



The Changing Landscape of Disruptive Technologies

**Tech hubs forging new paths to
outpace the competition**

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Foreword

KPMG recognizes the importance of innovation to the technology industry and the global economy as a whole. KPMG's publication series, *The Changing Landscape of Disruptive Technologies*, now in its sixth year, provides perspectives about tech innovation trends, top barriers to commercialize innovation and insights into tech innovation best practices.

As in prior years, this publication includes perspectives from KPMG's annual survey of more than 750 global technology industry leaders including start-up entrepreneurs and FORTUNE 500 executives, mostly representing the C-suite (85 percent). The 2018 publication is issued in two parts, featuring the following topics:

- **Part 1 | Tech hubs forging new paths to outpace the competition.** This section unveils the cities and countries that are leading as top innovation hubs. This publication also features the point of view of 16 KPMG professionals who are technology country industry leaders, across North America, Europe, Middle East, Africa (EMEA) and Asia Pacific (ASPAC), to better assess each market's advantages and challenges. With stakes so high to compete in a global technology industry ecosystem, leadership insights on innovation management are also provided.
- **Part 2 | Disruptive technology trends and barriers to commercialize emerging technologies.** This next issue examines the emerging technologies with the most potential to disrupt industries and transform business models. The publication also identifies the monetization opportunities of these disruptors and adoption challenges by country, region and industry.

Innovation has become decentralized globally with many cities making great progress while others have struggled with macroeconomic and infrastructure issues. Many factors affect a city's perception as an innovation hub, including favorable government policies and incentives, accelerators, tech parks, corporate investment, state-of-the-art infrastructure and, in all cases, at least a few highly successful and wildly popular success stories.

Global tech industry innovation management trends indicate the C-suite is increasingly in charge of spearheading innovation initiatives. No wonder—commercial results, corporate culture and successful implementation of emerging technologies are more closely aligned.

The success of Silicon Valley's entrepreneurial culture continues to incentivize countries and cities around the world to become leading tech innovation hubs. The promise is a better future for all, business and consumer alike, in developed and emerging regions. I trust you will find this publication insightful, and I welcome your feedback and suggestions for the next edition.



Tim Zanni

Global and U.S. Technology Sector Leader
Chair of Global and U.S. Technology, Media and Telecommunications (TMT) Line of Business

Leading tech innovation hubs

Country leadership

Silicon Valley innovation standing

Cities outpacing the competition



Country leadership

The United States and China continue to outpace the competition

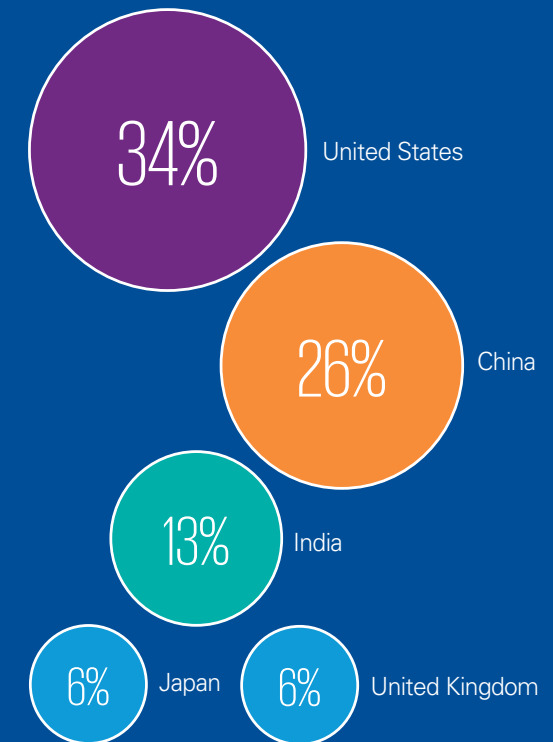
The United States and China dominate the tech leadership charts. A combined 60 percent of the global technology industry leaders point to these two powerhouses as the leaders for developing disruptive technology breakthroughs that are expected to have a global impact. The Silicon Valleys of China and the United States are both angling for an edge in artificial intelligence (AI), an important engine of innovation, and driving market leadership in platform business models. These two mega tech powers also outpace other countries in venture capital (VC) investment.

