate / maintain (37%)
 - Upfront cost / too expensive for what you get (37%)
 - Complexity / poor user experience (35%)
 - Required upgrades / built-in obsolescence (35%)

Emerging Technology

Top level perceptions of emerging technology

Nearly half of the firms in CompTIA's study are mostly excited about the potential of technologies that are still in the early stages of adoption such as AI, AR, IoT, etc. Another 1 in 5 hold some caution as well as excitement. With the remaining 36% largely feeling apprehensive toward the unknowns new technologies bring. However, businesses that report a high level of ROI with their current technology tend to have a more positive view of emtech.



Emerging tech adoption tracking

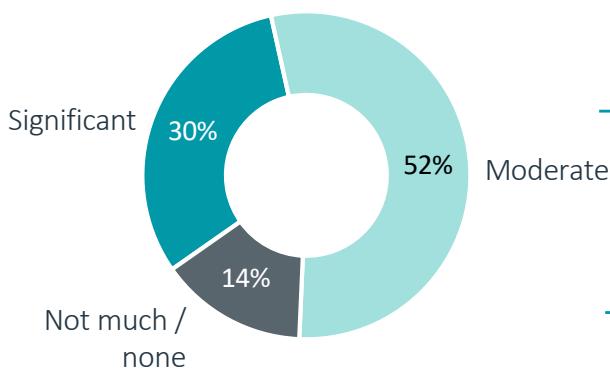
Sample of emerging tech	Exploratory	Early prototype/ limited use	Full imple- mentation	Net adoption
Internet of things	24%	34%	25%	59%
Edge computing	23%	32%	22%	54%
AI / machine learning	25%	36%	19%	55%
Blockchain / DLT	24%	30%	18%	48%
Virtual reality	26%	28%	17%	45%
RPA	25%	31%	17%	48%
Drones	19%	24%	15%	39%

28% Risk aversion

More than a quarter say risk aversion is a primary factor in their decision to postpone emtech adoption. Employers located in the Netherlands (33%), Japan (31%), and Singapore (31%) seem more risk averse compared to their counterparts in Germany (21%).

Budget constraints (31%) and lack of a clear business case (18%) also rate as barriers to adoption.

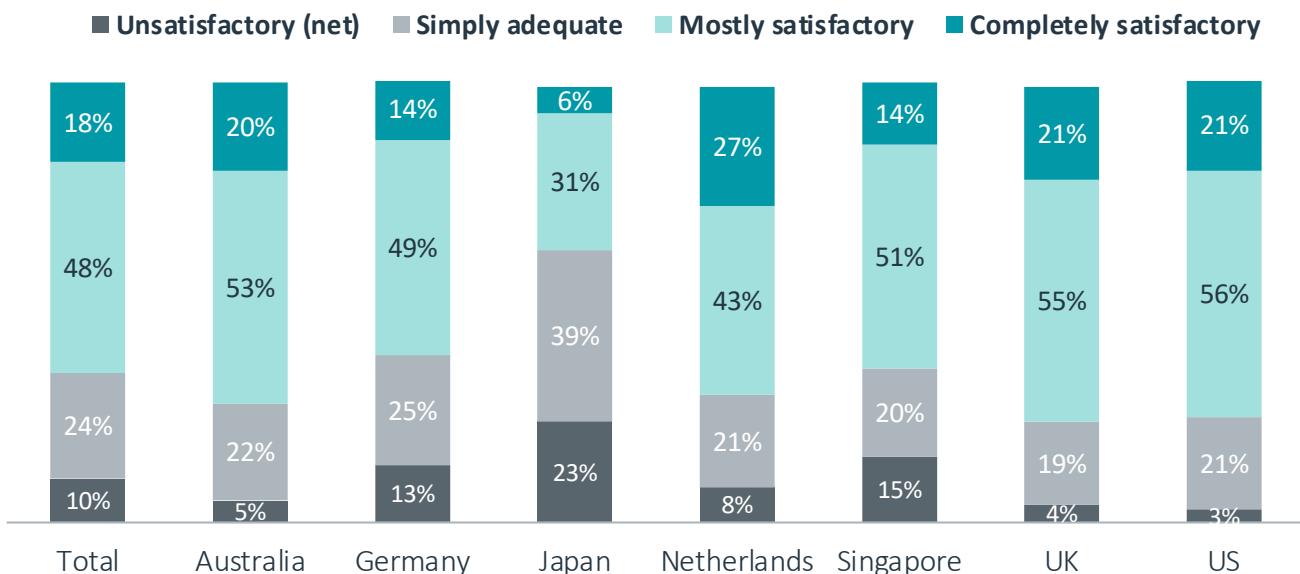
Estimate of innovation level derived from leveraging a diverse workforce



- Technology is only one aspect of innovation. When considering the workforce—specifically diverse workforces—about 8 in 10 technology and business professionals report that innovation at their organization is derived from leveraging a diverse workforce (82% net).
- Those in Singapore are especially likely to indicate as such (95% net). Conversely, rates are notably lower in Japan (58% net).

Cybersecurity

Business self-assessment of cybersecurity posture



- Virtually 2 in 3 professionals consider their organization's current level of cybersecurity satisfactory (66% net). This includes only 18% who would describe it as completely satisfactory. While there is always room for improvement—especially given the relentless threat advances in the cybersecurity arena—there are still some substantial steps companies can no longer afford to gloss over. At least nearly all recognize the importance of enhancing cybersecurity skills among staff (98% select one or more areas of priority, e.g. cloud).

