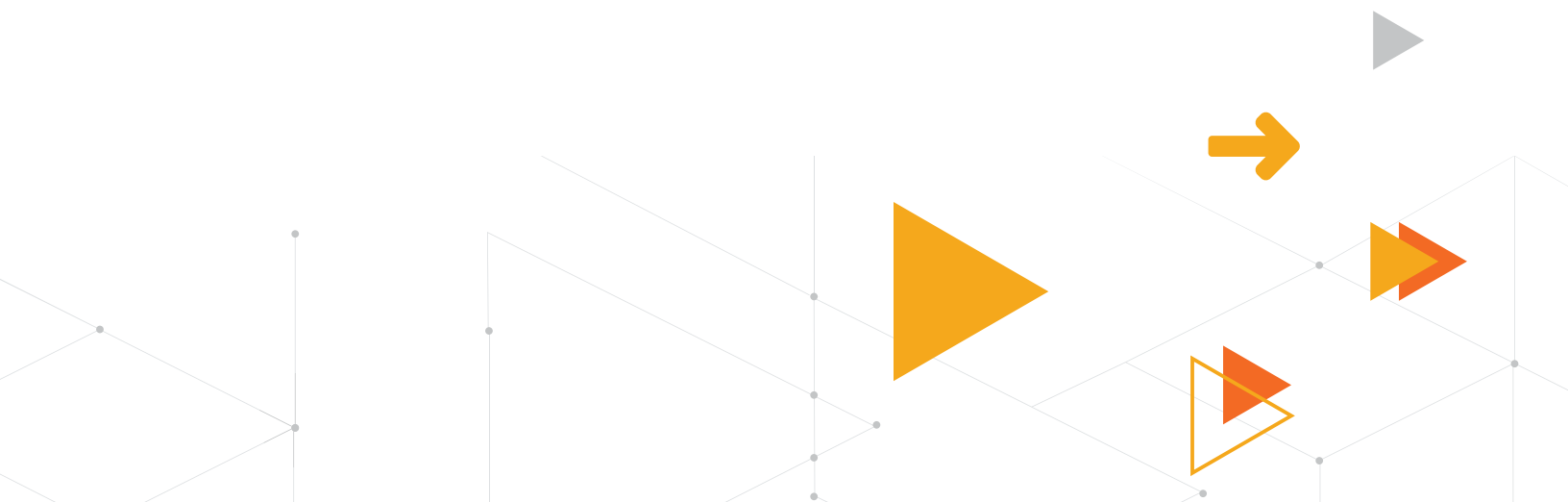




International Trends in Technology and Workforce

Country coverage: Australia | Brazil | Canada | China | India | Ireland
Japan | Oman | Saudi Arabia | United Arab Emirates | Netherlands
Thailand | United Kingdom | United States



INTRODUCTION

The impact of technology continues to grow. The intersection of technology and business operations, technology and people, technology and government, and technology and just about everything else, will mean more change on more fronts in the years to come.

While it is impossible to know precisely how these changes will unfold, CompTIA's latest research provides a number of clues as to how businesses are responding and the challenges they are working to overcome.

According to the data, innovation remains a top business priority. Likewise, robust spending projections on emerging technologies, such as the internet of things, big data, artificial intelligence, and robotics confirm the steady advance of digitization.

At the same time, the demand for tech talent has never been higher. Across every business type and industry sector, employers recognize the importance of cultivating a tech-savvy workforce.

While there are common threads underpinning many of these trends, there is much to learn from the unique experiences and approaches taken by countries around the world.



53.9 million

Estimated number of information technology workers worldwide
Source: IDC | 2020 projection

\$5.2 trillion

Total spending on tech in the global market. Inclusive of hardware, software, services, telecom, and emtech.
Source: IDC | 2020 projection

6 in 10

% of employers with some degree of difficulty in identifying and addressing skills gaps

43%

% citing the speed of innovation as a factor contributing to workforce gaps

87%

NET % of businesses relying on outside technology service providers at least occasionally

3 in 4

NET % with some degree of excitement for opportunities associated with emerging technologies

THE BUSINESS OF TECHNOLOGY

The size of the global technology industry continues to grow as spending is expected to reach nearly \$5.2 trillion worldwide in 2020, according to the research consultancy IDC. Despite the large size of the U.S. market (\$1.7 trillion, 2020 projection), the majority of tech spending (68%) occurs beyond its borders. See CompTIA's *IT Industry Outlook*.

While the mix of spending categories may vary, businesses around the world are investing in hardware, software, services, and telecommunications. Technology will play a growing integral role as companies focus on key strategic priorities such as implementing new systems and processes (56%), innovation (55%), identifying new customer segments and markets (48%), and launching new products (48%). Nearly half also prioritize hiring skilled workers to help them drive technology initiatives into the future (45%).

Businesses of all types rate technology a critically important factor to their success. Across all the countries CompTIA studied, nearly three-quarters rate technology as a primary factor in reaching business objectives (72%). Nearly a quarter consider technology a secondary factor in helping to meet those goals (23%), while just 4% describe technology as a nonfactor. However, there is a disconnect between technology as a priority and the reality that a segment of businesses say they under-invest in technology. About 1 in 5 believe their firm's allocation of budget to technology spending is "too low."

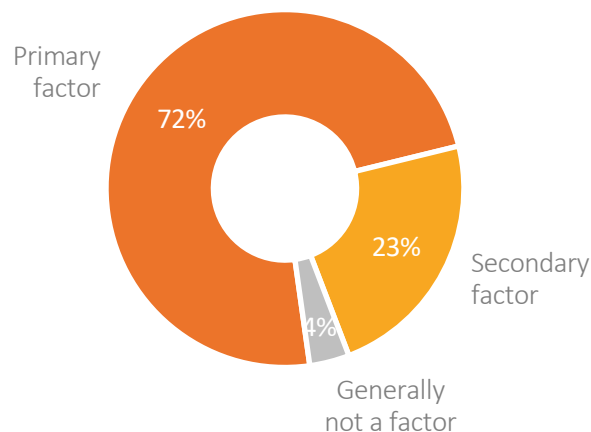
Furthermore, when considering what businesses spend vs. the value and benefits received, the great majority report that their firm gets excellent or good ROI from its technology spending (66%). Regardless, primary reasons that contribute to perceptions of disappointing ROI of technology investments include ongoing maintenance costs or support fees, required upgrades / built-in obsolescence, staff time required to operate / maintain, upfront cost / too expensive for what's received, complexity / poor user experience, and insufficient features / capabilities.

25% Managed services utilization

According to the data, 1 in 4 businesses report use of a managed service provider for ongoing IT operations management.

Firms who outsource more often report higher perceptions of ROI.

Rating of technology as a factor in reaching business objectives



Certainly technology plays a role in achieving corporate objectives, but technology alone will not produce the desired results. Employers must also address the people and process elements of the equation to achieve optimal outcomes. Businesses face a range of challenges in executing their vision, from resource constraints, lack of expertise, skills gaps, and so on. Consequently, most organizations rely on some degree of outside provider of tech services. For instance, nearly 9 in 10 indicate outsourcing or using outside tech firms / expertise at least occasionally in a typical year (87%); including more than half who do so regularly (34%) or frequently (19%).

Top reported uses of outside tech services

1. Troubleshooting / repair / maintenance
2. Consulting / advisory / strategy services
3. Deployment / integration (e.g. cloud migration)
4. Cybersecurity related
5. Software development

Organizations turn to outside expertise for a number of other services as well including data / analytics, web design, and emerging tech. In addition, a quarter report using managed services / use of a managed service provider (MSP) for ongoing IT management (25%). Interestingly, firms who regularly or frequently outsource are significantly more likely to report excellent or good ROI (72%) vs. those who occasionally outsource (63%) or rarely / never do so (56%).

EMERGING TECH MOMENTUM BUILDS

The concept of emerging technology is a common shorthand for a range of innovations in the early to mid stages of adoption. This may encompass distinct categories, such as drones or 3-D printers, or enabling technologies, such as artificial intelligence or blockchain, embedded or serving as a platform for countless products or services.

The current and future impact of these technologies can be seen in their growth rates and revenue contributions. According to IDC, sales of emerging tech categories will increase by 105% during the 2019-2023 time period, adding \$1.5 trillion in new revenue to the global tech sector. In the year ahead, categories such as AI (+31%), blockchain (+70%), AR/VR (+99%), and IoT (+15%) will gain further traction as they move into new segments of customers.

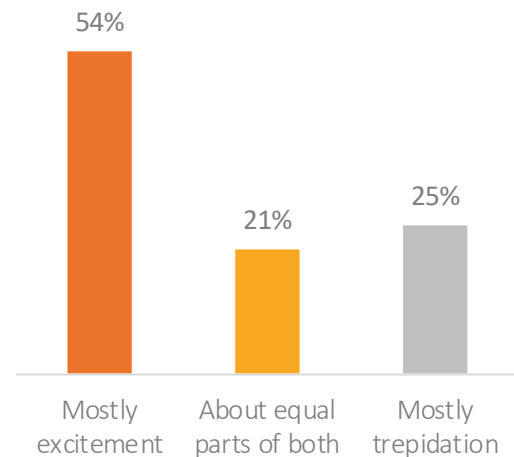
As a percentage of the overall technology pie, emerging tech will account for about 17% in 2020, with the remaining share stemming from the established categories of hardware, software, services, and telecom. Of course, there are gray areas where emerging tech overlaps multiple categories. Relatedly, no technology operates in a vacuum. Without robust networks and infrastructure, devices such as PCs and mobile phones, and integration expertise, emerging technologies cannot advance.

According to the CompTIA survey, most businesses have a positive view of emerging technology. It can be inferred that respondents see an opportunity specific to their business, or more broadly, a general sense of excitement for where technology is headed. At the other end of the spectrum, 1 in 4 report mostly feelings of trepidation. Again, this could be specific to their firm, such as the fear of falling behind in the market, or a broader concern for the uncertainty of technological disruption.

The data suggests there is a positive correlation between businesses that report a high level of ROI with their current technology spending and excitement for emerging technology. It follows that firms less satisfied with their current technology use express more concern for the future.

Although still far from mainstream adoption, the emerging technologies reported at the highest rates of implementation are IoT and big data (See chart on following page.) Granted, there is a continuum of use, from basic sensors on a network that could be

Top level perceptions of emerging tech



characterized as IoT, to highly complex deployments with myriad inputs generating volumes of data feeding various automating technologies. As such, reported adoption rates are best used as directional guidance.

Unsurprisingly, large enterprises report notably higher rates at the full implementation stage vs. small or medium-size enterprises (SMEs). The financial sector generally has higher rates of adoption compared to others. In others areas, adoption can be traced to need and relevant business value, such as robotics in manufacturing, or AR/VR in retail.

25%

% of businesses that say risk aversion is a primary factor in their decision to postpone emtech adoption



Primary factors cited as inhibiting the adoption of emerging technologies

1. Budget constraints
2. Risk aversion / uncertainty
3. Lack of a clear business case
4. Confusion / overwhelmed with options

CYBERSECURITY: DISCONNECTS ON MANY FRONTS

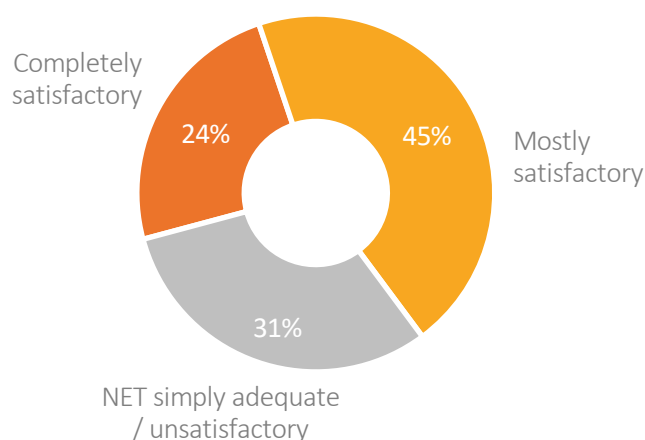
Cybersecurity continues to grow in importance in an increasingly digital and interconnected world. Many businesses are increasing their security investments or elevating their security focus, yet needing to employ progressively more proactive measures. Again, technologies and tools only go so far as employers need to build and enhance their processes, policies, and—most importantly—people.

Nearly 7 in 10 firms describe their firm's cybersecurity at a completely (24%) or mostly satisfactory (45%) level. This indicates a lot of room for improvement, especially with the remainder describing their firm's approach as simply adequate (25%) or unsatisfactory (6%).

Characteristics of those who indicate satisfactory levels at significantly higher rates than their counterparts include large-size firms, tech and financial / banking / insurance sectors, are mostly excited for emerging tech, frequently or regularly outsource tech, experience excellent or good tech ROI, and work in management. Contrarily, those self-assessing their firm's security as simply adequate or unsatisfactory levels include SMEs, aren't so excited about emerging tech, only occasionally or rarely outsource tech, experience just okay or poor tech ROI, and are staff-level workers.

Self-assessment levels of security satisfaction are presumably even lower as firms are more likely to report on themselves on the optimistic side. This is further compounded by the fact that businesses are oftentimes less prepared than they believe, and even more so as it relates to emerging areas.

Self-assessment of cybersecurity posture



Emerging tech adoption tracking

	Exploratory	Limited use	Full production
Internet of things (IoT)	28%	29%	31%
Big data	27%	29%	30%
Biometrics	29%	25%	24%
Blockchain / DLT	30%	28%	21%
Artificial intelligence	28%	30%	20%
AR / VR	30%	24%	19%
Robotics / RPA	31%	25%	17%
Drones	25%	19%	16%

Security underpins the many facets of emerging technology. This, along with the high growth rates for emerging technologies expected over the next several years, drives the need for businesses to re-evaluate their approaches to security. Consider that 88% of firms reported recently changing their security approach; with 4 in 10 being due to a change in IT operations (move to cloud, new IoT strategy, etc.). For another 32%, cybersecurity priorities shifted as a result of knowledge gained from training or certification.

Furthermore, a low understanding of new threats is a top challenge cited for why it may be difficult to pursue new cybersecurity challenges. For example, consider the wide range of security risks with IoT as digital meshes with physical properties. (See CompTIA's *2019 Trends in Internet of Things*.)

Top reported challenges to improving cybersecurity

1. Belief that current efforts are 'good enough'
2. Low understanding of new threats
3. Lack of budget dedicated to cybersecurity
4. Prioritization of other technology investments
5. Lack of metrics to demonstrate effectiveness

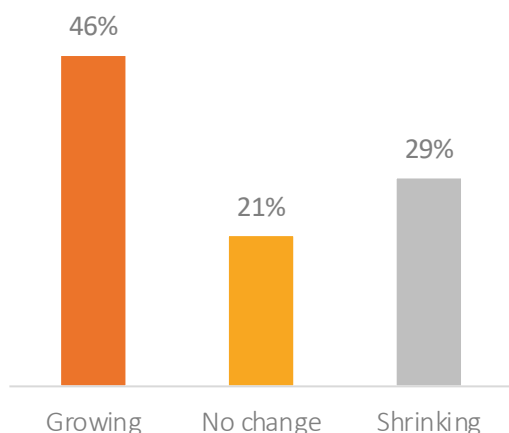
OVERCOMING WORKFORCE GAPS

The evolving tech labor market continues to present both opportunities and trials. Skills gaps particularly remain an ongoing challenge at most organizations. When considering the general concept of a country's tech skills gap, the great majority in CompTIA's latest research recall recently seeing or hearing about it (86%). Rates are especially high within countries that have more maturing economies, i.e. Brazil, China, India, Mideast, and Thailand vs. the more mature grouping that have been grappling with the issue for decades in countries such as Australia, Canada, UK, and US.

Moreover, nearly half report that the skills gap situation at their firm has grown over the past two years (46%). Firms operating in the tech industry are more likely to indicate so (56%). Similarly, managers in India and Thailand report markedly higher rates of a growing skills gap with nearly 6 in 10 each.

Much too often "skills gaps" are used as a term to generalize a host of other workforce issues. Skills gaps primarily meaning employee performance falling short of employer expectations or desires is far different from what could be described as a location or a pay gap. When breaking down some of the various types of gaps, the top ones the research identified as barriers in hiring and maintaining a robust tech workforce include innovation, soft skills, and wage gaps. Companies reporting an innovation gap see that the speed of innovation is exceeding the pace of training / workforce development. Soft skills challenges are a symptom of insufficient skill / capability in non-technical areas such as project management, collaboration, or communication. A wage gap will occur when market

**Perceived change in skills gap
over the past 2 years**



Top priorities for boosting cybersecurity skills

52%	Data loss prevention / data security
49%	Cloud security
45%	Firewalls and antivirus
43%	Network monitoring / access management
40%	Risk management / mitigation
38%	Legal compliance / policies
33%	Next-gen (e.g. AI predictive analytics tools)
32%	Penetration testing / ethical hacking

wages for certain positions / skills exceed employer budgets. With 4 in 10 or more citing these three types of gaps alone, and at least a quarter citing others such as gaps in perception, sector, confidence, or location, making even incremental changes in these types of issues is no small feat but will reap substantial rewards.

Getting more into the matter of tech skills gaps, the top areas of concern reported by managers in the CompTIA survey include a mix of newer tech areas as well as more core as technologies progress. For instance, the more specific areas of cybersecurity skill gap concerns address both cloud and networks. (See table above.)

Top tech skills gap areas include:

- Emerging tech, i.e. AI, automation, AI, blockchain, etc. [57% significant + moderate gaps]
- Cybersecurity [55%]
- Integrating different apps, data sources, platforms, devices [55%]
- Software or app development [54%]
- Digital business transformation / modernizing legacy hardware or software [54%]

33% Unrealistic expectations?

One-third of employers acknowledge that unrealistic expectations with skills and experience contribute to exaggerated perceptions of the skills gap. Another 53% acknowledge it is somewhat of a factor.

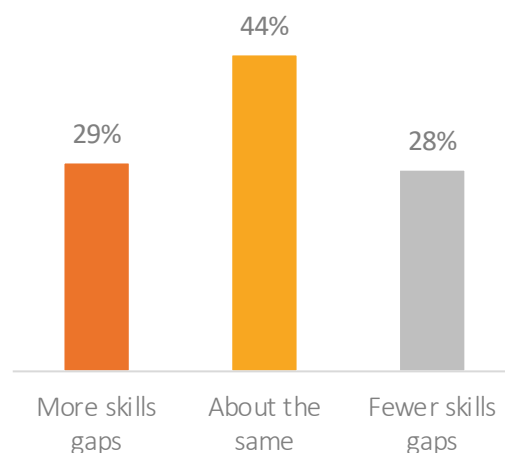
Obtaining an accurate read on the skills gap situation is difficult and compounded by the issue that only a minority report their own firm has a pretty good handle on identifying and assessing skills gaps (39%). Those that have a good handle on it however are more likely to be large-size firms, work in the tech or financial / banking / insurance sectors, or are managers. Conversely, retail / wholesale businesses are more likely to struggle compared to their counterparts (46% in this sector vs. 33% overall). A remaining 25% would place themselves in the middle with a good handle on some roles while struggling with others.

Furthermore, over half report only having informal strategies / resources in place at their firms to address skills gaps (43%) or no process at all (10%). This is at first hard to believe that only about 4 in 10 indicate having formal strategies (42%). Interestingly, more countries in the maturing grouping, notably China, India, and Thailand, report formal processes at much higher rates—perhaps born out of urgent necessity. While informal strategies are much preferred in the Netherlands. Not as surprising, large-size firms, or businesses operating in the tech, financial / banking / insurance, or manufacturing sectors, or managers are among those more likely to report formal processes in place. As important as it is to first identify business objectives then align tech accordingly, employers also need to recognize what needs fixing in regards to skills gaps before jumping into resolutions.

Top priorities for boosting soft skills

- 41% Flexibility / adaptability
- 39% Innovation / creative problem solving
- 38% Collaboration / teamwork
- 37% Leadership
- 36% Strong work ethic
- 35% Motivation / initiative
- 35% Analytical skills
- 32% Customer service
- 31% Project management
- 23% Verbal / written communication skills

Perception of skills gaps among Gen Y & Z vs. other segments of workers



Delving further into skills gap perceptions, the largest percentage believe that the skills gaps among young people are on par with the general workforce (44%). Though nearly 3 in 10 hold the often unfair and negative belief that there are *more* gaps among the younger Gen Y and Gen Z audience (29%). While on the other end of the spectrum, virtually the same portion believe there are *fewer* gaps among the younger group (28%). See CompTIA's *International Youth Perspectives of Technology and Careers* study.

63%

% of businesses indicate they have mandatory training and professional development requirements for staff



Overall, close to two-thirds report their firm has training and professional development for employees in technical or soft skills that is required. Another 31% describe it as solely voluntary; not required but encouraged. Firms that have mandatory training are more likely to be large-size, experience excellent tech ROI, are mostly excited by emerging tech, and more likely to be part of heavier regulated industries, i.e. financial / banking / insurance and healthcare / medical; though IT, education, and professional services firms do to a higher extent as well.

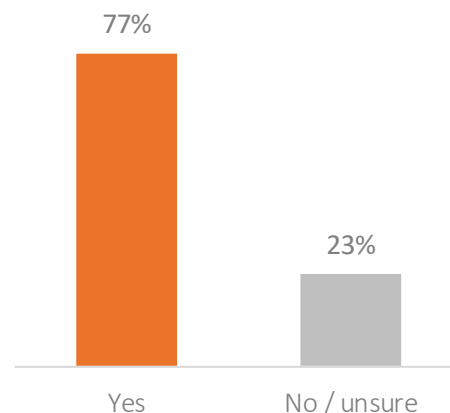
THE FUTURE OF WORK

Undoubtedly, technology will continue to profoundly impact nearly everyone's job—and it's mostly for the better. While on the one hand automating technologies have displaced segments of workers through substitution, in most cases automation frees up time for workers to focus on higher-level activities.

Automation of jobs is a prickly topic conjuring up ideas of mass layoffs and the robots taking over. Mass media has a tendency to latch on to the doom and gloom news. Regardless of viewpoints, more than three-quarters in CompTIA's study have recently seen articles about robotics, intelligent machines, and other automating technologies performing some aspects of jobs or possibly replacing them altogether. On the contrary, the automation of repetitive tasks has spun opportunities elsewhere. For instance, tech support at one time may have been considered as 'on its way out.' Quite the opposite occurred with this growing field as technological advancements breed support needs.

On a slightly more personal level, two-thirds are very concerned (23%) or somewhat concerned (44%) that automating technologies may mean fewer jobs for people like them. Another 28% aren't that concerned. McKinsey & Co. finds a very low portion of occupations that consists of activities that can be fully automated—less than 5%. Displacement rates will depend on a number of factors, but are most likely to occur in fields such as office support, food service, production work, and customer service and retail sales. McKinsey also points to growing demand for technological, social and emotional, and higher cognitive skills by 2030; especially given the adoption of automation and AI. See CompTIA's *International Youth Perspectives of Technology and Careers*.

Familiarity with stories about automating technologies and workforce impact



Almost 7 in 10 indicate at least some interest in attaining additional training or hands-on experience with technology as a result of the outlook for how robotics and automating technologies may impact the workforce (31% definitely + 38% somewhat).

At any rate there's a need for employers, employees, and candidates to focus now more than ever on the continuous improvements of skills and training to keep pace with emerging technology—and employers need to drive impactful professional development strategies.

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

1. More time set aside for training
2. More training alignment with development goals
3. More cross-training (e.g. other functions)
4. More e-Learning
5. More apprenticeship-type work-study programs
6. More classroom instructor-led training
7. More mobile options / app-based
8. More autonomy in developing training program
9. More social elements
10. More simulations or gaming elements



INTRODUCTION

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While it is impossible to know precisely how these changes will unfold, CompTIA's latest research provides a number of clues as to how businesses are responding and the challenges they are working to overcome.

According to the data, innovation remains a top business priority. Likewise, robust spending projections on emerging technologies, such as the internet of things, big data, artificial intelligence, and robotics confirm the steady advance of digitization.

At the same time, the demand for tech talent has never been higher. Across every business type and industry sector, employers recognize the importance of cultivating a tech-savvy workforce.

While there are common threads underpinning many of these trends, there is much to learn from the unique experiences and approaches taken by countries around the world.



70.3 score

Average of ICT adoption + digital skills of population (100-point scale)
Source: World Economic Forum Global Competitiveness 2019

\$93.1 billion

Total spending on tech in Australia. Inclusive of hardware, software, services, telecom, and emtech.
Sources: CompTIA | IDC | 2020 projection

6 in 10

% of employers with some degree of difficulty in identifying and addressing skills gaps

47%

% citing the speed of innovation as a factor contributing to workforce gaps

87%

NET % of businesses relying on outside technology service providers at least occasionally

2 in 3

NET % with some degree of excitement for opportunities associated with emerging technologies

THE BUSINESS OF TECHNOLOGY

The size of the global technology industry continues to grow as spending is expected to reach \$5.2 trillion worldwide in 2020, according to the research consultancy IDC. Tech spending in Australia is projected to reach an estimated \$93.1 billion in 2019. See CompTIA's *IT Industry Outlook* for more on the global market.

While the mix of spending categories may vary, businesses around the world are investing in hardware, software, services, and telecommunications. Technology will play a growing integral role as companies in Australia focus on key strategic priorities such as innovation (62%), identifying new customer segments and markets (58%), implementing new systems and processes (54%), and launching new products or services (50%). More than a third also prioritize hiring skilled workers to help them drive technology initiatives into the future (38%).

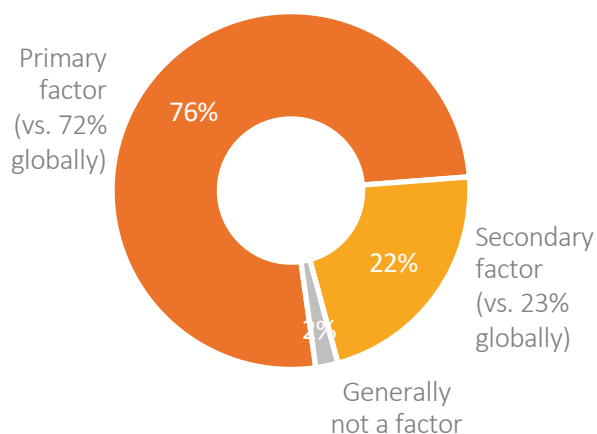
Businesses of all types rate technology a critically important factor to their success. Among the Australian firms that CompTIA surveyed, slightly more than three-quarters rate technology as a primary factor in reaching business objectives (76%). Most of the remainder consider technology a secondary factor in helping to meet those goals (22%), while just 2% describe technology as a nonfactor. There is a disconnect though between technology as a priority and the reality that a segment of businesses say they under-invest in technology. One-quarter believe their firm's allocation of budget to tech spending is "too low."

Furthermore, when considering what Australian businesses spend vs. the value and benefits received, the majority report that their firm gets excellent or good ROI from its technology spending (62%; slightly lower than the 66% global). Regardless, primary reasons that contribute to perceptions of disappointing ROI of technology investments include staff time required to operate / maintain, ongoing maintenance costs or support fees, upfront cost / too expensive, complexity / poor user experience, required upgrades / built-in obsolescence, and insufficient features / capabilities.

24% Managed services utilization

According to the data, 1 in 4 Australian firms report use of a managed service provider for ongoing IT operations management. Firms who outsource more often report higher perceptions of ROI.

Rating of technology as a factor in reaching business objectives



Certainly technology plays a role in achieving corporate objectives, but technology alone will not produce the desired results. Employers must also address the people and process elements of the equation to achieve optimal outcomes. Businesses face a range of challenges in executing their vision from resource constraints, lack of expertise, skills gaps, and so on. Consequently, most Australian organizations rely on some degree of outside provider of tech services. For instance, nearly 9 in 10 indicate outsourcing or using outside tech firms / expertise at least occasionally in a typical year (87%); including half who do so regularly (35%) or frequently (14%).

Top reported uses of outside tech services

1. Consulting / advisory / strategy services
2. Cybersecurity related
3. Software development
4. Web design / e-commerce related
5. Troubleshooting / repair / maintenance

Organizations in Australia turn to outside expertise for a number of other services as well including data / analytics, deployment / integration, and emerging tech. In addition, nearly a quarter report using managed services / use of a managed service provider (MSP) for ongoing IT management (24%). Interestingly, firms who regularly or frequently outsource are significantly more likely to report excellent or good ROI (65% in mature countries such as Australia) vs. those who occasionally outsource (60%) or rarely / never do so (57%).

EMERGING TECH MOMENTUM BUILDS

The concept of emerging technology is a common shorthand for a range of innovations in the early to mid stages of adoption. This may encompass distinct categories, such as drones or 3-D printers, or enabling technologies, such as artificial intelligence or blockchain, embedded or serving as a platform for countless products or services.

The current and future impact of these technologies can be seen in their growth rates and revenue contributions. According to IDC, sales of emerging tech categories will increase by 105% worldwide during the 2019-2023 time period, adding \$1.5 trillion in new revenue to the global tech sector. In the year ahead, categories such as AI (+31%), blockchain (+70%), AR/VR (+99%), and IoT (+15%) will gain further traction as they move into new segments of customers.

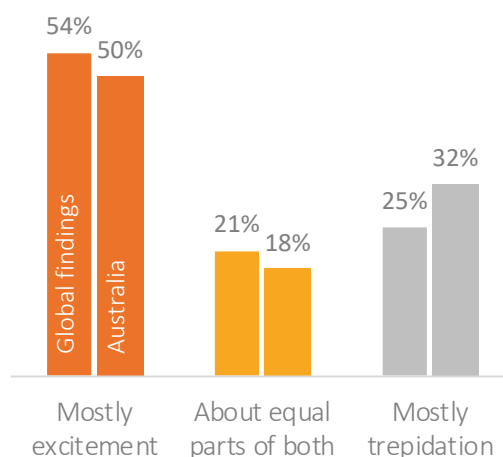
As a percentage of the overall technology pie, emerging tech will account for about 17% in 2020, with the remaining share stemming from the established categories of hardware, software, services, and telecom. Of course, there are gray areas where emerging tech overlaps multiple categories. Relatedly, no technology operates in a vacuum. Without robust networks and infrastructure, devices such as PCs and mobile phones, and integration expertise, emerging technologies cannot advance.

According to the CompTIA survey, 1 in 2 Australian businesses have a positive view of emerging technology. It can be inferred that respondents see an opportunity specific to their business, or more broadly, a general sense of excitement for where technology is headed. At the other end of the spectrum, 1 in 3 report mostly feelings of trepidation. Again, this could be specific to their firm, such as the fear of falling behind in the market, or a broader concern for the uncertainty of technological disruption. Organizations in the maturing bucket of countries tend to be much more eager for emtech opportunities (61% excited in maturing vs. 49% in mature countries).

The data suggests there is a positive correlation between businesses that report a high level of ROI with their current technology spending and excitement for emerging technology. It follows that firms less satisfied with their current technology use express more concern for the future.

Although still far from mainstream adoptions, the emerging technologies reported at the highest rates of implementation are big data and IoT. (See chart on

Top level perceptions of emerging tech



following page.) Granted, there is a continuum of use, from basic sensors on a network that could be characterized as IoT, to highly complex deployments with myriad inputs generating volumes of data feeding various automating technologies. As such, reported adoption rates are best used as directional guidance.

The primary factors indicated that could stall adoption and utilization of emerging tech tend to focus on risk and budget. Businesses in Australia are significantly more likely to indicate risk aversion (29%) vs. their counterparts in Ireland (17%), the Netherlands (18%), and Thailand (18%). While Middle Eastern firms are notably more risk averse (40%).

29%

% of Australian businesses that say risk aversion is a primary factor in their decision to postpone emtech adoption



Primary factors cited as inhibiting the adoption of emerging technologies

1. Risk aversion / uncertainty
2. Budget constraints
3. Lack of a clear business case
4. Confusion / overwhelmed with options

CYBERSECURITY: DISCONNECTS ON MANY FRONTS

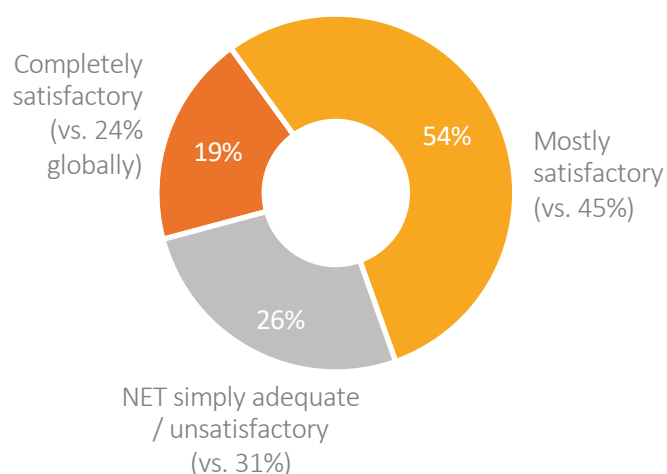
Cybersecurity continues to grow in importance in an increasingly digital and interconnected world. Many businesses are increasing their security investments or elevating their security focus, yet needing to employ progressively more proactive measures. Again, technologies and tools only go so far as employers need to build and enhance their processes, policies, and—most importantly—people.

Nearly three-quarters of Australian firms describe their firm's cybersecurity at a completely (19%) or mostly satisfactory (54%) level. This indicates some room for improvement, especially with the remainder describing their firm's approach as simply adequate (23%) or unsatisfactory (3%).

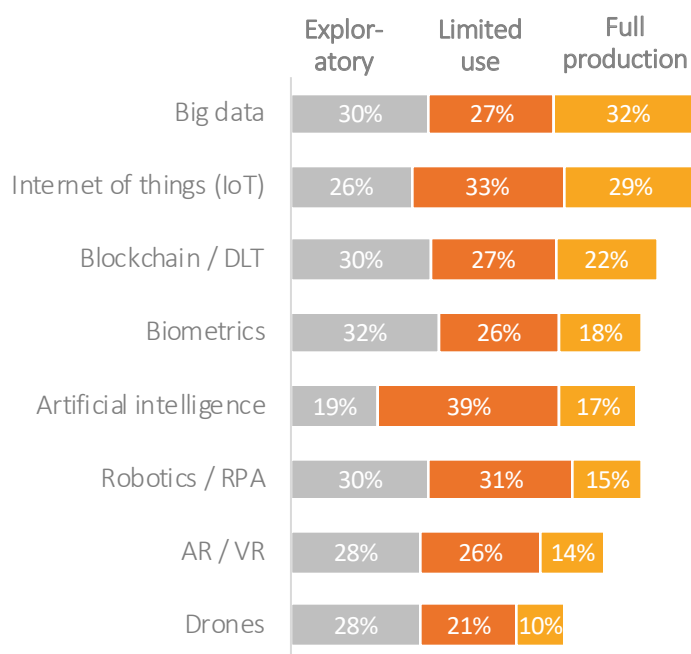
Satisfaction levels among firms in Australia are notably higher compared to overall results (54% vs. 45% mostly satisfied, respectively). However, employers in the maturing group of countries on a whole tend to report being satisfied significantly more than their counterparts in mature countries (74% vs. 65% net satisfied, respectively).

Self-assessment levels of security satisfaction are presumably even lower as firms are more likely to report on themselves on the optimistic side. This is further compounded by the fact that businesses are oftentimes less prepared than they believe, and even more so as it relates to emerging areas.

Self-assessment of cybersecurity posture



Emerging tech adoption tracking



Security underpins the many facets of emerging technology. This, along with the high growth rates for emerging technologies expected over the next several years, drives the need for businesses to re-evaluate their approaches to security. Consider that 85% of Australian firms reported recently changing their security approach; with 41% being due to a change in IT operations (move to cloud, new IoT strategy, etc.). For another 26%, cybersecurity priorities shifted as a result of knowledge gained from training or certification.

Furthermore, a low understanding of new threats is a top challenge cited for why it may be difficult to pursue new cybersecurity challenges. For example, consider the wide range of security risks with IoT as digital meshes with physical properties. (See CompTIA's *2019 Trends in Internet of Things*.)

Top reported challenges to improving cybersecurity

1. Belief that current efforts are 'good enough'
2. Low understanding of cybersecurity trends
3. Low understanding of new threats
4. Lack of budget dedicated to cybersecurity
5. Lack of metrics to demonstrate effectiveness

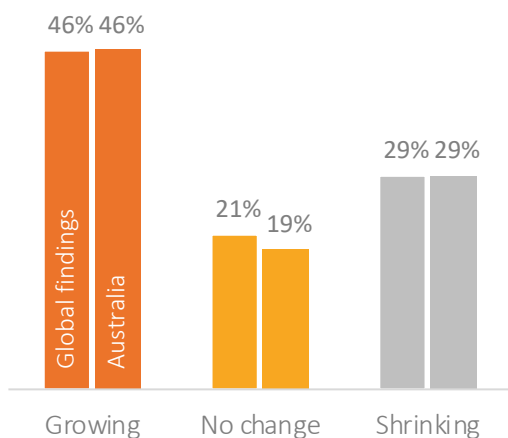
OVERCOMING WORKFORCE GAPS

The evolving tech labor market continues to present both opportunities and trials. Skills gaps particularly remain an ongoing challenge at most organizations. When considering the general concept of a country's tech skills gap, most in Australia in CompTIA's latest research recall recently seeing or hearing about it (72% vs. 86% global). Rates are especially high within countries that have more maturing economies, i.e. Brazil, China, India, Mideast, and Thailand vs. the more mature grouping that have been grappling with the issue for decades in countries such as Australia, Canada, UK, and US.

Moreover, nearly half report that the skills gap situation at their firm has grown over the past two years (46% for Australia, same as globally). Businesses in the mature grouping of countries report no change at a higher rate compared to firms in maturing countries.

Much too often "skills gaps" are used as a term to generalize a host of other workforce issues. Skills gaps primarily meaning employee performance falling short of employer expectations or desires is far different from what could be described as a location or a pay gap. When breaking down some of the various types of gaps, the top ones the research identified as barriers in hiring and maintaining a robust tech workforce in Australia include innovation, soft skills, and wage gaps. Companies reporting an innovation gap see that the speed of innovation is exceeding the pace of training / workforce development. Soft skills challenges are a symptom of insufficient skill / capability in non-technical areas such as project management, collaboration, or communication. A wage gap will occur

Perceived change in skills gap
over the past 2 years



Top priorities for boosting cybersecurity skills

52%	Cloud security
51%	Network monitoring / access management
49%	Data loss prevention / data security
44%	Firewalls and antivirus
39%	Risk management / mitigation
38%	Legal compliance / policies
36%	Next-gen (e.g. AI predictive analytics tools)
25%	Penetration testing / ethical hacking

when market wages for certain positions / skills exceed employer budgets. With over a third or more citing these three types of gaps alone, and at least 1 in 5 citing others such as gaps in confidence, perception, sector, or location, making even incremental changes in these types of issues is no small feat but will reap substantial rewards.