The United States continued to solidify its position as the global tech innovation leader in this year's findings. More than one-third of the respondents (34 percent) ranked the United States at the top. This rating is up from the prior year when 26 percent earmarked the United States in the lead. In the United States, innovation continues to gain momentum, as more cities want to duplicate Silicon Valley's success. In addition, many top market cap technology companies are spreading their headquarters and operations across many U.S. hubs fueling economic growth opportunities and the creation of a more diverse innovation ecosystem.

China retained the second place with 26 percent of the votes. China's status as a leading tech innovator continues to gain momentum given the increasing success of Chinese technology companies developing customized products and services for the tech-savvy, always-on digital Chinese consumer. In China, government-industry collaboration, the aggressive investment of tech giants in start-ups and massive addressable markets are fostering innovation. Municipal governments are also investing in building tech hubs to attract talent.

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Q: Which country/region shows the most promise for disruptive technology breakthroughs that will have a global impact?



Partial list of countries shown. Percentages do not sum to 100%.

Source: KPMG Technology Innovation findings, March 2018

India maintains a strong showing this year. It is ranked in third place, as 13 percent of the global technology industry leaders indicate its potential for tech breakthroughs. India has prioritized government support for entrepreneurship and a burgeoning culture of innovation. Many start-up business models are leveraging emerging technologies to cater to India's mobile-first generation.

The United Kingdom did the best in Europe with a 6 percent rating, a drop from 10 percent last year. The United Kingdom has gained recognition as an emerging innovation hub, but concerns about the economic impact of Brexit may be reflected in the lower vote. Recently the government made a significant commitment to its own investment fund and allowance for tax breaks to encourage VC and corporate investment in "knowledge-intensive companies."

Japan had a good showing in the survey results with 6 percent of the global technology industry executives selecting the country as a leader for disruptive technology breakthroughs. Japan, long known for its tech innovation acumen, is continuing to show its strength with expertise in robotics and Internet of Things (IoT). The government is moving forward with the initiative "Society 5.0" to focus on the opportunities digitization offers to improve the quality of life in Japan. In addition, the pace of disruptive technology development is expected to accelerate with the approach of the 2020 summer Olympics in Tokyo.

The survey findings showcase ASPAC's tech innovation evolution. Australia, China, India, Japan, South Korea and Taiwan were all named for a cumulative 53 percent. EMEA was the laggard by comparison (10 percent).

Responses by country

The results underscore a nationalistic bias.

United States

87% of the U.S. respondents believe the United States leads in potential for disruptive technology breakthroughs compared to 49 percent the prior year. Only 8 percent forecast China will take the lead, followed by India at 6 percent.

China

72% of those queried in China said their own country is the frontrunner (up from 59 percent the prior year). India was selected by 9 percent, followed by Japan at 7 percent. Only 3 percent pointed to the United States (compared with 9 percent the prior year).

This nationalistic bias was also noticeable for those polled in the United Kingdom. About one-third (31 percent) selected the United Kingdom (down from 57 percent in the prior year) while 26 percent selected China (up from 11 percent the prior year).

Germany, India, Japan and South Korea were among the countries that did not follow this nationalistic trend. Germany identified China as the leader (50 percent), followed by the United States at 27 percent. In India, 43 percent of tech leaders ranked the United States at the top followed by 26 percent naming their own country. The Japanese respondents placed both the United States and China at the top with 33 percent each. South Korea selected the United States as the leader (34 percent) followed by China (18 percent).

Responses by region

North America

67% among those polled in North America selected the United States as the innovation leader, compared to 46 percent the prior year. China drew 11 percent, a lower rank from 18 percent in the prior year.

EMEA

29% of the EMEA tech leaders identified China as the top leader ahead of the United States at 22 percent and the United Kingdom at 13 percent.

ASPAC

33% of the ASPAC respondents selected China. The United States drew 25 percent, a significant increase from 13 percent in the prior year.