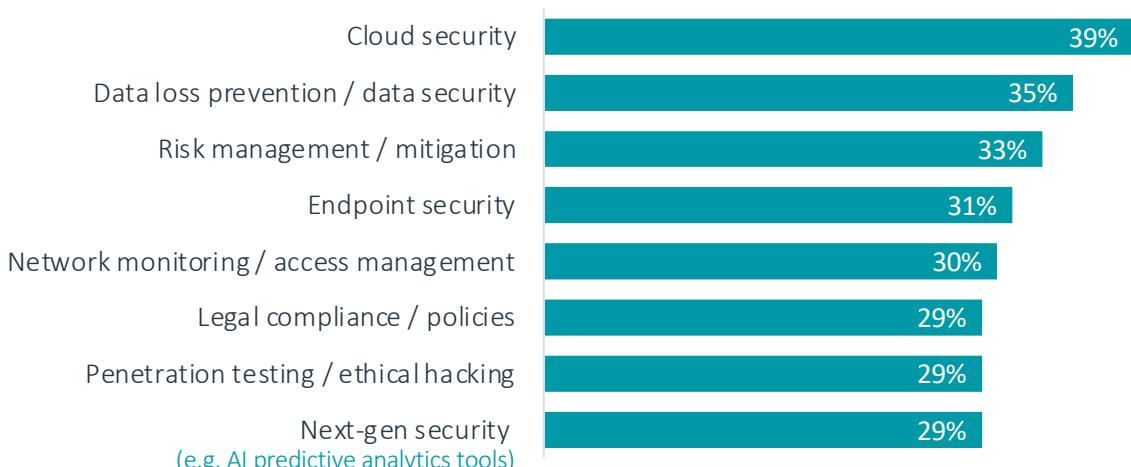
Top drivers of change in cybersecurity priority

1. Change in IT operations (37%)
2. Action taken after training or certification (32%)
3. Vulnerability discovered by a third party (28%)
4. Reports of breaches at other firms (28%)
5. Change in business operations or client base (25%)
6. Focus on a new industry vertical (25%)

Top challenges in improving cybersecurity

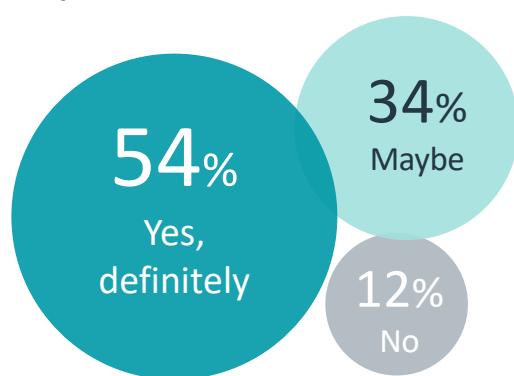
1. Prioritization of other technology investments (36%)
2. Lack of budget dedicated to cybersecurity (32%)
3. Low understanding of current tech trends (32%)
4. Belief that current efforts are 'good enough' (31%)
5. Low understanding of new threats (30%)
6. Lack of metrics to demonstrate effectiveness (29%)