Getting more into the matter of tech skills gaps, the top areas of concern reported by managers in the CompTIA survey include a mix of newer tech areas as well as more core as technologies progress. For instance, the more specific areas of cybersecurity skill gap concerns address both cloud and networks. (See table above.) Top tech skills gap [significant + moderate] areas include:

- Software or app development [60% vs. 54% global]
- Emerging tech, i.e. AI, automation, AI, blockchain, etc. [56% vs. 57% global]
- Digital business transformation / modernizing legacy hardware or software [53% vs. 54% global]
- Integrating different apps, data sources, platforms, devices [53% vs. 55% global]
- Cybersecurity [49% vs. 55% global]

18% Unrealistic expectations?

1 in 5 Australian employers acknowledge that unrealistic expectations with skills and experience contribute to exaggerated perceptions of the skills gap. Another 66% acknowledge it is somewhat of a factor.

Obtaining an accurate read on the skills gap situation is difficult and compounded by the issue that only a minority report their own firm has a pretty good handle on identifying and assessing skills gaps (42% Australia vs. 39% global). Conversely, 3 in 10 report they often struggle (30% vs. 33% overall). The remaining quarter would place themselves in the middle with a good handle on some roles while struggling with others (26% vs. 25% global).

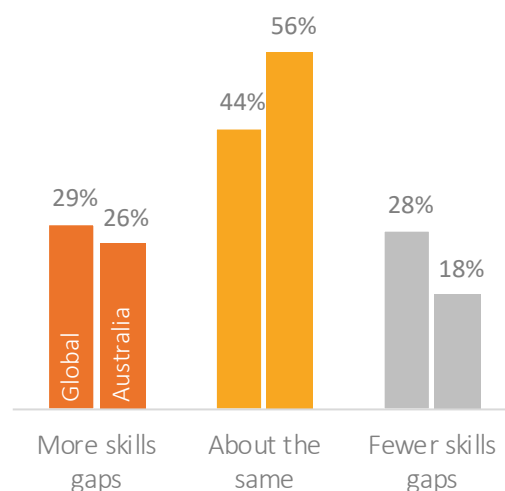
Furthermore, over half report only having informal strategies / resources in place at their firms to address skills gaps (42% vs. 43% global) or no process at all (13% vs. 10% global). This is at first hard to believe that only about 4 in 10 indicate having formal strategies (41% vs. 42% global). Interestingly, more countries in the maturing grouping, notably China, India, and Thailand, report formal processes at much higher rates—perhaps born out of urgent necessity. While informal strategies are much preferred in the Netherlands. Overall, businesses in the more mature countries report having informal strategies or nothing in place at significantly higher rates than those in maturing countries.

As important as it is to first identify business objectives then align tech accordingly, employers also need to recognize what needs fixing in regards to skills gaps before jumping into resolutions. And as far as addressing non-technical or ‘soft’ skills, priorities are pretty much in line across the board with few exceptions. For example, innovation ranks higher among those in maturing vs. mature countries.

Top priorities for boosting soft skills

44%	Flexibility / adaptability
44%	Innovation / creative problem solving
41%	Strong work ethic
37%	Analytical skills
36%	Collaboration / teamwork
32%	Leadership
31%	Customer service
29%	Motivation / initiative
25%	Verbal / written communication skills
24%	Project management

Perception of skills gaps among Gen Y & Z vs. other segments of workers



Delving further into skills gap perceptions, most believe that the skills gaps among young people are on par with the general workforce (56% vs. 44% global). Though about 1 in 4 hold the often unfair and negative belief that there are *more* gaps among the younger Gen Y and Gen Z audience (26% vs. 29% global). While on the other end of the spectrum, about 1 in 5 believe there are *fewer* gaps among the younger group (18% vs. 28% global). See CompTIA's *International Youth Perspectives of Technology and Careers* study.

53%

% of Australian firms indicate they have mandatory training and professional development requirements for staff



Overall, more than half report their firm has training and professional development for employees in technical or soft skills that is required (53% vs. 63% global). Another 4 in 10 describe it as solely voluntary; not required but encouraged (42% vs. 31% global). Businesses in the maturing countries are more likely to indicate having mandatory training compared to their counterparts in the mature countries (44% vs. 34%, respectively).

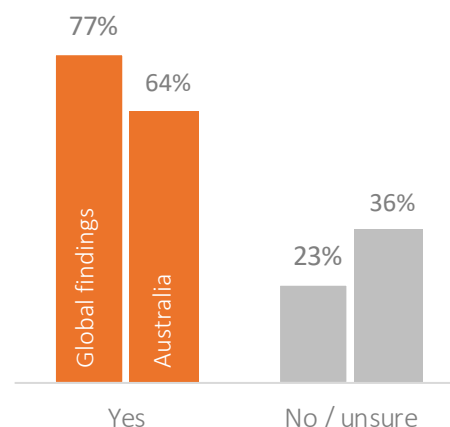
THE FUTURE OF WORK

Undoubtedly, technology will continue to profoundly impact nearly everyone's job—and it's mostly for the better. While on the one hand automating technologies have displaced segments of workers through substitution, in most cases automation frees up time for workers to focus on higher-level activities.

Automation of jobs is a prickly topic conjuring up ideas of mass layoffs and the robots taking over. Mass media has a tendency to latch on to the doom and gloom news. Regardless of viewpoints, the majority in CompTIA's study have recently seen articles about robotics, intelligent machines, and other automating technologies performing some aspects of jobs or possibly replacing them altogether (64% in Australia vs. 77% global). On the contrary, the automation of repetitive tasks has spun opportunities elsewhere. For instance, tech support at one time may have been considered as 'on its way out.' Quite the opposite occurred with this growing field as technological advancements breed support needs.

On a slightly more personal level, the majority are very concerned (18%) or somewhat concerned (45%) that automating technologies may mean fewer jobs for people like them. Another 35% aren't that concerned – notably higher vs. the 28% globally. McKinsey & Co. finds a very low portion of occupations that consists of activities that can be fully automated—less than 5%. Displacement rates will depend on a number of factors, but are most likely to occur in fields such as office support, food service, production work, and customer service and retail sales. McKinsey also points to growing demand for technological, social and emotional, and higher cognitive skills by 2030; especially given the adoption of automation and AI. See CompTIA's *International Youth Perspectives of Technology and Careers*.

Familiarity with stories about automating technologies and workforce impact



About 1 in 2 indicate at least some interest in attaining additional training or hands-on experience with technology as a result of the outlook for how robotics and automating technologies may impact the workforce (49% vs. 69% global, definitely + somewhat).

At any rate there's a need for employers, employees, and candidates to focus now more than ever on the continuous improvements of skills and training to keep pace with emerging technology—and employers need to drive impactful professional development strategies.

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

1. More time set aside for training
2. More e-Learning
3. More training alignment with development goals
4. More cross-training (e.g. other functions)
5. More classroom instructor-led training
6. More mobile options / app-based
7. More social elements
8. More autonomy in developing training program
9. More apprenticeship-type work-study programs
10. More simulations or gaming elements



INTRODUCTION

The impact of technology continues to grow. The intersection of technology and business operations, technology and people, technology and government, and technology and just about everything else, will mean more change on more fronts in the years to come.

While it is impossible to know precisely how these changes will unfold, CompTIA's latest research provides a number of clues as to how businesses are responding and the challenges they are working to overcome.

According to the data, innovation remains a top business priority. Likewise, robust spending projections on emerging technologies, such as the internet of things, big data, artificial intelligence, and robotics confirm the steady advance of digitization.

At the same time, the demand for tech talent has never been higher. Across every business type and industry sector, employers recognize the importance of cultivating a tech-savvy workforce.

While there are common threads underpinning many of these trends, there is much to learn from the unique experiences and approaches taken by countries around the world.



46.5 score

Average of ICT adoption + digital skills of population (100-point scale)
Source: World Economic Forum Global Competitiveness 2019

\$111.4 billion

Total spending on tech in Brazil.
Inclusive of hardware, software, services, telecom, and emtech.
Sources: CompTIA | IDC | 2020 projection

7 in 10

% of employers with some degree of difficulty in identifying and addressing skills gaps

46%

% citing the speed of innovation as a factor contributing to workforce gaps

87%

NET % of businesses relying on outside technology service providers at least occasionally

4 in 5

NET % with some degree of excitement for opportunities associated with emerging technologies

THE BUSINESS OF TECHNOLOGY

The size of the global technology industry continues to grow as spending is expected to reach \$5.2 trillion worldwide in 2020, according to the research consultancy IDC. Tech spending in Brazil is projected to reach an estimated \$111.4 billion in 2020. See CompTIA's *IT Industry Outlook* for more on the global market.

While the mix of spending categories may vary, businesses around the world are investing in hardware, software, services, and telecommunications. Technology will play a growing integral role as companies in Brazil focus on key strategic priorities such as innovation (59%), identifying new customer segments and markets (55%), implementing new systems and processes (54%), and launching new products or services (44%). More than half also prioritize hiring skilled workers to help them drive technology initiatives into the future (52%).

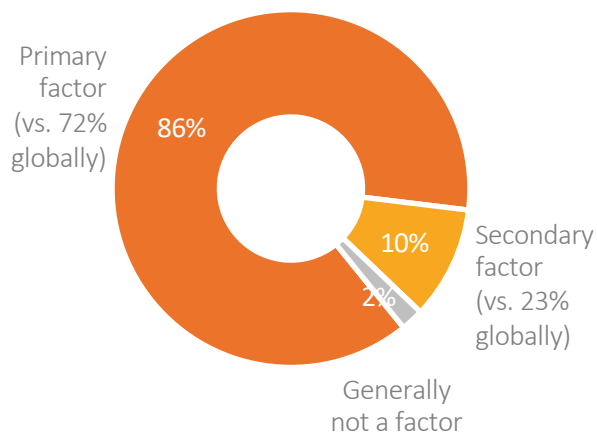
Businesses of all types rate technology a critically important factor to their success. Among the Brazilian firms that CompTIA surveyed, an astonishing majority rate technology as a primary factor in reaching business objectives (86%). Most of the remainder consider technology a secondary factor in helping to meet those goals (10%), while just 2% describe technology as a nonfactor. There is a disconnect though between technology as a priority and the reality that a segment of businesses say they under-invest in technology. More than 1 in 10 believe their firm's allocation of budget to tech spending is "too low" (14%).

Furthermore, when considering what Brazilian businesses spend vs. the value and benefits received, the majority report that their firm gets excellent or good ROI from its technology spending (70% vs. 66% global). Regardless, primary reasons that contribute to perceptions of disappointing ROI of technology investments include upfront cost / too expensive, required upgrades / built-in obsolescence, ongoing maintenance costs or support fees, insufficient features / capabilities, staff time required to operate / maintain, and complexity / poor user experience.

19% Managed services utilization

According to the data, 1 in 5 Brazilian firms report use of a managed service provider for ongoing IT operations management. Firms who outsource more often report higher perceptions of ROI.

Rating of technology as a factor in reaching business objectives



Certainly technology plays a role in achieving corporate objectives, but technology alone will not produce the desired results. Employers must also address the people and process elements of the equation to achieve optimal outcomes. Businesses face a range of challenges in executing their vision from resource constraints, lack of expertise, skills gaps, and so on. Consequently, most Brazilian organizations rely on some degree of outside provider of tech services. For instance, nearly 9 in 10 indicate outsourcing or using outside tech firms / expertise at least occasionally in a typical year (87%); including half who do so regularly (29%) or frequently (25%).

Top reported uses of outside tech services

1. Troubleshooting / repair / maintenance
2. Deployment / integration (e.g. cloud migration)
3. Consulting / advisory / strategy services
4. Cybersecurity related
5. Software development

Organizations in Brazil turn to outside expertise for a number of other services as well including web design, data / analytics, and emerging tech. In addition, almost 1 in 5 report using managed services / use of a managed service provider (MSP) for ongoing IT management (19%). Interestingly, firms who regularly or frequently outsource are significantly more likely to report excellent or good ROI (79% in maturing countries such as Brazil) vs. those who occasionally outsource (67%) or rarely / never do so (51%).

EMERGING TECH MOMENTUM BUILDS

The concept of emerging technology is a common shorthand for a range of innovations in the early to mid stages of adoption. This may encompass distinct categories, such as drones or 3-D printers, or enabling technologies, such as artificial intelligence or blockchain, embedded or serving as a platform for countless products or services.

The current and future impact of these technologies can be seen in their growth rates and revenue contributions. According to IDC, sales of emerging tech categories will increase by 105% worldwide during the 2019-2023 time period, adding \$1.5 trillion in new revenue to the global tech sector. In the year ahead, categories such as AI (+31%), blockchain (+70%), AR/VR (+99%), and IoT (+15%) will gain further traction as they move into new segments of customers.

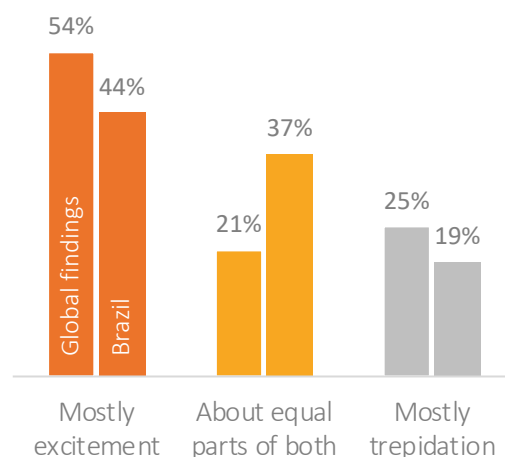
As a percentage of the overall technology pie, emerging tech will account for about 17% in 2020, with the remaining share stemming from the established categories of hardware, software, services, and telecom. Of course, there are gray areas where emerging tech overlaps multiple categories. Relatedly, no technology operates in a vacuum. Without robust networks and infrastructure, devices such as PCs and mobile phones, and integration expertise, emerging technologies cannot advance.

According to the CompTIA survey, about 4 in 10 Brazilian businesses have a positive view of emerging technology. It can be inferred that respondents see an opportunity specific to their business, or more broadly, a general sense of excitement for where technology is headed. At the other end of the spectrum, 1 in 5 report mostly feelings of trepidation. Again, this could be specific to their firm, such as the fear of falling behind in the market, or a broader concern for the uncertainty of technological disruption. Organizations in the maturing bucket of countries tend to be much more eager for emtech opportunities (61% excited in maturing vs. 49% in mature countries).

The data suggests there is a positive correlation between businesses that report a high level of ROI with their current technology spending and excitement for emerging technology. It follows that firms less satisfied with their current technology use express more concern for the future.

Although still far from mainstream adoptions, the emerging technologies reported at the highest rates of implementation are IoT and biometrics. (See chart on

Top level perceptions of emerging tech



following page.) Granted, there is a continuum of use, from basic sensors on a network that could be characterized as IoT, to highly complex deployments with myriad inputs generating volumes of data feeding various automating technologies. As such, reported adoption rates are best used as directional guidance.

The primary factors indicated that could stall adoption and utilization of emerging tech tend to focus on risk and budget. Businesses in Brazil are significantly more likely to indicate risk aversion (31%) vs. their counterparts in Ireland (17%), the Netherlands (18%), and Thailand (18%). While Middle Eastern firms are notably more risk averse (40%).

31%

% of Brazilian businesses that say risk aversion is a primary factor in their decision to postpone emtech adoption



Primary factors cited as inhibiting the adoption of emerging technologies

1. Risk aversion / uncertainty
2. Budget constraints
3. Lack of a clear business case
4. Confusion / overwhelmed with options

CYBERSECURITY: DISCONNECTS ON MANY FRONTS

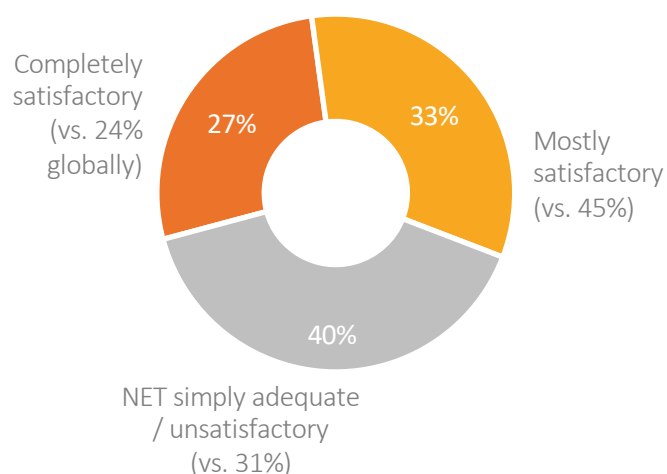
Cybersecurity continues to grow in importance in an increasingly digital and interconnected world. Many businesses are increasing their security investments or elevating their security focus, yet needing to employ progressively more proactive measures. Again, technologies and tools only go so far as employers need to build and enhance their processes, policies, and—most importantly—people.

Six in 10 Brazilian firms describe their firm's cybersecurity at a completely (27%) or mostly satisfactory (33%) level. This indicates quite some room for improvement, especially with the remainder describing their firm's approach as simply adequate (34%) or unsatisfactory (6%).

Satisfaction levels among firms in Brazil are notably lower compared to overall results (60% vs. 69% net satisfactory, respectively) as well as those in many of the other maturing countries included in this study such as China, India, and Thailand. Otherwise, employers in the maturing group of countries on a whole tend to report being satisfied significantly more than their counterparts in mature countries (74% vs. 65% net satisfied, respectively).

Self-assessment levels of security satisfaction are presumably even lower as firms are more likely to report on themselves on the optimistic side. This is further compounded by the fact that businesses are oftentimes less prepared than they believe, and even more so as it relates to emerging areas.

Self-assessment of cybersecurity posture



Emerging tech adoption tracking

	Explor- atory	Limited use	Full production
Internet of things (IoT)	24%	20%	44%
Biometrics	20%	22%	44%
Blockchain / DLT	24%	31%	30%
Robotics / RPA	26%	28%	27%
Big data	25%	33%	26%
Artificial intelligence	28%	29%	26%
AR / VR	31%	26%	25%
Drones	28%	17%	19%

Security underpins the many facets of emerging technology. This, along with the high growth rates for emerging technologies expected over the next several years, drives the need for businesses to re-evaluate their approaches to security. Consider that 89% of Brazilian firms reported recently changing their security approach; with 43% being due to a change in IT operations (move to cloud, new IoT strategy, etc.). For another 41%, cybersecurity priorities shifted as a result of knowledge gained from training or certification.

Furthermore, a low understanding of new threats is a top challenge cited for why it may be difficult to pursue new cybersecurity challenges. For example, consider the wide range of security risks with IoT as digital meshes with physical properties. (See CompTIA's *2019 Trends in Internet of Things*.)

Top reported challenges to improving cybersecurity

1. Prioritization of other technology investments
2. Lack of budget dedicated to cybersecurity
3. Low understanding of cybersecurity trends
4. Low understanding of new threats
5. Lack of metrics to demonstrate effectiveness

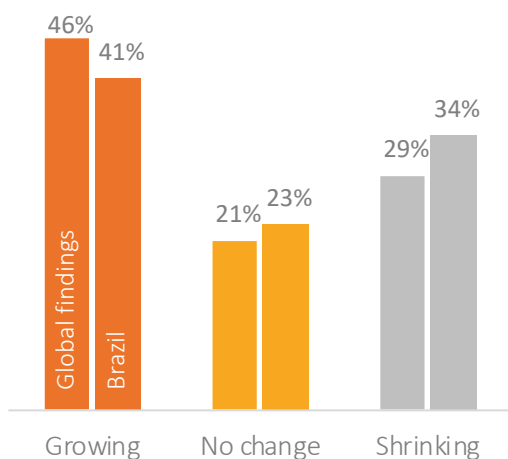
OVERCOMING WORKFORCE GAPS

The evolving tech labor market continues to present both opportunities and trials. Skills gaps particularly remain an ongoing challenge at most organizations. When considering the general concept of a country's tech skills gap, most in Brazil in CompTIA's latest research recall recently seeing or hearing about it (92% vs. 86% global). Rates are especially high within countries that have more maturing economies, i.e. Brazil, China, India, Mideast, and Thailand vs. the more mature grouping that have been grappling with the issue for decades in countries such as Australia, Canada, UK, and US.

Moreover, nearly half report that the skills gap situation at their firm has grown over the past two years (41% vs. 46% globally). Businesses in the mature grouping of countries report no change at a higher rate compared to firms in maturing countries.

Much too often "skills gaps" are used as a term to generalize a host of other workforce issues. Skills gaps primarily meaning employee performance falling short of employer expectations or desires is far different from what could be described as a location or a pay gap. When breaking down some of the various types of gaps, the top ones the research identified as barriers in hiring and maintaining a robust tech workforce in Brazil include innovation, soft skills, and perception gaps. Companies reporting an innovation gap see that the speed of innovation is exceeding the pace of training / workforce development. Soft skills challenges are a symptom of insufficient skill / capability in non-technical areas such as project management, collaboration, or communication. A perception gap

Perceived change in skills gap
over the past 2 years



Top priorities for boosting cybersecurity skills

65%	Data loss prevention / data security
56%	Cloud security
53%	Network monitoring / access management
53%	Firewalls and antivirus
39%	Risk management / mitigation
33%	Legal compliance / policies
32%	Next-gen (e.g. AI predictive analytics tools)
22%	Penetration testing / ethical hacking

exists when employers expect workers to fit a specific mold / not considering diverse backgrounds. With over a third or more citing these three types of gaps alone, and at least 1 in 5 citing others such as gaps in wage, sector, location, or confidence, making even incremental changes in these types of issues is no small feat but will reap substantial rewards.

Getting more into the matter of tech skills gaps, the top areas of concern reported by managers in the CompTIA survey include a mix of newer tech areas as well as more core as technologies progress. For instance, the more specific areas of cybersecurity skill gap concerns address both cloud and networks. (See table above.) Top tech skills gap [significant + moderate] areas include:

- Cybersecurity [77% vs. 55% global]
- Emerging tech, i.e. AI, automation, AI, blockchain, etc. [74% vs. 57% global]
- Data mgmt. / analytics [67% vs. 53% global]
- Digital business transformation / modernizing legacy hardware or software [66% vs. 54% global]
- Software or app development [65% vs. 54% global]

39% Unrealistic expectations?

4 in 10 Brazilian employers acknowledge that unrealistic expectations with skills and experience contribute to exaggerated perceptions of the skills gap. Another 50% acknowledge it is somewhat of a factor.

Obtaining an accurate read on the skills gap situation is difficult and compounded by the issue that only a minority report their own firm has a pretty good handle on identifying and assessing skills gaps (30% Brazil vs. 39% global). Conversely, 4 in 10 report they often struggle (40% vs. 33% overall). The remaining quarter would place themselves in the middle with a good handle on some roles while struggling with others (26% vs. 25% global).

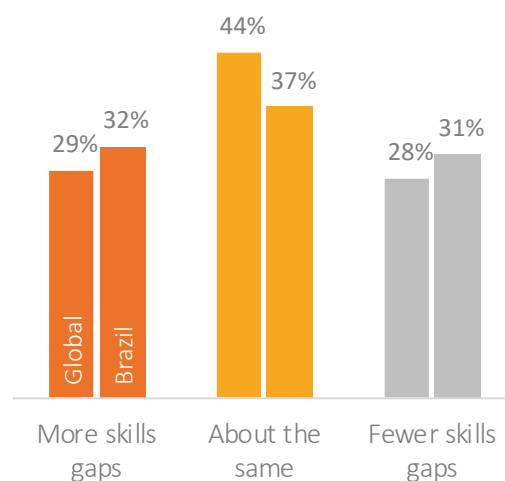
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As important as it is to first identify business objectives then align tech accordingly, employers also need to recognize what needs fixing in regards to skills gaps before jumping into resolutions. And as far as addressing non-technical or ‘soft’ skills, priorities are pretty much in line across the board with few exceptions. For example, innovation ranks higher among those in maturing vs. mature countries.

Top priorities for boosting soft skills

- 46% Strong work ethic
- 42% Motivation / initiative
- 41% Innovation / creative problem solving
- 41% Flexibility / adaptability
- 38% Customer service
- 35% Collaboration / teamwork
- 35% Leadership
- 35% Analytical skills
- 30% Project management
- 23% Verbal / written communication skills

Perception of skills gaps among Gen Y & Z vs. other segments of workers



Delving further into skills gap perceptions, the largest percentage believe that the skills gaps among young people are on par with the general workforce (37% vs. 44% global). Though 3 in 10 hold the often unfair and negative belief that there are *more* gaps among the younger Gen Y and Gen Z audience (32% vs. 29% global). While on the other end of the spectrum, another 3 in 10 believe there are *fewer* gaps among the younger group (31% vs. 28% global). See CompTIA's *International Youth Perspectives of Technology and Careers* study.

64%

% of Brazilian firms indicate they have mandatory training and professional development requirements for staff



Overall, about 6 in 10 report their firm has training and professional development for employees in technical or soft skills that is required (64% vs. 63% global). Another 3 in 10 describe it as solely voluntary; not required but encouraged (30% vs. 31% global). Businesses in the maturing countries are more likely to indicate having mandatory training compared to their counterparts in the mature countries (44% vs. 34%, respectively).

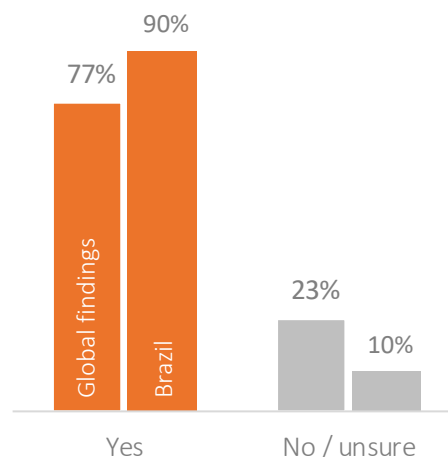
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Familiarity with stories about automating technologies and workforce impact



Seven in 10 indicate at least some interest in attaining additional training or hands-on experience with technology as a result of the outlook for how robotics and automating technologies may impact the workforce (70% vs. 69% global, definitely + somewhat).

At any rate there's a need for employers, employees, and candidates to focus now more than ever on the continuous improvements of skills and training to keep pace with emerging technology—and employers need to drive impactful professional development strategies.

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At the same time, the demand for tech talent has never been higher. Across every business type and industry sector, employers recognize the importance of cultivating a tech-savvy workforce.

While there are common threads underpinning many of these trends, there is much to learn from the unique experiences and approaches taken by countries around the world.



69.1

score

Average of ICT adoption + digital skills of population (100-point scale)
Source: World Economic Forum Global Competitiveness 2019

\$110.7

billion

Total spending on tech in Canada. Inclusive of hardware, software, services, telecom, and emtech.
Sources: CompTIA | IDC | 2020 projection

6 in 10

% of employers with some degree of difficulty in identifying and addressing skills gaps

32%

% citing the speed of innovation as a factor contributing to workforce gaps

76%

NET % of businesses relying on outside technology service providers at least occasionally

3 in 4

NET % with some degree of excitement for opportunities associated with emerging technologies

THE BUSINESS OF TECHNOLOGY

The size of the global technology industry continues to grow as spending is expected to reach \$5.2 trillion worldwide in 2020, according to the research consultancy IDC. Tech spending in Canada is projected to reach an estimated \$110.7 billion in 2020. See CompTIA's *IT Industry Outlook* for more on the global market.

While the mix of spending categories may vary, businesses around the world are investing in hardware, software, services, and telecommunications. Technology will play a growing integral role as companies in Canada focus on key strategic priorities such as identifying new customer segments and markets (58%), innovation (56%), launching new products or services (55%), and implementing new systems and processes (48%). Nearly half also prioritize hiring skilled workers to help them drive technology initiatives into the future (46%).

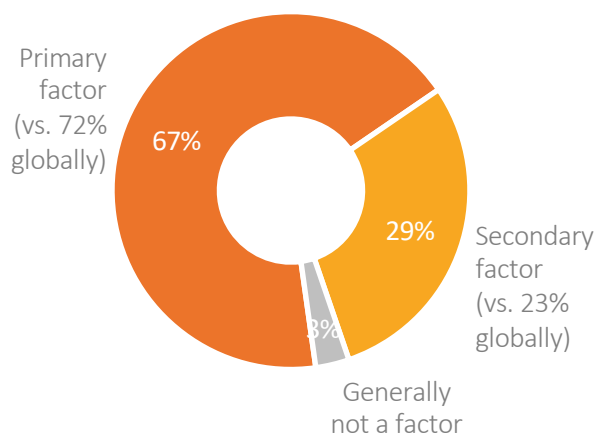
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Furthermore, when considering what Canadian businesses spend vs. the value and benefits received, the majority report that their firm gets excellent or good ROI from its technology spending (68% vs. 66% global). Regardless, primary reasons that contribute to perceptions of disappointing ROI of technology investments include staff time required to operate / maintain, required upgrades / built-in obsolescence, upfront cost / too expensive, ongoing maintenance costs or support fees, complexity / poor user experience, and insufficient features / capabilities.

23% Managed services utilization

According to the data, 1 in 4 Canadian firms report use of a managed service provider for ongoing IT operations management. Firms who outsource more often report higher perceptions of ROI.

Rating of technology as a factor in reaching business objectives



Certainly technology plays a role in achieving corporate objectives, but technology alone will not produce the desired results. Employers must also address the people and process elements of the equation to achieve optimal outcomes. Businesses face a range of challenges in executing their vision from resource constraints, lack of expertise, skills gaps, and so on. Consequently, most Canadian organizations rely on some degree of outside provider of tech services. For instance, about 3 in 4 indicate outsourcing or using outside tech firms / expertise at least occasionally in a typical year (76%); including nearly half who do so regularly (28%) or frequently (17%).

Top reported uses of outside tech services

1. Cybersecurity related
2. Troubleshooting / repair / maintenance
3. Consulting / advisory / strategy services
4. Web design / e-commerce related
5. Software development

Organizations in Canada turn to outside expertise for a number of other services as well including deployment / integration, data / analytics, and emerging tech. In addition, almost a quarter report using managed services / use of a managed service provider (MSP) for ongoing IT management (23%). Interestingly, firms who regularly or frequently outsource are significantly more likely to report excellent or good ROI (65% in mature countries such as Canada) vs. those who occasionally outsource (60%) or rarely / never do so (57%).

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The concept of emerging technology is a common shorthand for a range of innovations in the early to mid stages of adoption. This may encompass distinct categories, such as drones or 3-D printers, or enabling technologies, such as artificial intelligence or blockchain, embedded or serving as a platform for countless products or services.

The current and future impact of these technologies can be seen in their growth rates and revenue contributions. According to IDC, sales of emerging tech categories will increase by 105% worldwide during the 2019-2023 time period, adding \$1.5 trillion in new revenue to the global tech sector. In the year ahead, categories such as AI (+31%), blockchain (+70%), AR/VR (+99%), and IoT (+15%) will gain further traction as they move into new segments of customers.

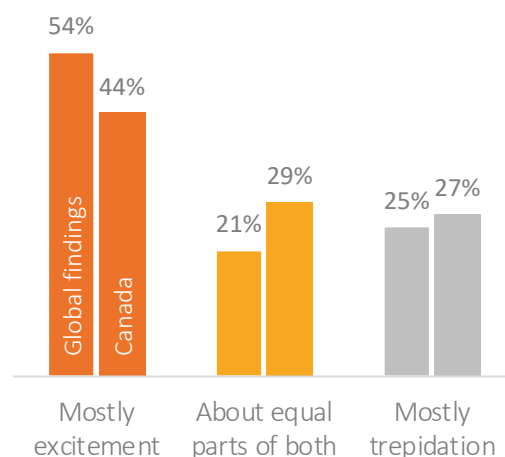
As a percentage of the overall technology pie, emerging tech will account for about 17% in 2020, with the remaining share stemming from the established categories of hardware, software, services, and telecom. Of course, there are gray areas where emerging tech overlaps multiple categories. Relatedly, no technology operates in a vacuum. Without robust networks and infrastructure, devices such as PCs and mobile phones, and integration expertise, emerging technologies cannot advance.

According to the CompTIA survey, about 4 in 10 Canadian businesses have a positive view of emerging technology. It can be inferred that respondents see an opportunity specific to their business, or more broadly, a general sense of excitement for where technology is headed. At the other end of the spectrum, 1 in 4 report mostly feelings of trepidation. Again, this could be specific to their firm, such as the fear of falling behind in the market, or a broader concern for the uncertainty of technological disruption. Organizations in the maturing bucket of countries tend to be much more eager for emtech opportunities (61% excited in maturing vs. 49% in mature countries).

The data suggests there is a positive correlation between businesses that report a high level of ROI with their current technology spending and excitement for emerging technology. It follows that firms less satisfied with their current technology use express more concern for the future.

Although still far from mainstream adoptions, the emerging technologies reported at the highest rates of implementation are IoT and big data. (See chart on

Top level perceptions of emerging tech



following page.) Granted, there is a continuum of use, from basic sensors on a network that could be characterized as IoT, to highly complex deployments with myriad inputs generating volumes of data feeding various automating technologies. As such, reported adoption rates are best used as directional guidance.

The primary factors indicated that could stall adoption and utilization of emerging tech tend to focus on budget and risk. Businesses in Canada are significantly more likely to indicate risk aversion (29%) vs. their counterparts in Ireland (17%), the Netherlands (18%), and Thailand (18%). While Middle Eastern firms are notably more risk averse (40%).

29%

% of Canadian businesses that say risk aversion is a primary factor in their decision to postpone emtech adoption



Primary factors cited as inhibiting the adoption of emerging technologies

1. Budget constraints
2. Risk aversion / uncertainty
3. Confusion / overwhelmed with options
4. Lack of a clear business case

CYBERSECURITY: DISCONNECTS ON MANY FRONTS

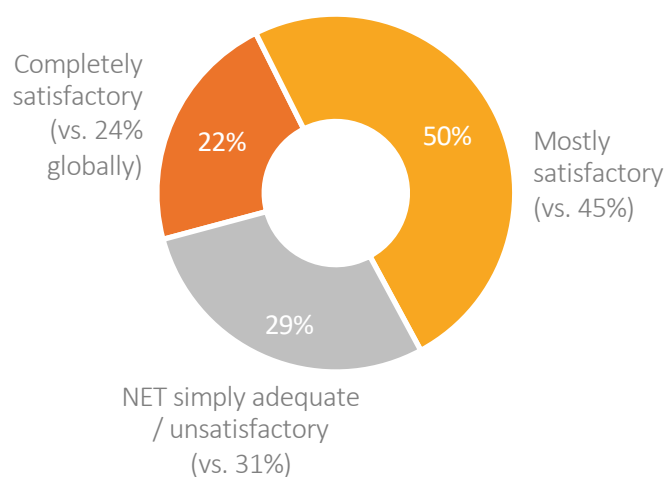
Cybersecurity continues to grow in importance in an increasingly digital and interconnected world. Many businesses are increasing their security investments or elevating their security focus, yet needing to employ progressively more proactive measures. Again, technologies and tools only go so far as employers need to build and enhance their processes, policies, and—most importantly—people.

About 7 in 10 Canadian firms describe their firm's cybersecurity at a completely (22%) or mostly satisfactory (50%) level. This indicates some room for improvement though, especially with the remainder describing their firm's approach as simply adequate (24%) or unsatisfactory (5%).

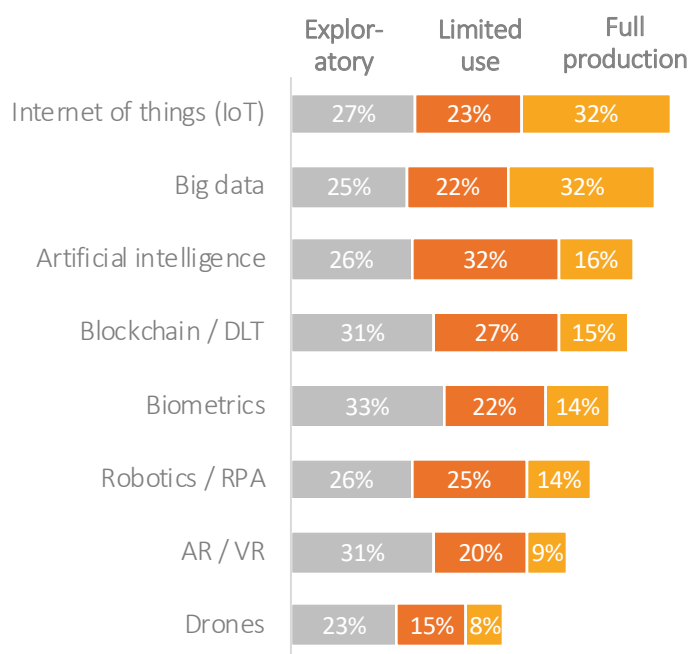
Satisfaction levels among firms in Canada are mostly on par with overall results. However, employers in the maturing group of countries on a whole tend to report being satisfied significantly more than their counterparts in mature countries (74% vs. 65% net satisfied, respectively).

Self-assessment levels of security satisfaction are presumably even lower as firms are more likely to report on themselves on the optimistic side. This is further compounded by the fact that businesses are oftentimes less prepared than they believe, and even more so as it relates to emerging areas.

Self-assessment of cybersecurity posture



Emerging tech adoption tracking



Security underpins the many facets of emerging technology. This, along with the high growth rates for emerging technologies expected over the next several years, drives the need for businesses to re-evaluate their approaches to security. Consider that 80% of Canadian firms reported recently changing their security approach; with 33% being due to a change in IT operations (move to cloud, new IoT strategy, etc.). For another 23%, cybersecurity priorities shifted as a result of knowledge gained from training or certification.

Furthermore, a low understanding of new threats is a top challenge cited for why it may be difficult to pursue new cybersecurity challenges. For example, consider the wide range of security risks with IoT as digital meshes with physical properties. (See CompTIA's *2019 Trends in Internet of Things*.)

Top reported challenges to improving cybersecurity

1. Belief that current efforts are 'good enough'
2. Lack of budget dedicated to cybersecurity
3. Prioritization of other technology investments
4. Low understanding of cybersecurity trends
5. Low understanding of new threats

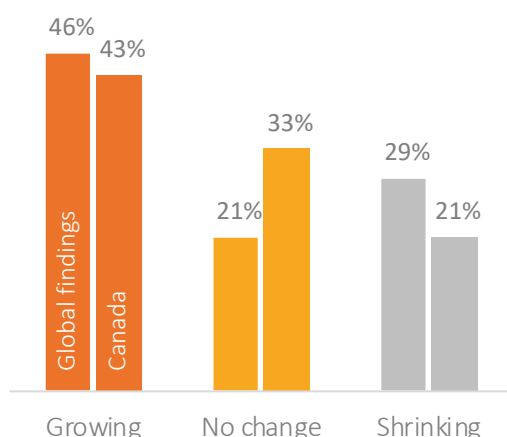
OVERCOMING WORKFORCE GAPS

The evolving tech labor market continues to present both opportunities and trials. Skills gaps particularly remain an ongoing challenge at most organizations. When considering the general concept of a country's tech skills gap, most in Canada in CompTIA's latest research recall recently seeing or hearing about it (76% vs. 86% global). Rates are especially high within countries that have more maturing economies, i.e. Brazil, China, India, Mideast, and Thailand vs. the more mature grouping that have been grappling with the issue for decades in countries such as Australia, Canada, UK, and US.