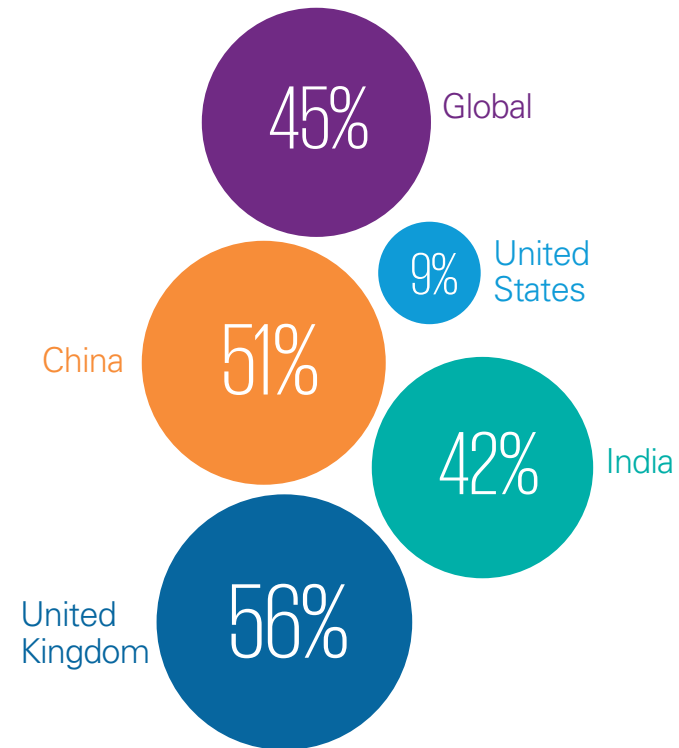
Silicon Valley innovation standing



Results were mixed: 45 percent globally predict the innovation epicenter will move from Silicon Valley by 2021 while the remainder were about evenly split between “unlikely” and “neutral.” In an interesting dynamic that underscored escalating competition between the United States and China over tech leadership, only 9 percent in the U.S. forecast that Silicon Valley will lose stature, while half of China respondents predicted that Silicon Valley will decline.

Among those who say the tech innovation center of the world will move from Silicon Valley, nearly one-third globally named China as the future tech hub. Other cities within the United States were selected by 24 percent to rise as contenders. India continues to be a strong competitor, highlighted by 16 percent again this year.

Q: What is the likelihood that the technology innovation center of the world will move from Silicon Valley to another country in the next four years?



Percentage of those who answered 4–5 on a 1–5 rating scale (1=very unlikely and 5=very likely).

Source: KPMG Technology Innovation findings, March 2018

Cities outpacing the competition

Q: In addition to Silicon Valley/San Francisco, which three cities will be seen as a leading technology innovation hub over the next four years?

Partial list of cities shown.

Respondents could enter up to three cities.

Source: KPMG Technology Innovation findings, March 2018

Shanghai, China  1	Tokyo, Japan  2	London, U.K.  3	New York, U.S.  3	Beijing, China  5
Singapore  5	Seoul, S. Korea  7	Bangalore, India  8	Tel Aviv, Israel  8	Berlin, Germany  10
11	• Sydney, Australia			
12	• Boston, U.S. • Chicago, U.S. • Toronto, Canada			
15	• Hong Kong, China • Shenzhen, China			

The Pearl City again ranks first, then Tokyo. London and New York place third as leading tech innovation hubs over the next four years.

ASPAC cities

In sync with a positive outlook for China, Shanghai was the leader globally (for the third year in a row).

The Pearl City of China, known for its more hospitable environment, was selected by one-quarter globally and by 38 percent in China. Tokyo's technology leadership and robotics focus helped it to rank second overall, drawing a strong 20 percent global response (and 43 percent within Japan).

Elsewhere in Asia, Singapore climbed up to 13 percent as the city emerges as a regional center of action. The tech epicenter of Beijing was named by 13 percent globally, a slight decline from last year, yet the capital city was favored by China respondents at a strong 23 percent. Seoul, with its tech business conglomerates such as Samsung, swung upward to 11 percent. Sydney gained to 7 percent, lifted by the success of several home-grown start-ups such as unicorn-financed design company Canva. Hong Kong gained slightly to 4 percent in a sign that its innovation push is working, tying with Shenzhen, also at 4 percent, given its continued core strengths in hardware innovation. The greater Shenzhen-Hong Kong area is gaining a top ranking in terms of global innovation clusters (measured by patents). The current national strategy for China is to develop Beijing (in Northern China) and the Greater Bay Area (including key cities in Guangdong province, Hong Kong and Macau) as key driving forces for innovation similar to Silicon Valley in the United States.