Top priorities for boosting cybersecurity skills



Addressing Workforce Gaps

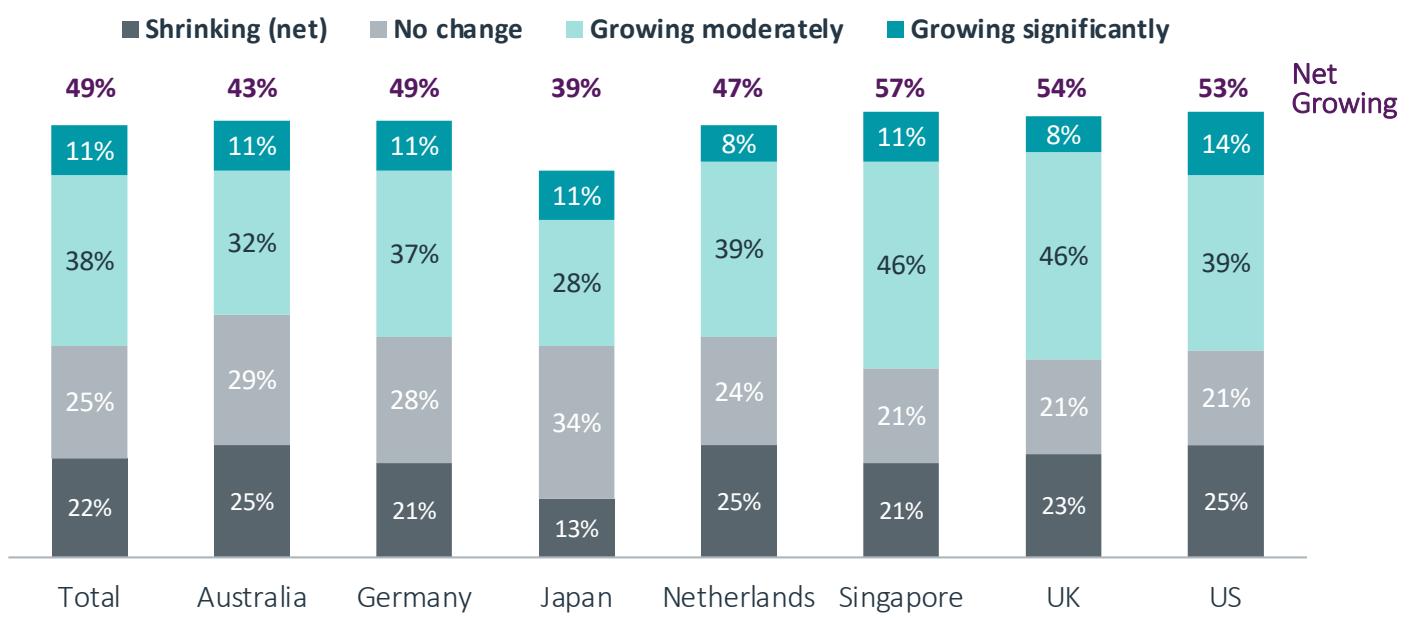
Concept awareness



The great majority of technology and business professionals recall recently seeing or hearing about the concept of a skills gap (88% net) as it relates to real or perceived skills-job role disconnects.

Furthermore, 1 in 2 report that the skills gap situation at their firm has grown over the past two years (49% net). Large-size firms (500+ employees) are significantly more likely to notice an increasing skills gap (58% net vs. 45% net of SMBs with <500 employees)

Perceived change in technology skills gap at firm over past 2 years



Note: 'don't know' results not shown (4% overall).

Workforce gaps contributing to tech workforce hiring & retention issues

- 40% Soft skills gap
- 36% Innovation gap
- 31% Wage gap
- 28% Confidence gap
- 28% Sector gap
- 25% Culture competence gap
- 25% Perception gap
- 24% Location gap

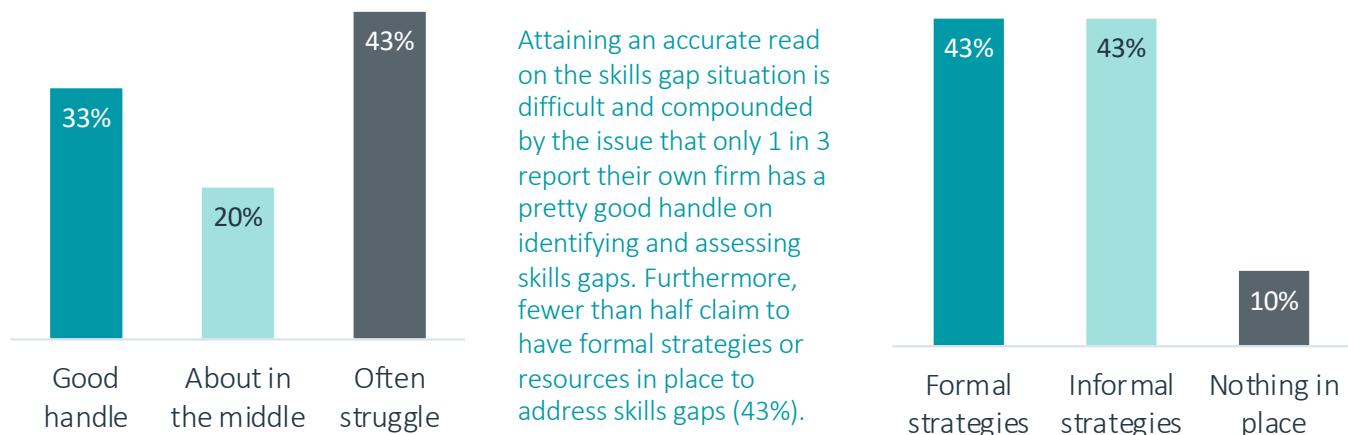
33% Unrealistic expectations?

One-third of employers acknowledge that unrealistic expectations with skills and experience contribute to exaggerated perceptions of the skills gap. Another 52% acknowledge it is somewhat of a factor.

When considering the **younger generations**, nearly 1 in 2 believe that the skills gaps among young people are in line with the general workforce (47%). However, 3 in 10 hold the often unfair and negative belief that there are more gaps among the younger Gen Y and Gen Z audience (30%). While on the other end of the spectrum, 22% believe there are fewer gaps among the younger group. See CompTIA's *Student Perspectives of Technology and Careers*.

Overcoming Workforce Gaps

Approach to identifying and addressing gaps in skills, training or job-readiness



Disciplines where business seek to further develop skills among their teams

Net significant + moderate	Total	Australia	Germany	Japan	Nether-lands	Singa-pore	UK	US
Cybersecurity	63%	70%	53%	52%	60%	76%	63%	65%
Cloud infrastructure / apps	61%	62%	55%	48%	68%	79%	57%	59%
Emerging tech (e.g. AI, IoT)	61%	68%	53%	47%	61%	77%	59%	63%
Integrating different tech	60%	67%	49%	53%	54%	73%	57%	65%
Soft / Durable skills	59%	61%	49%	55%	59%	71%	58%	59%
Software or app dev	58%	61%	49%	49%	61%	72%	57%	59%
Data mgmt. / analytics	57%	60%	48%	49%	58%	69%	61%	56%
Digital transformation	56%	62%	45%	45%	55%	68%	55%	63%
Tech / IT support	53%	54%	43%	53%	53%	68%	45%	55%
Network / systems admn.	51%	53%	38%	49%	56%	63%	49%	52%

Top priorities for boosting certain types of skills

Data-related skills

1. Data security (53%)
2. Data analytics (42%)
3. Database administration (38%)
4. Data architecture (37%)
5. Data visualization (36%)