Moreover, nearly half report that the skills gap situation at their firm has grown over the past two years (43% vs. 46% globally). Businesses in the mature grouping of countries report no change at a higher rate compared to firms in maturing countries.

Much too often "skills gaps" are used as a term to generalize a host of other workforce issues. Skills gaps primarily meaning employee performance falling short of employer expectations or desires is far different from what could be described as a location or a pay gap. When breaking down some of the various types of gaps, the top ones the research identified as barriers in hiring and maintaining a robust tech workforce in Canada include soft skills, wage, and confidence gaps. Soft skills challenges are a symptom of insufficient skill / capability in non-technical areas such as project management, collaboration, or communication. A wage gap will occur when market wages for certain positions / skills exceed employer budgets. A confidence gap

Perceived change in skills gap
over the past 2 years



Top priorities for boosting cybersecurity skills

59%	Cloud security
52%	Data loss prevention / data security
44%	Firewalls and antivirus
42%	Network monitoring / access management
36%	Next-gen (e.g. AI predictive analytics tools)
28%	Penetration testing / ethical hacking
25%	Risk management / mitigation
25%	Legal compliance / policies

exists when prospects are deterred by fears, uncertainty, or negative perceptions. With a third or more citing these three types of gaps alone, and at least 1 in 4 citing others such as gaps in innovation, sector, perception, or location, making even incremental changes in these types of issues is no small feat but will reap substantial rewards.

Getting more into the matter of tech skills gaps, the top areas of concern reported by managers in the CompTIA survey include a mix of newer tech areas as well as more core as technologies progress. For instance, the more specific areas of cybersecurity skill gap concerns address both cloud and networks. (See table above.)

Top tech skills gap [significant + moderate] areas include:

- Soft skills, e.g. communication [54% vs. 52% global]
- Integrating different apps, data sources, platforms, devices [51% vs. 55% global]
- Cybersecurity [48% vs. 55% global]
- Emerging tech, i.e. AI, automation, AI, blockchain, etc. [47% vs. 57% global]
- Network / systems administration [45% vs. 49% global]

22% Unrealistic expectations?

1 in 5 Canadian employers acknowledge that unrealistic expectations with skills and experience contribute to exaggerated perceptions of the skills gap. Another 53% acknowledge it is somewhat of a factor.

Obtaining an accurate read on the skills gap situation is difficult and compounded by the issue that only a minority report their own firm has a pretty good handle on identifying and assessing skills gaps (38% Canada vs. 39% global). Conversely, about a third report they often struggle (32% vs. 33% overall). The remaining would place themselves in the middle with a good handle on some roles while struggling with others (23% vs. 25% global).

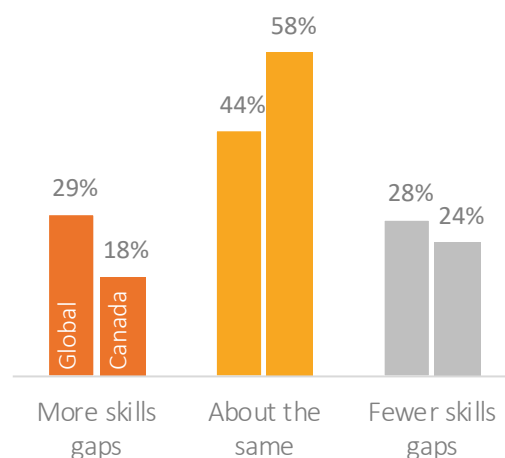
Furthermore, 4 in 10 report only having informal strategies / resources in place at their firms to address skills gaps (41% vs. 43% global) or no process at all (15% vs. 10% global). This is at first hard to believe that only about 4 in 10 indicate having formal strategies (38% vs. 42% global). Interestingly, more countries in the maturing grouping, notably China, India, and Thailand, report formal processes at much higher rates—perhaps born out of urgent necessity. While informal strategies are much preferred in the Netherlands. Overall, businesses in the more mature countries report having informal strategies or nothing in place at significantly higher rates than those in maturing countries.

As important as it is to first identify business objectives then align tech accordingly, employers also need to recognize what needs fixing in regards to skills gaps before jumping into resolutions. And as far as addressing non-technical or ‘soft’ skills, priorities are pretty much in line across the board with few exceptions. For example, innovation ranks higher among those in maturing vs. mature countries.

Top priorities for boosting soft skills

46%	Leadership
45%	Analytical skills
44%	Strong work ethic
38%	Innovation / creative problem solving
38%	Motivation / initiative
37%	Project management
32%	Collaboration / teamwork
31%	Flexibility / adaptability
27%	Customer service
18%	Verbal / written communication skills

Perception of skills gaps among Gen Y & Z vs. other segments of workers



Delving further into skills gap perceptions, the largest percentage believe that the skills gaps among young people are on par with the general workforce (58% vs. 44% global). Though almost 1 in 5 hold the often unfair and negative belief that there are *more* gaps among the younger Gen Y and Gen Z audience (18% vs. 29% global). While on the other end of the spectrum, another 1 in 4 believe there are *fewer* gaps among the younger group (24% vs. 28% global). See CompTIA's *International Youth Perspectives of Technology and Careers* study.

53%

% of Canadian firms indicate they have mandatory training and professional development requirements for staff



Overall, more than half report their firm has training and professional development for employees in technical or soft skills that is required (53% vs. 63% global). Another 4 in 10 describe it as solely voluntary; not required but encouraged (38% vs. 31% global). Businesses in the maturing countries are more likely to indicate having mandatory training compared to their counterparts in the mature countries (44% vs. 34%, respectively).

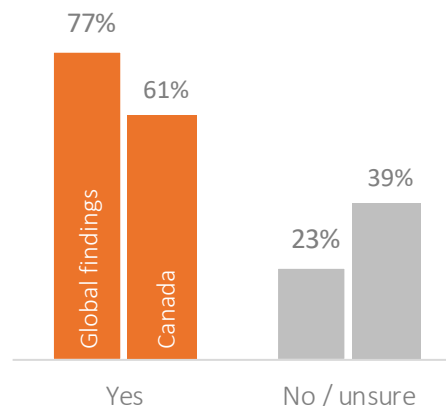
THE FUTURE OF WORK

Undoubtedly, technology will continue to profoundly impact nearly everyone's job—and it's mostly for the better. While on the one hand automating technologies have displaced segments of workers through substitution, in most cases automation frees up time for workers to focus on higher-level activities.

Automation of jobs is a prickly topic conjuring up ideas of mass layoffs and the robots taking over. Mass media has a tendency to latch on to the doom and gloom news. Regardless of viewpoints, the majority in CompTIA's study have recently seen articles about robotics, intelligent machines, and other automating technologies performing some aspects of jobs or possibly replacing them altogether (61% in Canada vs. 77% global). On the contrary, the automation of repetitive tasks has spun opportunities elsewhere. For instance, tech support at one time may have been considered as 'on its way out.' Quite the opposite occurred with this growing field as technological advancements breed support needs.

On a slightly more personal level, most are either very concerned (20%) or somewhat concerned (42%) that automating technologies may mean fewer jobs for people like them. Another 30% aren't that concerned—about the same as the 28% globally. McKinsey & Co. finds a very low portion of occupations that consists of activities that can be fully automated—less than 5%. Displacement rates will depend on a number of factors, but are most likely to occur in fields such as office support, food service, production work, and customer service and retail sales. McKinsey also points to growing demand for technological, social and emotional, and higher cognitive skills by 2030; especially given the adoption of automation and AI. See CompTIA's *International Youth Perspectives of Technology and Careers*.

Familiarity with stories about automating technologies and workforce impact



More than half indicate at least some interest in attaining additional training or hands-on experience with technology as a result of the outlook for how robotics and automating technologies may impact the workforce (53% vs. 69% global, definitely + somewhat).

At any rate there's a need for employers, employees, and candidates to focus now more than ever on the continuous improvements of skills and training to keep pace with emerging technology—and employers need to drive impactful professional development strategies.

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

1. More time set aside for training
2. More cross-training (e.g. other functions)
3. More training alignment with development goals
4. More classroom instructor-led training
5. More apprenticeship-type work-study programs
6. More e-Learning
7. More autonomy in developing training program
8. More mobile options / app-based
9. More simulations or gaming elements
10. More social elements



INTRODUCTION

The impact of technology continues to grow. The intersection of technology and business operations, technology and people, technology and government, and technology and just about everything else, will mean more change on more fronts in the years to come.

While it is impossible to know precisely how these changes will unfold, CompTIA's latest research provides a number of clues as to how businesses are responding and the challenges they are working to overcome.

According to the data, innovation remains a top business priority. Likewise, robust spending projections on emerging technologies, such as the internet of things, big data, artificial intelligence, and robotics confirm the steady advance of digitization.

At the same time, the demand for tech talent has never been higher. Across every business type and industry sector, employers recognize the importance of cultivating a tech-savvy workforce.

While there are common threads underpinning many of these trends, there is much to learn from the unique experiences and approaches taken by countries around the world.



69.8

score

Average of ICT adoption + digital skills of population (100-point scale)
Source: World Economic Forum Global Competitiveness 2019

\$747.9

billion

Total spending on tech in China.
Inclusive of hardware, software, services, telecom, and emtech.
Sources: CompTIA | IDC | 2020 projection

7 in 10

% of employers with some degree of difficulty in identifying and addressing skills gaps

35%

% citing the speed of innovation as a factor contributing to workforce gaps

97%

NET % of businesses relying on outside technology service providers at least occasionally

2 in 3

NET % with some degree of excitement for opportunities associated with emerging technologies

THE BUSINESS OF TECHNOLOGY

The size of the global technology industry continues to grow as spending is expected to reach \$5.2 trillion worldwide in 2020, according to the research consultancy IDC. Tech spending in China is projected to reach an estimated \$747.9 billion in 2020. See CompTIA's *IT Industry Outlook* for more on the global market.

While the mix of spending categories may vary, businesses around the world are investing in hardware, software, services, and telecommunications. Technology will play a growing integral role as companies in China focus on key strategic priorities such as implementing new systems and processes (52%), launching new products or services (44%), identifying new customer segments and markets (43%), innovation (40%), and defending business against new competitive threats (40%). Close to a third also prioritize hiring skilled workers to help them drive technology initiatives into the future (30%).

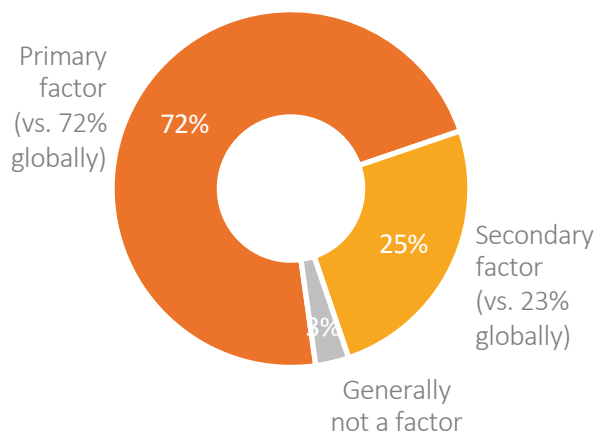
Businesses of all types rate technology a critically important factor to their success. Among firms in China that CompTIA surveyed, nearly three-quarters rate technology as a primary factor in reaching business objectives (72%). Another quarter consider technology a secondary factor in helping to meet those goals (25%), while just 3% describe technology as a nonfactor. There is a disconnect though between technology as a priority and the reality that a segment of businesses say they under-invest in technology. About 1 in 10 believe their firm's allocation of budget to tech spending is "too low."

Furthermore, when considering what businesses in China spend vs. the value and benefits received, the majority report that their firm gets excellent or good ROI from its technology spending (72% vs. 66% global). Regardless, primary reasons that contribute to perceptions of disappointing ROI of technology investments include required upgrades / built-in obsolescence, ongoing maintenance costs or support fees, upfront cost / too expensive, complexity / poor user experience, insufficient features / capabilities, and staff time required to operate / maintain.

36% Managed services utilization

According to the data, 1 in 3 firms in China report use of a managed service provider for ongoing IT operations management. Firms who outsource more often report higher perceptions of ROI.

Rating of technology as a factor in reaching business objectives



Certainly technology plays a role in achieving corporate objectives, but technology alone will not produce the desired results. Employers must also address the people and process elements of the equation to achieve optimal outcomes. Businesses face a range of challenges in executing their vision from resource constraints, lack of expertise, skills gaps, and so on. Consequently, most organizations in China rely on some degree of outside provider of tech services. For instance, nearly all indicate outsourcing or using outside tech firms / expertise at least occasionally in a typical year (97%); including almost three-quarters who do so regularly (61%) or frequently (12%).

Top reported uses of outside tech services

1. Troubleshooting / repair / maintenance
2. Deployment / integration (e.g. cloud migration)
3. Consulting / advisory / strategy services
4. Emerging technology related
5. Data / analytics / AI related

Organizations in China turn to outside expertise for a number of other services as well including software development, cybersecurity, and web design. In addition, nearly 4 in 10 report using managed services / use of a managed service provider (MSP) for ongoing IT management (36%). Interestingly, firms who regularly or frequently outsource are significantly more likely to report excellent or good ROI (79% in maturing countries such as China) vs. those who occasionally outsource (67%) or rarely / never do so (51%).

EMERGING TECH MOMENTUM BUILDS

The concept of emerging technology is a common shorthand for a range of innovations in the early to mid stages of adoption. This may encompass distinct categories, such as drones or 3-D printers, or enabling technologies, such as artificial intelligence or blockchain, embedded or serving as a platform for countless products or services.

The current and future impact of these technologies can be seen in their growth rates and revenue contributions. According to IDC, sales of emerging tech categories will increase by 105% worldwide during the 2019-2023 time period, adding \$1.5 trillion in new revenue to the global tech sector. In the year ahead, categories such as AI (+31%), blockchain (+70%), AR/VR (+99%), and IoT (+15%) will gain further traction as they move into new segments of customers.

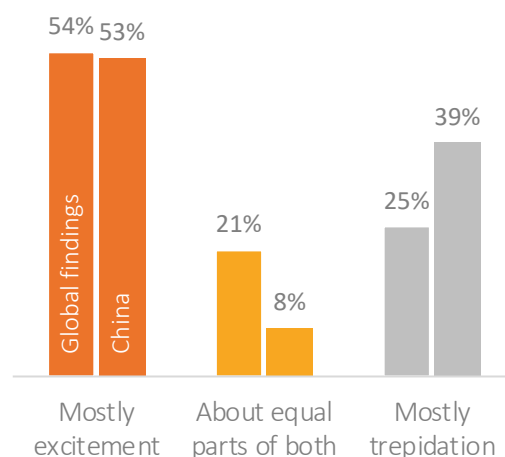
As a percentage of the overall technology pie, emerging tech will account for about 17% in 2020, with the remaining share stemming from the established categories of hardware, software, services, and telecom. Of course, there are gray areas where emerging tech overlaps multiple categories. Relatedly, no technology operates in a vacuum. Without robust networks and infrastructure, devices such as PCs and mobile phones, and integration expertise, emerging technologies cannot advance.

According to the CompTIA survey, 1 in 2 businesses in China have a positive view of emerging technology. It can be inferred that respondents see an opportunity specific to their business, or more broadly, a general sense of excitement for where technology is headed. At the other end of the spectrum, 4 in 10 report mostly feelings of trepidation. Again, this could be specific to their firm, such as the fear of falling behind in the market, or a broader concern for the uncertainty of technological disruption. Organizations in the maturing bucket of countries tend to be much more eager for emtech opportunities (61% excited in maturing vs. 49% in mature countries).

The data suggests there is a positive correlation between businesses that report a high level of ROI with their current technology spending and excitement for emerging technology. It follows that firms less satisfied with their current technology use express more concern for the future.

Although still far from mainstream adoptions, the emerging technologies reported at the highest rates of implementation are big data and IoT. (See chart on

Top level perceptions of emerging tech



following page.) Granted, there is a continuum of use, from basic sensors on a network that could be characterized as IoT, to highly complex deployments with myriad inputs generating volumes of data feeding various automating technologies. As such, reported adoption rates are best used as directional guidance.

The primary factors indicated that could stall adoption and utilization of emerging tech tend to focus on risk and budget. Businesses in China are significantly more likely to indicate lack of a clear business case / need than those in several other countries (26% vs. 17% global).

32%

% of businesses in China that say risk aversion is a primary factor in their decision to postpone emtech adoption



Primary factors cited as inhibiting the adoption of emerging technologies

1. Risk aversion / uncertainty
2. Lack of a clear business case
3. Budget constraints
4. Confusion / overwhelmed with options

CYBERSECURITY: DISCONNECTS ON MANY FRONTS

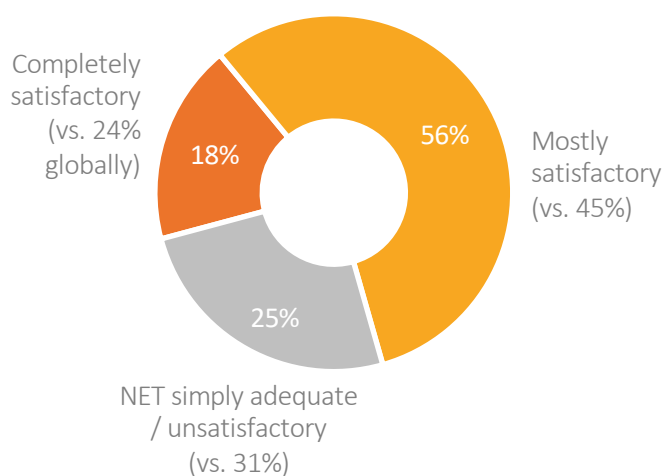
Cybersecurity continues to grow in importance in an increasingly digital and interconnected world. Many businesses are increasing their security investments or elevating their security focus, yet needing to employ progressively more proactive measures. Again, technologies and tools only go so far as employers need to build and enhance their processes, policies, and—most importantly—people.

Three-quarters of firms in China describe their firm's cybersecurity at a completely (18%) or mostly satisfactory (56%) level. This indicates some room for improvement, especially with the remainder describing their firm's approach as simply adequate (22%) or unsatisfactory (3%).

Satisfaction levels among organizations in China are mostly on par with overall results. Though, employers in the maturing group of countries on a whole tend to report being satisfied significantly more than their counterparts in mature countries (74% vs. 65% net satisfied, respectively).

Self-assessment levels of security satisfaction are presumably even lower as firms are more likely to report on themselves on the optimistic side. This is further compounded by the fact that businesses are oftentimes less prepared than they believe, and even more so as it relates to emerging areas.

Self-assessment of cybersecurity posture



Emerging tech adoption tracking

	Exploratory	Limited use	Full production
Big data	26%	35%	30%
Internet of things (IoT)	32%	32%	30%
AR / VR	33%	36%	26%
Blockchain / DLT	33%	40%	25%
Biometrics	38%	35%	23%
Robotics / RPA	44%	29%	23%
Artificial intelligence	39%	34%	22%
Drones	33%	37%	18%

Security underpins the many facets of emerging technology. This, along with the high growth rates for emerging technologies expected over the next several years, drives the need for businesses to re-evaluate their approaches to security. Consider that 100% of firms in China reported recently changing their security approach; with 50% being due to a change in IT operations (move to cloud, new IoT strategy, etc.). For another 38%, cybersecurity priorities shifted as a result of knowledge gained from training or certification.

Furthermore, a low understanding of new threats is a top challenge cited for why it may be difficult to pursue new cybersecurity challenges. For example, consider the wide range of security risks with IoT as digital meshes with physical properties. (See CompTIA's *2019 Trends in Internet of Things*.)

Top reported challenges to improving cybersecurity

1. Low understanding of new threats
2. Lack of metrics to demonstrate effectiveness
3. Belief that current efforts are 'good enough'
4. Low understanding of cybersecurity trends
5. Prioritization of other technology investments

OVERCOMING WORKFORCE GAPS

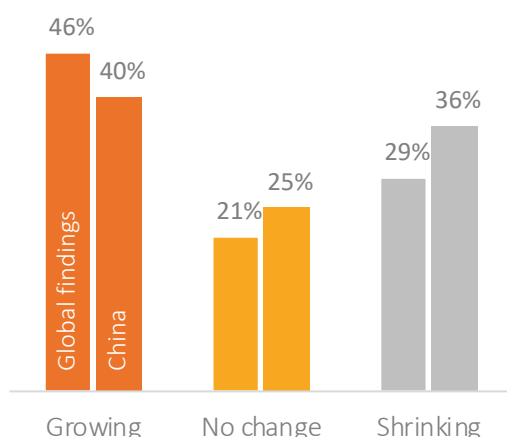
The evolving tech labor market continues to present both opportunities and trials. Skills gaps particularly remain an ongoing challenge at most organizations. When considering the general concept of a country's tech skills gap, all respondents in China in CompTIA's latest research recall recently seeing or hearing about it (100% vs. 86% global). Rates are especially high within countries that have more maturing economies, i.e. Brazil, China, India, Mideast, and Thailand vs. the more mature grouping that have been grappling with the issue for decades in countries such as Australia, Canada, UK, and US.

Moreover, 4 in 10 report that the skills gap situation at their firm has grown over the past two years (40% for China vs. 46% global). Businesses in the mature grouping of countries report no change at a higher rate compared to firms in maturing countries.

Much too often "skills gaps" are used as a term to generalize a host of other workforce issues. Skills gaps primarily meaning employee performance falling short of employer expectations or desires is far different from what could be described as a location or a pay gap.

When breaking down some of the various types of gaps, the top ones the research identified as barriers in hiring and maintaining a robust tech workforce in China include perception, soft skills, and sector gaps. A perception gap exists when employers expect workers to fit a specific mold / not considering diverse backgrounds. Soft skills challenges are a symptom of insufficient skill / capability in non-technical areas such as project management, collaboration, or communication. A sector gap indicates insufficient

Perceived change in skills gap
over the past 2 years



Top priorities for boosting cybersecurity skills

48%	Firewalls and antivirus
48%	Data loss prevention / data security
43%	Network monitoring / access management
40%	Cloud security
40%	Legal compliance / policies
38%	Next-gen (e.g. AI predictive analytics tools)
27%	Risk management / mitigation
22%	Penetration testing / ethical hacking

expertise in specific industry sectors such as finance, healthcare, and manufacturing. With nearly half citing these three types of gaps alone, and over a third citing others such as gaps in wage, innovation, confidence, or location, making even incremental changes in these types of issues is no small feat but will reap substantial rewards.

Getting more into the matter of tech skills gaps, the top areas of concern reported by managers in the CompTIA survey include a mix of newer tech areas as well as more core as technologies progress. For instance, the more specific areas of cybersecurity skill gap concerns address both cloud and networks. (See table above.) Top tech skills gap [significant + moderate] areas include:

- Tech / IT support [54% vs. 49% global]
- Digital business transformation / modernizing legacy hardware or software [52% vs. 54% global]
- Network / systems administration [52% vs. 49% global]
- Integrating different apps, data sources, platforms, devices [51% vs. 55% global]
- Software or app development [51% vs. 54% global]

31% Unrealistic expectations?

3 in 10 employers in China acknowledge that unrealistic expectations with skills and experience contribute to exaggerated perceptions of the skills gap. Another 62% acknowledge it is somewhat of a factor.

Obtaining an accurate read on the skills gap situation is difficult and compounded by the issue that only a minority report their own firm has a pretty good handle on identifying and assessing skills gaps (29% China vs. 39% global). Conversely, over half report they often struggle (54% vs. 33% overall). The remainder would place themselves in the middle with a good handle on some roles while struggling with others (17% vs. 25% global).

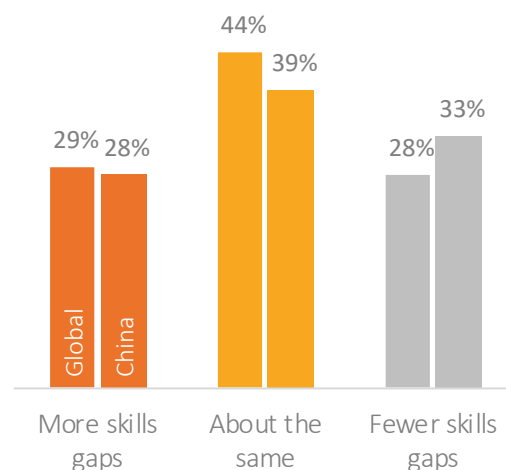
Furthermore, close to half report only having informal strategies / resources in place at their firms to address skills gaps (44% vs. 43% global) or no process at all (2% vs. 10% global). In China though, over half indicate having formal strategies (54% vs. 42% global). Interestingly, more countries in the maturing grouping, notably China, India, and Thailand, report formal processes at much higher rates—perhaps born out of urgent necessity. While informal strategies are much preferred in the Netherlands. Overall, businesses in the more mature countries report having informal strategies or nothing in place at significantly higher rates than those in maturing countries.

As important as it is to first identify business objectives then align tech accordingly, employers also need to recognize what needs fixing in regards to skills gaps before jumping into resolutions. And as far as addressing non-technical or ‘soft’ skills, priorities are pretty much in line across the board with few exceptions. For example, innovation ranks higher among those in maturing vs. mature countries.

Top priorities for boosting soft skills

42%	Strong work ethic
38%	Innovation / creative problem solving
38%	Collaboration / teamwork
35%	Motivation / initiative
35%	Project management
34%	Flexibility / adaptability
29%	Analytical skills
29%	Leadership
28%	Customer service
25%	Verbal / written communication skills

Perception of skills gaps among Gen Y & Z vs. other segments of workers



Delving further into skills gap perceptions, the largest percentage believe that the skills gaps among young people are on par with the general workforce (39% vs. 44% global). Though 3 in 10 hold the often unfair and negative belief that there are *more* gaps among the younger Gen Y and Gen Z audience (28% vs. 29% global). While on the other end of the spectrum, 1 in 3 believe there are *fewer* gaps among the younger group (33% vs. 28% global). See CompTIA's *International Youth Perspectives of Technology and Careers* study.

46%

% of firms in China indicate they have mandatory training and professional development requirements for staff



Overall, fewer than half report their firm has training and professional development for employees in technical or soft skills that is required (46% vs. 63% global). The remainder describe it as solely voluntary; not required but encouraged (54% vs. 31% global). This is notably higher in China compared to all the other countries covered in the CompTIA survey. Also, businesses in the maturing countries as a whole are more likely to indicate having mandatory training compared to their counterparts in the mature countries (44% vs. 34%, respectively).

THE FUTURE OF WORK

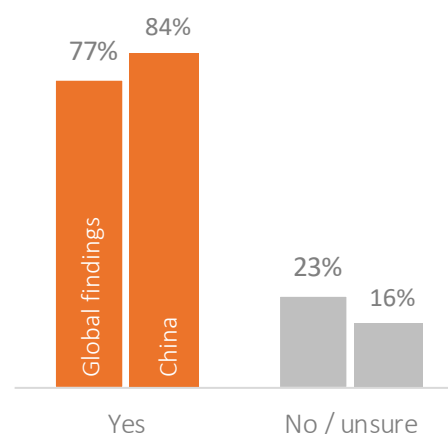
Undoubtedly, technology will continue to profoundly impact nearly everyone's job—and it's mostly for the better. While on the one hand automating technologies have displaced segments of workers through substitution, in most cases automation frees up time for workers to focus on higher-level activities.

Automation of jobs is a prickly topic conjuring up ideas of mass layoffs and the robots taking over. Mass media has a tendency to latch on to the doom and gloom news. Regardless of viewpoints, the majority in CompTIA's study have recently seen articles about robotics, intelligent machines, and other automating technologies performing some aspects of jobs or possibly replacing them altogether (84% in China vs. 77% global). On the contrary, the automation of repetitive tasks has spun opportunities elsewhere. For instance, tech support at one time may have been considered as 'on its way out.' Quite the opposite occurred with this growing field as technological advancements breed support needs.

On a slightly more personal level, about 7 in 10 are very concerned (10%) or somewhat concerned (61%) that automating technologies may mean fewer jobs for people like them. Another 28% aren't that concerned—same as the 28% globally. McKinsey & Co. finds a very low portion of occupations that consists of activities that can be fully automated—less than 5%.

Displacement rates will depend on a number of factors, but are most likely to occur in fields such as office support, food service, production work, and customer service and retail sales. McKinsey also points to growing demand for technological, social and emotional, and higher cognitive skills by 2030; especially given the adoption of automation and AI. See CompTIA's *International Youth Perspectives of Technology and Careers*.

Familiarity with stories about automating technologies and workforce impact



About 8 in 10 indicate at least some interest in attaining additional training or hands-on experience with technology as a result of the outlook for how robotics and automating technologies may impact the workforce (83% vs. 69% global, definitely + somewhat).

At any rate there's a need for employers, employees, and candidates to focus now more than ever on the continuous improvements of skills and training to keep pace with emerging technology—and employers need to drive impactful professional development strategies.

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

1. More time set aside for training
2. More training alignment with development goals
3. More apprenticeship-type work-study programs
4. More cross-training (e.g. other functions)
5. More mobile options / app-based
6. More e-Learning
7. More autonomy in developing training program
8. More classroom instructor-led training
9. More social elements
10. More simulations or gaming elements



INTRODUCTION

The impact of technology continues to grow. The intersection of technology and business operations, technology and people, technology and government, and technology and just about everything else, will mean more change on more fronts in the years to come.

While it is impossible to know precisely how these changes will unfold, CompTIA's latest research provides a number of clues as to how businesses are responding and the challenges they are working to overcome.

According to the data, innovation remains a top business priority. Likewise, robust spending projections on emerging technologies, such as the internet of things, big data, artificial intelligence, and robotics confirm the steady advance of digitization.

At the same time, the demand for tech talent has never been higher. Across every business type and industry sector, employers recognize the importance of cultivating a tech-savvy workforce.

While there are common threads underpinning many of these trends, there is much to learn from the unique experiences and approaches taken by countries around the world.



44.7

 score

Average of ICT adoption + digital skills of population (100-point scale)
Source: World Economic Forum Global Competitiveness 2019

\$120.5

 billion

Total spending on tech in India.
Inclusive of hardware, software, services, telecom, and emtech.
Sources: CompTIA | IDC | 2020 projection

3 in 10

% of employers with some degree of difficulty in identifying and addressing skills gaps

43%

% citing the speed of innovation as a factor contributing to workforce gaps

92%

NET % of businesses relying on outside technology service providers at least occasionally

4 in 5

NET % with some degree of excitement for opportunities associated with emerging technologies

THE BUSINESS OF TECHNOLOGY

The size of the global technology industry continues to grow as spending is expected to reach \$5.2 trillion worldwide in 2020, according to the research consultancy IDC. Tech spending in India is projected to reach an estimated \$120.5 billion in 2020. See CompTIA's *IT Industry Outlook* for more on the global market.

While the mix of spending categories may vary, businesses around the world are investing in hardware, software, services, and telecommunications. Technology will play a growing integral role as companies in India focus on key strategic priorities such as launching new products or services (65%), implementing new systems and processes (52%), innovation (52%), and identifying new customer segments and markets (48%). Virtually 4 in 10 also prioritize hiring skilled workers to help them drive technology initiatives into the future (39%).

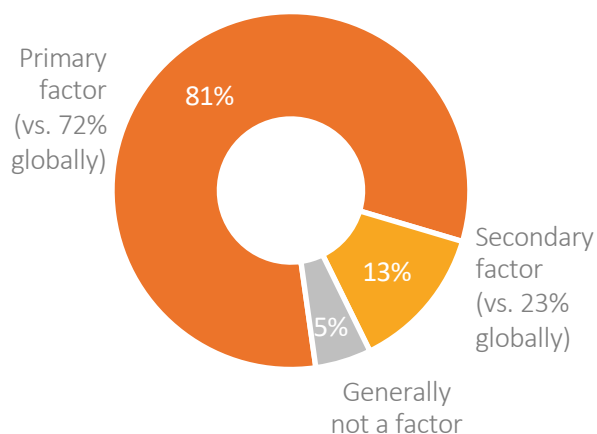
Businesses of all types rate technology a critically important factor to their success. Among Indian firms that CompTIA surveyed, about 8 in 10 rate technology as a primary factor in reaching business objectives (81%). Most of the remainder consider technology a secondary factor in helping to meet those goals (13%), while 5% describe technology as a nonfactor. There is a disconnect though between technology as a priority and the reality that a segment of businesses say they under-invest in technology. About 1 in 10 believe their firm's allocation of budget to tech spending is "too low."

Furthermore, when considering what businesses in India spend vs. the value and benefits received, the great majority report that their firm gets excellent or good ROI from its technology spending (87% vs. 66% global). Regardless, primary reasons that contribute to perceptions of disappointing ROI of technology investments include staff time required to operate / maintain, required upgrades / built-in obsolescence, ongoing maintenance costs or support fees, insufficient features / capabilities, complexity / poor user experience, and upfront cost / too expensive.

42% Managed services utilization

According to the data, 4 in 10 Indian firms report use of a managed service provider for ongoing IT operations management. Firms who outsource more often report higher perceptions of ROI.

Rating of technology as a factor in reaching business objectives



Certainly technology plays a role in achieving corporate objectives, but technology alone will not produce the desired results. Employers must also address the people and process elements of the equation to achieve optimal outcomes. Businesses face a range of challenges in executing their vision from resource constraints, lack of expertise, skills gaps, and so on. Consequently, most organizations in India rely on some degree of outside provider of tech services. For instance, about 9 in 10 indicate outsourcing or using outside tech firms / expertise at least occasionally in a typical year (92%); including three-quarters who do so regularly (30%) or frequently (45%).

Top reported uses of outside tech services

1. Managed services
2. Troubleshooting / repair / maintenance
3. Deployment / integration (e.g. cloud migration)
4. Data / analytics / AI related
5. Web design / e-commerce

Organizations in India turn to outside expertise for a number of other services as well including software development, consulting / strategy, cybersecurity, and emerging tech. In addition, about 4 in 10 report using managed services / use of a managed service provider (MSP) for ongoing IT management (42%). Interestingly, firms who regularly or frequently outsource are significantly more likely to report excellent or good ROI (79% in maturing countries such as India) vs. those who occasionally outsource (67%) or rarely / never do so (51%).

EMERGING TECH MOMENTUM BUILDS

The concept of emerging technology is a common shorthand for a range of innovations in the early to mid stages of adoption. This may encompass distinct categories, such as drones or 3-D printers, or enabling technologies, such as artificial intelligence or blockchain, embedded or serving as a platform for countless products or services.

The current and future impact of these technologies can be seen in their growth rates and revenue contributions. According to IDC, sales of emerging tech categories will increase by 105% worldwide during the 2019-2023 time period, adding \$1.5 trillion in new revenue to the global tech sector. In the year ahead, categories such as AI (+31%), blockchain (+70%), AR/VR (+99%), and IoT (+15%) will gain further traction as they move into new segments of customers.

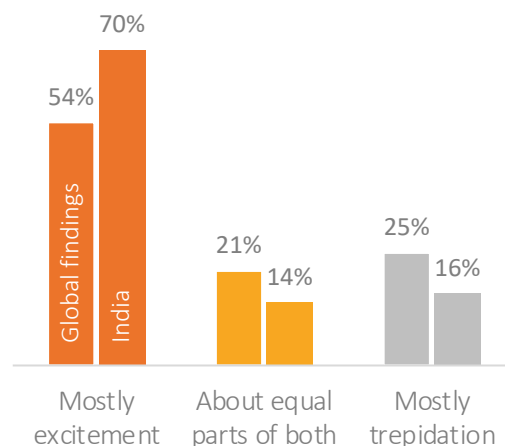
As a percentage of the overall technology pie, emerging tech will account for about 17% in 2020, with the remaining share stemming from the established categories of hardware, software, services, and telecom. Of course, there are gray areas where emerging tech overlaps multiple categories. Relatedly, no technology operates in a vacuum. Without robust networks and infrastructure, devices such as PCs and mobile phones, and integration expertise, emerging technologies cannot advance.

According to the CompTIA survey, 7 in 10 businesses in India have a positive view of emerging technology. It can be inferred that respondents see an opportunity specific to their business, or more broadly, a general sense of excitement for where technology is headed. At the other end of the spectrum, 16% report mostly feelings of trepidation. Again, this could be specific to their firm, such as the fear of falling behind in the market, or a broader concern for the uncertainty of technological disruption. Organizations in the maturing bucket of countries tend to be much more eager for emtech opportunities (61% excited in maturing vs. 49% in mature countries).

The data suggests there is a positive correlation between businesses that report a high level of ROI with their current technology spending and excitement for emerging technology. It follows that firms less satisfied with their current technology use express more concern for the future.

Although still far from mainstream adoptions, the emerging technologies reported at the highest rates of implementation are IoT and biometrics. (See chart on

Top level perceptions of emerging tech



following page.) Granted, there is a continuum of use, from basic sensors on a network that could be characterized as IoT, to highly complex deployments with myriad inputs generating volumes of data feeding various automating technologies. As such, reported adoption rates are best used as directional guidance.

The primary factors indicated that could stall adoption and utilization of emerging tech tend to focus on budget and risk. Firms in the maturing group of countries indicate risk aversion at a significantly higher rate than those in the mature group (29% vs. 23%, respectively).

24%

% of businesses in India that say risk aversion is a primary factor in their decision to postpone emtech adoption



Primary factors cited as inhibiting the adoption of emerging technologies

1. Budget constraints
2. Risk aversion / uncertainty
3. Lack of a clear business case
4. Confusion / overwhelmed with options

CYBERSECURITY: DISCONNECTS ON MANY FRONTS

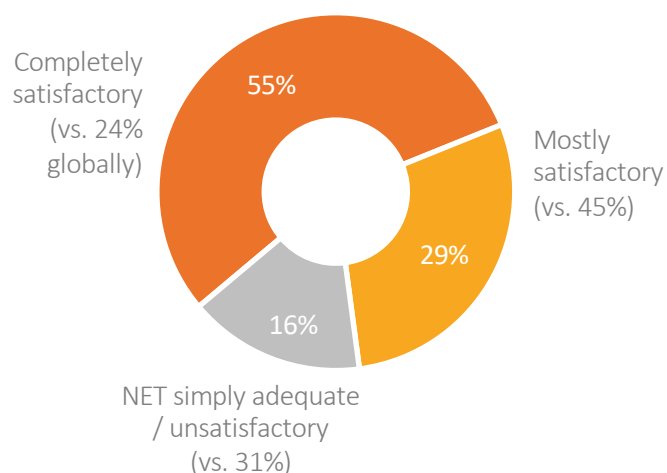
Cybersecurity continues to grow in importance in an increasingly digital and interconnected world. Many businesses are increasing their security investments or elevating their security focus, yet needing to employ progressively more proactive measures. Again, technologies and tools only go so far as employers need to build and enhance their processes, policies, and—most importantly—people.