India's cities drew relatively weak results in the global survey of which three cities are expected to become leading tech hubs: the financial capital of

Mumbai drew 2 percent while Hyderabad and New Delhi were named by only 1 percent. The outlier was software-centric Bangalore, cited by 10 percent in a slight increase from last year and by a large margin (58 percent) by those in India.

EMEA cities

The global outlook for European cities was mixed.

London drew a strong 19 percent response rate with its Silicon Roundabout despite Brexit concerns. Confidence shone as the U.K. poll segment placed London first, at 39 percent, though that was slightly down from the prior year. Among the other European cities named, tech hub rival Berlin drew 8 percent (down from 10 percent a year ago).

In the start-up nation of Israel, Tel Aviv scored eighth, at 10 percent, up slightly from a year ago as Israel continues to excel with innovations in security, agriculture and deep tech and sees increased venture investment and more Research & Development (R&D) hubs formed by major tech companies.

North American cities

A number of U.S. cities earned global high marks, led by New York's Silicon Alley at 19 percent globally and, again showing a national bias, by a strong 28 percent among those polled in the United States. Chicago gained stature in the global ranking of U.S. cities, obtaining the second place in a tie with Boston. Chicago improved its U.S. standing from third place last year but slid from 10 percent to 6 percent on the global poll. Boston dropped from 9 percent to 6 percent on the global vote as other cities around the world gained momentum as top contenders. Chicago and Boston are positioned to be leading tech hubs for years to come given the continued rise in VC investment and the incremental presence of key tech giants.

Los Angeles decreased from 4 percent to 3 percent this year, even though the city is the center of digital media revolution with leading companies in gaming, entertainment, internet and biotech. Seattle and the Texas cities of Houston and Austin still made the listings this year but in a slight surprise, Washington, DC was not named this year. Whichever cities are selected by U.S. platform companies to expand headquarters and operations will likely climb in next year's rankings.

In Canada, Toronto's strong ecosystem helped it draw 6 percent of the global vote while on the western coast, Vancouver was named by 1 percent of the respondents as a potential leading hub over the next four years. The tech sector in Canada continues to demonstrate robust growth led by advances in AI.



U.S. city rankings

Rankings based on a global poll

- | | |
|---|--|
| 1 | • New York, NY |
| 2 | • Boston, MA • Chicago, IL |
| 4 | • Los Angeles, CA |
| 5 | • Austin, TX • Houston, TX • Seattle, WA |

Rankings based on a U.S. poll

- | | |
|---|-------------------|
| 1 | • New York, NY |
| 2 | • Boston, MA |
| 3 | • Chicago, IL |
| 4 | • Los Angeles, CA |
| 5 | • Seattle, WA |

Partial list of cities shown.

Source: KPMG Technology Innovation findings, March 2018

Country and regional highlights

Fierce competition and nationalistic pride



China		India		Japan		United Kingdom		United States	
Shanghai	38%	Bangalore	58%	Tokyo	43%	London	39%	New York	28%
Beijing	23%	London	22%	Shanghai	23%	Tokyo	23%	Shanghai	27%
Tokyo	19%	New York	14%	New York	20%	New York	21%	Tokyo	24%
		Shanghai	14%						
		Tokyo	14%						

ASPAC		EMEA		North America	
Shanghai	27%	London	25%	New York	28%
Tokyo	20%	Shanghai	19%	Shanghai	27%
Singapore	17%	New York	18%	Tokyo	21%
		Tokyo	18%		

Partial list of cities and countries shown.

Source: KPMG Technology Innovation findings, March 2018

Innovation management trends

Incentives

Innovation metrics

Who is leading innovation?

Visionary companies

Visionary leaders



Incentives

Promotions matter more than cash

Career progression gained as the most effective motivator of employees across geographies. More than a quarter earmarked promotions, up from 24 percent. Financial incentives and cash combined were cited by 30 percent, a drop from 33 percent a year ago. A related factor of internal recognition was marked by 10 percent and even higher by India, at 22 percent.