Software development skills

1. Testing / QA (43%)
2. AI / ML / deep learning (43%)
3. User experience (42%)
4. Web development (37%)
5. DevOps / Scrum / Agile (34%)

Durable or 'soft' skills

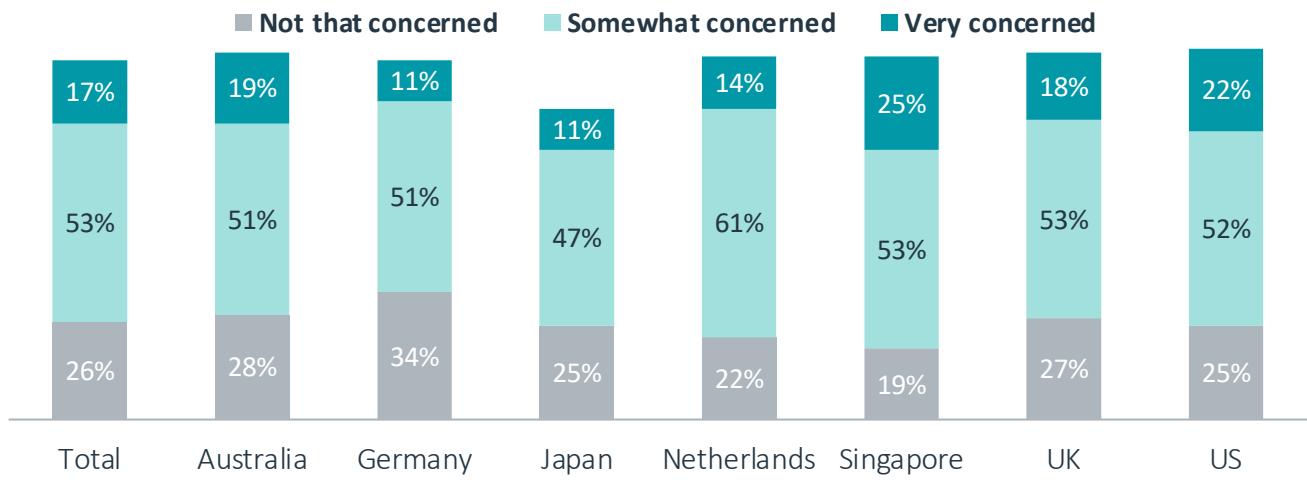
1. Innovation / creativity (39%)
2. Flexibility / adaptability (39%)
3. Project mgmt. (36%)
4. Collaboration / teamwork (35%)
5. Motivation / initiative (34%)

49% Provide mandatory training and professional development for staff

Nearly one-half indicate that their organization requires training / professional development for staff. Another 44% describe it as solely voluntary – not required, but encouraged.

The Future of Work

Automating technologies and workforce impact



Note: 'don't know' results not shown (5% overall).

- Technology will continue to impact jobs of all types. As history has shown these changes will take many forms – some positive and some negative. Most professionals in CompTIA's study have recently seen articles about robotic process automation (RPA), intelligent machines, and other automating technologies performing some aspects of jobs or possibly replacing them altogether (71%), especially in Singapore (89%) and the US (81%).
- Regardless, not quite 1 in 5 (17%) are very concerned that automating technologies may mean fewer jobs for people like them. But do note that another 53% are somewhat concerned. Furthermore, two-thirds indicate at least some interest in attaining additional training or hands-on experience with technology as a result of the outlook for how RPA and automating technologies may impact the workforce (67% net). Continuous improvement and professional development are more important now than ever, for organizations and individuals alike.

Top requests for improving staff knowledge retention, performance, and satisfaction

- More e-Learning (34%)
- More training alignment with development goals (30%)
- More time set aside for training (29%)
- More cross-training e.g. other functions (28%)
- More autonomy in developing training program (26%)
- More in-person classroom training (26%)
- More mobile options / app-based (25%)
- More apprenticeship-type programs (23%)
- More cultural awareness training (21%)
- More simulations or gaming elements (21%)

Top approaches businesses think will enhance skills among technology workers

- | | |
|--|-----|
| More training for managers to better identify & support workers with skills gaps | 41% |
| More resources for on-the-job training or continuing education | 39% |
| Better worker retention programs | 34% |
| Certifications / credentials specific to a technology skill set | 34% |
| More formal & regular skills assessments | 33% |
| Apprenticeships & related work / study programs | 31% |

Profiling and Methodology

Methodology

CompTIA's *Business Technology Adoption and Skills Trends* was conducted to collect and share information on technology adoption and workforce trends across several countries. The primary topics this study explores are business priorities, tech perceptions including emerging tech and cybersecurity, outsourcing, workforce and skills gaps, professional development strategies, and the future of work.

The quantitative study consisted of an online survey fielded to technology and business executives and professionals during July 2022. A total of 1,053 qualified respondents involved in setting or executing technology policies and processes within their firm participated in the survey, yielding an overall margin of sampling error at 95% confidence of +/- 3.0 percentage points. This survey was fielded in Australia, Germany, Japan, Netherlands, Singapore, United Kingdom, and United States. Sampling error is larger for subgroups of the data.

As with any survey, sampling error is only one source of possible error. While non-sampling error cannot be accurately calculated, precautionary steps were taken in all phases of the survey design, collection and processing of the data to minimize its influence. See the complementary CompTIA *Student Perspectives of Technology and Careers* study to learn about what young people (13-18 years) think about technology, their careers, and the future of work.