Eighty-four percent of employers in India describe their firm's cybersecurity at a completely (55%) or mostly satisfactory (29%) level. This indicates some room for improvement though, especially with the remainder describing their firm's approach as simply adequate (9%) or unsatisfactory (7%).

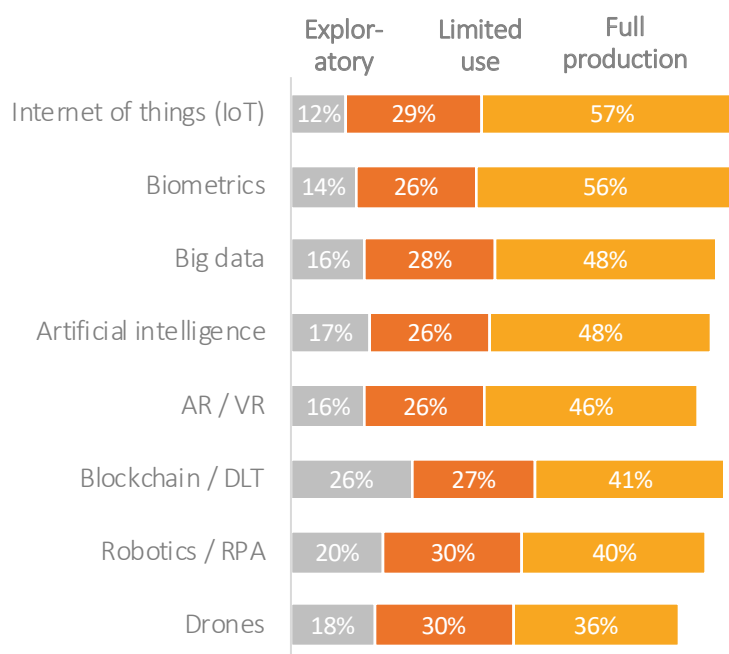
Satisfaction levels among organizations in India are notably higher than all the other countries covered in CompTIA's study. Furthermore, employers in the maturing group of countries on a whole tend to report being satisfied significantly more than their counterparts in mature countries (74% vs. 65% net satisfied, respectively).

Self-assessment levels of security satisfaction are presumably lower though as firms are more likely to report on themselves on the optimistic side. This is further compounded by the fact that businesses are oftentimes less prepared than they believe, and even more so as it relates to emerging areas.

Self-assessment of cybersecurity posture



Emerging tech adoption tracking



Security underpins the many facets of emerging technology. This, along with the high growth rates for emerging technologies expected over the next several years, drives the need for businesses to re-evaluate their approaches to security. Consider that 95% of firms in India reported recently changing their security approach; with 48% being due to a change in IT operations (move to cloud, new IoT strategy, etc.). For another 48%, cybersecurity priorities shifted as a result of knowledge gained from training or certification.

Furthermore, a low understanding of new threats is a top challenge cited for why it may be difficult to pursue new cybersecurity challenges. For example, consider the wide range of security risks with IoT as digital meshes with physical properties. (See CompTIA's 2019 *Trends in Internet of Things*.)

Top reported challenges to improving cybersecurity

1. Prioritization of other technology investments
2. Belief that current efforts are 'good enough'
3. Low understanding of new threats
4. Lack of metrics to demonstrate effectiveness
5. Low understanding of cybersecurity trends

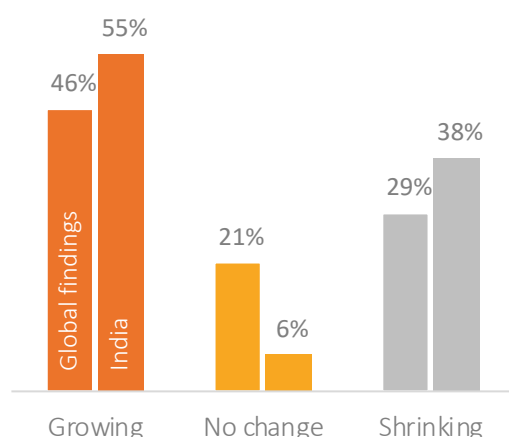
OVERCOMING WORKFORCE GAPS

The evolving tech labor market continues to present both opportunities and trials. Skills gaps particularly remain an ongoing challenge at most organizations. When considering the general concept of a country's tech skills gap, nearly all respondents in India in CompTIA's latest research recall recently seeing or hearing about it (97% vs. 86% global). Rates are especially high within countries that have more maturing economies, i.e. Brazil, China, India, Mideast, and Thailand vs. the more mature grouping that have been grappling with the issue for decades in countries such as Australia, Canada, UK, and US.

Moreover, over half report that the skills gap situation at their firm has grown over the past two years (55% for India vs. 46% global). Businesses in the mature grouping of countries report no change at a higher rate compared to firms in maturing countries.

Much too often "skills gaps" are used as a term to generalize a host of other workforce issues. Skills gaps primarily meaning employee performance falling short of employer expectations or desires is far different from what could be described as a location or a pay gap. When breaking down some of the various types of gaps, the top ones the research identified as barriers in hiring and maintaining a robust tech workforce in India include wage, innovation, and sector gaps. A wage gap will occur when market wages for certain positions / skills exceed employer budgets. Companies reporting an innovation gap see that the speed of innovation is exceeding the pace of training / workforce development. A sector gap indicates insufficient

Perceived change in skills gap
over the past 2 years



Top priorities for boosting cybersecurity skills

52%	Legal compliance / policies
50%	Data loss prevention / data security
50%	Network monitoring / access management
49%	Cloud security
46%	Risk management / mitigation
42%	Penetration testing / ethical hacking
34%	Next-gen (e.g. AI predictive analytics tools)
30%	Firewalls and antivirus

expertise in specific industry sectors such as finance, healthcare, and manufacturing. With more than 4 in 10 citing these three types of gaps alone, and over a third citing others such as gaps in soft skills, perception, confidence, or location, making even incremental changes in these types of issues is no small feat but will reap substantial rewards.

Getting more into the matter of tech skills gaps, the top areas of concern reported by managers in the CompTIA survey include a mix of newer tech areas as well as more core as technologies progress. For instance, the more specific areas of cybersecurity skill gap concerns address both cloud and networks. (See table above.) Top tech skills gap [significant + moderate] areas include:

- Cybersecurity [77% vs. 55% global]
- Digital business transformation / modernizing legacy hardware or software [75% vs. 54% global]
- Integrating different apps, data sources, platforms, devices [75% vs. 55% global]
- Data mgmt. / analytics [74% vs. 53% global]
- Software or app development [73% vs. 54% global]

66% Unrealistic expectations?

2 in 3 employers in India acknowledge that unrealistic expectations with skills and experience contribute to exaggerated perceptions of the skills gap. Another 25% acknowledge it is somewhat of a factor.

Obtaining an accurate read on the skills gap situation is difficult and compounded by the issue that only a minority overall report their own firm has a pretty good handle on identifying and assessing skills gaps (39% global). However, India appears to be the exception with 71% claiming these capabilities. Conversely, about 1 in 10 report they often struggle (12% vs. 33% overall). The remainder would place themselves in the middle with a good handle on some roles while struggling with others (15% vs. 25% global).

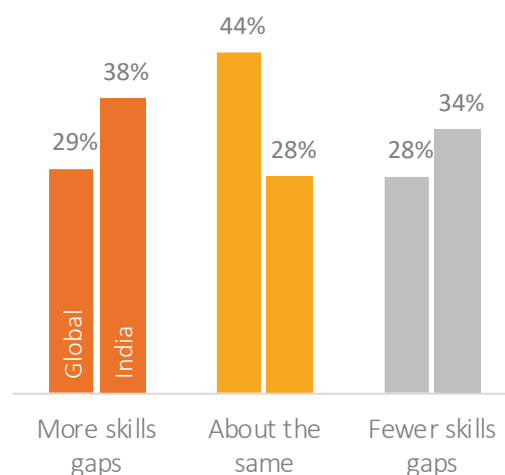
Furthermore, about 1 in 4 report only having informal strategies / resources in place at their firms to address skills gaps (27% vs. 43% global) or no process at all (2% vs. 10% global). In India though, most indicate having formal strategies (70% vs. 42% global). Interestingly, more countries in the maturing grouping, notably China, India, and Thailand, report formal processes at much higher rates—perhaps born out of urgent necessity. While informal strategies are much preferred in the Netherlands. Overall, businesses in the more mature countries report having informal strategies or nothing in place at significantly higher rates than those in maturing countries.

As important as it is to first identify business objectives then align tech accordingly, employers also need to recognize what needs fixing in regards to skills gaps before jumping into resolutions. And as far as addressing non-technical or ‘soft’ skills, priorities are pretty much in line across the board with few exceptions. For example, innovation ranks higher among those in maturing vs. mature countries.

Top priorities for boosting soft skills

- 46% Innovation / creative problem solving
- 42% Leadership
- 41% Flexibility / adaptability
- 40% Collaboration / teamwork
- 38% Motivation / initiative
- 37% Strong work ethic
- 35% Analytical skills
- 34% Customer service
- 33% Project management
- 23% Verbal / written communication skills

Perception of skills gaps among Gen Y & Z vs. other segments of workers



Delving further into skills gap perceptions, the smallest percentage in India believe that the skills gaps among young people are on par with the general workforce (28% vs. 44% global). About 4 in 10 hold the often unfair and negative belief that there are *more* gaps among the younger Gen Y and Gen Z audience (38% vs. 29% global). While on the other end of the spectrum, 1 in 3 believe there are *fewer* gaps among the younger group (34% vs. 28% global). See CompTIA's *International Youth Perspectives of Technology and Careers* study.

79%

% of firms in India indicate they have mandatory training and professional development requirements for staff



Overall, about 8 in 10 report their firm has training and professional development for employees in technical or soft skills that is required (79% vs. 63% global). The portion who report it's mandatory is notably higher in India compared to all the other countries covered in the CompTIA survey. The remainder describe it as solely voluntary; not required but encouraged (20% vs. 31% global). Businesses in the maturing countries as a whole are more likely to indicate having mandatory training compared to their counterparts in the mature countries (44% vs. 34%, respectively).

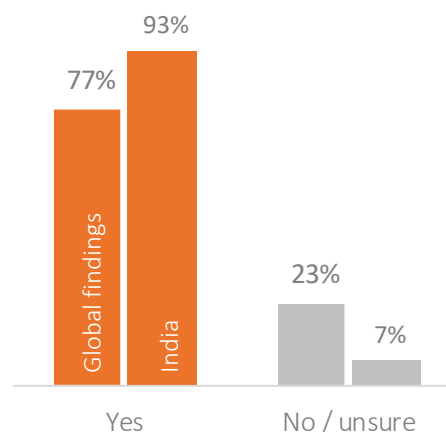
THE FUTURE OF WORK

Undoubtedly, technology will continue to profoundly impact nearly everyone's job—and it's mostly for the better. While on the one hand automating technologies have displaced segments of workers through substitution, in most cases automation frees up time for workers to focus on higher-level activities.

Automation of jobs is a prickly topic conjuring up ideas of mass layoffs and the robots taking over. Mass media has a tendency to latch on to the doom and gloom news. Regardless of viewpoints, the great majority in CompTIA's study have recently seen articles about robotics, intelligent machines, and other automating technologies performing some aspects of jobs or possibly replacing them altogether (93% in India vs. 77% global). On the contrary, the automation of repetitive tasks has spun opportunities elsewhere. For instance, tech support at one time may have been considered as 'on its way out.' Quite the opposite occurred with this growing field as technological advancements breed support needs.

On a slightly more personal level, about 9 in 10 are very concerned (64%) or somewhat concerned (27%) that automating technologies may mean fewer jobs for people like them. Another 7% aren't that concerned—much lower than the 28% globally. McKinsey & Co. finds a very low portion of occupations that consists of activities that can be fully automated—less than 5%. Displacement rates will depend on a number of factors, but are most likely to occur in fields such as office support, food service, production work, and customer service and retail sales. McKinsey also points to growing demand for technological, social and emotional, and higher cognitive skills by 2030; especially given the adoption of automation and AI. See CompTIA's *International Youth Perspectives of Technology and Careers*.

Familiarity with stories about automating technologies and workforce impact



About 9 in 10 indicate at least some interest in attaining additional training or hands-on experience with technology as a result of the outlook for how robotics and automating technologies may impact the workforce (88% vs. 69% global, definitely + somewhat).

At any rate there's a need for employers, employees, and candidates to focus now more than ever on the continuous improvements of skills and training to keep pace with emerging technology—and employers need to drive impactful professional development strategies.

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

1. More social elements
2. More time set aside for training
3. More e-Learning
4. More training alignment with development goals
5. More cross-training (e.g. other functions)
6. More autonomy in developing training program
7. More mobile options / app-based
8. More classroom instructor-led training
9. More simulations or gaming elements
10. More apprenticeship-type work-study programs



INTRODUCTION

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While it is impossible to know precisely how these changes will unfold, CompTIA's latest research provides a number of clues as to how businesses are responding and the challenges they are working to overcome.

According to the data, innovation remains a top business priority. Likewise, robust spending projections on emerging technologies, such as the internet of things, big data, artificial intelligence, and robotics confirm the steady advance of digitization.

At the same time, the demand for tech talent has never been higher. Across every business type and industry sector, employers recognize the importance of cultivating a tech-savvy workforce.

While there are common threads underpinning many of these trends, there is much to learn from the unique experiences and approaches taken by countries around the world.



66.6

score

Average of ICT adoption + digital skills of population (100-point scale)
Source: World Economic Forum Global Competitiveness 2019

\$13.1

billion

Total spending on tech in Ireland. Inclusive of hardware, software, services, telecom, and emtech.
Sources: CompTIA | IDC | 2020 projection

7 in 10

% of employers with some degree of difficulty in identifying and addressing skills gaps

42%

% citing the speed of innovation as a factor contributing to workforce gaps

76%

NET % of businesses relying on outside technology service providers at least occasionally

2 in 3

NET % with some degree of excitement for opportunities associated with emerging technologies

THE BUSINESS OF TECHNOLOGY

The size of the global technology industry continues to grow as spending is expected to reach \$5.2 trillion worldwide in 2020, according to the research consultancy IDC. Tech spending in Ireland is projected to reach an estimated \$13.1 billion in 2020. See CompTIA's *IT Industry Outlook* for more on the global market.

While the mix of spending categories may vary, businesses around the world are investing in hardware, software, services, and telecommunications. Technology will play a growing integral role as companies in Ireland focus on key strategic priorities such as innovation (59%), identifying new customer segments and markets (55%), implementing new systems and processes (53%), and launching new products (50%). One-half also prioritize hiring skilled workers to help them drive technology initiatives into the future (50%).

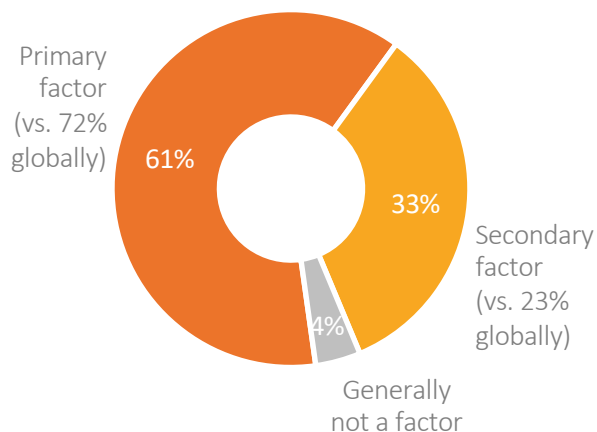
Businesses of all types rate technology a critically important factor to their success. Among the Ireland firms that CompTIA surveyed, 6 in 10 rate technology as a primary factor in reaching business objectives (61%). One-third consider technology a secondary factor in helping to meet those goals (33%), while just 4% describe technology as a nonfactor. There is a disconnect though between technology as a priority and the reality that a segment of businesses say they under-invest in technology. About one-quarter believe their firm's allocation of budget to tech spending is "too low."

Furthermore, when considering what Ireland businesses spend vs. the value and benefits received, the majority report that their firm gets excellent or good ROI from its technology spending (71% vs. 66% global). Regardless, primary reasons that contribute to perceptions of disappointing ROI of technology investments include ongoing maintenance costs or support fees, staff time required to operate / maintain, required upgrades / built-in obsolescence, upfront cost / too expensive, complexity / poor user experience, and insufficient features / capabilities.

20% Managed services utilization

According to the data, 1 in 5 Ireland firms report use of a managed service provider for ongoing IT operations management. Firms who outsource more often report higher perceptions of ROI.

Rating of technology as a factor in reaching business objectives



Certainly technology plays a role in achieving corporate objectives, but technology alone will not produce the desired results. Employers must also address the people and process elements of the equation to achieve optimal outcomes. Businesses face a range of challenges in executing their vision from resource constraints, lack of expertise, skills gaps, and so on. Consequently, most Ireland organizations rely on some degree of outside provider of tech services. For instance, 3 in 4 indicate outsourcing or using outside tech firms / expertise at least occasionally in a typical year (76%); including more than a third who do so regularly (29%) or frequently (7%).

Top reported uses of outside tech services

1. Consulting / advisory / strategy services
2. Troubleshooting / repair / maintenance
3. Cybersecurity related
4. Software development
5. Deployment / integration (e.g. cloud migration)

Organizations in Ireland turn to outside expertise for a number of other services as well including data / analytics, emerging tech, and web design. In addition, 1 in 5 report using managed services / use of a managed service provider (MSP) for ongoing IT management (20%). Interestingly, firms who regularly or frequently outsource are significantly more likely to report excellent or good ROI (65% in mature countries such as Ireland) vs. those who occasionally outsource (60%) or rarely / never do so (57%).

EMERGING TECH MOMENTUM BUILDS

The concept of emerging technology is a common shorthand for a range of innovations in the early to mid stages of adoption. This may encompass distinct categories, such as drones or 3-D printers, or enabling technologies, such as artificial intelligence or blockchain, embedded or serving as a platform for countless products or services.

The current and future impact of these technologies can be seen in their growth rates and revenue contributions. According to IDC, sales of emerging tech categories will increase by 105% worldwide during the 2019-2023 time period, adding \$1.5 trillion in new revenue to the global tech sector. In the year ahead, categories such as AI (+31%), blockchain (+70%), AR/VR (+99%), and IoT (+15%) will gain further traction as they move into new segments of customers.

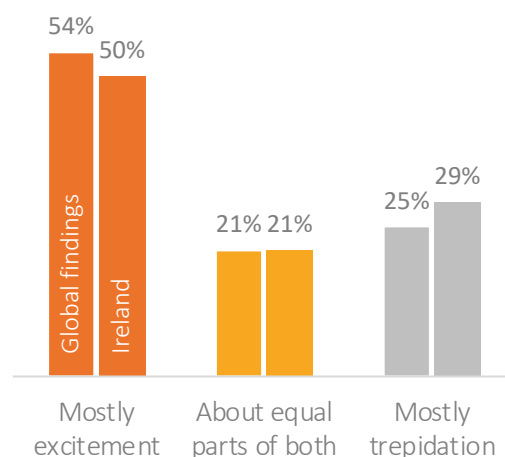
As a percentage of the overall technology pie, emerging tech will account for about 17% in 2020, with the remaining share stemming from the established categories of hardware, software, services, and telecom. Of course, there are gray areas where emerging tech overlaps multiple categories. Relatedly, no technology operates in a vacuum. Without robust networks and infrastructure, devices such as PCs and mobile phones, and integration expertise, emerging technologies cannot advance.

According to the CompTIA survey, 1 in 2 Ireland businesses have a positive view of emerging technology. It can be inferred that respondents see an opportunity specific to their business, or more broadly, a general sense of excitement for where technology is headed. At the other end of the spectrum, 3 in 10 report mostly feelings of trepidation. Again, this could be specific to their firm, such as the fear of falling behind in the market, or a broader concern for the uncertainty of technological disruption. Organizations in the maturing bucket of countries tend to be much more eager for emtech opportunities (61% excited in maturing vs. 49% in mature countries).

The data suggests there is a positive correlation between businesses that report a high level of ROI with their current technology spending and excitement for emerging technology. It follows that firms less satisfied with their current technology use express more concern for the future.

Although still far from mainstream adoptions, the emerging technologies reported at the highest rates of implementation are big data and IoT. (See chart on

Top level perceptions of emerging tech



following page.) Granted, there is a continuum of use, from basic sensors on a network that could be characterized as IoT, to highly complex deployments with myriad inputs generating volumes of data feeding various automating technologies. As such, reported adoption rates are best used as directional guidance.

The primary factors indicated that could stall adoption and utilization of emerging tech tend to focus on budget and confusion among customers. Overall, firms in the maturing group of countries indicate risk aversion at a significantly higher rate than those in the mature group (29% vs. 23%, respectively).

17%

% of Ireland businesses that say risk aversion is a primary factor in their decision to postpone emtech adoption



Primary factors cited as inhibiting the adoption of emerging technologies

1. Budget constraints
2. Confusion / overwhelmed with options
3. Lack of a clear business case
4. Risk aversion / uncertainty

CYBERSECURITY: DISCONNECTS ON MANY FRONTS

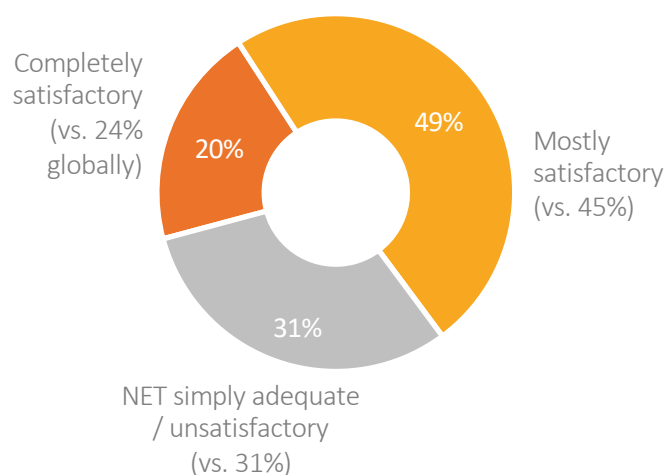
Cybersecurity continues to grow in importance in an increasingly digital and interconnected world. Many businesses are increasing their security investments or elevating their security focus, yet needing to employ progressively more proactive measures. Again, technologies and tools only go so far as employers need to build and enhance their processes, policies, and—most importantly—people.

Just over two-thirds of Ireland firms describe their firm's cybersecurity at a completely (20%) or mostly satisfactory (49%) level. This indicates some room for improvement, especially with the remainder describing their firm's approach as simply adequate (29%) or unsatisfactory (2%).

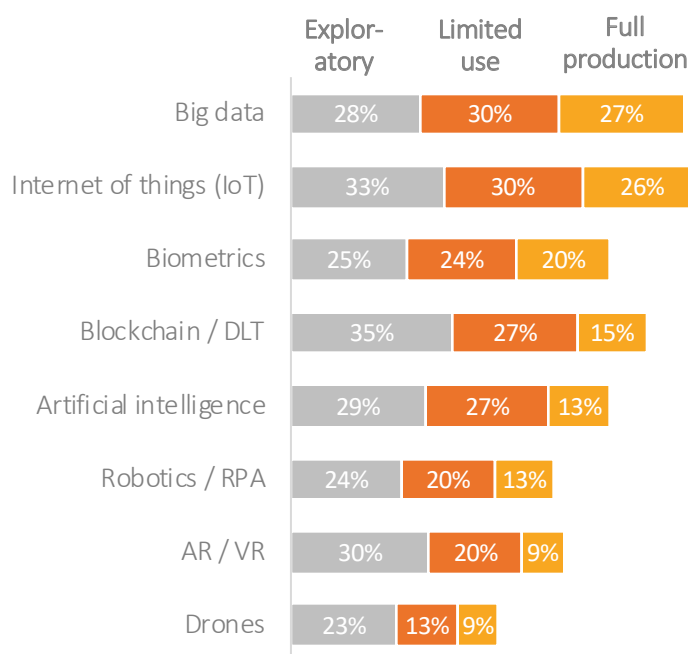
Satisfaction levels among Ireland firms are on par with overall results. However, employers in the maturing group of countries on a whole tend to report being satisfied significantly more than their counterparts in mature countries (74% vs. 65% net satisfied, respectively).

Self-assessment levels of security satisfaction are presumably even lower as firms are more likely to report on themselves on the optimistic side. This is further compounded by the fact that businesses are oftentimes less prepared than they believe, and even more so as it relates to emerging areas.

Self-assessment of cybersecurity posture



Emerging tech adoption tracking



Security underpins the many facets of emerging technology. This, along with the high growth rates for emerging technologies expected over the next several years, drives the need for businesses to re-evaluate their approaches to security. Consider that 87% of Ireland firms reported recently changing their security approach; with 38% being due to a change in IT operations (move to cloud, new IoT strategy, etc.). For another 28%, cybersecurity priorities shifted as a result of knowledge gained from training or certification.

Furthermore, a low understanding of new threats is a top challenge cited for why it may be difficult to pursue new cybersecurity challenges. For example, consider the wide range of security risks with IoT as digital meshes with physical properties. (See CompTIA's *2019 Trends in Internet of Things*.)

Top reported challenges to improving cybersecurity

1. Low understanding of new threats
2. Lack of budget dedicated to cybersecurity
3. Belief that current efforts are 'good enough'
4. Low understanding of cybersecurity trends
5. Lack of metrics to demonstrate effectiveness

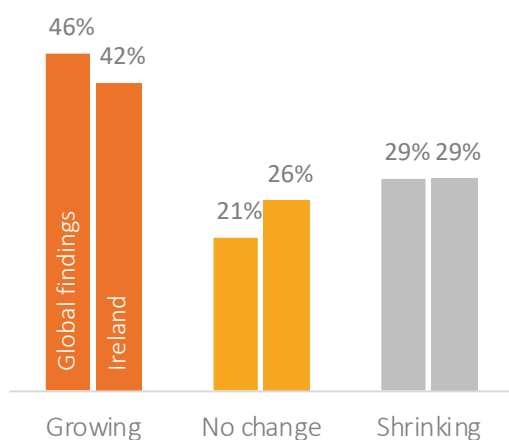
OVERCOMING WORKFORCE GAPS

The evolving tech labor market continues to present both opportunities and trials. Skills gaps particularly remain an ongoing challenge at most organizations. When considering the general concept of a country's tech skills gap, most in Ireland in CompTIA's latest research recall recently seeing or hearing about it (87% vs. 86% global). Rates are especially high within countries that have more maturing economies, i.e. Brazil, China, India, Mideast, and Thailand vs. the more mature grouping that have been grappling with the issue for decades in countries such as Australia, Canada, UK, and US.

Moreover, close to half report that the skills gap situation at their firm has grown over the past two years (42% vs. 46% global). Businesses in the mature grouping of countries report no change at a higher rate compared to firms in maturing countries.

Much too often "skills gaps" are used as a term to generalize a host of other workforce issues. Skills gaps primarily meaning employee performance falling short of employer expectations or desires is far different from what could be described as a location or a pay gap. When breaking down some of the various types of gaps, the top ones the research identified as barriers in hiring and maintaining a robust tech workforce in Ireland include innovation, wage, and soft skills gaps. Companies reporting an innovation gap see that the speed of innovation is exceeding the pace of training / workforce development. A wage gap will occur when market wages for certain positions / skills exceed employer budgets. Soft skills challenges are a symptom of insufficient skill / capability in non-technical areas

Perceived change in skills gap
over the past 2 years



Top priorities for boosting cybersecurity skills

56%	Cloud security
53%	Data loss prevention / data security
47%	Firewalls and antivirus
39%	Legal compliance / policies
38%	Risk management / mitigation
36%	Network monitoring / access management
34%	Penetration testing / ethical hacking
25%	Next-gen (e.g. AI predictive analytics tools)

such as project management, collaboration, or communication. With over a third or more citing these three types of gaps alone, and more than a quarter citing others such as gaps in location, confidence, perception, or sector, making even incremental changes in these types of issues is no small feat but will reap substantial rewards.

Getting more into the matter of tech skills gaps, the top areas of concern reported by managers in the CompTIA survey include a mix of newer tech areas as well as more core as technologies progress. For instance, the more specific areas of cybersecurity skill gap concerns address both cloud and networks. (See table above.) Top tech skills gap [significant + moderate] areas include:

- Cybersecurity [50% vs. 55% global]
- Emerging tech, i.e. AI, automation, AI, blockchain, etc. [48% vs. 57% global]
- Data mgmt. / analytics [47% vs. 53% global]
- Software or app development [47% vs. 54% global]
- Integrating different apps, data sources, platforms, devices [46% vs. 55% global]

25% Unrealistic expectations?

1 in 4 Ireland employers acknowledge that unrealistic expectations with skills and experience contribute to exaggerated perceptions of the skills gap. Another 57% acknowledge it is somewhat of a factor.

Obtaining an accurate read on the skills gap situation is difficult and compounded by the issue that only a minority overall report their own firm has a pretty good handle on identifying and assessing skills gaps (39% global). However, Ireland has one of the highest ratings with 50% claiming these capabilities. Conversely, about 3 in 10 report they often struggle (27% vs. 33% overall). The remaining 1 in 5 would place themselves in the middle with a good handle on some roles while struggling with others (20% vs. 25% global).

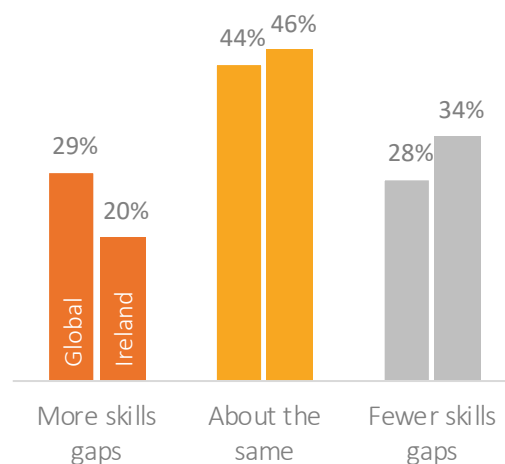
Furthermore, over half report only having informal strategies / resources in place at their firms to address skills gaps (51% vs. 43% global) or no process at all (11% vs. 10% global). This is at first hard to believe that only 1 in 3 indicate having formal strategies (33% vs. 42% global). Interestingly, more countries in the maturing grouping, notably China, India, and Thailand, report formal processes at much higher rates—perhaps born out of urgent necessity. While informal strategies are much preferred in the Netherlands. Overall, businesses in the more mature countries report having informal strategies or nothing in place at significantly higher rates than those in maturing countries.

As important as it is to first identify business objectives then align tech accordingly, employers also need to recognize what needs fixing in regards to skills gaps before jumping into resolutions. And as far as addressing non-technical or ‘soft’ skills, priorities are pretty much in line across the board with few exceptions. For example, innovation ranks higher among those in maturing vs. mature countries.

Top priorities for boosting soft skills

43%	Strong work ethic
41%	Flexibility / adaptability
39%	Motivation / initiative
39%	Leadership
35%	Customer service
33%	Collaboration / teamwork
25%	Analytical skills
24%	Project management
20%	Innovation / creative problem solving
18%	Verbal / written communication skills

Perception of skills gaps among Gen Y & Z vs. other segments of workers



Delving further into skills gap perceptions, the largest percentage believe that the skills gaps among young people are on par with the general workforce (46% vs. 44% global). Though 1 in 5 hold the often unfair and negative belief that there are *more* gaps among the younger Gen Y and Gen Z audience (20% vs. 29% global). While on the other end of the spectrum, about 1 in 3 believe there are *fewer* gaps among the younger group (34% vs. 28% global). See CompTIA's *International Youth Perspectives of Technology and Careers* study.

73%

% of Ireland firms indicate they have mandatory training and professional development requirements for staff



Overall, about 3 in 4 report their firm has training and professional development for employees in technical or soft skills that is required (73% vs. 63% global). Another 2 in 10 describe it as solely voluntary; not required but encouraged (22% vs. 31% global). Businesses in the maturing countries are more likely to indicate having mandatory training compared to their counterparts in the mature countries (44% vs. 34%, respectively).

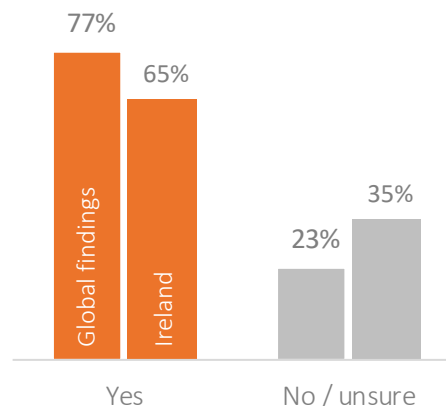
THE FUTURE OF WORK

Undoubtedly, technology will continue to profoundly impact nearly everyone's job—and it's mostly for the better. While on the one hand automating technologies have displaced segments of workers through substitution, in most cases automation frees up time for workers to focus on higher-level activities.

Automation of jobs is a prickly topic conjuring up ideas of mass layoffs and the robots taking over. Mass media has a tendency to latch on to the doom and gloom news. Regardless of viewpoints, the majority in CompTIA's study have recently seen articles about robotics, intelligent machines, and other automating technologies performing some aspects of jobs or possibly replacing them altogether (65% in Ireland vs. 77% global). On the contrary, the automation of repetitive tasks has spun opportunities elsewhere. For instance, tech support at one time may have been considered as 'on its way out.' Quite the opposite occurred with this growing field as technological advancements breed support needs.

On a slightly more personal level, two-thirds are very concerned (21%) or somewhat concerned (45%) that automating technologies may mean fewer jobs for people like them. Another 26% aren't that concerned—on par with the 28% globally. McKinsey & Co. finds a very low portion of occupations that consists of activities that can be fully automated—less than 5%. Displacement rates will depend on a number of factors, but are most likely to occur in fields such as office support, food service, production work, and customer service and retail sales. McKinsey also points to growing demand for technological, social and emotional, and higher cognitive skills by 2030; especially given the adoption of automation and AI. See CompTIA's *International Youth Perspectives of Technology and Careers*.

Familiarity with stories about automating technologies and workforce impact



About 6 in 10 indicate at least some interest in attaining additional training or hands-on experience with technology as a result of the outlook for how robotics and automating technologies may impact the workforce (61% vs. 69% global, definitely + somewhat).

At any rate there's a need for employers, employees, and candidates to focus now more than ever on the continuous improvements of skills and training to keep pace with emerging technology—and employers need to drive impactful professional development strategies.

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

1. More cross-training (e.g. other functions)
2. More time set aside for training
3. More classroom instructor-led training
4. More e-Learning
5. More training alignment with development goals
6. More mobile options / app-based
7. More apprenticeship-type work-study programs
8. More social elements
9. More autonomy in developing training program
10. More simulations or gaming elements



INTRODUCTION

The impact of technology continues to grow. The intersection of technology and business operations, technology and people, technology and government, and technology and just about everything else, will mean more change on more fronts in the years to come.

While it is impossible to know precisely how these changes will unfold, CompTIA's latest research provides a number of clues as to how businesses are responding and the challenges they are working to overcome.

According to the data, innovation remains a top business priority. Likewise, robust spending projections on emerging technologies, such as the internet of things, big data, artificial intelligence, and robotics confirm the steady advance of digitization.

At the same time, the demand for tech talent has never been higher. Across every business type and industry sector, employers recognize the importance of cultivating a tech-savvy workforce.

While there are common threads underpinning many of these trends, there is much to learn from the unique experiences and approaches taken by countries around the world.



71.7

score

Average of ICT adoption + digital skills of population (100-point scale)
Source: World Economic Forum Global Competitiveness 2019

\$349.9

billion

Total spending on tech in the Japan.
Inclusive of hardware, software, services, telecom, and emtech.
Sources: CompTIA | IDC | 2020 projection

7 in 10

% of employers with some degree of difficulty in identifying and addressing skills gaps

38%

% citing the speed of innovation as a factor contributing to workforce gaps

83%

NET % of businesses relying on outside technology service providers at least occasionally

3 in 4

NET % with some degree of excitement for opportunities associated with emerging technologies

THE BUSINESS OF TECHNOLOGY

The size of the global technology industry continues to grow as spending is expected to reach \$5.2 trillion worldwide in 2020, according to the research consultancy IDC. Tech spending in Japan is projected to reach an estimated \$349.9 billion in 2020. See CompTIA's *IT Industry Outlook* for more on the global market.

While the mix of spending categories may vary, businesses around the world are investing in hardware, software, services, and telecommunications. Technology will play a growing integral role as companies in Japan focus on key strategic priorities such as implementing new systems and processes (58%), identifying new customer segments (49%), launching new products or services (48%), and innovation (47%). More than a third also prioritize hiring skilled workers to help them drive technology initiatives into the future (37%).

Businesses of all types rate technology a critically important factor to their success. Among the Japan firms that CompTIA surveyed, almost half rate technology as a primary factor in reaching business objectives (45%). A third consider technology a secondary factor in helping to meet those goals (33%), while 13% describe technology as a nonfactor. There is a disconnect though between technology as a priority and the reality that a segment of businesses say they under-invest in technology. About 1 in 5 believe their firm's allocation of budget to tech spending is "too low" (22%).

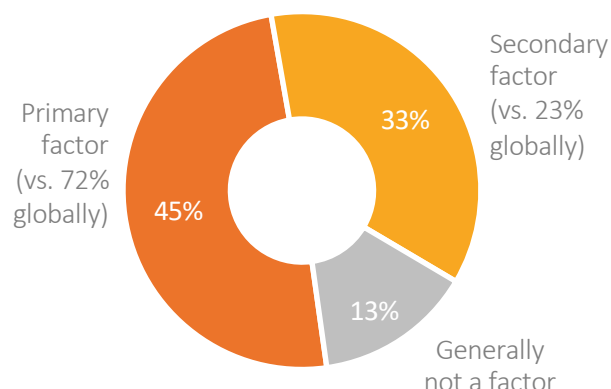
Furthermore, when considering what Japanese businesses spend vs. the value and benefits received, nearly a third report that their firm gets excellent or good ROI from its technology spending (27%; much lower than the 66% global). Primary reasons that contribute to perceptions of disappointing ROI of technology investments include staff time required to operate / maintain, ongoing maintenance costs or support fees, complexity / poor user experience, upfront cost / too expensive for what's received, and required upgrades / built-in obsolescence.