Lesser ratings globally were given to time allocation for ideation (11 percent), external recognition (10 percent) and stock compensation (8 percent).

Q: If you had to select just ONE approach, which of the following is the most effective for an organization to motivate its employees to be innovative?

Career progression (promotion)



27% Global
26% China
29% U.S.

Other financial incentives



16% Global
18% China
19% U.S.

Cash



14% Global
18% China
13% U.S.

Partial list of responses shown.

Source: KPMG Technology Innovation findings, March 2018

Innovation metrics

Revenue and market share are at the top

A clear pattern of direct commercial results as the top metrics for innovation were prominent again across geographies in this year's findings. Among mid-to-large size companies polled globally, revenue growth, market share and return on investment (ROI) were each earmarked by about one-third as leading innovation measures.

Revenue growth was selected as the top global metric this year (33 percent) compared to ranking second the previous year. Geographically, the U.S. (38 percent), China and the U.K. (37 percent each), identified revenue growth as the top indicator to measure the value of innovation.

Market share ranked second globally (32 percent) compared to ranking fourth the previous year. Respondents from Russia and Singapore (50 percent each), Japan (47 percent), Canada (44 percent) and Taiwan (42 percent) pointed to market share as the leading innovation metric in their region.

Other highlights

Market value – In a few year-to-year differences, market value drew 28 percent this year on the global poll compared to 31 percent the previous year. Singapore and Japan ranked market value as the second most important metric at 44 percent and 37 percent respectively.

Brand/reputation barometer – Among the votes globally, brand reputation got 27 percent compared to 33 percent the year before. This metric ranked second in Taiwan with a vote of 35 percent and in the United States with 30 percent.

Incremental revenue from new products and services – India's tech executives selected the successful monetization of

products and services to increase revenue as the second most important metric with 37 percent of the votes. The United States drew 30 percent this year (a tie for second place with brand/reputation barometer and market share).

Number of patents – The top-rated factor globally in the prior year was number of patents. The United Kingdom, Germany and China had strong responses for the number of patents as an innovation measure at 35 percent, 33 percent and 26 percent respectively.

Number of new customers acquired – Winning new customers is critical to grow the business. Germany gave the highest rating (43 percent) to this metric.

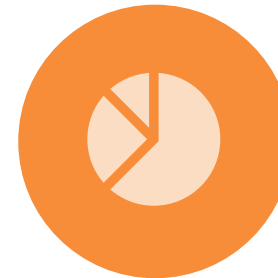
Q: What is the top metric used in your organization to measure the value of innovation?

Revenue growth



33% Global
37% China
38% U.S.

Market share



32% Global
32% China
30% U.S.

ROI



30% Global
29% China
26% U.S.

Partial list of responses shown.

Source: KPMG Technology Innovation findings, March 2018

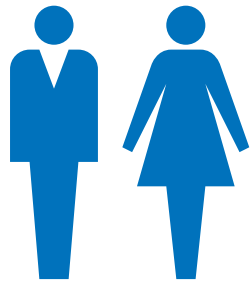
Who is leading innovation?

The C-suite is forging ahead to outpace the competition. For the first time, the chief information officer received the top global rank (29 percent) followed by the chief innovation officer (27 percent) as the function most responsible for moving innovation initiatives forward among mid-to-large size enterprises.

The high votes for the chief information officer and chief innovation officer positions globally were followed by the chief executive officer (CEO) at 21 percent—a clear indication that innovation is central to the C-suite agenda. Most other countries tracked the global finding while Japan gave extra high marks to the chief information role (53 percent).

R&D functions were cited by 10 percent globally. R&D was weighted more heavily at 20 percent by respondents in India but to a lesser degree by other Asian markets (Japan, China and Korea) surveyed.

Q: What function/role has the responsibility to drive innovation in your company?



	Global	U.S.	China
Chief information officer	29%	32%	26%
Chief innovation officer	27%	30%	29%
Chief executive officer	21%	22%	11%

Partial list of responses shown.