CompTIA is responsible for all content and analysis. Any questions regarding the study should be directed to CompTIA Research and Market Intelligence staff at research@comptia.org.

CompTIA is a member of the market research industry's Insights Association and adheres to its internationally respected *Code of Standards and Ethics*.

About CompTIA

The Computing Technology Industry Association (CompTIA) is a leading voice and advocate for the \$5 trillion global information technology ecosystem; and the estimated 75 million industry and tech professionals who design, implement, manage, and safeguard the technology that powers the world's economy.

Through education, training, certifications, advocacy, philanthropy, and market research, CompTIA is the hub for unlocking the potential of the tech industry and its workforce.

Job Level

- 64% Management / Senior level
- 36% Staff level

Firm Employee Size

- 10% Micro (1-9)
- 35% Small (10-99)
- 24% Medium (100-499)
- 30% Large (500+)

Primary Industry

- 19% IT / ICT
- 11% Manufacturing
- 10% Financial / Banking / Insurance
- 9% Retail / Wholesale
- 8% Professional Services
- 6% Media / Publishing / Entertainment
- 6% Government (federal, state, local)
- 6% Healthcare / Medical
- 5% Hospitality / Restaurants
- 5% Education
- 4% AMTUC
- 8% Other

Country Sample Size

- 150 Australia
- 150 Germany
- 150 Japan
- 153 Netherlands
- 150 Singapore
- 150 United Kingdom
- 150 United States

Appendix

Strategic Business Objectives

	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
Implementing new systems or work processes to enhance efficiencies	46%	54%	47%	57%	39%	36%	45%	46%
Hiring / retaining / developing skilled workforce	42%	43%	44%	45%	39%	39%	45%	42%
Innovation / cultivating new ideas and putting them into practice	40%	43%	32%	39%	42%	41%	37%	45%
Successfully launching new products or services	39%	34%	45%	37%	42%	35%	33%	47%
Identifying new customer segments / new markets	38%	41%	32%	35%	37%	32%	41%	44%
Diversifying revenue by growing new product lines	32%	35%	34%	21%	27%	37%	34%	34%
Executing a new branding or marketing campaign	29%	25%	34%	17%	29%	34%	27%	33%
Defending business against new competitive threats	27%	31%	27%	21%	31%	32%	33%	18%
Hiring a more diverse workforce	26%	24%	26%	28%	24%	27%	25%	25%
Navigating government policies / regulations	24%	31%	27%	13%	24%	27%	25%	23%

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Source: CompTIA's Business Technology Adoption and Skills Trends | n=1,053

Role of Technology to Business and Allocation to Technology Views

	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
Technology is generally a primary factor in reaching our objectives	72%	78%	70%	62%	68%	74%	73%	81%
Technology is generally a secondary factor in reaching our objectives	24%	19%	25%	27%	29%	24%	27%	17%
Technology is generally a limited or non-factor in reaching our objectives	3%	3%	5%	9%	3%	2%	1%	2%
Don't know	1%	1%	-	3%	1%	-	-	-

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Source: CompTIA's Business Technology Adoption and Skills Trends | n=1,053

Perception of ROI from Firm's Tech Investments

	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
Excellent + Good ROI	48%	58%	37%	15%	43%	54%	61%	67%
Excellent ROI	8%	10%	3%	3%	4%	11%	5%	16%
Good ROI	40%	48%	33%	12%	39%	43%	56%	51%
Just okay ROI	35%	27%	42%	56%	45%	27%	29%	22%
Disappointing + Below Average ROI	15%	13%	20%	25%	10%	17%	9%	11%

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Source: CompTIA's Business Technology Adoption and Skills Trends | n=1,053

Factors Contributing to Perceptions of Disappointing ROI

	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
On-going maintenance costs or support fees	39%	45%	41%	35%	34%	41%	35%	43%
Staff time requirements to operate / maintain	37%	36%	35%	37%	31%	44%	38%	38%
Upfront cost / too expensive for what you get	37%	40%	31%	26%	32%	46%	40%	43%
Complexity / poor user experience	35%	43%	34%	29%	37%	36%	36%	31%
Required upgrades / built-in obsolescence	35%	37%	29%	25%	33%	37%	37%	45%
Insufficient features / capabilities	32%	38%	33%	23%	31%	38%	28%	32%
Unreliable / doesn't work the way it should	32%	28%	37%	22%	33%	37%	33%	31%
Nothing specific – just falls short relative to expectations	6%	5%	5%	7%	6%	4%	6%	7%
Don't know	3%	2%	2%	9%	5%	-	1%	-

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Source: CompTIA's Business Technology Adoption and Skills Trends | n=1,053

General Usage of Outside Tech Firms / Expertise

	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
Frequently / regularly outsource tech expertise	57%	45%	61%	49%	63%	72%	54%	53%
Occasionally	29%	39%	23%	26%	31%	23%	33%	30%
Rarely / never outsource tech expertise	13%	16%	13%	18%	6%	5%	13%	17%
Don't know	1%	-	3%	7%	1%	-	-	-

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Source: CompTIA's Business Technology Adoption and Skills Trends | n=1,053