11% Managed services utilization

According to the data, about 1 in 10 of Japan firms report use of a managed service provider for ongoing IT operations management.

Firms who outsource more often report higher perceptions of ROI.

Rating of technology as a factor in reaching business objectives



Certainly technology plays a role in achieving corporate objectives, but technology alone will not produce the desired results. Employers must also address the people and process elements of the equation to achieve optimal outcomes. Businesses face a range of challenges in executing their vision from resource constraints, lack of expertise, skills gaps, and so on. Consequently, most Japanese organizations rely on some degree of outside provider of tech services. For instance, more than 4 out of 5 firms indicate outsourcing or using outside tech firms / expertise at least occasionally in a typical year (83%); including more than half who do so regularly (16%) or frequently (43%).

Top reported uses of outside tech services

1. Cybersecurity related
2. Troubleshooting / repair / maintenance
3. Software development
4. Data / analytics related
5. Deployment / integration (e.g. cloud migration)

Organizations in Japan turn to outside expertise for a number of other services as well including, consulting / advisory / strategy services, web design, and emerging technology. In addition, 1 in 10 report using managed services / use of a managed service provider (MSP) for ongoing IT management (11%). Interestingly, firms who regularly or frequently outsource are significantly more likely to report excellent or good ROI (65% in mature countries such as Japan) vs. those who occasionally outsource (60%) or rarely / never do so (57%).

EMERGING TECH MOMENTUM BUILDS

The concept of emerging technology is a common shorthand for a range of innovations in the early to mid stages of adoption. This may encompass distinct categories, such as drones or 3-D printers, or enabling technologies, such as artificial intelligence or blockchain, embedded or serving as a platform for countless products or services.

The current and future impact of these technologies can be seen in their growth rates and revenue contributions. According to IDC, sales of emerging tech categories will increase by 105% worldwide during the 2019-2023 time period, adding \$1.5 trillion in new revenue to the global tech sector. In the year ahead, categories such as AI (+31%), blockchain (+70%), AR/VR (+99%), and IoT (+15%) will gain further traction as they move into new segments of customers.

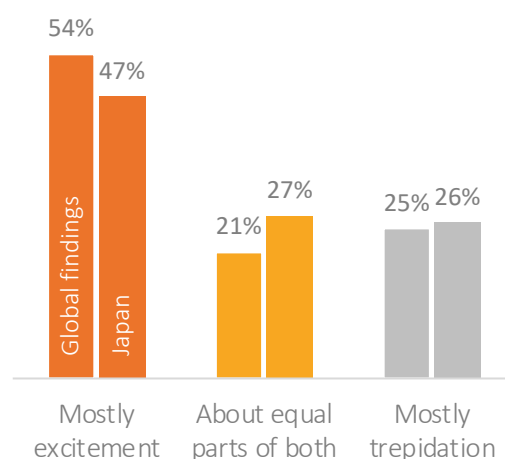
As a percentage of the overall technology pie, emerging tech will account for about 17% in 2020, with the remaining share stemming from the established categories of hardware, software, services, and telecom. Of course, there are gray areas where emerging tech overlaps multiple categories. Relatedly, no technology operates in a vacuum. Without robust networks and infrastructure, devices such as PCs and mobile phones, and integration expertise, emerging technologies cannot advance.

According to the CompTIA survey, nearly half of Japanese businesses have a positive view of emerging technology (47%). It can be inferred that respondents see an opportunity specific to their business, or more broadly, a general sense of excitement for where technology is headed. At the other end of the spectrum, 26% report mostly feelings of trepidation. Again, this could be specific to their firm, such as the fear of falling behind in the market, or a broader concern for the uncertainty of technological disruption. Organizations in the maturing bucket of countries tend to be much more eager for emtech opportunities (61% excited in maturing vs. 49% in mature countries).

The data suggests there is a positive correlation between businesses that report a high level of ROI with their current technology spending and excitement for emerging technology. It follows that firms less satisfied with their current technology use express more concern for the future.

Although still far from mainstream adoptions, the emerging technologies reported at the highest rates of implementation are biometrics and big data. (See chart

Top level perceptions of emerging tech



on following page.) Granted, there is a continuum of use, from basic sensors on a network that could be characterized as IoT, to highly complex deployments with myriad inputs generating volumes of data feeding various automating technologies. As such, reported adoption rates are best used as directional guidance.

The primary factors indicated that could stall adoption and utilization of emerging tech tend to focus on budget and the unknowns associated with emerging tech. Overall, firms in the maturing group of countries indicate risk aversion at a significantly higher rate than those in the mature group (29% vs. 23%, respectively).

23%

% of Japanese businesses that say risk aversion is a primary factor in their decision to postpone emtech adoption



Primary factors cited as inhibiting the adoption of emerging technologies

1. Budget constraints
2. Risk aversion / uncertainty
3. Lack of a clear business case
4. Confusion / overwhelmed with options

CYBERSECURITY: DISCONNECTS ON MANY FRONTS

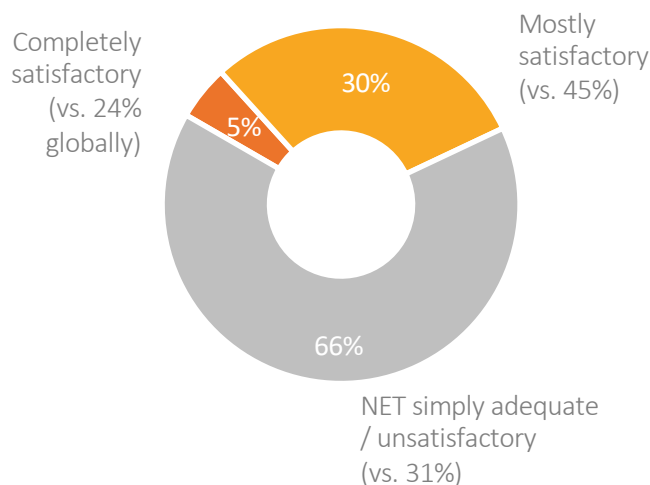
Cybersecurity continues to grow in importance in an increasingly digital and interconnected world. Many businesses are increasing their security investments or elevating their security focus, yet needing to employ progressively more proactive measures. Again, technologies and tools only go so far as employers need to build and enhance their processes, policies, and—most importantly—people.

A little more than a third of Japanese firms describe their firm's cybersecurity at a completely (5%) or mostly satisfactory (30%) level. This indicates some room for improvement, especially with the remainder describing their firm's approach as simply adequate or unsatisfactory (66%).

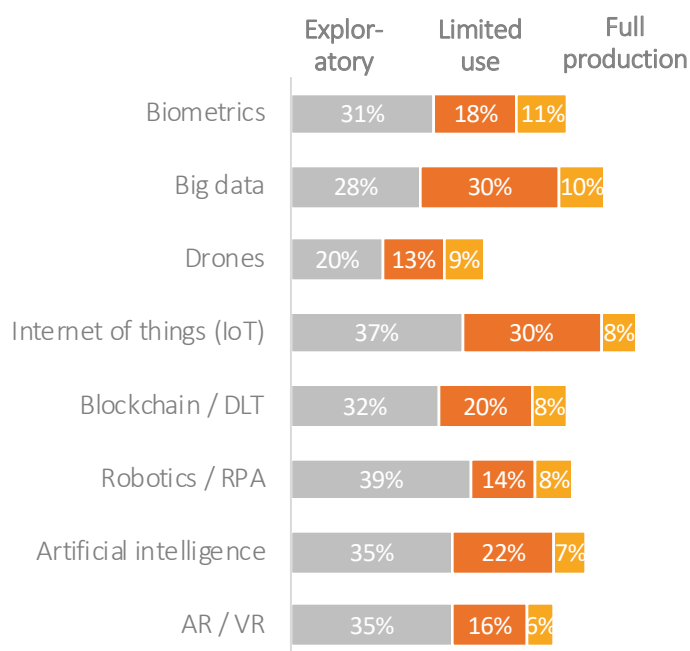
Satisfaction levels among firms in Japan are lower when compared to overall results (34% vs. 69% net satisfactory, respectively). Satisfaction rates in Japan are the lowest among all the countries surveyed in this study.

Self-assessment levels of security satisfaction are presumably even lower as firms are more likely to report on themselves on the optimistic side. This is further compounded by the fact that businesses are oftentimes less prepared than they believe, and even more so as it relates to emerging areas.

Self-assessment of cybersecurity posture



Emerging tech adoption tracking



Security underpins the many facets of emerging technology. This, along with the high growth rates for emerging technologies expected over the next several years, drives the need for businesses to re-evaluate their approaches to security. Consider that 76% of Japanese firms reported recently changing their security approach; with 34% being due to a change in IT operations (move to cloud, new IoT strategy, etc.), 26% being due to a vulnerability being discovered by an outside party. For another 21%, cybersecurity priorities shifted as a result of knowledge gained from training or certification.

Furthermore, a low understanding of new threats is a top challenge cited for why it may be difficult to pursue new cybersecurity challenges. For example, consider the wide range of security risks with IoT as digital meshes with physical properties. (See CompTIA's *2019 Trends in Internet of Things*.)

Top reported challenges to improving cybersecurity

1. Lack of budget dedicated to cybersecurity
2. Low understanding of cybersecurity trends
3. Low understanding of new threats
4. Belief that current efforts are good enough
5. Lack of metrics to demonstrate effectiveness

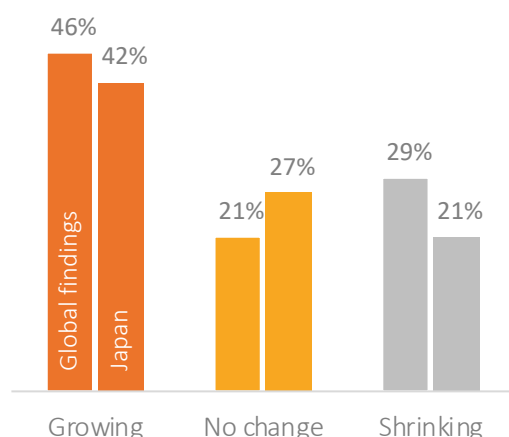
OVERCOMING WORKFORCE GAPS

The evolving tech labor market continues to present both opportunities and trials. Skills gaps particularly remain an ongoing challenge at most organizations. When considering the general concept of a country's tech skills gap, most in Japan in CompTIA's latest research recall recently seeing or hearing about it (87% vs. 86% globally). Rates are especially high within countries that have more maturing economies, i.e. Brazil, China, India, Mideast, and Thailand vs. the more mature grouping that have been grappling with the issue for decades in countries such as Australia, Canada, UK, and US.

Moreover, 4 in 10 report that the skills gap situation at their firm has grown over the past two years (42% for Japan vs. 46% globally). Businesses in the mature grouping of countries report no change at a higher rate compared to firms in maturing countries.

Much too often "skills gaps" are used as a term to generalize a host of other workforce issues. Skills gaps primarily meaning employee performance falling short of employer expectations or desires is far different from what could be described as a location or a pay gap. When breaking down some of the various types of gaps, the top ones the research identified as barriers in hiring and maintaining a robust tech workforce in Japan include soft skills, perception, innovation, and wage gaps. Soft skills challenges are a symptom of insufficient skill / capability in non-technical areas such as project management, collaboration, or communication. A perception gap exists when employers expect workers to fit a specific mold / not considering diverse backgrounds. Companies reporting an innovation gap

**Perceived change in skills gap
over the past 2 years**



Top priorities for boosting cybersecurity skills

55%	Risk management / mitigation
49%	Network monitoring / access management
47%	Data loss prevention / data security
45%	Cloud security
40%	Legal compliance / policies
35%	Next-gen (e.g. AI predictive analytics tools)
33%	Firewalls and antivirus
24%	Penetration testing / ethical hacking

see that the speed of innovation is exceeding the pace of training / workforce development. A wage gap will occur when market wages for certain positions / skills exceed employer budgets. With over a third or more citing these three types of gaps alone, and at least a quarter citing others such as gaps in location, confidence, or sector, making even incremental changes in these types of issues is no small feat but will reap substantial rewards.

Getting more into the matter of tech skills gaps, the top areas of concern reported by managers in the CompTIA survey include a mix of newer tech areas as well as more core as technologies progress. For instance, the more specific areas of cybersecurity skill gap concerns address both cloud and networks. (See table above.) Top tech skills gap [significant + moderate] areas include:

- Integrating different apps, data sources, platforms, devices [49% vs. 55% global]
- Emerging tech [48% vs. 57% global]
- Software or app development [46% vs. 54% global]
- Soft skills [44% vs. 52% global]
- Data mgmt. / analytics [43% vs. 53% global]
- Cybersecurity [42% vs. 55% global]

21% Unrealistic expectations?

A fifth of Japanese employers acknowledge that unrealistic expectations with skills and experience contribute to exaggerated perceptions of the skills gap. Another 60% acknowledge it is somewhat of a factor.

Obtaining an accurate read on the skills gap situation is difficult and compounded by the issue that only a minority report their own firm has a pretty good handle on identifying and assessing skills gaps (15% Japan vs. 39% global). Conversely, almost half report they often struggle (45% vs. 33% overall). Much of the remainder would place themselves in the middle with a good handle on some roles while struggling with others (27% vs. 25% global).

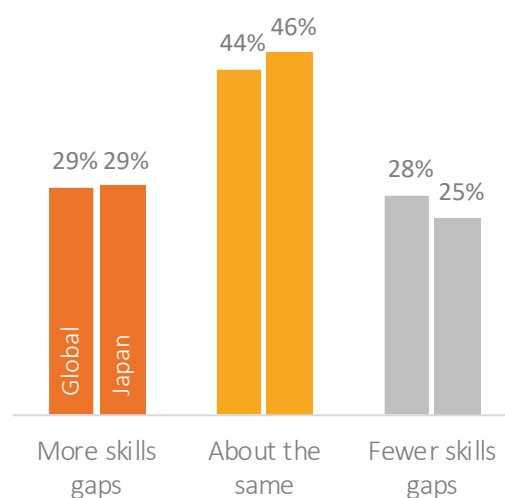
Furthermore, almost 6 in 10 report only having informal strategies / resources in place at their firms to address skills gaps (38% vs. 43% global) or no process at all (21% vs. 10% global). This is at first hard to believe that less than a third indicate having formal strategies (27% vs. 42% global). Interestingly, more countries in the maturing grouping, notably China, India, and Thailand, report formal processes at much higher rates—perhaps born out of urgent necessity. Among the mature economies, the United States has a higher percentage reporting formal strategies to address skills gaps. Overall, businesses in the more mature countries report having informal strategies or nothing in place at significantly higher rates than those in maturing countries.

As important as it is to first identify business objectives then align tech accordingly, employers also need to recognize what needs fixing in regards to skills gaps before jumping into resolutions. And as far as addressing non-technical or ‘soft’ skills, priorities are pretty much in line across the board with few exceptions. For example, innovation ranks higher among those in maturing vs. mature countries.

Top priorities for boosting soft skills

- 48% Flexibility / adaptability
- 45% Project management
- 38% Collaboration / teamwork
- 38% Analytical skills
- 36% Innovation / creative problem solving
- 29% Customer service
- 29% Verbal / written communication skills
- 29% Leadership
- 26% Motivation / initiative
- 21% Strong work ethic

Perception of skills gaps among Gen Y & Z vs. other segments of workers



Delving further into skills gap perceptions, the largest percentage hold the view that skills gaps are about the same among younger workers when compared to the general workforce. Nearly 3 in 10 hold the often unfair and negative belief that there are *more* gaps among the younger Gen Y and Gen Z audience (29% vs. 29% global). While on the other end of the spectrum, a quarter believe there are *fewer* gaps among the younger group (25% vs. 28% global). See CompTIA's *International Youth Perspectives of Technology and Careers* study.

42%

% of Japanese firms indicate they have mandatory training and professional development requirements for staff



Overall, 4 in 10 report their firm has training and professional development for employees in technical or soft skills that is required (42% vs. 63% global). Four in 10 describe it as solely voluntary; not required but encouraged (39% vs. 31% global). Businesses in the maturing countries are more likely to indicate having mandatory training compared to their counterparts in the mature countries (44% vs. 34%, respectively).

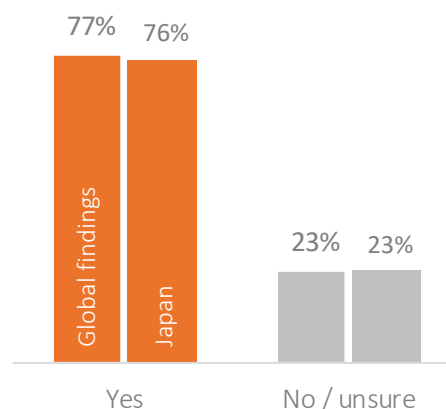
THE FUTURE OF WORK

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Automation of jobs is a prickly topic conjuring up ideas of mass layoffs and the robots taking over. Mass media has a tendency to latch on to the doom and gloom news. Regardless of viewpoints, the majority in CompTIA's study have recently seen articles about robotics, intelligent machines, and other automating technologies performing some aspects of jobs or possibly replacing them altogether (76% in Japan vs. 77% global). On the contrary, the automation of repetitive tasks has spun opportunities elsewhere. For instance, tech support at one time may have been considered as 'on its way out.' Quite the opposite occurred with this growing field as technological advancements breed support needs.

On a slightly more personal level, more than 6 in 10 are very concerned (17%) or somewhat concerned (47%) that automating technologies may mean fewer jobs for people like them. A fifth aren't that concerned—21% in Japan versus the 28% globally. McKinsey & Co. finds a very low portion of occupations that consists of activities that can be fully automated—less than 5%. Displacement rates will depend on a number of factors, but are most likely to occur in fields such as office support, food service, production work, and customer service and retail sales. McKinsey also points to growing demand for technological, social and emotional, and higher cognitive skills by 2030; especially given the adoption of automation and AI. See CompTIA's *International Youth Perspectives of Technology and Careers*.

Familiarity with stories about automating technologies and workforce impact



Three out of 4 indicate at least some interest in attaining additional training or hands-on experience with technology as a result of the outlook for how robotics and automating technologies may impact the workforce (75% in Japan versus the 69% global, definitely + somewhat).

At any rate there's a need for employers, employees, and candidates to focus now more than ever on the continuous improvements of skills and training to keep pace with emerging technology—and employers need to drive impactful professional development strategies.

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

1. More time set aside for training
2. More e-Learning
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5. More autonomy in developing training program
6. More apprenticeship-type work-study programs
7. More mobile options / app-based
8. More simulations or gaming elements
9. More social elements
10. More classroom instructor-led training



INTRODUCTION

The impact of technology continues to grow. The intersection of technology and business operations, technology and people, technology and government, and technology and just about everything else, will mean more change on more fronts in the years to come.

While it is impossible to know precisely how these changes will unfold, CompTIA's latest research provides a number of clues as to how businesses are responding and the challenges they are working to overcome.

According to the data, innovation remains a top business priority. Likewise, robust spending projections on emerging technologies, such as the internet of things, big data, artificial intelligence, and robotics confirm the steady advance of digitization.

At the same time, the demand for tech talent has never been higher. Across every business type and industry sector, employers recognize the importance of cultivating a tech-savvy workforce.

While there are common threads underpinning many of these trends, there is much to learn from the unique experiences and approaches taken by countries around the world.



71.4

score

Average of ICT adoption + digital skills of population (100-point scale)
Source: World Economic Forum Global Competitiveness 2019

\$57.7

billion

Total spending on tech in Oman, Saudi Arabia, and the United Arab Emirates. Inclusive of hardware, software, services, telecom, and emtech.
Sources: CompTIA | IDC | 2020 projection

6 in 10

% of employers with some degree of difficulty in identifying and addressing skills gaps

48%

% citing the speed of innovation as a factor contributing to workforce gaps

93%

NET % of businesses relying on outside technology service providers at least occasionally

3 in 4

NET % with some degree of excitement for opportunities associated with emerging technologies

THE BUSINESS OF TECHNOLOGY

The size of the global technology industry continues to grow as spending is expected to reach \$5.2 trillion worldwide in 2020, according to the research consultancy IDC. Tech spending in the Middle East (represented by Oman, Saudi Arabia, and the United Arab Emirates in this study) is projected to reach an estimated \$57.7 billion in 2020. See CompTIA's *IT Industry Outlook* for more on the global market.

While the mix of spending categories may vary, businesses around the world are investing in hardware, software, services, and telecommunications. Technology will play a growing integral role as companies in the Middle East focus on key strategic priorities such as innovation (63%), implementing new systems and processes (58%), launching new products or services (46%), and navigating government policies (38%). More than a third also prioritize hiring skilled workers to help them drive technology initiatives into the future (39%).

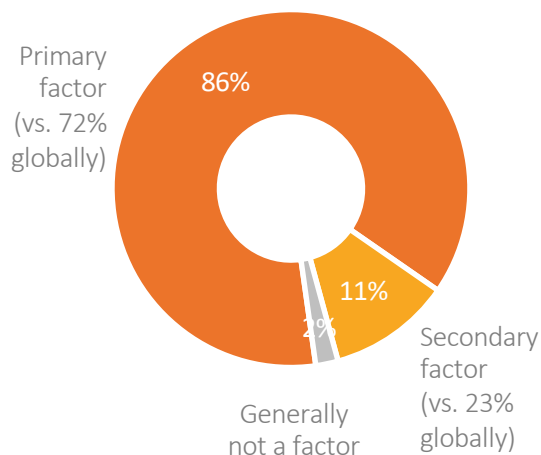
Businesses of all types rate technology a critically important factor to their success. Among the Middle East firms that CompTIA surveyed, almost 9 in 10 rate technology as a primary factor in reaching business objectives (86%). One in 10 consider technology a secondary factor in helping to meet those goals (11%), while just 2% describe technology as a nonfactor. There is a disconnect though between technology as a priority and the reality that a segment of businesses say they under-invest in technology. Nearly 1 in 10 (7%) believe their firm's allocation of budget to tech spending is "too low."

Furthermore, when considering what Middle East businesses spend vs. the value and benefits received, nearly 7 out of 10 report that their firm gets excellent or good ROI from its technology spending (69%; on par with the 66% global). Primary reasons that contribute to perceptions of disappointing ROI of technology investments include ongoing maintenance costs or support fees, upfront cost / too expensive, required upgrades / built-in obsolescence, insufficient features / capabilities, staff time time required to operate / maintain, and complexity / poor user experience.

29% Managed services utilization

According to the data, 3 in 10 Mideastern firms report use of a managed service provider for ongoing IT operations management. Firms who outsource more often report higher perceptions of ROI.

Rating of technology as a factor in reaching business objectives



Certainly technology plays a role in achieving corporate objectives, but technology alone will not produce the desired results. Employers must also address the people and process elements of the equation to achieve optimal outcomes. Businesses face a range of challenges in executing their vision from resource constraints, lack of expertise, skills gaps, and so on. Consequently, most Middle East organizations rely on some degree of outside provider of tech services. For instance, 9 in 10 firms indicate outsourcing or using outside tech firms / expertise at least occasionally in a typical year (93%); including more than half who do so regularly (33%) or frequently (22%).

Top reported uses of outside tech services

1. Web design / e-commerce related
2. Troubleshooting / repair / maintenance
3. Cybersecurity related
4. Deployment / integration (e.g. cloud migration)
5. Consulting / advisory / strategy services

Organizations in the Middle East turn to outside expertise for a number of other services as well including data / analytics, software development, and emerging technology. In addition, close to a third report using managed services / use of a managed service provider (MSP) for ongoing IT management (29%). Interestingly, firms who regularly or frequently outsource are significantly more likely to report excellent or good ROI (79% in maturing economies such as the Mideast) vs. those who occasionally outsource (67%) or rarely / never do so (51%).

EMERGING TECH MOMENTUM BUILDS

The concept of emerging technology is a common shorthand for a range of innovations in the early to mid stages of adoption. This may encompass distinct categories, such as drones or 3-D printers, or enabling technologies, such as artificial intelligence or blockchain, embedded or serving as a platform for countless products or services.

The current and future impact of these technologies can be seen in their growth rates and revenue contributions. According to IDC, sales of emerging tech categories will increase by 105% worldwide during the 2019-2023 time period, adding \$1.5 trillion in new revenue to the global tech sector. In the year ahead, categories such as AI (+31%), blockchain (+70%), AR/VR (+99%), and IoT (+15%) will gain further traction as they move into new segments of customers.

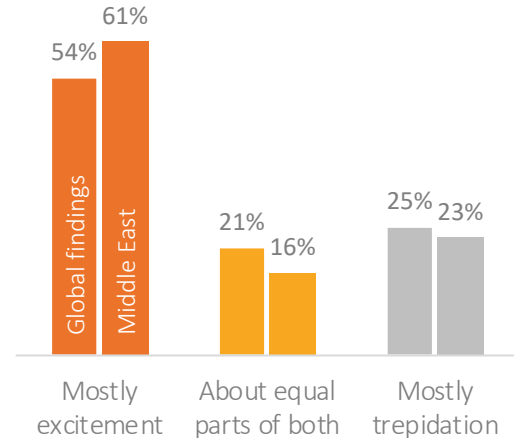
As a percentage of the overall technology pie, emerging tech will account for about 17% in 2020, with the remaining share stemming from the established categories of hardware, software, services, and telecom. Of course, there are gray areas where emerging tech overlaps multiple categories. Relatedly, no technology operates in a vacuum. Without robust networks and infrastructure, devices such as PCs and mobile phones, and integration expertise, emerging technologies cannot advance.

According to the CompTIA survey, 6 out of 10 Middle East businesses have a positive view of emerging technology. It can be inferred that respondents see an opportunity specific to their business, or more broadly, a general sense of excitement for where technology is headed. At the other end of the spectrum, 23% report mostly feelings of trepidation. Again, this could be specific to their firm, such as the fear of falling behind in the market, or a broader concern for the uncertainty of technological disruption. Organizations in the maturing bucket of countries tend to be much more eager for emtech opportunities (61% excited in maturing vs. 49% in mature countries).

The data suggests there is a positive correlation between businesses that report a high level of ROI with their current technology spending and excitement for emerging technology. It follows that firms less satisfied with their current technology use express more concern for the future.

Although still far from mainstream adoptions, the emerging technologies reported at the highest rates of implementation are big data, and IoT. (See chart

Top level perceptions of emerging tech



on following page.) Granted, there is a continuum of use, from basic sensors on a network that could be characterized as IoT, to highly complex deployments with myriad inputs generating volumes of data feeding various automating technologies. As such, reported adoption rates are best used as directional guidance.

The primary factors indicated that could stall adoption and utilization of emerging tech tend to focus on the unknowns associated with emerging tech and budget. Businesses in the Mideast are significantly more likely to indicate risk aversion than those in several other countries (40% vs. 25% global).

40%

% of Middle East businesses that say risk aversion is a primary factor in their decision to postpone emtech adoption



Primary factors cited as inhibiting the adoption of emerging technologies

1. Risk aversion / uncertainty
2. Budget constraints
3. Confusion / overwhelmed with options
4. Lack of a clear business case

CYBERSECURITY: DISCONNECTS ON MANY FRONTS

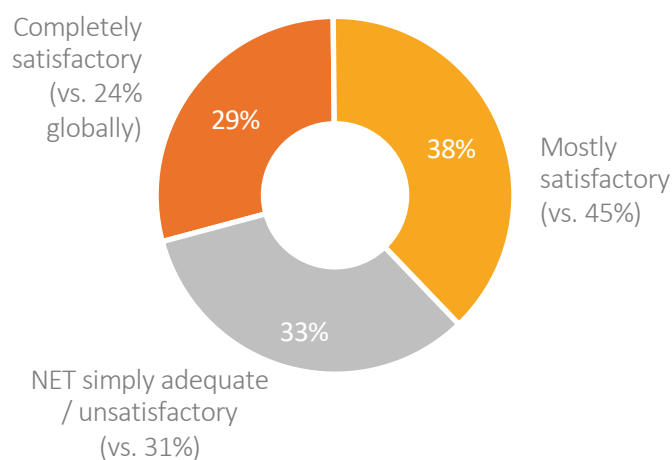
Cybersecurity continues to grow in importance in an increasingly digital and interconnected world. Many businesses are increasing their security investments or elevating their security focus, yet needing to employ progressively more proactive measures. Again, technologies and tools only go so far as employers need to build and enhance their processes, policies, and—most importantly—people.

Nearly 7 out of 10 Middle East businesses (again, represented by Oman, Saudi Arabia, and the United Arab Emirates in this study) describe their firm's cybersecurity at a completely (29%) or mostly satisfactory (38%) level. This still indicates some room for improvement, with the remainder describing their firm's approach as simply adequate or unsatisfactory (33%).

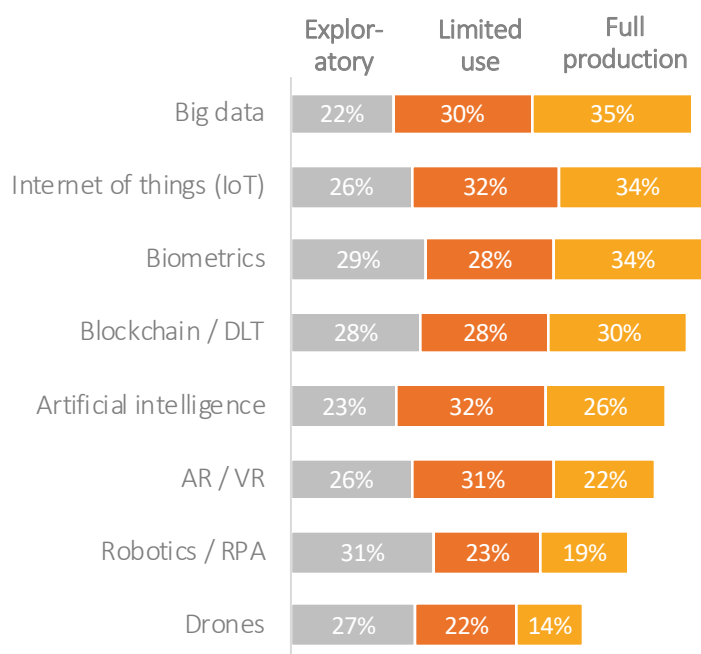
Satisfaction levels among firms in the Middle East are largely on par when compared to overall results (67% vs. 69% net satisfactory, respectively). Satisfaction rates in the Middle East are significantly higher than those in Japan and the Netherlands.

Self-assessment levels of security satisfaction are presumably even lower as firms are more likely to report on themselves on the optimistic side. This is further compounded by the fact that businesses are oftentimes less prepared than they believe, and even more so as it relates to emerging areas.

Self-assessment of cybersecurity posture



Emerging tech adoption tracking



Security underpins the many facets of emerging technology. This, along with the high growth rates for emerging technologies expected over the next several years, drives the need for businesses to re-evaluate their approaches to security. Consider that 90% of Middle East firms reported recently changing their security approach; with 35% being due to a change in IT operations (move to cloud, new IoT strategy, etc.), 34% being due to a change in management. For another 36%, cybersecurity priorities shifted as a result of knowledge gained from training or certification.

Furthermore, a low understanding of new threats is a top challenge cited for why it may be difficult to pursue new cybersecurity challenges. For example, consider the wide range of security risks with IoT as digital meshes with physical properties. (See CompTIA's *2019 Trends in Internet of Things*.)

Top reported challenges to improving cybersecurity

1. Low understanding of cybersecurity trends
2. Prioritization of other technology investments
3. Lack of metrics to demonstrate effectiveness
4. Low understanding of new threats
5. Lack of budget dedicated to cybersecurity

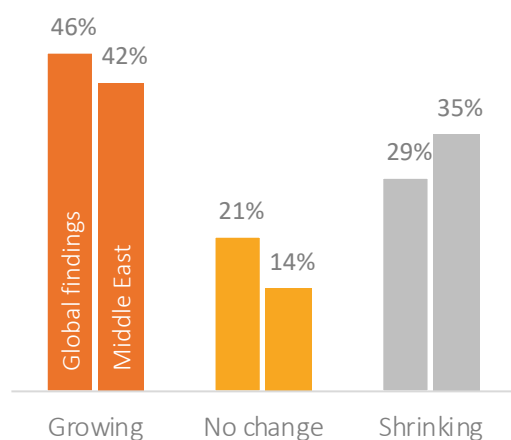
OVERCOMING WORKFORCE GAPS

The evolving tech labor market continues to present both opportunities and trials. Skills gaps particularly remain an ongoing challenge at most organizations. When considering the general concept of a country's tech skills gap, most in the Middle East in CompTIA's latest research recall recently seeing or hearing about it (85% vs. 86% globally). Rates are especially high within countries that have more maturing economies, i.e. Brazil, China, India, Mideast, and Thailand vs. the more mature grouping that have been grappling with the issue for decades in countries such as Australia, Canada, UK, and US.

Moreover, 4 in 10 report that the skills gap situation at their firm has grown over the past two years (42% for Middle East vs. 46% globally). Businesses in the mature grouping of countries report no change at a higher rate compared to firms in maturing countries.

Much too often "skills gaps" are used as a term to generalize a host of other workforce issues. Skills gaps primarily meaning employee performance falling short of employer expectations or desires is far different from what could be described as a location or a pay gap. When breaking down some of the various types of gaps, the top ones the research identified as barriers in hiring and maintaining a robust tech workforce in the Middle East include soft skills, innovation, and wage gaps. Soft skills challenges are a symptom of insufficient skill / capability in non-technical areas such as project management, collaboration, or communication. Companies reporting an innovation gap see that the speed of innovation is exceeding the pace of training / workforce development. A wage gap will occur when

**Perceived change in skills gap
over the past 2 years**



Top priorities for boosting cybersecurity skills

62%	Network monitoring / access management
52%	Data loss prevention / data security
44%	Penetration testing / ethical hacking
41%	Risk management / mitigation
38%	Firewalls and antivirus
36%	Next-gen (e.g. AI predictive analytics tools)
33%	Cloud security
33%	Legal compliance / policies

market wages for certain positions / skills exceed employer budgets. With over a third or more citing these three types of gaps alone, and at least a quarter citing others such as gaps in sector, confidence, perception, or location, making even incremental changes in these types of issues is no small feat but will reap substantial rewards.

Getting more into the matter of tech skills gaps, the top areas of concern reported by managers in the CompTIA survey include a mix of newer tech areas as well as more core as technologies progress. For instance, the more specific areas of cybersecurity skill gap concerns address both cloud and networks. (See table above.) Top tech skills gap [significant + moderate] areas include:

- Data mgmt. / analytics [58% vs. 53% global]
- Emerging tech [54% vs. 57% global]
- Software or app development [54% vs. 54% global]
- Cybersecurity [53% vs. 55% global]
- Digital business transformation / modernizing legacy hardware or software [52% vs. 54% global]

34% Unrealistic expectations?

A third of Middle East employers acknowledge that unrealistic expectations with skills and experience contribute to exaggerated perceptions of the skills gap. Another 59% acknowledge it is somewhat of a factor.

Obtaining an accurate read on the skills gap situation is difficult and compounded by the issue that only a minority report their own firm has a pretty good handle on identifying and assessing skills gaps (42% Middle East vs. 39% global). Conversely, about 3 in 10 report they often struggle (34% vs. 33% overall). The remaining fifth would place themselves in the middle with a good handle on some roles while struggling with others (22% vs. 25% global).

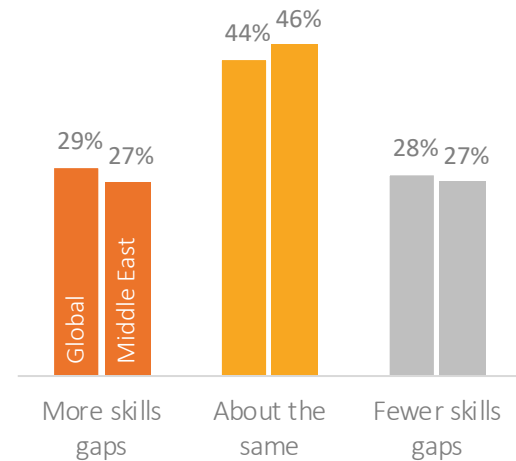
Furthermore, more than half report only having informal strategies / resources in place at their firms to address skills gaps (43% vs. 43% global) or no process at all (14% vs. 10% global). This is at first hard to believe that less than half indicate having formal strategies (41% vs. 42% global). Interestingly, more countries in the maturing grouping, notably China, India, and Thailand, report formal processes at much higher rates—perhaps born out of urgent necessity. Among the mature economies, the United States has a higher percentage reporting formal strategies to address skills gaps. Overall, businesses in the more mature countries report having informal strategies or nothing in place at significantly higher rates than those in maturing countries.

As important as it is to first identify business objectives then align tech accordingly, employers also need to recognize what needs fixing in regards to skills gaps before jumping into resolutions. And as far as addressing non-technical or ‘soft’ skills, priorities are pretty much in line across the board with few exceptions. For example, innovation ranks higher among those in maturing vs. mature countries.

Top priorities for boosting soft skills

- 57% Innovation / creative problem solving
- 41% Collaboration / teamwork
- 40% Flexibility / adaptability
- 34% Analytical skills
- 34% Customer service
- 33% Strong work ethic
- 31% Project management
- 29% Leadership
- 29% Verbal / written communication skills
- 28% Motivation / initiative

Perception of skills gaps among Gen Y & Z vs. other segments of workers



Delving further into skills gap perceptions, the largest percentage hold the view that skills gaps are about the same among younger workers when compared to the general workforce. A third hold the often unfair and negative belief that there are *more* gaps among the younger Gen Y and Gen Z audience (27% vs. 29% global). While on the other end of the spectrum, little more than a quarter believe there are *fewer* gaps among the younger group (27% vs. 28% global). See CompTIA's *International Youth Perspectives of Technology and Careers* study.

70%

% of Middle East firms indicate they have mandatory training and professional development requirements for staff



Overall, 7 in 10 report their firm has training and professional development for employees in technical or soft skills that is required (70% vs. 63% global). Another quarter describe it as solely voluntary; not required but encouraged (26% vs. 31% global). Businesses in the maturing countries are more likely to indicate having mandatory training compared to their counterparts in the mature countries (44% vs. 34%, respectively).

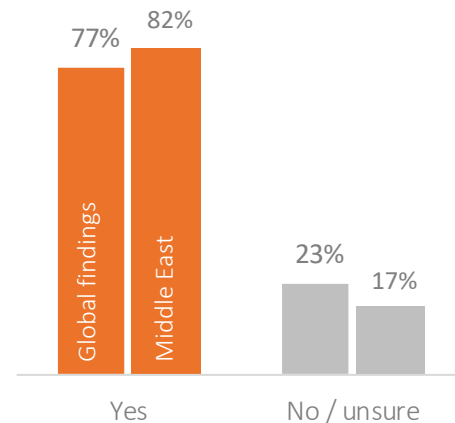
THE FUTURE OF WORK

Undoubtedly, technology will continue to profoundly impact nearly everyone's job—and it's mostly for the better. While on the one hand automating technologies have displaced segments of workers through substitution, in most cases automation frees up time for workers to focus on higher-level activities.