Source: KPMG Technology Innovation findings, March 2018

These findings are consistent with the Harvey Nash/KPMG global chief information officer (CIO) survey. According to the survey, tech sector CIOs are more likely to lead innovation across the business and less likely to only lead in technical matters compared to non-technology industry CIOs.

The tech sector is at the forefront of innovation and CIOs play a critical role in enabling business results by creating an effective enterprise-wide digital strategy and implementing nimble Information Technology (IT) ecosystems. The overall outlook is for tech industry chief information officers and chief innovation officers to lead innovation across the enterprise and take a more prominent role in corporate boards. Challenging areas to maintain their role as the innovation leaders include the capability to measure initiatives that impact business results and continuing to attract and retain the right talent.

Q: What percentage of time does your C-suite allocate to drive innovation initiatives?

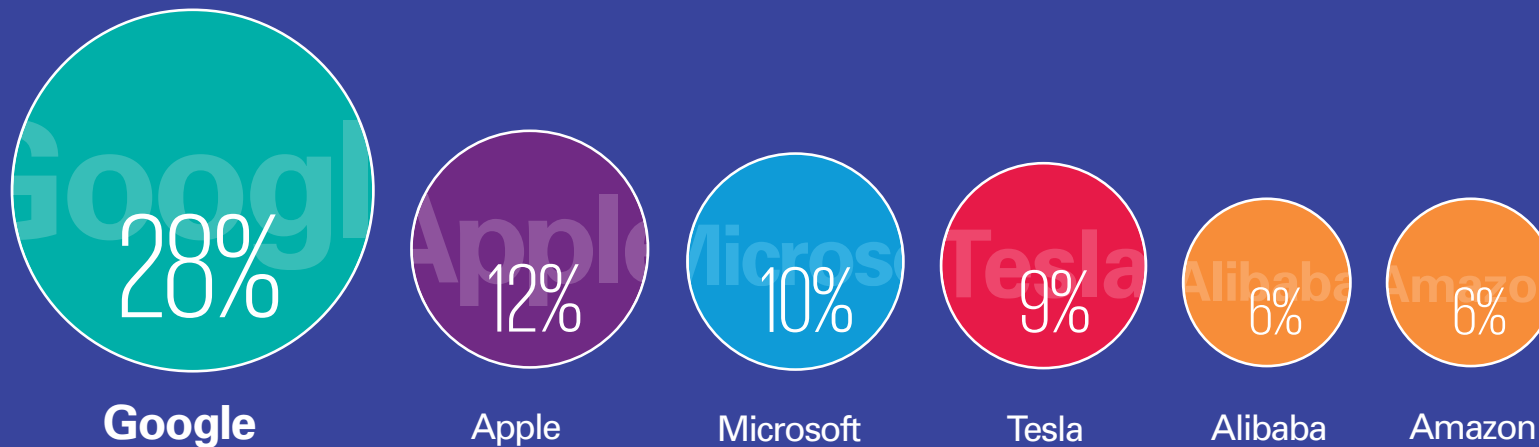


	Global	U.S.	China
Less than 10%	21%	30%	26%
10% – 40%	45%	44%	40%
41% – 75%	25%	19%	21%
Over 75%	10%	7%	13%

Source: KPMG Technology Innovation findings, March 2018

Visionary companies

Q: In your opinion, which company is the leader in driving technology innovation?



Google retains top status

Google retained its lead globally, as it spearheads innovation into next-generation technologies. Google outpaced other companies, climbing to 28 percent globally, up from 20 percent the previous year, and earning a nod from China, which also ranked the company as the leader—ahead of Alibaba.