Reported Types of Outside Tech Services Used

	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
General IT / tech consulting / advisory / strategy services	33%	37%	35%	27%	35%	34%	35%	27%
Cloud computing / digitalization	31%	34%	38%	23%	25%	33%	29%	33%
Cybersecurity related	30%	25%	33%	23%	32%	34%	29%	31%
Software development / mobile app development	28%	27%	25%	21%	33%	33%	27%	29%
Repair or troubleshooting computer, network or related IT problem	27%	28%	21%	31%	24%	29%	25%	27%
Data / analytics / AI related	26%	23%	23%	19%	25%	38%	22%	31%
Deployment, installation or integration of IT or software system	24%	24%	21%	25%	22%	30%	22%	23%
Web design or e-commerce related	24%	27%	21%	14%	25%	31%	21%	27%
Managed services / use of a MSP for ongoing IT management	23%	22%	21%	21%	23%	28%	26%	19%
Telecom, communications, A/V related	19%	24%	20%	18%	17%	25%	16%	14%
Mobile app development / mobility related	19%	16%	18%	13%	27%	20%	19%	19%
Emerging technology related	18%	19%	20%	5%	16%	29%	21%	18%
None of the above – 100% of our tech needs were handled in-house	8%	9%	8%	13%	4%	2%	6%	11%

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Source: CompTIA's Business Technology Adoption and Skills Trends | n=1,053

Factors that Inhibit the Adoption of Emerging Tech

	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
Budget constraints / lack of willingness to spend on emerging tech	31%	32%	29%	31%	25%	31%	31%	34%
Risk aversion / too many unknowns with emerging tech	28%	27%	21%	31%	33%	31%	24%	26%
Lack of a clear business case / need	18%	19%	21%	16%	16%	17%	18%	16%
Confusion / customers overwhelmed with options	16%	16%	21%	7%	20%	17%	19%	14%
None of the above or not applicable	8%	5%	8%	15%	5%	3%	8%	10%

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Source: CompTIA's Business Technology Adoption and Skills Trends | n=1,053

Current Level of Emerging Tech Activity

	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
Net: Fully Implemented + Limited Use	61%	62%	58%	34%	62%	74%	64%	73%
Internet of Things (IoT)	59%	59%	56%	37%	61%	70%	62%	67%
Artificial intelligence / machine learning	55%	49%	56%	32%	57%	70%	59%	60%
Edge computing	54%	49%	51%	26%	57%	69%	61%	65%
Biometrics	49%	47%	42%	19%	56%	68%	55%	55%
Blockchain / Distributed ledger technology	48%	42%	48%	28%	51%	58%	48%	60%
Robotics process automation (RPA)	48%	43%	49%	31%	49%	56%	50%	54%
Robotics	47%	44%	44%	23%	48%	63%	52%	53%
Augmented reality (AR)	46%	33%	50%	26%	48%	62%	51%	51%
Virtual reality (VR)	45%	39%	50%	21%	45%	58%	50%	53%
Drones	39%	38%	35%	19%	49%	49%	41%	46%

[Note: 'exploratory' phase and 'no activity' results not shown.]

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Source: CompTIA's Business Technology Adoption and Skills Trends | n=1,053

Appendix

Extent of Leveraging a Diverse Workforce for Innovation

	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
Significant + Moderate (Net)	82%	84%	81%	58%	88%	95%	86%	84%
Significant	30%	36%	33%	10%	32%	42%	29%	31%
Moderate	52%	48%	48%	48%	56%	53%	57%	53%
Not that much or not at all	14%	13%	15%	29%	9%	5%	12%	13%
Don't know or not applicable	4%	3%	5%	13%	3%	1%	2%	3%

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Source: CompTIA's Business Technology Adoption and Skills Trends | n=1,053

Skills Gap Concept Awareness

As it relates to real or perceived skills-job role disconnects	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
Yes, definitely	54%	49%	55%	41%	54%	67%	53%	57%
Maybe, I think so	34%	38%	34%	39%	36%	28%	35%	29%
No, I don't recall seeing or hearing anything	12%	13%	11%	21%	10%	5%	11%	13%

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Source: CompTIA's Business Technology Adoption and Skills Trends | n=1,053

Gaps that are Barriers to Maintaining a Robust Workforce

	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
Soft skills gap – insufficient skill/capability in non-technical areas such as project management, collaboration, communication	40%	42%	34%	41%	40%	48%	41%	33%
Innovation gap – speed of innovation exceeding pace of training/workforce development	36%	37%	36%	33%	33%	40%	33%	41%
Wage gap – market wages for certain positions/skills exceeding employer budgets	31%	34%	23%	30%	32%	33%	31%	36%
Confidence gap – prospects deterred by fears, uncertainty, or negative perceptions	28%	25%	31%	25%	25%	34%	33%	25%
Sector gap – insufficient expertise in specific industry sectors	28%	33%	29%	17%	26%	29%	31%	31%
Culture competence gap – lack of awareness across diverse groups	25%	30%	23%	19%	24%	29%	25%	25%
Perception gap – expecting workers to fit a specific mold / not considering diverse backgrounds	25%	25%	29%	19%	25%	26%	21%	27%
Location gap – jobs in one location and workers in another	24%	23%	24%	19%	27%	21%	27%	25%

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Extent to which Unrealistic Expectations Contribute to Skills Gaps | Perceptions of Skills Gaps among Younger Workers

Extent unrealistic expectations contribute to exaggerated perceptions of skills gap	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
Yes, I think this is definitely a factor	33%	31%	29%	23%	35%	47%	31%	35%
Yes, I think this is somewhat a factor	52%	57%	49%	49%	52%	49%	56%	53%
No, I do not think this is much of a factor	10%	9%	19%	14%	8%	3%	10%	9%
Not sure	5%	3%	3%	14%	5%	1%	3%	3%