Automation of jobs is a prickly topic conjuring up ideas of mass layoffs and the robots taking over. Mass media has a tendency to latch on to the doom and gloom news. Regardless of viewpoints, the majority in CompTIA's study have recently seen articles about robotics, intelligent machines, and other automating technologies performing some aspects of jobs or possibly replacing them altogether (82% in the Middle East vs. 77% global). On the contrary, the automation of repetitive tasks has spun opportunities elsewhere. For instance, tech support at one time may have been considered as 'on its way out.' Quite the opposite occurred with this growing field as technological advancements breed support needs.

On a slightly more personal level, almost 7 in 10 are very concerned (22%) or somewhat concerned (46%) that automating technologies may mean fewer jobs for people like them. Another quarter aren't that concerned—25% in the Middle East, about the same as the 28% globally. McKinsey & Co. finds a very low portion of occupations that consists of activities that can be fully automated—less than 5%. Displacement rates will depend on a number of factors, but are most likely to occur in fields such as office support, food service, production work, and customer service and retail sales. McKinsey also points to growing demand for technological, social and emotional, and higher cognitive skills by 2030; especially given the adoption of automation and AI. See CompTIA's *International Youth Perspectives of Technology and Careers*.

Familiarity with stories about automating technologies and workforce impact



Three out of 4 indicate at least some interest in attaining additional training or hands-on experience with technology as a result of the outlook for how robotics and automating technologies may impact the workforce (75% vs. 69% global, definitely + somewhat).

At any rate there's a need for employers, employees, and candidates to focus now more than ever on the continuous improvements of skills and training to keep pace with emerging technology—and employers need to drive impactful professional development strategies.

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

1. More cross-training (e.g. other functions)
2. More time set aside for training
3. More training alignment with development goals
4. More mobile options / app-based
5. More e-Learning
6. More classroom instructor-led training
7. More apprenticeship-type work-study programs
8. More autonomy in developing training program
9. More simulations or gaming elements
10. More social elements



INTRODUCTION

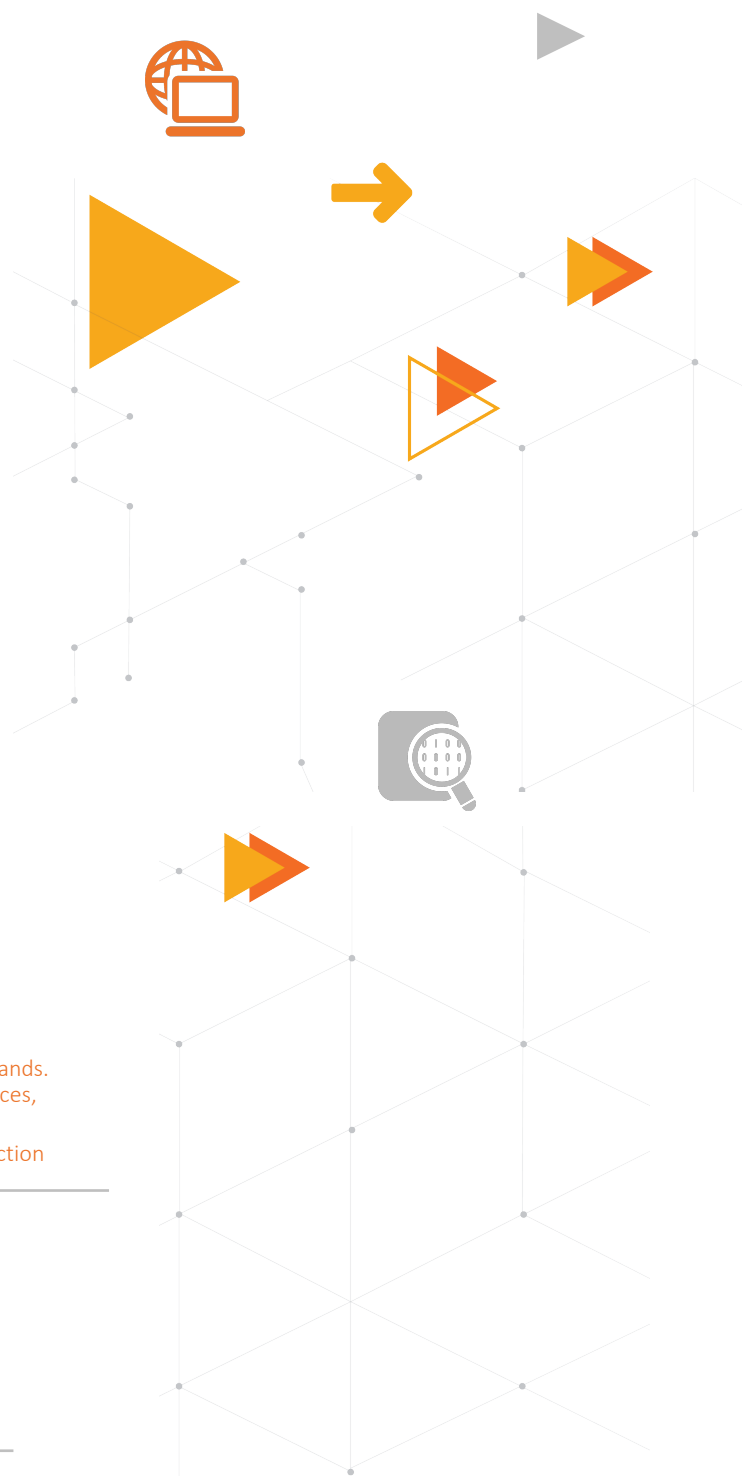
The impact of technology continues to grow. The intersection of technology and business operations, technology and people, technology and government, and technology and just about everything else, will mean more change on more fronts in the years to come.

While it is impossible to know precisely how these changes will unfold, CompTIA's latest research provides a number of clues as to how businesses are responding and the challenges they are working to overcome.

According to the data, innovation remains a top business priority. Likewise, robust spending projections on emerging technologies, such as the internet of things, big data, artificial intelligence, and robotics confirm the steady advance of digitization.

At the same time, the demand for tech talent has never been higher. Across every business type and industry sector, employers recognize the importance of cultivating a tech-savvy workforce.

While there are common threads underpinning many of these trends, there is much to learn from the unique experiences and approaches taken by countries around the world.



76.7

score

Average of ICT adoption + digital skills of population (100-point scale)
Source: World Economic Forum Global Competitiveness 2019

\$49.0

billion

Total spending on tech in the Netherlands. Inclusive of hardware, software, services, telecom, and emtech.
Sources: CompTIA | IDC | 2020 projection

6 in 10

% of employers with some degree of difficulty in identifying and addressing skills gaps

48%

% citing the speed of innovation as a factor contributing to workforce gaps

86%

NET % of businesses relying on outside technology service providers at least occasionally

2 in 3

NET % with some degree of excitement for opportunities associated with emerging technologies

THE BUSINESS OF TECHNOLOGY

The size of the global technology industry continues to grow as spending is expected to reach \$5.2 trillion worldwide in 2020, according to the research consultancy IDC. Tech spending in the Netherlands is projected to reach an estimated \$49.0 billion in 2020. See CompTIA's *IT Industry Outlook* for more on the global market.

While the mix of spending categories may vary, businesses around the world are investing in hardware, software, services, and telecommunications. Technology will play a growing integral role as companies in the Netherlands focus on key strategic priorities such as innovation (54%), implementing new systems and processes (51%), identifying new customer segments and markets (40%), and defending business against new competitive threats (40%). Over half also prioritize hiring skilled workers to help them drive technology initiatives into the future (54%).

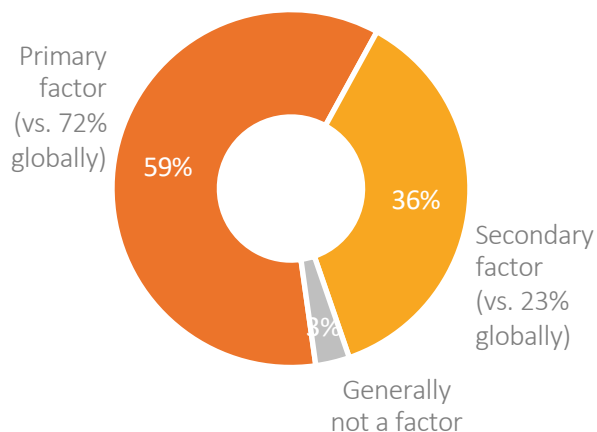
Businesses of all types rate technology a critically important factor to their success. Among the Netherlands firms that CompTIA surveyed, nearly 6 in 10 rate technology as a primary factor in reaching business objectives (59%). More than a third consider technology a secondary factor in helping to meet those goals (36%), while just 3% describe technology as a nonfactor. There is a disconnect though between technology as a priority and the reality that a segment of businesses say they under-invest in technology. Over a quarter believe their firm's allocation of budget to tech spending is "too low."

Furthermore, when considering what Netherlands businesses spend vs. the value and benefits received, the majority report that their firm gets excellent or good ROI from its technology spending (53%; much lower than the 66% global). Regardless, primary reasons that contribute to perceptions of disappointing ROI of technology investments include staff time required to operate / maintain, ongoing maintenance costs or support fees, complexity / poor user experience, upfront cost / too expensive, unreliability, and required upgrades / built-in obsolescence.

21% Managed services utilization

According to the data, 1 in 5 Netherlands firms report use of a managed service provider for ongoing IT operations management. Firms who outsource more often report higher perceptions of ROI.

Rating of technology as a factor in reaching business objectives



Certainly technology plays a role in achieving corporate objectives, but technology alone will not produce the desired results. Employers must also address the people and process elements of the equation to achieve optimal outcomes. Businesses face a range of challenges in executing their vision from resource constraints, lack of expertise, skills gaps, and so on. Consequently, most Netherlands organizations rely on some degree of outside provider of tech services. For instance, nearly 9 in 10 indicate outsourcing or using outside tech firms / expertise at least occasionally in a typical year (86%); including more than half who do so regularly (34%) or frequently (14%).

Top reported uses of outside tech services

1. Troubleshooting / repair / maintenance
2. Deployment / integration (e.g. cloud migration)
3. Consulting / advisory / strategy services
4. Cybersecurity related
5. Software development

Organizations in the Netherlands turn to outside expertise for a number of other services as well including data / analytics, web design, and emerging tech. In addition, nearly a quarter report using managed services / use of a managed service provider (MSP) for ongoing IT management (21%). Interestingly, firms who regularly or frequently outsource are significantly more likely to report excellent or good ROI (65% in mature economies such as the Netherlands) vs. those who occasionally outsource (60%) or rarely / never do so (57%).

EMERGING TECH MOMENTUM BUILDS

The concept of emerging technology is a common shorthand for a range of innovations in the early to mid stages of adoption. This may encompass distinct categories, such as drones or 3-D printers, or enabling technologies, such as artificial intelligence or blockchain, embedded or serving as a platform for countless products or services.

The current and future impact of these technologies can be seen in their growth rates and revenue contributions. According to IDC, sales of emerging tech categories will increase by 105% worldwide during the 2019-2023 time period, adding \$1.5 trillion in new revenue to the global tech sector. In the year ahead, categories such as AI (+31%), blockchain (+70%), AR/VR (+99%), and IoT (+15%) will gain further traction as they move into new segments of customers.

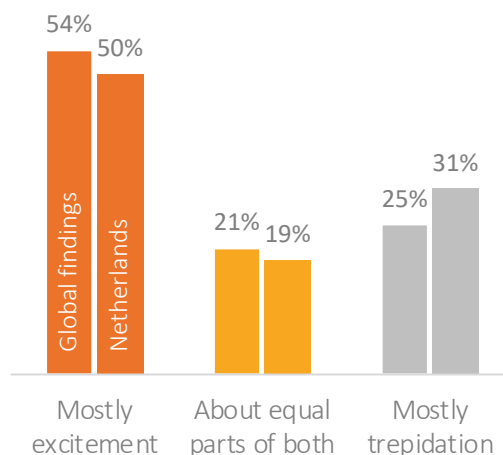
As a percentage of the overall technology pie, emerging tech will account for about 17% in 2020, with the remaining share stemming from the established categories of hardware, software, services, and telecom. Of course, there are gray areas where emerging tech overlaps multiple categories. Relatedly, no technology operates in a vacuum. Without robust networks and infrastructure, devices such as PCs and mobile phones, and integration expertise, emerging technologies cannot advance.

According to the CompTIA survey, 1 in 2 Netherlands businesses have a positive view of emerging technology. It can be inferred that respondents see an opportunity specific to their business, or more broadly, a general sense of excitement for where technology is headed. At the other end of the spectrum, 1 in 3 report mostly feelings of trepidation. Again, this could be specific to their firm, such as the fear of falling behind in the market, or a broader concern for the uncertainty of technological disruption. Organizations in the maturing bucket of countries tend to be much more eager for emtech opportunities (61% excited in maturing vs. 49% in mature countries).

The data suggests there is a positive correlation between businesses that report a high level of ROI with their current technology spending and excitement for emerging technology. It follows that firms less satisfied with their current technology use express more concern for the future.

Although still far from mainstream adoptions, the emerging technologies reported at the highest rates of implementation are big data and IoT. (See chart on

Top level perceptions of emerging tech



following page.) Granted, there is a continuum of use, from basic sensors on a network that could be characterized as IoT, to highly complex deployments with myriad inputs generating volumes of data feeding various automating technologies. As such, reported adoption rates are best used as directional guidance.

The primary factors indicated that could stall adoption and utilization of emerging tech tend to focus on budget and confusion among customers. Businesses in the Netherlands are significantly more likely to indicate confusion / customers overwhelmed with options than those in other countries (21% vs. 14% global).

18%

% of Netherlands businesses that say risk aversion is a primary factor in their decision to postpone emtech adoption



Primary factors cited as inhibiting the adoption of emerging technologies

1. Budget constraints
2. Confusion / overwhelmed with options
3. Lack of a clear business case
4. Risk aversion / uncertainty

CYBERSECURITY: DISCONNECTS ON MANY FRONTS

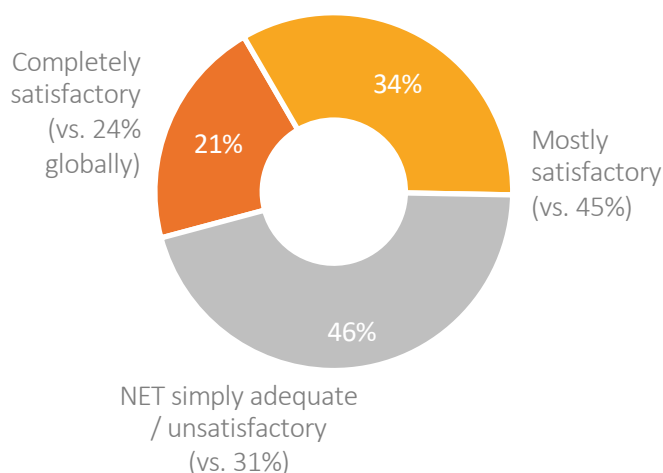
Cybersecurity continues to grow in importance in an increasingly digital and interconnected world. Many businesses are increasing their security investments or elevating their security focus, yet needing to employ progressively more proactive measures. Again, technologies and tools only go so far as employers need to build and enhance their processes, policies, and—most importantly—people.

Just over half of Netherlands firms describe their firm's cybersecurity at a completely (21%) or mostly satisfactory (34%) level. This indicates a lot of room for improvement, especially with the remainder describing their firm's approach as simply adequate (34%) or unsatisfactory (12%).

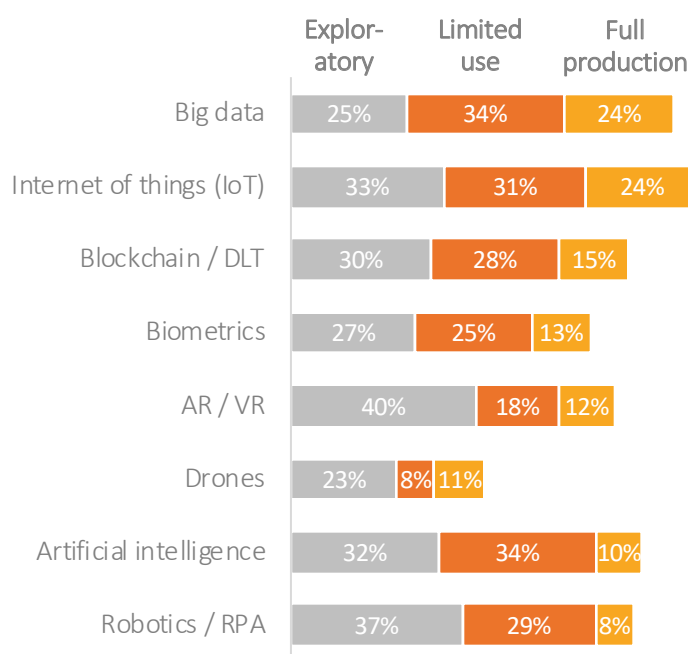
Satisfaction levels among firms in the Netherlands are notably lower compared to overall results (54% vs. 69% net satisfactory, respectively) as well as those in many of the other mature countries included in this study. For instance, those in Australia, Canada, Ireland, the UK, and the US all report significantly higher satisfactory ratings than their Netherlands counterparts.

Self-assessment levels of security satisfaction are presumably even lower as firms are more likely to report on themselves on the optimistic side. This is further compounded by the fact that businesses are oftentimes less prepared than they believe, and even more so as it relates to emerging areas.

Self-assessment of cybersecurity posture



Emerging tech adoption tracking



Security underpins the many facets of emerging technology. This, along with the high growth rates for emerging technologies expected over the next several years, drives the need for businesses to re-evaluate their approaches to security. Consider that 85% of Netherlands firms reported recently changing their security approach; with 34% being due to a change in IT operations (move to cloud, new IoT strategy, etc.). For another 29%, cybersecurity priorities shifted as a result of knowledge gained from training or certification.

Furthermore, a low understanding of new threats is a top challenge cited for why it may be difficult to pursue new cybersecurity challenges. For example, consider the wide range of security risks with IoT as digital meshes with physical properties. (See CompTIA's *2019 Trends in Internet of Things*.)

Top reported challenges to improving cybersecurity

1. Prioritization of other technology investments
2. Belief that current efforts are 'good enough'
3. Low understanding of new threats
4. Lack of budget dedicated to cybersecurity
5. Lack of metrics to demonstrate effectiveness

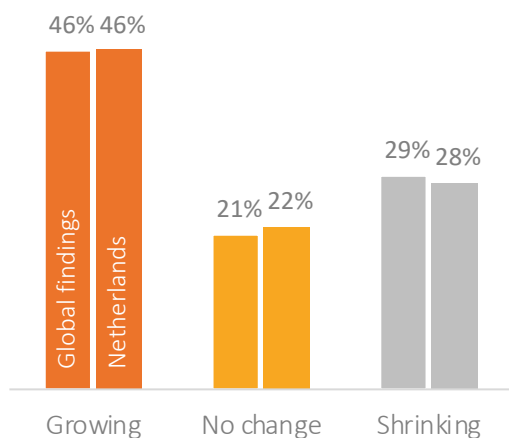
OVERCOMING WORKFORCE GAPS

The evolving tech labor market continues to present both opportunities and trials. Skills gaps particularly remain an ongoing challenge at most organizations. When considering the general concept of a country's tech skills gap, most in the Netherlands in CompTIA's latest research recall recently seeing or hearing about it (79% vs. 86% global). Rates are especially high within countries that have more maturing economies, i.e. Brazil, China, India, Mideast, and Thailand vs. the more mature grouping that have been grappling with the issue for decades in countries such as Australia, Canada, UK, and US.

Moreover, nearly half report that the skills gap situation at their firm has grown over the past two years (46% for the Netherlands, same as globally). Businesses in the mature grouping of countries report no change at a higher rate compared to firms in maturing countries.

Much too often "skills gaps" are used as a term to generalize a host of other workforce issues. Skills gaps primarily meaning employee performance falling short of employer expectations or desires is far different from what could be described as a location or a pay gap. When breaking down some of the various types of gaps, the top ones the research identified as barriers in hiring and maintaining a robust tech workforce in the Netherlands include innovation, wage, and soft skills gaps. Companies reporting an innovation gap see that the speed of innovation is exceeding the pace of training / workforce development. A wage gap will occur when market wages for certain positions / skills exceed employer budgets. Soft skills challenges are a symptom of insufficient skill / capability in non-

Perceived change in skills gap
over the past 2 years



Top priorities for boosting cybersecurity skills

57%	Cloud security
49%	Risk management / mitigation
45%	Firewalls and antivirus
40%	Data loss prevention / data security
34%	Next-gen (e.g. AI predictive analytics tools)
28%	Network monitoring / access management
28%	Penetration testing / ethical hacking
22%	Legal compliance / policies

technical areas such as project management, collaboration, or communication. With over a third or more citing these three types of gaps alone, and at least 1 in 5 citing others such as gaps in sector, confidence, perception, or location, making even incremental changes in these types of issues is no small feat but will reap substantial rewards.

Getting more into the matter of tech skills gaps, the top areas of concern reported by managers in the CompTIA survey include a mix of newer tech areas as well as more core as technologies progress. For instance, the more specific areas of cybersecurity skill gap concerns address both cloud and networks. (See table above.) Top tech skills gap [significant + moderate] areas include:

- Digital business transformation / modernizing legacy hardware or software [58% vs. 54% global]
- Tech / IT support [55% vs. 49% global]
- Soft skills [54% vs. 52% global]
- Cybersecurity [52% vs. 55% global]
- Data mgmt. / analytics [52% vs. 53% global]

29% Unrealistic expectations?

3 in 10 Netherlands employers acknowledge that unrealistic expectations with skills and experience contribute to exaggerated perceptions of the skills gap. Another 53% acknowledge it is somewhat of a factor.

Obtaining an accurate read on the skills gap situation is difficult and compounded by the issue that only a minority report their own firm has a pretty good handle on identifying and assessing skills gaps (36% Netherlands vs. 39% global). Conversely, about 3 in 10 report they often struggle (27% vs. 33% overall). The remaining third would place themselves in the middle with a good handle on some roles while struggling with others (33% vs. 25% global).

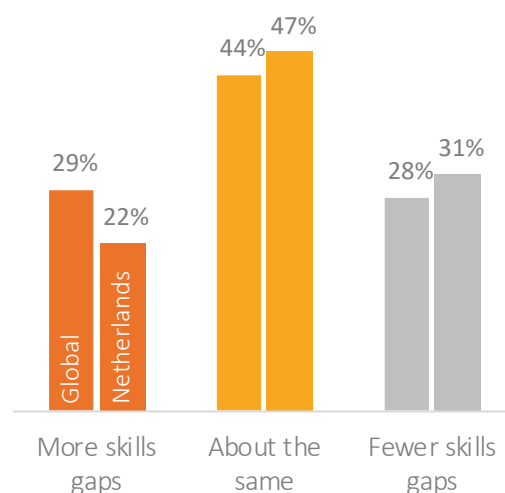
Furthermore, over half report only having informal strategies / resources in place at their firms to address skills gaps (57% vs. 43% global) or no process at all (6% vs. 10% global). This is at first hard to believe that only about 3 in 10 indicate having formal strategies (32% vs. 42% global). Interestingly, more countries in the maturing grouping, notably China, India, and Thailand, report formal processes at much higher rates—perhaps born out of urgent necessity. While informal strategies are much preferred in the Netherlands. Overall, businesses in the more mature countries report having informal strategies or nothing in place at significantly higher rates than those in maturing countries.

As important as it is to first identify business objectives then align tech accordingly, employers also need to recognize what needs fixing in regards to skills gaps before jumping into resolutions. And as far as addressing non-technical or ‘soft’ skills, priorities are pretty much in line across the board with few exceptions. For example, innovation ranks higher among those in maturing vs. mature countries.

Top priorities for boosting soft skills

40%	Collaboration / teamwork
40%	Motivation / initiative
37%	Leadership
37%	Customer service
30%	Analytical skills
29%	Flexibility / adaptability
29%	Strong work ethic
29%	Project management
26%	Innovation / creative problem solving
20%	Verbal / written communication skills

Perception of skills gaps among Gen Y & Z vs. other segments of workers



Delving further into skills gap perceptions, the largest percentage believe that the skills gaps among young people are on par with the general workforce (47% vs. 44% global). Though 2 in 10 hold the often unfair and negative belief that there are *more* gaps among the younger Gen Y and Gen Z audience (22% vs. 29% global). While on the other end of the spectrum, about 3 in 10 believe there are *fewer* gaps among the younger group (31% vs. 28% global). See CompTIA's *International Youth Perspectives of Technology and Careers* study.

60%

% of Netherlands firms indicate they have mandatory training and professional development requirements for staff



Overall, 6 in 10 report their firm has training and professional development for employees in technical or soft skills that is required (60% vs. 63% global). Another third describe it as solely voluntary; not required but encouraged (33% vs. 31% global). Businesses in the maturing countries are more likely to indicate having mandatory training compared to their counterparts in the mature countries (44% vs. 34%, respectively).

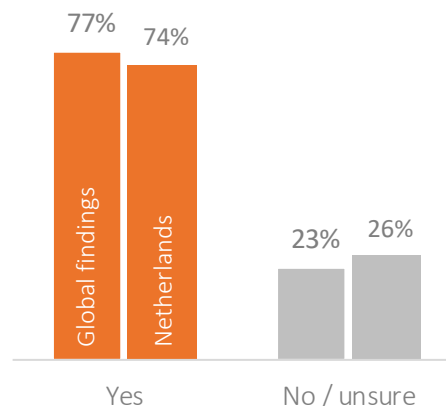
THE FUTURE OF WORK

Undoubtedly, technology will continue to profoundly impact nearly everyone's job—and it's mostly for the better. While on the one hand automating technologies have displaced segments of workers through substitution, in most cases automation frees up time for workers to focus on higher-level activities.

Automation of jobs is a prickly topic conjuring up ideas of mass layoffs and the robots taking over. Mass media has a tendency to latch on to the doom and gloom news. Regardless of viewpoints, the majority in CompTIA's study have recently seen articles about robotics, intelligent machines, and other automating technologies performing some aspects of jobs or possibly replacing them altogether (74% in the Netherlands vs. 77% global). On the contrary, the automation of repetitive tasks has spun opportunities elsewhere. For instance, tech support at one time may have been considered as 'on its way out.' Quite the opposite occurred with this growing field as technological advancements breed support needs.

On a slightly more personal level, about half are very concerned (16%) or somewhat concerned (36%) that automating technologies may mean fewer jobs for people like them. Another 43% aren't that concerned—much higher vs. the 28% globally. McKinsey & Co. finds a very low portion of occupations that consists of activities that can be fully automated—less than 5%. Displacement rates will depend on a number of factors, but are most likely to occur in fields such as office support, food service, production work, and customer service and retail sales. McKinsey also points to growing demand for technological, social and emotional, and higher cognitive skills by 2030; especially given the adoption of automation and AI. See CompTIA's *International Youth Perspectives of Technology and Careers*.

Familiarity with stories about automating technologies and workforce impact



About 6 in 10 indicate at least some interest in attaining additional training or hands-on experience with technology as a result of the outlook for how robotics and automating technologies may impact the workforce (61% vs. 69% global, definitely + somewhat).

At any rate there's a need for employers, employees, and candidates to focus now more than ever on the continuous improvements of skills and training to keep pace with emerging technology—and employers need to drive impactful professional development strategies.

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

1. More training alignment with development goals
2. More time set aside for training
3. More e-Learning
4. More classroom instructor-led training
5. More cross-training (e.g. other functions)
6. More autonomy in developing training program
7. More apprenticeship-type work-study programs
8. More simulations or gaming elements
9. More social elements
10. More mobile options / app-based



INTRODUCTION

The impact of technology continues to grow. The intersection of technology and business operations, technology and people, technology and government, and technology and just about everything else, will mean more change on more fronts in the years to come.

While it is impossible to know precisely how these changes will unfold, CompTIA's latest research provides a number of clues as to how businesses are responding and the challenges they are working to overcome.

According to the data, innovation remains a top business priority. Likewise, robust spending projections on emerging technologies, such as the internet of things, big data, artificial intelligence, and robotics confirm the steady advance of digitization.

At the same time, the demand for tech talent has never been higher. Across every business type and industry sector, employers recognize the importance of cultivating a tech-savvy workforce.

While there are common threads underpinning many of these trends, there is much to learn from the unique experiences and approaches taken by countries around the world.



57.2

score

Average of ICT adoption + digital skills of population (100-point scale)
Source: World Economic Forum Global Competitiveness 2019

\$30.0

billion

Total spending on tech in Thailand.
Inclusive of hardware, software, services, telecom, and emtech.
Sources: CompTIA | IDC | 2020 projection

2 in 3

% of employers with some degree of difficulty in identifying and addressing skills gaps

54%

% citing the speed of innovation as a factor contributing to workforce gaps

94%

NET % of businesses relying on outside technology service providers at least occasionally

9 in 10

NET % with some degree of excitement for opportunities associated with emerging technologies

THE BUSINESS OF TECHNOLOGY

The size of the global technology industry continues to grow as spending is expected to reach \$5.2 trillion worldwide in 2020, according to the research consultancy IDC. Tech spending in Thailand is projected to reach an estimated \$30.0 billion in 2020. See CompTIA's *IT Industry Outlook* for more on the global market.

While the mix of spending categories may vary, businesses around the world are investing in hardware, software, services, and telecommunications. Technology will play a growing integral role as companies in Thailand focus on key strategic priorities such as implementing new systems and processes (70%), innovation (66%), identifying new customer segments and markets (38%), and navigating government policies (34%). Nearly half also prioritize hiring skilled workers to help them drive technology initiatives into the future (47%).

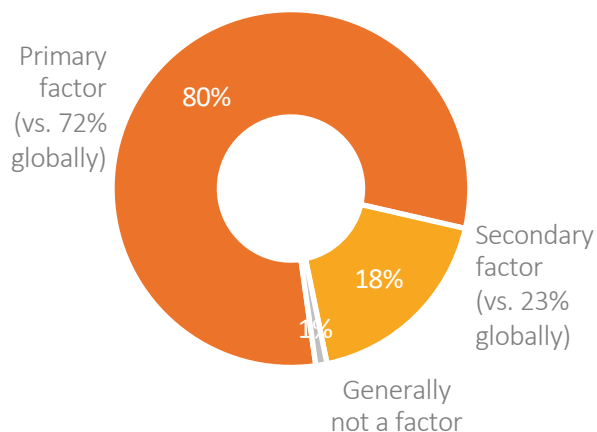
Businesses of all types rate technology a critically important factor to their success. Among the Thailand firms that CompTIA surveyed, 8 in 10 rate technology as a primary factor in reaching business objectives (80%). One in 5 consider technology a secondary factor in helping to meet those goals (18%), while just 1% describe technology as a nonfactor. There is a disconnect though between technology as a priority and the reality that a segment of businesses say they under-invest in technology. Nearly 1 in 5 (17%) believe their firm's allocation of budget to tech spending is "too low."

Furthermore, when considering what Thailand businesses spend vs. the value and benefits received, 7 out of 10 report that their firm gets excellent or good ROI from its technology spending (70%; on par with the 66% global). Primary reasons that contribute to perceptions of disappointing ROI of technology investments include required upgrades / built-in obsolescence, ongoing maintenance costs or support fees, staff time required to operate / maintain, upfront cost / too expensive, unreliability, and complexity.

28% Managed services utilization

According to the data, over a quarter of Thailand firms report use of a managed service provider for ongoing IT operations management. Firms who outsource more often report higher perceptions of ROI.

Rating of technology as a factor in reaching business objectives



Certainly technology plays a role in achieving corporate objectives, but technology alone will not produce the desired results. Employers must also address the people and process elements of the equation to achieve optimal outcomes. Businesses face a range of challenges in executing their vision from resource constraints, lack of expertise, skills gaps, and so on. Consequently, most Thailand organizations rely on some degree of outside provider of tech services. For instance, nearly all firms indicate outsourcing or using outside tech firms / expertise at least occasionally in a typical year (94%); including more than half who do so regularly (32%) or frequently (21%).

Top reported uses of outside tech services

1. Deployment / integration (e.g. cloud migration)
2. Troubleshooting / repair / maintenance
3. Emerging technology related
4. Software development
5. Consulting / advisory / strategy services

Organizations in Thailand turn to outside expertise for a number of other services as well including data / analytics, web design, and cybersecurity. In addition, more than a quarter report using managed services / use of a managed service provider (MSP) for ongoing IT management (28%). Interestingly, firms who regularly or frequently outsource are significantly more likely to report excellent or good ROI (79% in maturing countries such as Thailand) vs. those who occasionally outsource (67%) or rarely / never do so (51%).

EMERGING TECH MOMENTUM BUILDS

The concept of emerging technology is a common shorthand for a range of innovations in the early to mid stages of adoption. This may encompass distinct categories, such as drones or 3-D printers, or enabling technologies, such as artificial intelligence or blockchain, embedded or serving as a platform for countless products or services.

The current and future impact of these technologies can be seen in their growth rates and revenue contributions. According to IDC, sales of emerging tech categories will increase by 105% worldwide during the 2019-2023 time period, adding \$1.5 trillion in new revenue to the global tech sector. In the year ahead, categories such as AI (+31%), blockchain (+70%), AR/VR (+99%), and IoT (+15%) will gain further traction as they move into new segments of customers.

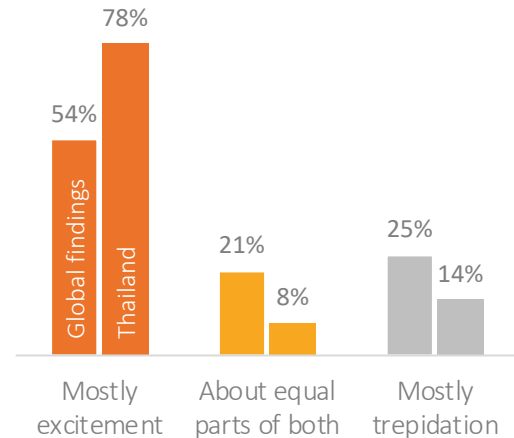
As a percentage of the overall technology pie, emerging tech will account for about 17% in 2020, with the remaining share stemming from the established categories of hardware, software, services, and telecom. Of course, there are gray areas where emerging tech overlaps multiple categories. Relatedly, no technology operates in a vacuum. Without robust networks and infrastructure, devices such as PCs and mobile phones, and integration expertise, emerging technologies cannot advance.

According to the CompTIA survey, 3 out of 4 Thailand businesses have a positive view of emerging technology. It can be inferred that respondents see an opportunity specific to their business, or more broadly, a general sense of excitement for where technology is headed. At the other end of the spectrum, 14% report mostly feelings of trepidation. Again, this could be specific to their firm, such as the fear of falling behind in the market, or a broader concern for the uncertainty of technological disruption. Organizations in the maturing bucket of countries tend to be much more eager for emtech opportunities (61% excited in maturing vs. 49% in mature countries).

The data suggests there is a positive correlation between businesses that report a high level of ROI with their current technology spending and excitement for emerging technology. It follows that firms less satisfied with their current technology use express more concern for the future.

Although still far from mainstream adoptions, the emerging technologies reported at the highest rates of implementation are big data, AR/VR, and IoT. (See chart

Top level perceptions of emerging tech



on following page.) Granted, there is a continuum of use, from basic sensors on a network that could be characterized as IoT, to highly complex deployments with myriad inputs generating volumes of data feeding various automating technologies. As such, reported adoption rates are best used as directional guidance.

The primary factors indicated that could stall adoption and utilization of emerging tech tend to focus on budget and the unknowns associated with emerging tech. Businesses in Thailand are significantly more likely to indicate budget constraints than those in several other countries (40% vs. 32% global).

18%

% of Thailand businesses that say risk aversion is a primary factor in their decision to postpone emtech adoption



Primary factors cited as inhibiting the adoption of emerging technologies

1. Budget constraints
2. Risk aversion / uncertainty
3. Confusion / overwhelmed with options
4. Lack of a clear business case

CYBERSECURITY: DISCONNECTS ON MANY FRONTS

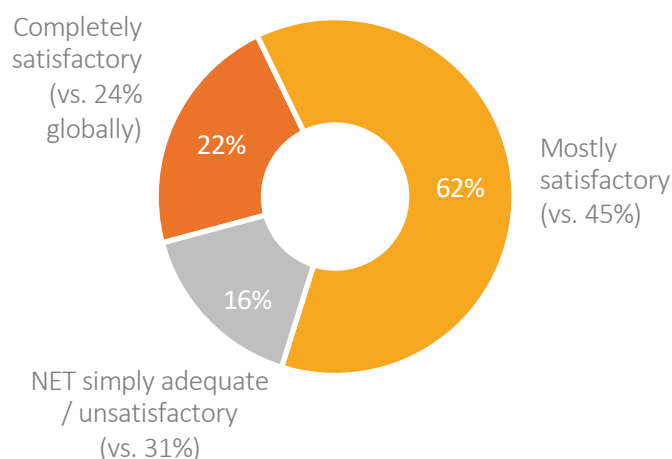
Cybersecurity continues to grow in importance in an increasingly digital and interconnected world. Many businesses are increasing their security investments or elevating their security focus, yet needing to employ progressively more proactive measures. Again, technologies and tools only go so far as employers need to build and enhance their processes, policies, and—most importantly—people.

Four out of 5 of Thailand firms describe their firm's cybersecurity at a completely (22%) or mostly satisfactory (62%) level. This still indicates some room for improvement, with the remainder describing their firm's approach as simply adequate (10%) or unsatisfactory (6%).

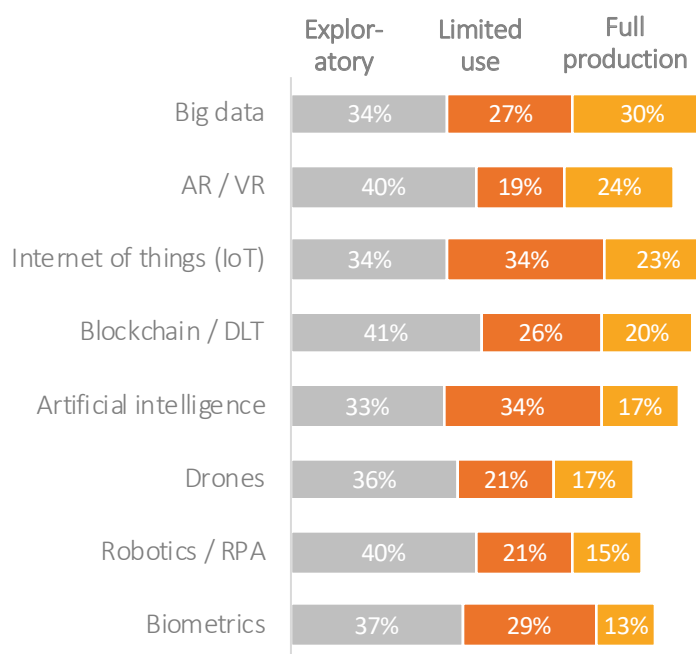
Satisfaction levels among firms in Thailand are higher compared to overall results (84% vs. 69% net satisfactory, respectively) as well as those in Brazil, Canada, Ireland, Netherlands, Japan, Middle East, and the UK.