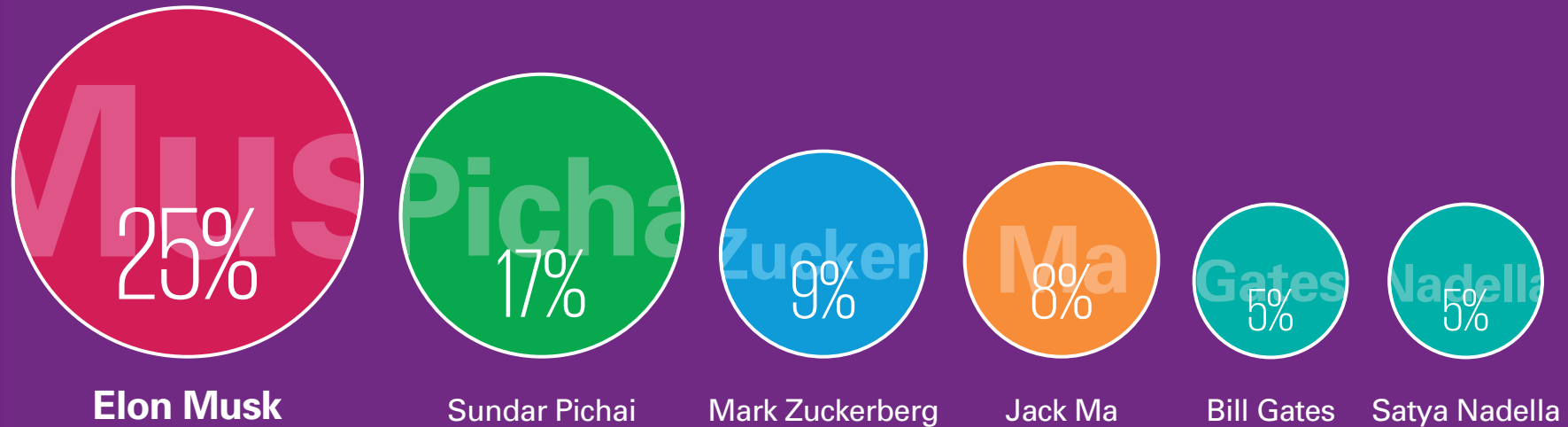
Apple got 12 percent and Microsoft 10 percent: both were off slightly from last year at 15 percent and 12 percent, respectively. Tesla jumped into fourth place at 9 percent from 5 percent last year. Alibaba and Amazon climbed to 6 percent globally. IBM and Facebook followed with 4 percent each.

Partial list of companies shown. Respondents could enter one company.

Source: KPMG Technology Innovation findings, March 2018

Visionary leaders

Q: Who is the *top person* emerging as a global technology innovation visionary?



Elon Musk is in the top spot for emerging global technology leadership.

He was named by one-quarter of those surveyed globally, a significant increase from last year, as he cements his status internationally with innovation breakthroughs including transportation, space exploration and AI.

Chinese tech leader Jack Ma of Alibaba continued to get credit globally, in fourth place with 8 percent (and second place at 18 percent from China). His visionary leadership has climbed over the past few years and he is universally recognized for innovations in e-commerce, fintech and logistics as well as recent overseas investments in tech start-ups.

Other upward movers and high rankers in the ratings continued to be from U.S. tech powerhouses: Google CEO Sundar Pichai at 17 percent, Facebook leader

Mark Zuckerberg at 9 percent, and Bill Gates and Satya Nadella of Microsoft at 5 percent each. Apple CEO Tim Cook and Larry Page (CEO) of Google's parent company, Alphabet Inc., dropped in the ratings to 4 percent this year.

There was not much variation from a country perspective, which, in effect, helped to underscore the strength of U.S. tech leaders. The one exception was India, where 23 percent understandably named Indian-American Sundar Pichai in the top spot.

Partial list of visionaries shown. Respondents could enter one name.

Source: KPMG Technology Innovation findings, March 2018

Tech start-ups outlook

Growth path

Hiring plans



Growth path

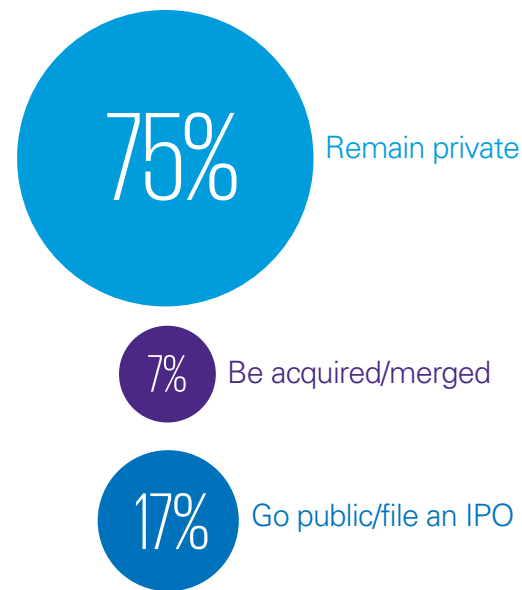
Among start-ups, a strong preference for remaining private was clearly earmarked for future direction and growth. Only a slight change was evident in year-over-year comparisons.