Skills gaps perceptions among young people	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
More gaps among young people	30%	35%	27%	22%	32%	31%	31%	33%
About the same as the general workforce	47%	41%	50%	59%	47%	40%	48%	44%
Fewer gaps among young people	22%	23%	23%	19%	20%	29%	20%	23%

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Approaches to Address Gaps in Skills, Training or Job-Readiness

Approach to identifying gaps	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
We have a pretty good handle on identifying and assessing skills gaps	33%	38%	35%	17%	31%	34%	34%	41%
About in the middle – we have a pretty good handle on some roles and skills, but struggle with others	20%	25%	21%	17%	13%	21%	19%	24%
We often struggle in identifying and assessing skills gaps	43%	33%	41%	52%	53%	43%	46%	34%
Don't know	4%	3%	3%	13%	3%	1%	1%	1%

Strategies to address gaps	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
Formal strategies / resources	43%	43%	40%	24%	48%	55%	44%	49%
Informal strategies / resources	43%	43%	47%	35%	45%	40%	47%	43%
Nothing in place	10%	11%	10%	26%	5%	5%	8%	8%
Don't know	4%	3%	3%	15%	3%	-	1%	1%

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Source: CompTIA's Business Technology Adoption and Skills Trends | n=1,053

Areas of Durable or 'Soft' Skills Priorities

	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
Innovation / creative problem solving	39%	40%	36%	29%	34%	42%	44%	46%
Flexibility / adaptability	39%	44%	33%	38%	41%	37%	34%	43%
Project management	36%	35%	36%	35%	27%	44%	44%	33%
Collaboration / teamwork	35%	32%	36%	32%	32%	33%	39%	42%
Motivation / initiative	34%	36%	32%	38%	36%	30%	30%	38%
Analytical skills	32%	37%	33%	34%	24%	37%	26%	34%
Leadership	30%	29%	27%	40%	24%	33%	32%	28%
Strong work ethic	30%	35%	32%	24%	36%	26%	25%	31%
Verbal / written communication skills	27%	22%	25%	22%	35%	26%	28%	30%
Customer service	27%	32%	21%	21%	32%	26%	28%	28%
None of the above / other	0%	-	-	-	1%	-	-	-

CompTIA

Source: CompTIA's Business Technology Adoption and Skills Trends | n=620 firms with moderate to significant concerns in soft skills

Areas of Software Development Skills Priorities

	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
Testing / Quality assurance	43%	37%	51%	44%	36%	40%	41%	56%
Artificial intelligence / machine learning / deep learning / neural networks	43%	37%	32%	40%	45%	54%	39%	49%
User experience	42%	49%	41%	29%	41%	46%	42%	42%
Web development	37%	48%	25%	36%	29%	31%	41%	47%
DevOps / Scrum / Agile Development	34%	35%	22%	27%	32%	44%	38%	35%
Mobile development	34%	31%	40%	34%	33%	40%	30%	29%
Scripting language(s), e.g. Python	32%	37%	29%	24%	38%	33%	27%	36%
Natural language processing	32%	33%	34%	19%	37%	30%	35%	31%
None of the above / other	2%	2%	3%	8%	2%	2%	2%	-

CompTIA

Source: CompTIA's Business Technology Adoption and Skills Trends | n=793 firms with moderate to significant concerns in software/app development or emerging tech

Areas of Data-Related Skills Priorities

	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
Data security	53%	57%	65%	51%	48%	51%	49%	51%
Data analytics	42%	38%	47%	27%	40%	49%	46%	45%
Database administration	38%	36%	29%	51%	35%	47%	36%	33%
Data architecture	37%	40%	38%	26%	31%	41%	35%	46%
Data visualization	36%	31%	29%	41%	34%	37%	33%	45%
Data infrastructure (storage, networking)	35%	39%	24%	32%	31%	36%	41%	42%
Data governance	33%	42%	36%	24%	34%	35%	27%	30%
Data mining	25%	24%	22%	18%	25%	28%	28%	31%
None of the above / other	2%	1%	1%	3%	2%	1%	1%	2%

CompTIA

Source: CompTIA's Business Technology Adoption and Skills Trends | n=604 firms with moderate to significant concerns in data management/data analytics

Appendix

Areas of Cybersecurity Skills Priorities

	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
Cloud security	39%	38%	38%	37%	37%	44%	36%	44%
Data loss prevention / data security best practices	35%	39%	38%	29%	32%	34%	33%	38%
Risk management / mitigation	33%	34%	24%	40%	26%	32%	35%	38%
Endpoint security	31%	34%	34%	26%	32%	27%	35%	28%
Network monitoring / access management	30%	27%	27%	33%	30%	29%	28%	35%
Next-generation security (e.g. AI-based predictive analytics tools)	29%	31%	25%	24%	32%	35%	22%	33%
Firewalls and antivirus	29%	32%	30%	24%	30%	28%	29%	29%
Penetration testing / ethical hacking	29%	30%	28%	13%	28%	34%	34%	32%
Legal compliance / security policy development and enforcement	29%	27%	27%	24%	33%	34%	21%	35%
End user education	26%	30%	28%	26%	23%	21%	29%	25%
None of the above / other	2%	1%	3%	3%	3%	1%	-	1%

CompTIA

Source: CompTIA's Business Technology Adoption and Skills Trends | n=659 firms with moderate to significant concern in Cybersecurity