Self-assessment levels of security satisfaction are presumably even lower as firms are more likely to report on themselves on the optimistic side. This is further compounded by the fact that businesses are oftentimes less prepared than they believe, and even more so as it relates to emerging areas.

Self-assessment of cybersecurity posture



Emerging tech adoption tracking



Security underpins the many facets of emerging technology. This, along with the high growth rates for emerging technologies expected over the next several years, drives the need for businesses to re-evaluate their approaches to security. Consider that 97% of Thailand firms reported recently changing their security approach; with 45% being due to a change in management, 44% being due to a change in IT operations (move to cloud, new IoT strategy, etc.). For another 45%, cybersecurity priorities shifted as a result of knowledge gained from training or certification.

Furthermore, a low understanding of new threats is a top challenge cited for why it may be difficult to pursue new cybersecurity challenges. For example, consider the wide range of security risks with IoT as digital meshes with physical properties. (See CompTIA's 2019 *Trends in Internet of Things*.)

Top reported challenges to improving cybersecurity

1. Low understanding of new threats
2. Low understanding of cybersecurity trends
3. Prioritization of other technology investments
4. Lack of metrics to demonstrate effectiveness
5. Lack of budget dedicated to cybersecurity

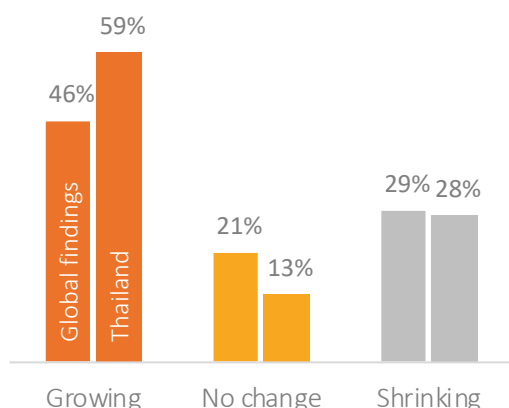
OVERCOMING WORKFORCE GAPS

The evolving tech labor market continues to present both opportunities and trials. Skills gaps particularly remain an ongoing challenge at most organizations. When considering the general concept of a country's tech skills gap, most in Thailand in CompTIA's latest research recall recently seeing or hearing about it (98% vs. 86% globally). Rates are especially high within countries that have more maturing economies, i.e. Brazil, China, India, Mideast, and Thailand vs. the more mature grouping that have been grappling with the issue for decades in countries such as Australia, Canada, UK, and US.

Moreover, nearly 6 in 10 report that the skills gap situation at their firm has grown over the past two years (59% for Thailand; notably higher vs. the 46% globally). Businesses in the mature grouping of countries report no change at a higher rate compared to firms in maturing countries.

Much too often "skills gaps" are used as a term to generalize a host of other workforce issues. Skills gaps primarily meaning employee performance falling short of employer expectations or desires is far different from what could be described as a location or a pay gap. When breaking down some of the various types of gaps, the top ones the research identified as barriers in hiring and maintaining a robust tech workforce in Thailand include innovation, soft skills, and wage gaps. Companies reporting an innovation gap see that the speed of innovation is exceeding the pace of training / workforce development. Soft skills challenges are a symptom of insufficient skill / capability in non-technical areas such as project management,

Perceived change in skills gap
over the past 2 years



Top priorities for boosting cybersecurity skills

60%	Data loss prevention / data security
51%	Firewalls and antivirus
49%	Legal compliance / policies
40%	Risk management / mitigation
36%	Penetration testing / ethical hacking
35%	Network monitoring / access management
35%	Cloud security
29%	Next-gen (e.g. AI predictive analytics tools)

collaboration, or communication. A wage gap will occur when market wages for certain positions / skills exceed employer budgets. With close to half citing these three types of gaps alone, and at least 1 in 5 citing others such as gaps in perception, sector, confidence, or location, making even incremental changes in these types of issues is no small feat but will reap substantial rewards.

Getting more into the matter of tech skills gaps, the top areas of concern reported by managers in the CompTIA survey include a mix of newer tech areas as well as more core as technologies progress. For instance, the more specific areas of cybersecurity skill gap concerns address both cloud and networks. (See table above.)

Top tech skills gap [significant + moderate] areas include:

- Emerging tech [69% vs. 57% global]
- Software or app development [65% vs. 54% global]
- Integrating different apps, data sources, platforms, devices [64% vs. 55% global]
- Digital business transformation / modernizing legacy hardware or software [62% vs. 54% global]
- Data mgmt. / analytics [62% vs. 53% global]

50% Unrealistic expectations?

Half of Thailand employers acknowledge that unrealistic expectations with skills and experience contribute to exaggerated perceptions of the skills gap. Another 41% acknowledge it is somewhat of a factor.

Obtaining an accurate read on the skills gap situation is difficult and compounded by the issue that only a minority report their own firm has a pretty good handle on identifying and assessing skills gaps (31% Thailand vs. 39% global). Conversely, a third report they often struggle (34% vs. 33% overall). The remaining third would place themselves in the middle with a good handle on some roles while struggling with others (34% vs. 25% global).

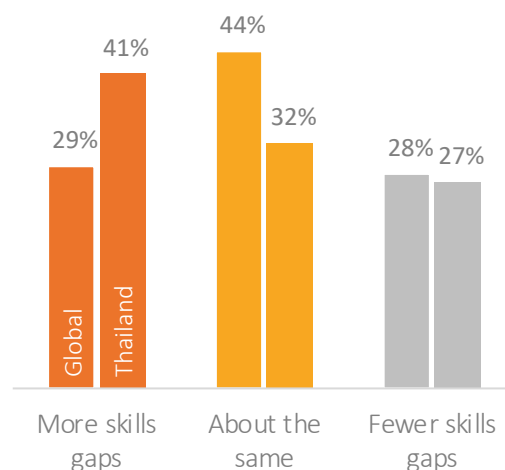
Furthermore, slightly less than half report only having informal strategies / resources in place at their firms to address skills gaps (42% vs. 43% global) or no process at all (6% vs. 10% global). This is at first hard to believe that half indicate having formal strategies (50% vs. 42% global). Interestingly, more countries in the maturing grouping, notably China, India, and Thailand, report formal processes at much higher rates—perhaps born out of urgent necessity. Among the mature economies, the United States has a higher percentage reporting formal strategies to address skills gaps. Overall, businesses in the more mature countries report having informal strategies or nothing in place at significantly higher rates than those in maturing countries.

As important as it is to first identify business objectives then align tech accordingly, employers also need to recognize what needs fixing in regards to skills gaps before jumping into resolutions. And as far as addressing non-technical or ‘soft’ skills, priorities are pretty much in line across the board with few exceptions. For example, innovation ranks higher among those in maturing vs. mature countries.

Top priorities for boosting soft skills

54%	Collaboration / teamwork
52%	Innovation / creative problem solving
49%	Flexibility / adaptability
39%	Analytical skills
37%	Leadership
30%	Motivation / initiative
25%	Strong work ethic
25%	Customer service
25%	Project management
10%	Verbal / written communication skills

Perception of skills gaps among Gen Y & Z vs. other segments of workers



Delving further into skills gap perceptions, nearly a third believe that the skills gaps among young people are on par with the general workforce (32% vs. 44% global). However, the largest percentage hold the often unfair and negative belief that there are *more* gaps among the younger Gen Y and Gen Z audience (41% vs. 29% global). While on the other end of the spectrum, little more than a quarter believe there are *fewer* gaps among the younger group (27% vs. 28% global). See CompTIA's *International Youth Perspectives of Technology and Careers* study.

72%

% of Thailand firms indicate they have mandatory training and professional development requirements for staff



Overall, 7 in 10 report their firm has training and professional development for employees in technical or soft skills that is required (72% vs. 63% global). Another quarter describe it as solely voluntary; not required but encouraged (26% vs. 31% global). Businesses in the maturing countries are more likely to indicate having mandatory training compared to their counterparts in the mature countries (44% vs. 34%, respectively).

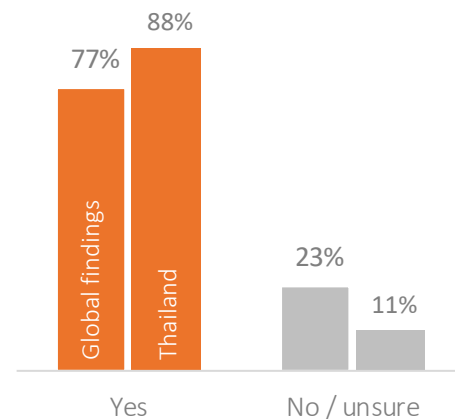
THE FUTURE OF WORK

Undoubtedly, technology will continue to profoundly impact nearly everyone's job—and it's mostly for the better. While on the one hand automating technologies have displaced segments of workers through substitution, in most cases automation frees up time for workers to focus on higher-level activities.

Automation of jobs is a prickly topic conjuring up ideas of mass layoffs and the robots taking over. Mass media has a tendency to latch on to the doom and gloom news. Regardless of viewpoints, the majority in CompTIA's study have recently seen articles about robotics, intelligent machines, and other automating technologies performing some aspects of jobs or possibly replacing them altogether (88% in Thailand vs. 77% global). On the contrary, the automation of repetitive tasks has spun opportunities elsewhere. For instance, tech support at one time may have been considered as 'on its way out.' Quite the opposite occurred with this growing field as technological advancements breed support needs.

On a slightly more personal level, 3 out of 4 are very concerned (25%) or somewhat concerned (48%) that automating technologies may mean fewer jobs for people like them. Another quarter aren't that concerned—24% in Thailand, about the same as the 28% globally. McKinsey & Co. finds a very low portion of occupations that consists of activities that can be fully automated—less than 5%. Displacement rates will depend on a number of factors, but are most likely to occur in fields such as office support, food service, production work, and customer service and retail sales. McKinsey also points to growing demand for technological, social and emotional, and higher cognitive skills by 2030; especially given the adoption of automation and AI. See CompTIA's *International Youth Perspectives of Technology and Careers*.

Familiarity with stories about automating technologies and workforce impact



More than 8 in 10 indicate at least some interest in attaining additional training or hands-on experience with technology as a result of the outlook for how robotics and automating technologies may impact the workforce (84% in Thailand versus the 69% global, definitely + somewhat).

At any rate there's a need for employers, employees, and candidates to focus now more than ever on the continuous improvements of skills and training to keep pace with emerging technology—and employers need to drive impactful professional development strategies.

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

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INTRODUCTION

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According to the data, innovation remains a top business priority. Likewise, robust spending projections on emerging technologies, such as the internet of things, big data, artificial intelligence, and robotics confirm the steady advance of digitization.

At the same time, the demand for tech talent has never been higher. Across every business type and industry sector, employers recognize the importance of cultivating a tech-savvy workforce.

While there are common threads underpinning many of these trends, there is much to learn from the unique experiences and approaches taken by countries around the world.



69.3

score

Average of ICT adoption + digital skills of population (100-point scale)
Source: World Economic Forum Global Competitiveness 2019

\$187.6

billion

Total spending on tech in the United Kingdom. Inclusive of hardware, software, services, telecom, and emtech.
Sources: CompTIA | IDC | 2020 projection

6 in 10

% of employers with some degree of difficulty in identifying and addressing skills gaps

34%

% citing the speed of innovation as a factor contributing to workforce gaps

86%

NET % of businesses relying on outside technology service providers at least occasionally

3 in 4

NET % with some degree of excitement for opportunities associated with emerging technologies

THE BUSINESS OF TECHNOLOGY

The size of the global technology industry continues to grow as spending is expected to reach \$5.2 trillion worldwide in 2020, according to the research consultancy IDC. Tech spending in the United Kingdom is projected to reach an estimated \$187.6 billion in 2020. See CompTIA's *IT Industry Outlook* for more on the global market.

While the mix of spending categories may vary, businesses around the world are investing in hardware, software, services, and telecommunications. Technology will play a growing integral role as companies in the United Kingdom focus on key strategic priorities such as implementing new systems and processes (62%), innovation (58%), identifying new customer segments and markets (54%), and launching new products or services (53%). Half also prioritize hiring skilled workers to help them drive technology initiatives into the future (53%).

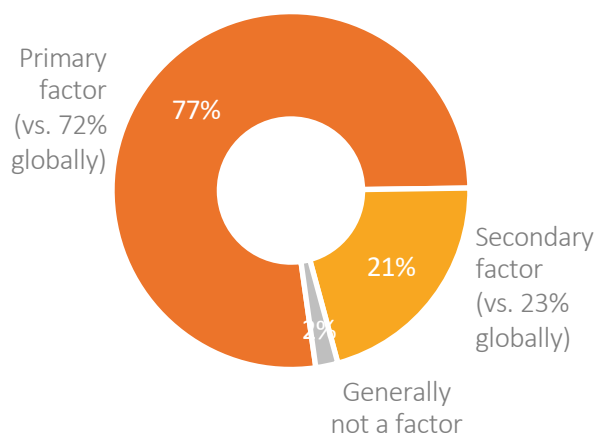
Businesses of all types rate technology a critically important factor to their success. Among the United Kingdom firms that CompTIA surveyed, almost 8 in 10 rate technology as a primary factor in reaching business objectives (77%). One in 5 consider technology a secondary factor in helping to meet those goals (21%), while just 2% describe technology as a nonfactor. There is a disconnect though between technology as a priority and the reality that a segment of businesses say they under-invest in technology. A quarter (26%) believe their firm's allocation of budget to tech spending is "too low."

Furthermore, when considering what United Kingdom businesses spend vs. the value and benefits received, almost 7 in 10 report that their firm gets excellent or good ROI from its technology spending (69%; on par with the 66% global). Primary reasons that contribute to perceptions of disappointing ROI of technology investments include staff time required to operate / maintain, ongoing maintenance costs or support fees, complexity / poor user experience, upfront cost / too expensive, required upgrades / built-in obsolescence, and insufficient features / capabilities.

25% Managed services utilization

According to the data, a quarter of UK firms report use of a managed service provider for ongoing IT operations management. Firms who outsource more often report higher perceptions of ROI.

Rating of technology as a factor in reaching business objectives



Certainly technology plays a role in achieving corporate objectives, but technology alone will not produce the desired results. Employers must also address the people and process elements of the equation to achieve optimal outcomes. Businesses face a range of challenges in executing their vision from resource constraints, lack of expertise, skills gaps, and so on. Consequently, most United Kingdom organizations rely on some degree of outside provider of tech services. For instance, nearly 9 in 10 indicate outsourcing or using outside tech firms / expertise at least occasionally in a typical year (86%); including more than half who do so regularly (32%) or frequently (14%).

Top reported uses of outside tech services

1. Troubleshooting / repair / maintenance
2. Software development
3. Consulting / advisory / strategy services
4. Cybersecurity
5. Data / analytics / AI related

Organizations in the United Kingdom turn to outside expertise for a number of other services as well including data / analytics, deployment / integration (e.g. cloud migration), and web design. In addition, 1 in 4 report using managed services / use of a managed service provider (MSP) for ongoing IT management (25%). Interestingly, firms who regularly or frequently outsource are significantly more likely to report excellent or good ROI (65% in mature economies such as the UK) vs. those who occasionally outsource (60%) or rarely / never do so (57%).

EMERGING TECH MOMENTUM BUILDS

The concept of emerging technology is a common shorthand for a range of innovations in the early to mid stages of adoption. This may encompass distinct categories, such as drones or 3-D printers, or enabling technologies, such as artificial intelligence or blockchain, embedded or serving as a platform for countless products or services.

The current and future impact of these technologies can be seen in their growth rates and revenue contributions. According to IDC, sales of emerging tech categories will increase by 105% worldwide during the 2019-2023 time period, adding \$1.5 trillion in new revenue to the global tech sector. In the year ahead, categories such as AI (+31%), blockchain (+70%), AR/VR (+99%), and IoT (+15%) will gain further traction as they move into new segments of customers.

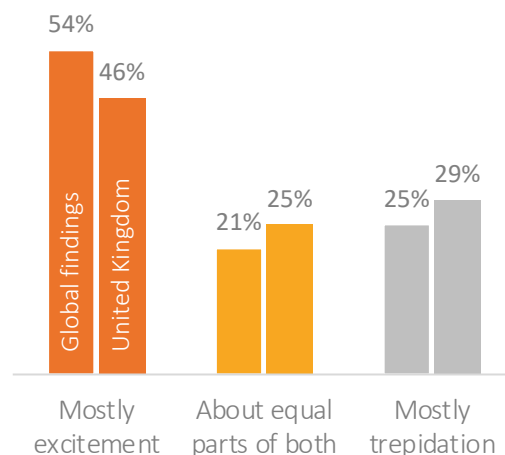
As a percentage of the overall technology pie, emerging tech will account for about 17% in 2020, with the remaining share stemming from the established categories of hardware, software, services, and telecom. Of course, there are gray areas where emerging tech overlaps multiple categories. Relatedly, no technology operates in a vacuum. Without robust networks and infrastructure, devices such as PCs and mobile phones, and integration expertise, emerging technologies cannot advance.

According to the CompTIA survey, almost 1 in 2 United Kingdom businesses (46%) have a positive view of emerging technology. It can be inferred that respondents see an opportunity specific to their business, or more broadly, a general sense of excitement for where technology is headed. At the other end of the spectrum, 3 in 10 report mostly feelings of trepidation. Again, this could be specific to their firm, such as the fear of falling behind in the market, or a broader concern for the uncertainty of technological disruption. Organizations in the maturing bucket of countries tend to be much more eager for emtech opportunities (61% excited in maturing vs. 49% in mature countries).

The data suggests there is a positive correlation between businesses that report a high level of ROI with their current technology spending and excitement for emerging technology. It follows that firms less satisfied with their current technology use express more concern for the future.

Although still far from mainstream adoptions, the emerging technologies reported at the highest rates of implementation are IoT and big data. (See chart on

Top level perceptions of emerging tech



following page.) Granted, there is a continuum of use, from basic sensors on a network that could be characterized as IoT, to highly complex deployments with myriad inputs generating volumes of data feeding various automating technologies. As such, reported adoption rates are best used as directional guidance.

The primary factors indicated that could stall adoption and utilization of emerging tech tend to focus on budget and the unknowns associated with emerging tech. Businesses in the UK are notably more likely to indicate budget constraints than those in several other countries (39% vs. 32% global).

24%

% of United Kingdom businesses that say risk aversion is a primary factor in their decision to postpone emtech adoption



Primary factors cited as inhibiting the adoption of emerging technologies

1. Budget constraints
2. Risk aversion / uncertainty
3. Confusion / overwhelmed with options
4. Lack of a clear business case

CYBERSECURITY: DISCONNECTS ON MANY FRONTS

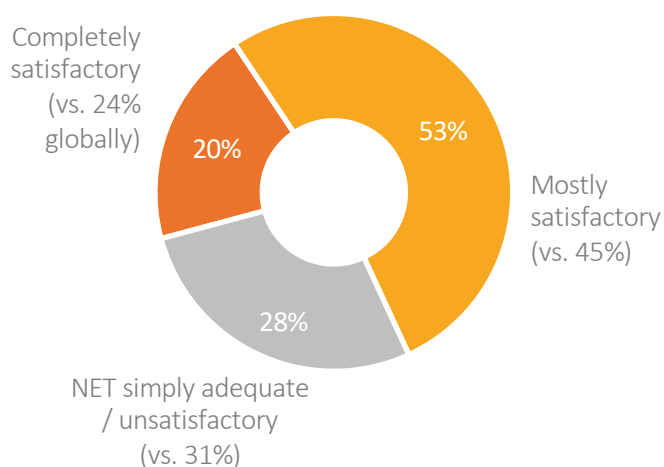
Cybersecurity continues to grow in importance in an increasingly digital and interconnected world. Many businesses are increasing their security investments or elevating their security focus, yet needing to employ progressively more proactive measures. Again, technologies and tools only go so far as employers need to build and enhance their processes, policies, and—most importantly—people.

Seven out of 10 United Kingdom firms describe their firm's cybersecurity at a completely (20%) or mostly satisfactory (53%) level. This still indicates some room for improvement, with the remainder describing their firm's approach as simply adequate (24%) or unsatisfactory (4%).

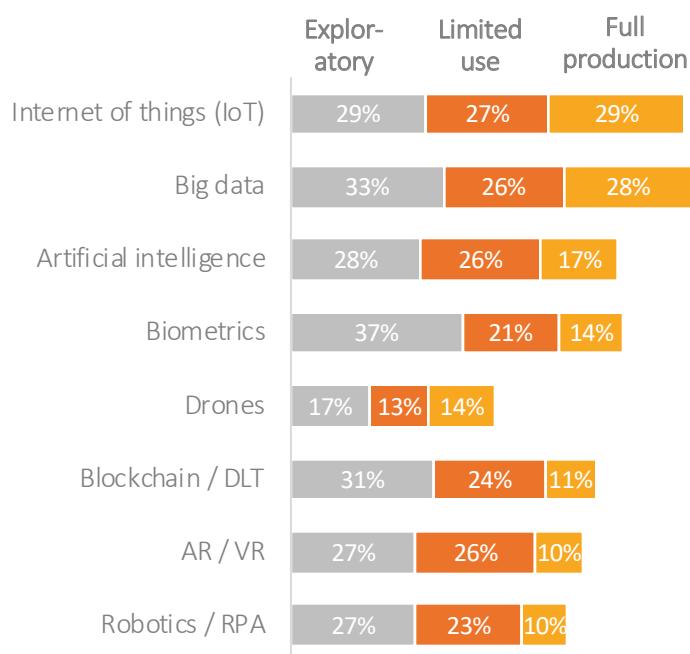
Satisfaction levels among firms in the United Kingdom are on par with the overall results (72% vs. 69% net satisfactory, respectively), but significantly higher than those in Brazil, Netherlands, and Japan.

Self-assessment levels of security satisfaction are presumably even lower as firms are more likely to report on themselves on the optimistic side. This is further compounded by the fact that businesses are oftentimes less prepared than they believe, and even more so as it relates to emerging areas.

Self-assessment of cybersecurity posture



Emerging tech adoption tracking



Security underpins the many facets of emerging technology. This, along with the high growth rates for emerging technologies expected over the next several years, drives the need for businesses to re-evaluate their approaches to security. Consider that 84% of United Kingdom firms reported recently changing their security approach; with 39% being due to a change in IT operations (move to cloud, new IoT strategy, etc.). For another 23%, cybersecurity priorities shifted as a result of knowledge gained from training or certification.

Furthermore, a low understanding of new threats is a top challenge cited for why it may be difficult to pursue new cybersecurity challenges. For example, consider the wide range of security risks with IoT as digital meshes with physical properties. (See CompTIA's *2019 Trends in Internet of Things*.)

Top reported challenges to improving cybersecurity

1. Belief that current efforts are 'good enough'
2. Lack of budget dedicated to cybersecurity
3. Low understanding of new threats
4. Low understanding of cybersecurity trends
5. Prioritization of other technology investments

OVERCOMING WORKFORCE GAPS

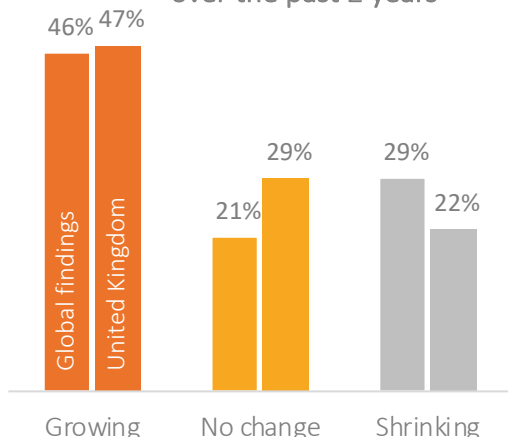
The evolving tech labor market continues to present both opportunities and trials. Skills gaps particularly remain an ongoing challenge at most organizations. When considering the general concept of a country's tech skills gap, most in the United Kingdom in CompTIA's latest research recall recently seeing or hearing about it (76% vs. 86% globally). Rates are especially high within countries that have more maturing economies, i.e. Brazil, China, India, Mideast, and Thailand vs. the more mature grouping that have been grappling with the issue for decades in countries such as Australia, Canada, UK, and US.

Moreover, nearly half report that the skills gap situation at their firm has grown over the past two years (47% for the United Kingdom vs. 46% globally). Businesses in the mature grouping of countries report no change at a higher rate compared to firms in maturing countries.

Much too often "skills gaps" are used as a term to generalize a host of other workforce issues. Skills gaps primarily meaning employee performance falling short of employer expectations or desires is far different from what could be described as a location or a pay gap.

When breaking down some of the various types of gaps, the top ones the research identified as barriers in hiring and maintaining a robust tech workforce in the United Kingdom include wage, soft skills, and innovation gaps. A wage gap will occur when market wages for certain positions / skills exceed employer budgets. Soft skills challenges are a symptom of insufficient skill / capability in non-technical areas such as project management, collaboration, or communication. Companies reporting an innovation gap see that the speed of innovation is exceeding the pace of training /

Perceived change in skills gap
over the past 2 years



Top priorities for boosting cybersecurity skills

55%	Cloud security
47%	Firewalls and antivirus
47%	Risk management / mitigation
45%	Data loss prevention / data security
44%	Legal compliance / policies
42%	Next-gen (e.g. AI predictive analytic tools)
33%	Penetration testing / ethical hacking
30%	Network monitoring / access management

workforce development. With over a third or more citing these three types of gaps alone, and at least 1 in 5 citing others such as gaps in sector, confidence, perception, or location, making even incremental changes in these types of issues is no small feat but will reap substantial rewards.

Getting more into the matter of tech skills gaps, the top areas of concern reported by managers in the CompTIA survey include a mix of newer tech areas as well as more core as technologies progress. For instance, the more specific areas of cybersecurity skill gap concerns address both cloud and networks. (See table above.)

Top tech skills gap [significant + moderate] areas include:

- Emerging tech [61% vs. 57% global]
- Digital business transformation / modernizing legacy hardware or software [53% vs. 54% global]
- Cloud infrastructure [52% vs. 50% global]
- Cybersecurity [50% vs. 55% global]
- Integrating different apps, data sources, platforms, devices [50% vs. 55% global]

23% Unrealistic expectations?

Almost a quarter of UK employers acknowledge that unrealistic expectations with skills and experience contribute to exaggerated perceptions of the skills gap. Another 61% acknowledge it is somewhat of a factor.

Obtaining an accurate read on the skills gap situation is difficult and compounded by the issue that only a minority report their own firm has a pretty good handle on identifying and assessing skills gaps (41% United Kingdom vs. 39% global). Conversely, 3 in 10 report they often struggle (30% vs. 33% overall). The remaining quarter would place themselves in the middle with a good handle on some roles while struggling with others (26% vs. 25% global).

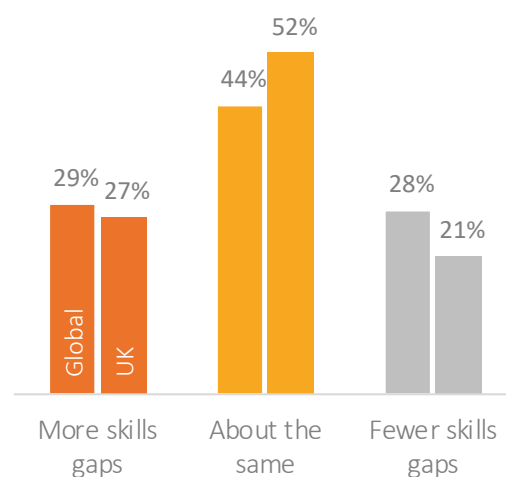
Furthermore, more than half report only having informal strategies / resources in place at their firms to address skills gaps (48% vs. 43% global) or no process at all (16% vs. 10% global). This is at first hard to believe only a third indicate having formal strategies (32% vs. 42% global). Interestingly, more countries in the maturing grouping, notably China, India, and Thailand, report formal processes at much higher rates—perhaps born out of urgent necessity. Among the mature economies, the United Kingdom has a percentage in line with most other advanced countries reporting formal strategies to address skills gaps. Overall, businesses in the more mature countries report having informal strategies or nothing in place at significantly higher rates than those in maturing countries.

As important as it is to first identify business objectives then align tech accordingly, employers also need to recognize what needs fixing in regards to skills gaps before jumping into resolutions. And as far as addressing non-technical or ‘soft’ skills, priorities are pretty much in line across the board with few exceptions. For example, innovation ranks higher among those in maturing vs. mature countries.

Top priorities for boosting soft skills

46%	Flexibility / adaptability
43%	Collaboration / teamwork
37%	Innovation / creative problem solving
37%	Motivation / initiative
33%	Customer service
33%	Leadership
32%	Analytical skills
32%	Verbal / written communication skills
32%	Strong work ethic
30%	Project management

Perception of skills gaps among Gen Y & Z vs. other segments of workers



Delving further into skills gap perceptions, the largest percentage believe that the skills gaps among young people are on par with the general workforce (52% vs. 44% global) and about a quarter hold the often unfair and negative belief that there are *more* gaps among the younger Gen Y and Gen Z audience (27% vs. 29% global). While on the other end of the spectrum, about 1 in 5 believe there are *fewer* gaps among the younger group (21% vs. 28% global). See CompTIA's *International Youth Perspectives of Technology and Careers* study.

72%

% of United Kingdom firms indicate they have mandatory training and professional development requirements for staff



Overall, 7 in 10 report their firm has training and professional development for employees in technical or soft skills that is required (72% vs. 63% global). Another 1 in 5 describe it as solely voluntary; not required but encouraged (18% vs. 31% global). Businesses in the maturing countries are more likely to indicate having mandatory training compared to their counterparts in the mature countries (44% vs. 34%, respectively).

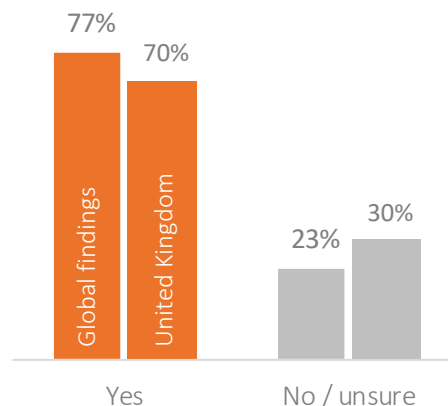
THE FUTURE OF WORK

Undoubtedly, technology will continue to profoundly impact nearly everyone's job—and it's mostly for the better. While on the one hand automating technologies have displaced segments of workers through substitution, in most cases automation frees up time for workers to focus on higher-level activities.

Automation of jobs is a prickly topic conjuring up ideas of mass layoffs and the robots taking over. Mass media has a tendency to latch on to the doom and gloom news. Regardless of viewpoints, the majority in CompTIA's study have recently seen articles about robotics, intelligent machines, and other automating technologies performing some aspects of jobs or possibly replacing them altogether (70% in the UK vs. 77% global). On the contrary, the automation of repetitive tasks has spun opportunities elsewhere. For instance, tech support at one time may have been considered as 'on its way out.' Quite the opposite occurred with this growing field as technological advancements breed support needs.

On a slightly more personal level, the majority are very concerned (21%) or somewhat concerned (40%) that automating technologies may mean fewer jobs for people like them. More than a third (37%) aren't that concerned—higher than the 28% globally. McKinsey & Co. finds a very low portion of occupations that consists of activities that can be fully automated—less than 5%. Displacement rates will depend on a number of factors, but are most likely to occur in fields such as office support, food service, production work, and customer service and retail sales. McKinsey also points to growing demand for technological, social and emotional, and higher cognitive skills by 2030; especially given the adoption of automation and AI. See CompTIA's *International Youth Perspectives of Technology and Careers*.

Familiarity with stories about automating technologies and workforce impact



Six in 10 indicate at least some interest in attaining additional training or hands-on experience with technology as a result of the outlook for how robotics and automating technologies may impact the workforce (58% UK vs. 69% global, definitely + somewhat).

At any rate there's a need for employers, employees, and candidates to focus now more than ever on the continuous improvements of skills and training to keep pace with emerging technology—and employers need to drive impactful professional development strategies.

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

1. More time set aside for training
2. More cross-training (e.g. other functions)
3. More e-Learning
4. More training alignment with development goals
5. More mobile options / app-based
6. More classroom instructor-led training
7. More apprenticeship-type work-study programs
8. More social elements
9. More autonomy in developing training program
10. More simulations or gaming elements



INTRODUCTION

The impact of technology continues to grow. The intersection of technology and business operations, technology and people, technology and government, and technology and just about everything else, will mean more change on more fronts in the years to come.

While it is impossible to know precisely how these changes will unfold, CompTIA's latest research provides a number of clues as to how businesses are responding and the challenges they are working to overcome.

According to the data, innovation remains a top business priority. Likewise, robust spending projections on emerging technologies, such as the internet of things, big data, artificial intelligence, and robotics confirm the steady advance of digitization.

At the same time, the demand for tech talent has never been higher. Across every business type and industry sector, employers recognize the importance of cultivating a tech-savvy workforce.

While there are common threads underpinning many of these trends, there is much to learn from the unique experiences and approaches taken by countries around the world.



73.3

score

Average of ICT adoption + digital skills of population (100-point scale)
Source: World Economic Forum Global Competitiveness 2019

\$1.7

trillion

Total spending on tech in the United States. Inclusive of hardware, software, services, telecom, and emtech.
Sources: CompTIA | IDC | 2020 projection

1 in 2

% of employers with some degree of difficulty in identifying and addressing skills gaps

45%

% citing the speed of innovation as a factor contributing to workforce gaps

88%

NET % of businesses relying on outside technology service providers at least occasionally

8 in 10

NET % with some degree of excitement for opportunities associated with emerging technologies

THE BUSINESS OF TECHNOLOGY

The size of the global technology industry continues to grow as spending is expected to reach \$5.2 trillion worldwide in 2020, according to the research consultancy IDC. Tech spending in the United States is projected to reach an estimated \$1.7 trillion in 2020. See CompTIA's *IT Industry Outlook* for more on the global market.

While the mix of spending categories may vary, businesses around the world are investing in hardware, software, services, and telecommunications. Technology will play a growing integral role as companies in the United States focus on key strategic priorities such as implementing new systems and processes (62%), innovation (51%), launching new products or services (49%), and identifying new customer segments and markets (48%). Virtually half also prioritize hiring skilled workers to help them drive technology initiatives into the future (49%).

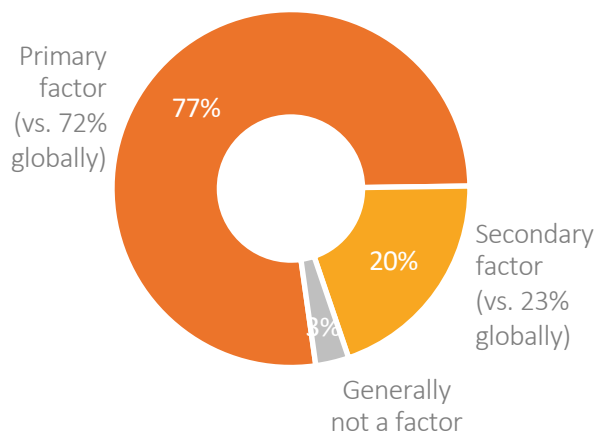
Businesses of all types rate technology a critically important factor to their success. Among the United States firms that CompTIA surveyed, almost 8 in 10 rate technology as a primary factor in reaching business objectives (77%). One in 5 consider technology a secondary factor in helping to meet those goals (20%), while just 3% describe technology as a nonfactor. There is a disconnect though between technology as a priority and the reality that a segment of businesses say they under-invest in technology. One in 5 (21%) believe their firm's allocation of budget to tech spending is "too low."

Furthermore, when considering what United States businesses spend vs. the value and benefits received, almost 3 out of 4 report that their firm gets excellent or good ROI from its technology spending (73%; higher than the 66% global). Primary reasons that contribute to perceptions of disappointing ROI of technology investments include required upgrades / built-in obsolescence, staff time required to operate / maintain, ongoing maintenance costs or support fees, complexity / poor user experience, upfront cost / too expensive for what's received, and insufficient features / capabilities.

23% Managed services utilization

According to the data, nearly a quarter of US firms report use of a managed service provider for ongoing IT operations management. Firms who outsource more often report higher perceptions of ROI.

Rating of technology as a factor in reaching business objectives



Certainly technology plays a role in achieving corporate objectives, but technology alone will not produce the desired results. Employers must also address the people and process elements of the equation to achieve optimal outcomes. Businesses face a range of challenges in executing their vision from resource constraints, lack of expertise, skills gaps, and so on. Consequently, most United States organizations rely on some degree of outside provider of tech services. For instance, nearly 9 in 10 indicate outsourcing or using outside tech firms / expertise at least occasionally in a typical year (88%); including nearly half who do so regularly (28%) or frequently (21%).

Top reported uses of outside tech services

1. Data / analytics / AI related
2. Consulting / advisory / strategy services
3. Web design / e-commerce
4. Software development
5. Troubleshooting / repair / maintenance

Organizations in the United States turn to outside expertise for a number of other services as well including deployment / integration (e.g. cloud migration), cybersecurity, and emerging tech. In addition, 1 in 4 report using managed services / use of a managed service provider (MSP) for ongoing IT management (23%). Interestingly, firms who regularly or frequently outsource are significantly more likely to report excellent or good ROI (65% in mature countries such as the US) vs. those who occasionally outsource (60%) or rarely / never do so (57%).

EMERGING TECH MOMENTUM BUILDS

The concept of emerging technology is a common shorthand for a range of innovations in the early to mid stages of adoption. This may encompass distinct categories, such as drones or 3-D printers, or enabling technologies, such as artificial intelligence or blockchain, embedded or serving as a platform for countless products or services.

The current and future impact of these technologies can be seen in their growth rates and revenue contributions. According to IDC, sales of emerging tech categories will increase by 105% worldwide during the 2019-2023 time period, adding \$1.5 trillion in new revenue to the global tech sector. In the year ahead, categories such as AI (+31%), blockchain (+70%), AR/VR (+99%), and IoT (+15%) will gain further traction as they move into new segments of customers.

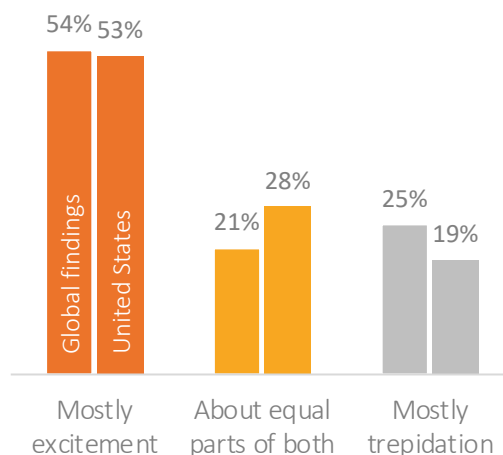
As a percentage of the overall technology pie, emerging tech will account for about 17% in 2020, with the remaining share stemming from the established categories of hardware, software, services, and telecom. Of course, there are gray areas where emerging tech overlaps multiple categories. Relatedly, no technology operates in a vacuum. Without robust networks and infrastructure, devices such as PCs and mobile phones, and integration expertise, emerging technologies cannot advance.

According to the CompTIA survey, 1 in 2 United States businesses have a positive view of emerging technology. It can be inferred that respondents see an opportunity specific to their business, or more broadly, a general sense of excitement for where technology is headed. At the other end of the spectrum, 1 in 5 report mostly feelings of trepidation. Again, this could be specific to their firm, such as the fear of falling behind in the market, or a broader concern for the uncertainty of technological disruption. Organizations in the maturing bucket of countries tend to be much more eager for emtech opportunities (61% excited in maturing vs. 49% in mature countries).

The data suggests there is a positive correlation between businesses that report a high level of ROI with their current technology spending and excitement for emerging technology. It follows that firms less satisfied with their current technology use express more concern for the future.

Although still far from mainstream adoptions, the emerging technologies reported at the highest rates of implementation are big data and IoT. (See chart on

Top level perceptions of emerging tech



following page.) Granted, there is a continuum of use, from basic sensors on a network that could be characterized as IoT, to highly complex deployments with myriad inputs generating volumes of data feeding various automating technologies. As such, reported adoption rates are best used as directional guidance.

The primary factors indicated that could stall adoption and utilization of emerging tech tend to focus on budget and the unknowns associated with emerging tech. Overall, firms in the maturing group of countries indicate risk aversion at a significantly higher rate than those in the mature group (29% vs. 23%, respectively).

21%

% of United States businesses that say risk aversion is a primary factor in their decision to postpone emtech adoption



Primary factors cited as inhibiting the adoption of emerging technologies

1. Budget constraints
2. Risk aversion / uncertainty
3. Lack of a clear business case
4. Confusion / overwhelmed with options

CYBERSECURITY: DISCONNECTS ON MANY FRONTS

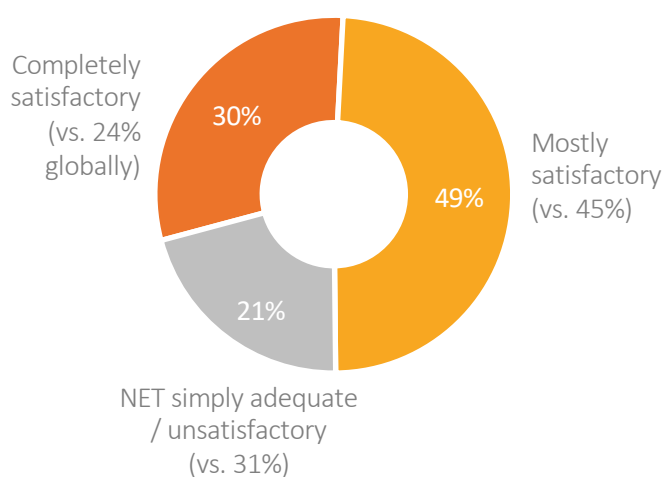
Cybersecurity continues to grow in importance in an increasingly digital and interconnected world. Many businesses are increasing their security investments or elevating their security focus, yet needing to employ progressively more proactive measures. Again, technologies and tools only go so far as employers need to build and enhance their processes, policies, and—most importantly—people.

Four out of 5 of United States firms describe their firm's cybersecurity at a completely (30%) or mostly satisfactory (49%) level. This still indicates some room for improvement, with the remainder describing their firm's approach as simply adequate (19%) or unsatisfactory (2%).

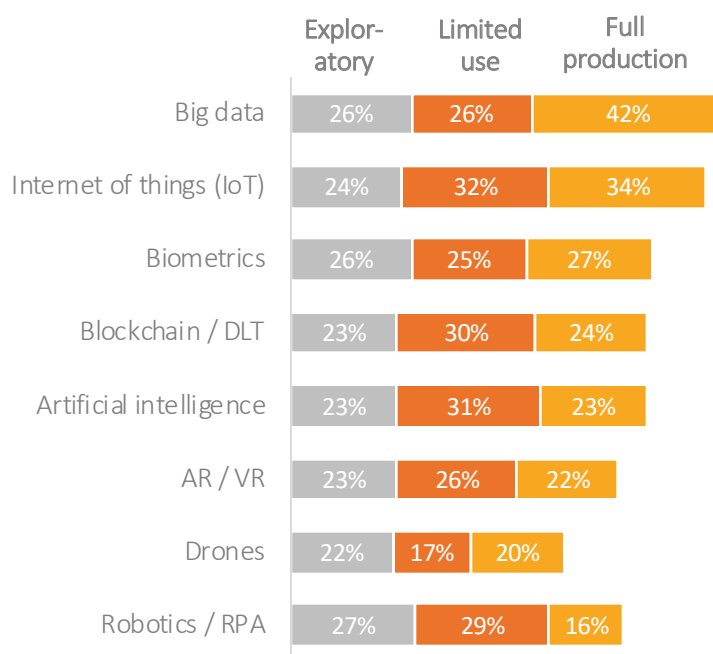
Satisfaction levels among firms in the United States are higher compared to overall results (79% vs. 69% net satisfactory, respectively) as well as those in Brazil, Ireland, Netherlands, Japan, and the Middle East.

Self-assessment levels of security satisfaction are presumably even lower as firms are more likely to report on themselves on the optimistic side. This is further compounded by the fact that businesses are oftentimes less prepared than they believe, and even more so as it relates to emerging areas.

Self-assessment of cybersecurity posture



Emerging tech adoption tracking



Security underpins the many facets of emerging technology. This, along with the high growth rates for emerging technologies expected over the next several years, drives the need for businesses to re-evaluate their approaches to security. Consider that 89% of United States firms reported recently changing their security approach; with 38% being due to a change in IT operations (move to cloud, new IoT strategy, etc.). For another 26%, cybersecurity priorities shifted as a result of knowledge gained from training or certification.

Furthermore, a low understanding of new threats is a top challenge cited for why it may be difficult to pursue new cybersecurity challenges. For example, consider the wide range of security risks with IoT as digital meshes with physical properties. (See CompTIA's *2019 Trends in Internet of Things*.)

Top reported challenges to improving cybersecurity

1. Belief that current efforts are 'good enough'
2. Lack of budget dedicated to cybersecurity
3. Low understanding of new threats
4. Low understanding of cybersecurity trends
5. Prioritization of other technology investments

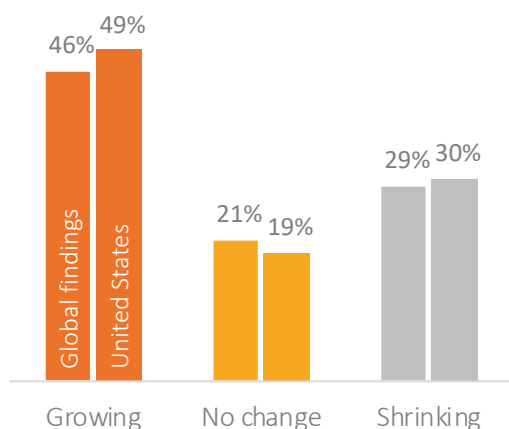
OVERCOMING WORKFORCE GAPS

The evolving tech labor market continues to present both opportunities and trials. Skills gaps particularly remain an ongoing challenge at most organizations. When considering the general concept of a country's tech skills gap, most in the United States in CompTIA's latest research recall recently seeing or hearing about it (86% in the US, same as globally). Rates are especially high within countries that have more maturing economies, i.e. Brazil, China, India, Mideast, and Thailand vs. the more mature grouping that have been grappling with the issue for decades in countries such as Australia, Canada, UK, and US.

Moreover, nearly half report that the skills gap situation at their firm has grown over the past two years (49% for the United States vs. 46% globally). Businesses in the mature grouping of countries report no change at a higher rate compared to firms in maturing countries.

Much too often "skills gaps" are used as a term to generalize a host of other workforce issues. Skills gaps primarily meaning employee performance falling short of employer expectations or desires is far different from what could be described as a location or a pay gap. When breaking down some of the various types of gaps, the top ones the research identified as barriers in hiring and maintaining a robust tech workforce in the United States include innovation, wage, and soft skills gaps. Companies reporting an innovation gap see that the speed of innovation is exceeding the pace of training / workforce development. A wage gap will occur when market wages for certain positions / skills exceed employer budgets. Soft skills challenges are a symptom of insufficient skill / capability in non-technical areas

**Perceived change in skills gap
over the past 2 years**



Top priorities for boosting cybersecurity skills

54%	Data loss prevention / data security
54%	Firewalls and antivirus
46%	Cloud security
41%	Legal compliance / policies
37%	Penetration testing / ethical hacking
35%	Network monitoring / access management
35%	Risk management/mitigation
22%	Next-gen (e.g. AI predictive analytics tools)

such as project management, collaboration, or communication. With close to half citing these three types of gaps alone, and at least a quarter citing others such as gaps in confidence, perception, sector, or location, making even incremental changes in these types of issues is no small feat but will reap substantial rewards.

Getting more into the matter of tech skills gaps, the top areas of concern reported by managers in the CompTIA survey include a mix of newer tech areas as well as more core as technologies progress. For instance, the more specific areas of cybersecurity skill gap concerns address both cloud and networks. (See table above.) Top tech skills gap [significant + moderate] areas include:

- Integrating different apps, data sources, platforms, devices [62% vs. 55% global]
- Emerging tech [59% vs. 57% global]
- Software or app development [58% vs. 54% global]
- Digital business transformation / modernizing legacy hardware or software [57% vs. 54% global]
- Cybersecurity [56% vs. 55% global]

40% Unrealistic expectations?

4 in 10 US employers acknowledge that unrealistic expectations with skills and experience contribute to exaggerated perceptions of the skills gap. Another 46% acknowledge it is somewhat of a factor.

Obtaining an accurate read on the skills gap situation is difficult and compounded by the issue that only a minority report their own firm has a pretty good handle on identifying and assessing skills gaps (44% United States vs. 39% global). Conversely, about 3 in 10 report they often struggle (27% vs. 33% overall). The remaining quarter would place themselves in the middle with a good handle on some roles while struggling with others (26% vs. 25% global).

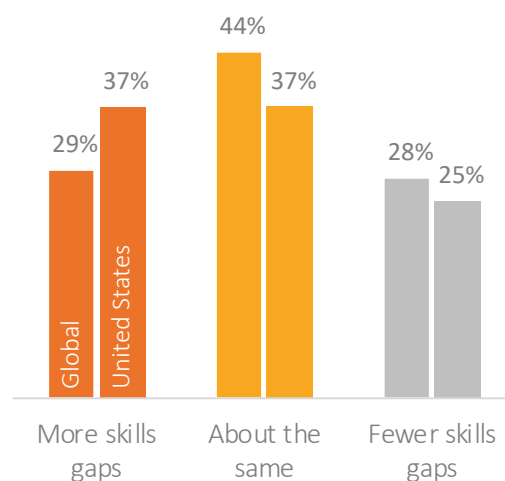
Furthermore, slightly less than half report only having informal strategies / resources in place at their firms to address skills gaps (42% vs. 43% global) or no process at all (6% vs. 10% global). On the other hand, almost half indicate having formal strategies (48% vs. 42% global). Interestingly, more countries in the maturing grouping, notably China, India, and Thailand, report formal processes at much higher rates—perhaps born out of urgent necessity. Among the mature economies, the United States has a higher percentage reporting formal strategies to address skills gaps. Overall, businesses in the more mature countries report having informal strategies or nothing in place at significantly higher rates than those in maturing countries.

As important as it is to first identify business objectives then align tech accordingly, employers also need to recognize what needs fixing in regards to skills gaps before jumping into resolutions. And as far as addressing non-technical or ‘soft’ skills, priorities are pretty much in line across the board with few exceptions. For example, innovation ranks higher among those in maturing vs. mature countries.

Top priorities for boosting soft skills

- 48% Flexibility / adaptability
- 44% Leadership
- 41% Strong work ethic
- 37% Motivation / initiative
- 33% Innovation / creative problem solving
- 33% Customer service
- 33% Analytical skills
- 30% Verbal / written communication skills
- 29% Collaboration/teamwork
- 27% Project management

Perception of skills gaps among Gen Y & Z vs. other segments of workers



Delving further into skills gap perceptions, over a third believe that the skills gaps among young people are on par with the general workforce (37% vs. 44% global), and the same percentage hold the often unfair and negative belief that there are *more* gaps among the younger Gen Y and Gen Z audience (37% vs. 29% global). While on the other end of the spectrum, about a quarter believe there are *fewer* gaps among the younger group (25% vs. 28% global). See CompTIA's *International Youth Perspectives of Technology and Careers* study.

69%

% of United States firms indicate they have mandatory training and professional development requirements for staff



Overall, 7 in 10 report their firm has training and professional development for employees in technical or soft skills that is required (69% vs. 63% global). Another 3 in 10 describe it as solely voluntary; not required but encouraged (27% vs. 31% global). Businesses in the maturing countries are more likely to indicate having mandatory training compared to their counterparts in the mature countries (44% vs. 34%, respectively).

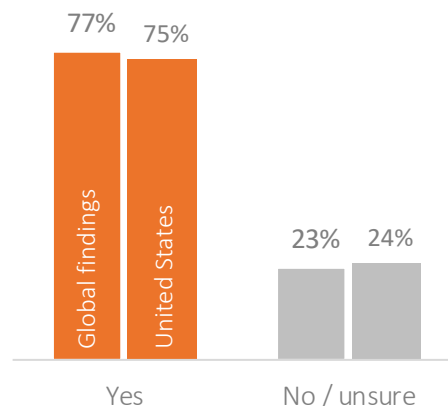
THE FUTURE OF WORK

Undoubtedly, technology will continue to profoundly impact nearly everyone's job—and it's mostly for the better. While on the one hand automating technologies have displaced segments of workers through substitution, in most cases automation frees up time for workers to focus on higher-level activities.

Automation of jobs is a prickly topic conjuring up ideas of mass layoffs and the robots taking over. Mass media has a tendency to latch on to the doom and gloom news. Regardless of viewpoints, the majority in CompTIA's study have recently seen articles about robotics, intelligent machines, and other automating technologies performing some aspects of jobs or possibly replacing them altogether (75% in the US vs. 77% global). On the contrary, the automation of repetitive tasks has spun opportunities elsewhere. For instance, tech support at one time may have been considered as 'on its way out.' Quite the opposite occurred with this growing field as technological advancements breed support needs.

On a slightly more personal level, 3 out of 4 are very concerned (28%) or somewhat concerned (45%) that automating technologies may mean fewer jobs for people like them. Another quarter aren't that concerned—on par with the 28% globally. McKinsey & Co. finds a very low portion of occupations that consists of activities that can be fully automated—less than 5%. Displacement rates will depend on a number of factors, but are most likely to occur in fields such as office support, food service, production work, and customer service and retail sales. McKinsey also points to growing demand for technological, social and emotional, and higher cognitive skills by 2030; especially given the adoption of automation and AI. See CompTIA's *International Youth Perspectives of Technology and Careers*.

Familiarity with stories about automating technologies and workforce impact



About 7 in 10 indicate at least some interest in attaining additional training or hands-on experience with technology as a result of the outlook for how robotics and automating technologies may impact the workforce (69% in the US, same as the 69% global, definitely + somewhat).

At any rate there's a need for employers, employees, and candidates to focus now more than ever on the continuous improvements of skills and training to keep pace with emerging technology—and employers need to drive impactful professional development strategies.

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

1. More time set aside for training
2. More cross-training (e.g. other functions)
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5. More classroom instructor-led training
6. More apprenticeship-type work-study programs
7. More autonomy in developing training program
8. More mobile options / app-based
9. More simulations or gaming elements
10. More social elements



METHODOLOGY | ABOUT COMPTIA | APPENDIX

ABOUT THIS RESEARCH

CompTIA's *International Trends in Technology and Workforce* study 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 August 2019. A total of 1,554 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 +/- 2.5 percentage points. This survey was fielded in Australia, Brazil, Canada, China, India, Ireland (Republic of), Japan, the Middle East (i.e. Oman, Saudi Arabia, United Arab Emirates), the Netherlands, Thailand, the United Kingdom, and the United States. Sampling error is larger for subgroups of the data. Prior year surveys had similar sample sizes and margins of error.

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 World Economic Forum Global Competitiveness 2019 [report](#) for details on their methodology for scoring ICT adoption and digital skills.

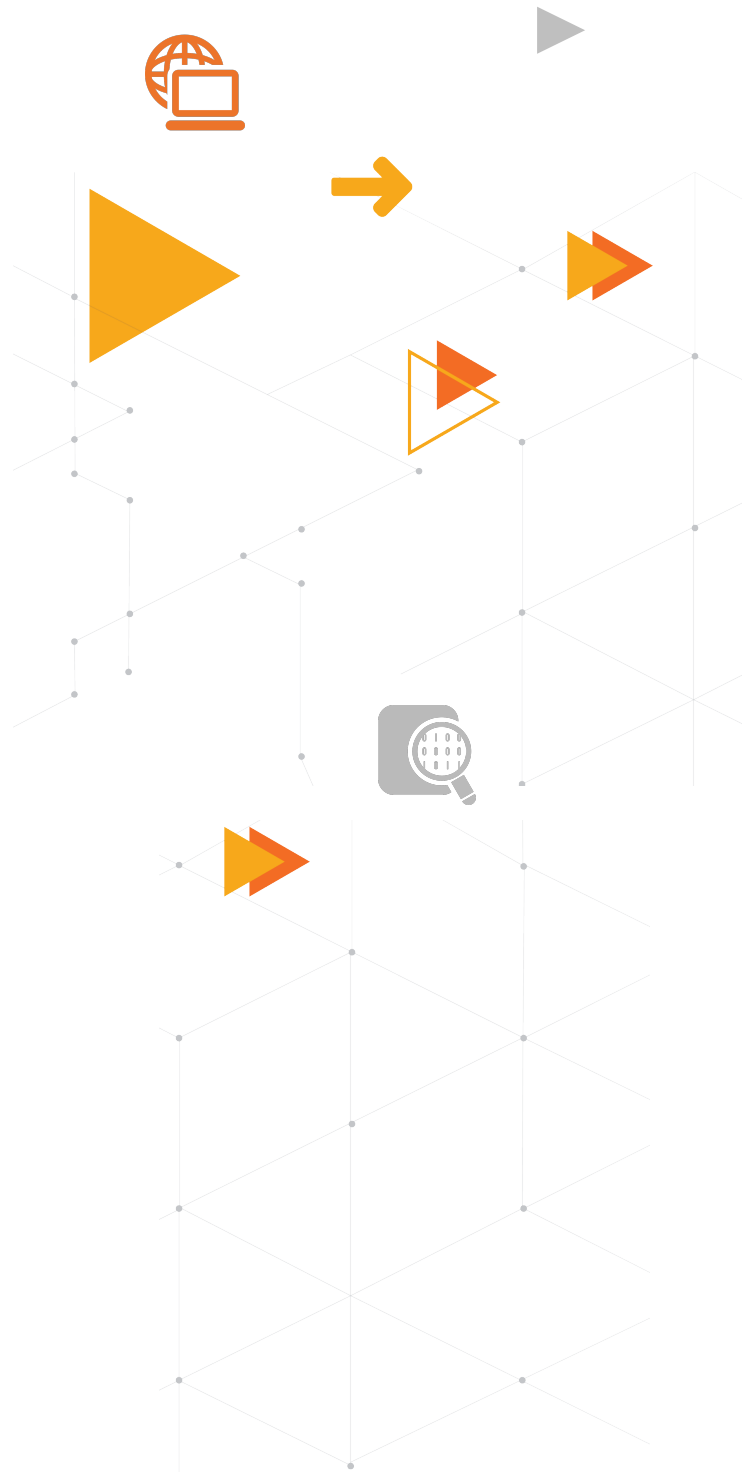
CompTIA is responsible for all content and analysis. Any questions regarding the study should be directed to CompTIA Research and Market Intelligence staff at research@comptia.org.

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

ABOUT COMPTIA

The Computing Technology Industry Association (CompTIA) is a leading voice and advocate for the global information technology ecosystem; and the tens of millions 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 advancing the tech industry and its workforce.



APPENDIX I

Business Perceptions of Technology Spending Level

	Australia	Brazil	Canada	China	India	Ireland	Japan	Middle East*	Netherlands	Thailand	United Kingdom	United States
Too low NET (ideally, should be spending more on technology)	25%	14%	17%	14%	13%	23%	22%	7%	27%	17%	26%	21%
About right	59%	40%	68%	47%	23%	65%	47%	47%	57%	69%	56%	51%
Too high NET (ideally, should be spending less on technology)	16%	46%	16%	39%	65%	13%	31%	46%	16%	14%	19%	28%

Sample Base: n = 1,554 business respondents roughly evenly distributed across countries
*Middle East region includes responses from Oman, Saudi Arabia, and United Arab Emirates

CompTIA

Source: CompTIA's International Trends in Technology and Workforce study

Business Perceptions of Technology Spending Level

	Firm Size by Staffing					Perception of Emtech			Outsourced IT Services Use		
	Overall	Micro (1-9)	Small (10-99)	Medium (100-499)	Large (500+)	Mostly Excite-ment	Mostly Trepid-ation	Equal Parts Each	Frequent/Regularly	Occasio-nally	Rarely
Too low NET (prefer to be spending more on technology)	19%	18%	19%	18%	20%	16%	21%	25%	18%	19%	22%
About right	52%	59%	57%	51%	50%	51%	50%	59%	43%	61%	64%
Too high NET (prefer to be spending less on technology)	29%	22%	24%	32%	30%	34%	29%	16%	39%	19%	14%

Sample Base: n = 1,554 business respondents roughly evenly distributed across countries
*Middle East region includes responses from Oman, Saudi Arabia, and United Arab Emirates

CompTIA

Source: CompTIA's International Trends in Technology and Workforce study

Perceptions of ROI of Technology in Use at Their Firm

	Australia	Brazil	Canada	China	India	Ireland	Japan	Middle East*	Netherlands	Thailand	United Kingdom	United States
Excellent or good ROI NET	62%	70%	68%	72%	87%	71%	27%	69%	53%	70%	69%	73%
Excellent ROI	13%	28%	14%	16%	57%	19%	6%	30%	9%	16%	17%	26%
Good ROI	50%	42%	53%	56%	30%	52%	21%	38%	44%	53%	52%	47%
Just okay or below average ROI	38%	30%	32%	28%	13%	29%	73%	31%	47%	30%	31%	27%

Sample Base: n = 1,554 business respondents roughly evenly distributed across countries
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CompTIA

Source: CompTIA's International Trends in Technology and Workforce study

Perceptions of ROI of Technology in Use at Their Firm

	Firm Size by Staffing					Perception of Emtech			Outsourced IT Services Use		
	Overall	Micro (1-9)	Small (10-99)	Medium (100-499)	Large (500+)	Mostly Excite-ment	Mostly Trepid-ation	Equal Parts Each	Frequent/Regularly	Occasio-nally	Rarely
Excellent or good ROI NET	66%	44%	63%	67%	71%	76%	52%	56%	72%	63%	56%
Excellent ROI	21%	10%	13%	22%	27%	30%	9%	12%	29%	12%	14%
Good ROI	45%	34%	50%	45%	44%	46%	43%	44%	43%	50%	42%
Just okay or below average ROI	34%	56%	37%	33%	29%	24%	48%	44%	28%	37%	44%

Sample Base: n = 1,554 business respondents roughly evenly distributed across countries
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CompTIA

Source: CompTIA's International Trends in Technology and Workforce study

Utilization of Outsourced IT Services

	Australia	Brazil	Canada	China	India	Ireland	Japan	Middle East*	Netherlands	Thailand	United Kingdom	United States
Frequent or regular utilization of outsourced IT services NET	53%	50%	54%	44%	73%	75%	36%	59%	55%	47%	53%	45%
Occasionally utilization	34%	37%	33%	32%	24%	17%	40%	24%	38%	39%	41%	41%
Rarely or no utilization	11%	12%	12%	22%	3%	5%	19%	10%	6%	10%	4%	14%
Managed Services - reported utilization**	25%	24%	19%	23%	36%	42%	20%	11%	29%	21%	28%	25%

Sample Base: n = 1,554 business respondents roughly evenly distributed across countries
*Middle East region includes responses from Oman, Saudi Arabia, and United Arab Emirates
**Managed services utilization was asked separately of outsourced IT services utilization

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Source: CompTIA's International Trends in Technology and Workforce study

Utilization of Outsourced IT Services

	Firm Size by Staffing					Perception of Emtech			Outsourced IT Services Use		
	Overall	Micro (1-9)	Small (10-99)	Medium (100-499)	Large (500+)	Mostly Excite-ment	Mostly Trepid-ation	Equal Parts Each	Frequent/Regularly	Occasio-nally	Rarely
Frequent or regular utilization of outsourced IT services NET	53%	37%	46%	58%	56%	60%	54%	36%	100%	-	-
Occasionally utilization	34%	29%	39%	30%	36%	30%	35%	42%	-	100%	-
Rarely or no utilization	11%	30%	11%	9%	7%	9%	7%	18%	-	-	100%
Managed Services - reported utilization**	25%	7%	16%	29%	30%	30%	22%	16%	32%	20%	11%

Sample Base: n = 1,554 business respondents roughly evenly distributed across countries
*Middle East region includes responses from Oman, Saudi Arabia, and United Arab Emirates
**Managed services utilization was asked separately of outsourced IT services utilization

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Source: CompTIA's International Trends in Technology and Workforce study

Types of Outsourced IT Services Utilized in Past Year

	Australia	Brazil	Canada	China	India	Ireland	Japan	Middle East*	Netherlands	Thailand	United Kingdom	United States
Repair or troubleshooting	32%	44%	29%	41%	41%	34%	37%	41%	37%	48%	38%	29%
General IT consulting / advisory	42%	35%	29%	39%	35%	40%	27%	36%	29%	33%	34%	34%
Deployment / integration	26%	39%	24%	41%	41%	29%	28%	38%	34%	50%	26%	28%
Cybersecurity related	38%	35%	32%	31%	32%	33%	38%	40%	32%	29%	33%	26%
Software development / mobile app	34%	33%	25%	37%	38%	31%	31%	31%	30%	34%	36%	32%
Data / analytics / AI related	30%	30%	24%	37%	41%	29%	30%	35%	24%	31%	29%	35%
Web design or e-commerce related	34%	31%	26%	29%	41%	23%	23%	42%	23%	31%	23%	33%
Emerging technology related	23%	26%	20%	39%	32%	27%	18%	26%	19%	43%	20%	16%

Sample Base: n = 1,554 business respondents roughly evenly distributed across countries
*Middle East region includes responses from Oman, Saudi Arabia, and United Arab Emirates

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Source: CompTIA's International Trends in Technology and Workforce study

Types of Outsourced IT Services Utilized in Past Year

	Firm Size by Staffing					Perception of Emtech			Outsourced IT Services Use		
	Overall	Micro (1-9)	Small (10-99)	Medium (100-499)	Large (500+)	Mostly Excite-ment	Mostly Trepid-ation	Equal Parts Each	Frequent/Regularly	Occasio-nally	Rarely
Repair or troubleshooting	38%	34%	36%	38%	38%	40%	33%	38%	40%	39%	25%
General IT consulting / advisory	34%	17%	27%	34%	42%	40%	28%	28%	38%	34%	22%
Deployment / integration	34%	20%	29%	34%	38%	37%	27%	32%	39%	31%	19%
Cybersecurity related	33%	21%	26%	32%	41%	34%	32%	32%	35%	35%	20%
Software development / mobile app	33%	14%	27%	36%	37%	35%	28%	31%	36%	33%	16%
Data / analytics / AI related	31%	15%	22%	31%	39%	36%	27%	24%	36%	28%	19%
Web design or e-commerce related	30%	29%	27%	29%	32%	33%	26%	25%	32%	31%	20%
Emerging technology related	26%	7%	20%	27%	31%	29%	23%	20%	30%	24%	13%

Sample Base: n = 1,554 business respondents roughly evenly distributed across countries
*Middle East region includes responses from Oman, Saudi Arabia, and United Arab Emirates

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Source: CompTIA's International Trends in Technology and Workforce study

APPENDIX II

Perceptions of the Skills Gap

Compared to 2 years ago...	Australia	Brazil	Canada	China	India	Ireland	Japan	Middle East*	Netherlands	Thailand	United Kingdom	United States
Skills gap growing NET	46%	41%	43%	40%	55%	42%	42%	42%	46%	59%	47%	49%
No change in skills gap	19%	23%	33%	25%	6%	26%	27%	14%	22%	13%	29%	19%
Skills gap shrinking NET	29%	34%	21%	36%	38%	29%	21%	35%	28%	28%	22%	30%

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*Middle East region includes responses from Oman, Saudi Arabia, and United Arab Emirates

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Source: CompTIA's International Trends in Technology and Workforce study

Perceptions of the Skills Gap

Compared to 2 years ago...	Firm Size by Staffing					Perception of Emtech			Outsourced IT Services Use		
	Overall	Micro (1-9)	Small (10-99)	Medium (100-499)	Large (500+)	Mostly Excite-ment	Mostly Trepid-ation	Equal Parts Each	Frequent/Regularly	Occasio-nally	Rarely
Skills gap growing NET	46%	33%	47%	47%	48%	53%	42%	33%	51%	41%	38%
No change in skills gap	21%	37%	22%	20%	18%	14%	27%	33%	16%	27%	31%
Skills gap shrinking NET	29%	20%	26%	30%	32%	31%	27%	28%	31%	29%	24%

Sample Base: n = 1,554 business respondents roughly evenly distributed across countries
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CompTIA

Source: CompTIA's International Trends in Technology and Workforce study

Perceptions of Other Gaps Affecting Hiring and Retention in Tech

	Australia	Brazil	Canada	China	India	Ireland	Japan	Middle East*	Netherlands	Thailand	United Kingdom	United States
Innovation gap	47%	46%	32%	35%	43%	42%	38%	48%	48%	54%	34%	45%
Soft skills gap	41%	42%	40%	47%	40%	37%	43%	55%	36%	47%	43%	40%
Wage gap	39%	34%	34%	37%	45%	37%	38%	38%	38%	42%	53%	41%
Perception gap	29%	38%	29%	48%	37%	29%	39%	29%	22%	32%	26%	26%
Sector gap	27%	32%	31%	40%	41%	26%	23%	38%	28%	30%	33%	26%
Confidence gap	34%	18%	33%	35%	34%	30%	24%	37%	25%	26%	30%	30%
Location gap	22%	24%	25%	35%	34%	31%	25%	25%	20%	20%	20%	25%

Gap Definitions:

Innovation gap - speed of innovation exceeding pace of training/workforce development

Soft skills gap - insufficient soft/capability in non-technical areas such as project mgmt., collaboration, comm. etc.

Wage gap - market wages for certain professions/skills exceeding employer budgets

Perception gap - expecting workers to fit a specific mold / not considering diverse backgrounds

Sector gap - insufficient expertise in specific sectors, i.e. finance, healthcare, manufacturing, etc.

Confidence gap - prospects deterred by fears, uncertainty, or negative perceptions

Location gap - jobs in one location and workers in another

Sample Base: n = 1,554 business respondents roughly evenly distributed across countries
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CompTIA

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Perceptions of Other Gaps Affecting Hiring and Retention in Tech

	Firm Size by Staffing					Perception of Emtech			Outsourced IT Services Use		
	Overall	Micro (1-9)	Small (10-99)	Medium (100-499)	Large (500+)	Mostly Excite-ment	Mostly Trepid-ation	Equal Parts Each	Frequent/Regularly	Occasio-nally	Rarely
Innovation gap	43%	32%	37%	42%	48%	45%	39%	41%	43%	45%	37%
Soft skills gap	42%	29%	41%	43%	46%	42%	39%	47%	42%	45%	37%
Wage gap	40%	39%	44%	37%	41%	40%	41%	38%	39%	41%	37%
Perception gap	32%	29%	23%	33%	35%	35%	26%	31%	35%	29%	28%
Sector gap	31%	26%	27%	31%	34%	31%	32%	30%	33%	32%	21%
Confidence gap	30%	31%	26%	30%	30%	31%	32%	24%	31%	28%	26%
Location gap	43%	32%	37%	42%	48%	45%	39%	41%	43%	45%	37%

Gap Definitions:

Innovation gap - speed of innovation exceeding pace of training/workforce development

Soft skills gap - insufficient soft/capability in non-technical areas such as project mgmt., collaboration, comm. etc.

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Location gap - jobs in one location and workers in another

Sample Base: n = 1,554 business respondents roughly evenly distributed across countries
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CompTIA

Source: CompTIA's International Trends in Technology and Workforce study

Self-reported Ability to Identify and Assess Skills Gaps

	Firm Size by Staffing					Perception of Emtech			Outsourced IT Services Use		
	Overall	Micro (1-9)	Small (10-99)	Medium (100-499)	Large (500+)	Mostly Excite-ment	Mostly Trepid-ation	Equal Parts Each	Frequent/Regularly	Occasio-nally	Rarely
Have a pretty good handle on identifying and assessing skills gaps	39%	39%	30%	39%	44%	51%	19%	31%	43%	34%	39%
Often struggle in identifying and assessing skills gaps	33%	23%	34%	37%	30%	27%	52%	25%	37%	32%	22%
About in the middle	25%	32%	27%	21%	25%	21%	23%	36%	19%	31%	34%
Don't know	4%	6%	9%	3%	1%	1%	6%	8%	1%	3%	5%

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CompTIA

Source: CompTIA's International Trends in Technology and Workforce study

Skills Gap Areas of Concern

	Firm Size by Staffing					Perception of Emtech			Outsourced IT Services Use		
	Overall	Micro (1-9)	Small (10-99)	Medium (100-499)	Large (500+)	Mostly Excite-ment	Mostly Trepid-ation	Equal Parts Each	Frequent/Regularly	Occasio-nally	Rarely
Significant or moderate concern NET	57%	47%	45%	60%	63%	64%	46%	53%	61%	56%	49%
Emerging tech, i.e. IoT, AI, blockchain	57%	47%	45%	60%	63%	64%	46%	53%	61%	56%	49%
Cybersecurity	55%	46%	46%	57%	60%	59%	54%	47%	59%	54%	46%
Integration, i.e. systems, platforms	55%	39%	47%	57%	61%	59%	49%	52%	61%	52%	44%
Software or app development	54%	45%	47%	57%	58%	58%	50%	51%	59%	53%	42%
Digital business transformation	54%	48%	47%	55%	58%	59%	49%	48%	60%	52%	40%
Data mgmt. / analytics / big data	53%	42%	44%	55%	58%	59%	47%	45%	58%	50%	40%
Soft skills	52%	35%	46%	54%	57%	57%	48%	44%	57%	51%	40%
Cloud IaaS / PaaS / SaaS	50%	41%	42%	53%	53%	53%	51%	40%	56%	48%	35%
Tech / IT support	49%	36%	44%	51%	52%	51%	52%	40%	55%	46%	33%
Network / systems administration	49%	40%	43%	51%	52%	51%	50%	40%	54%	47%	34%

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CompTIA

Source: CompTIA's International Trends in Technology and Workforce study

Soft Skill Development / Areas for Improvement Priorities

	Firm Size by Staffing					Perception of Emtech			Outsourced IT Services Use		
	Overall	Micro (1-9)	Small (10-99)	Medium (100-499)	Large (500+)	Mostly Excite-ment	Mostly Trepid-ation	Equal Parts Each	Frequent/Regularly	Occasio-nally	Rarely
Flexibility / adaptability	41%	31%	46%	40%	41%	43%	31%	46%	41%	42%	33%
Innovation / creative problem solving	39%	38%	34%	41%	40%	41%	34%	41%	39%	38%	49%
Collaboration / teamwork	38%	33%	38%	40%	38%	39%	38%	38%	39%	40%	30%
Leadership	37%	25%	38%	34%	40%	40%	32%	33%	37%	34%	48%
Strong work ethic	36%	40%	37%	34%	38%	36%	36%	37%	36%	36%	39%
Motivation / initiative	35%	27%	32%	37%	36%	36%	30%	40%	32%	40%	37%
Analytical skills	35%	40%	32%	32%	37%	37%	31%	33%	35%	35%	31%
Customer service	32%	46%	33%	29%	33%	34%	31%	28%	32%	33%	33%
Project management	31%	25%	31%	31%	32%	31%	30%	34%	31%	31%	31%
Verbal / written communication skills	23%	19%	27%	22%	23%	23%	22%	27%	24%	21%	25%

Sample Base: n = 1,554 business respondents roughly evenly distributed across countries
*Middle East region includes responses from Oman, Saudi Arabia, and United Arab Emirates

CompTIA

Source: CompTIA's International Trends in Technology and Workforce study

Top Triggers that Prompt Change to Cybersecurity Approach

	Firm Size by Staffing					Perception of Emtech			Outsourced IT Services Use		
	Overall	Micro (1-9)	Small (10-99)	Medium (100-499)	Large (500+)	Mostly Excite-ment	Mostly Trepid-ation	Equal Parts Each	Frequent/Regularly	Occasio-nally	Rarely
Change in IT operations, i.e. cloud initiative, DX, IoT, etc.	40%	20%	28%	45%	46%	45%	34%	34%	43%	39%	31%
Action taken after knowledge gained from training or certification	32%	24%	28%	32%	36%	35%	32%	23%	37%	31%	14%
Change in management	29%	22%	28%	32%	30%	32%	31%	20%	32%	31%	19%
Vulnerability discovered by an outside IT services firm	28%	17%	22%	28%	33%	29%	28%	23%	32%	26%	12%
Reports of breaches at other organizations	27%	15%	23%	30%	29%	29%	27%	23%	32%	25%	14%
Change in business operations or customer base	27%	16%	26%	29%	27%	30%	23%	21%	29%	27%	14%
Internal breach or incident	25%	21%	22%	25%	28%	28%	22%	21%	28%	25%	15%

Sample Base: n = 1,554 business respondents roughly evenly distributed across countries
*Middle East region includes responses from Oman, Saudi Arabia, and United Arab Emirates

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