Factors Contributing to Change of Cybersecurity Priority

	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
Change in IT operations	37%	36%	37%	38%	37%	43%	33%	33%
Action taken after knowledge gained from training or certification	32%	30%	33%	23%	37%	32%	32%	37%
Vulnerability discovered by an outside party	28%	25%	25%	24%	30%	41%	28%	25%
Reports of breaches at other organizations	28%	35%	24%	24%	27%	37%	25%	28%
Change in business operations or client base	25%	26%	24%	14%	31%	27%	27%	28%
Focus on a new industry vertical	25%	25%	27%	19%	22%	30%	23%	29%
Internal breach or incident	23%	21%	26%	13%	19%	32%	19%	28%
Change in management	21%	23%	20%	14%	22%	28%	19%	23%
None of the above—we have not recently changed our approach to security	15%	16%	14%	25%	12%	9%	15%	15%

CompTIA

Source: CompTIA's Business Technology Adoption and Skills Trends | n=1,053

Factors Contributing to Difficulties in Pursuing New Cybersecurity Initiatives

	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
Prioritization of other technology that directly impacts business objectives	36%	41%	28%	32%	26%	47%	37%	39%
Lack of budget dedicated to cybersecurity	32%	35%	24%	24%	29%	42%	38%	34%
Low understanding of current cybersecurity technology trends	32%	30%	31%	27%	37%	37%	29%	32%
Belief that current efforts are "good enough"	31%	31%	27%	20%	35%	37%	31%	37%
Low understanding of new threats	30%	34%	33%	28%	24%	33%	30%	29%
Lack of metrics to demonstrate cybersecurity effectiveness	29%	24%	27%	25%	29%	35%	29%	33%
None of the above	11%	11%	14%	24%	9%	3%	9%	7%

CompTIA

Source: CompTIA's Business Technology Adoption and Skills Trends | n=1,053

Firm's Approach to Training / Professional Development

	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
Mandatory training/professional development – required	30%	35%	26%	25%	30%	33%	29%	31%
Voluntary training/professional development – not required, but encouraged	44%	40%	48%	37%	56%	47%	49%	34%
Both mandatory and voluntary training/professional development	19%	19%	21%	15%	7%	19%	19%	33%
Neither	7%	7%	5%	23%	7%	1%	3%	2%

CompTIA

Source: CompTIA's Business Technology Adoption and Skills Trends | n=1,053

Most Helpful Approaches Employers Think Will Enhance Skills among Tech Workers

	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
More training for managers to better identify and support workers with skills gaps	41%	40%	43%	31%	41%	48%	41%	41%
More resources for on-the-job training or continuing education	39%	46%	41%	23%	37%	41%	41%	46%
Better worker retention programs	34%	35%	37%	23%	33%	39%	35%	33%
Certifications / credentials specific to a technology skill set	34%	41%	28%	21%	29%	34%	41%	41%
More formal and regular skills assessments	33%	33%	29%	31%	31%	37%	31%	41%
Apprenticeships and related work/study programs	31%	29%	34%	25%	24%	32%	35%	39%
National workforce policies to respond to workers displaced by obsolescence, etc.	28%	33%	23%	23%	29%	33%	29%	25%
Other	0	1%	-	-	-	-	1%	-
Don't know	5%	4%	5%	19%	5%	1%	3%	3%

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Source: CompTIA's Business Technology Adoption and Skills Trends | n=1,053

Ways to Improve Staff Knowledge Retention, Performance, Satisfaction

	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
More e-Learning (including instructor led online and interactive self-paced online)	34%	29%	34%	33%	35%	34%	39%	35%
More follow-up after training to ensure it aligns with professional development goals	30%	33%	29%	23%	24%	35%	33%	35%
More opportunities for training and professional development	29%	31%	27%	21%	21%	36%	33%	36%
More cross-training with employees from other departments or divisions of the company	28%	21%	31%	23%	27%	31%	26%	37%
More autonomy – allowing staff to design their own training/professional development	26%	21%	29%	25%	26%	32%	26%	24%
More in-person classroom training	26%	32%	27%	21%	24%	24%	25%	33%
More mobility elements, such as app-based training	25%	25%	26%	23%	31%	22%	22%	25%
More apprenticeship-type work-study programs	23%	28%	20%	12%	19%	29%	30%	23%
More cultural awareness training	21%	23%	17%	21%	18%	25%	19%	21%
More simulations or gaming elements	21%	19%	21%	20%	17%	23%	17%	27%
More social elements	17%	21%	19%	11%	21%	17%	13%	15%
None of these would have value	5%	5%	4%	15%	6%	1%	3%	2%

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Source: CompTIA's Business Technology Adoption and Skills Trends | n=1,053

Awareness of Automation / RPA and Influence on Training

Recollection of automation replacing jobs stories	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
Yes	71%	64%	71%	55%	68%	89%	70%	81%
No	20%	27%	18%	29%	20%	5%	23%	14%
Not sure	9%	9%	11%	17%	12%	5%	7%	5%
Automation's influence on own interest in training	Total	Australia	Germany	Japan	Netherlands	Singapore	United Kingdom	United States
Yes, definitely	25%	29%	19%	19%	23%	29%	25%	33%
Yes, somewhat	42%	35%	38%	39%	47%	52%	43%	39%
Neutral – not sure yet	22%	22%	28%	25%	22%	17%	22%	15%
No, not really	8%	9%	12%	9%	7%	2%	7%	11%
Not, not at all	3%	5%	3%	9%	1%	-	3%	1%

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