A merger or acquisition was cited by 7 percent, slightly off from 10 percent last year. In the strong stock market environment, going public elicited a stronger response (17 percent) than a year ago (13 percent).

Among those favoring an initial public offering (IPO), 16 percent said they would go public within just one year while 22 percent indicated upwards of a two-year timeline. The majority (62 percent) indicated going public is more than two years away, a finding that tracks last year.

Growth path

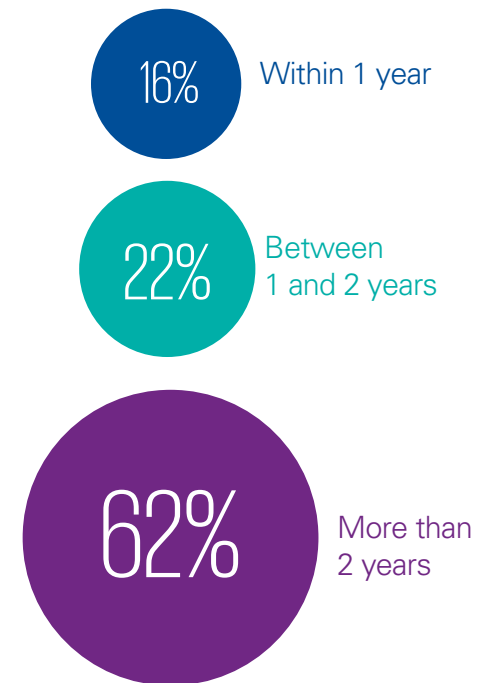
Q: What is your company's preferred growth path?



Source: KPMG Technology Innovation findings, March 2018

Plans to go public

Q: When are you planning to go public?



Among those who plan to go public/file an IPO.

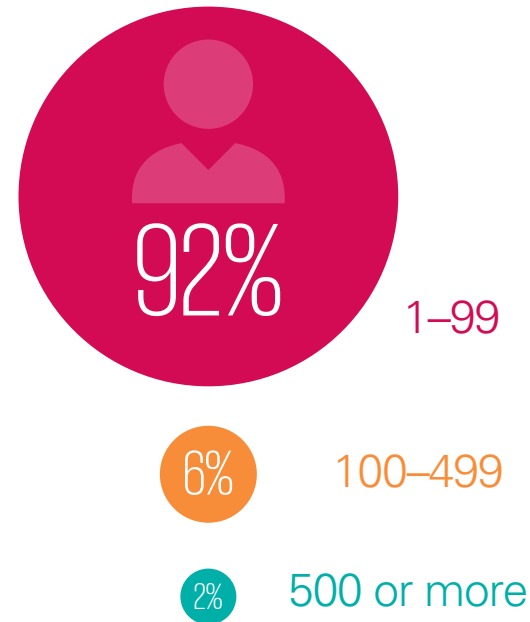
Source: KPMG Technology Innovation findings, March 2018

Hiring plans

Q: How many employees does your company plan to hire in the next 12 months?

The most promising startups carefully assess their staffing needs to successfully grow and retain their talent to leap frog the competition. A stronger economic climate was reflected in the global survey among start-ups. Responses reflect their optimistic plans to hire new employees. Over 90 percent of the global poll said they would hire up to 100 employees in the next year, a sharp increase from 68 percent a year ago.

While startups have a positive hiring outlook, there is aggressive competition to attract talent especially in technologies that require specialized engineers and data scientists, who are in short supply. Tech companies are looking at the global talent pool to identify the best resources to gain competitive advantage.



Asked among start-ups only.

Source: KPMG Technology Innovation findings, March 2018

Tech innovation perspectives

Canada

China

France

Germany

Hong Kong

India

Ireland

Israel

Japan

Korea

Russia

Singapore

Spain

Taiwan

United Kingdom

United States





“Canada’s technology sector continues to surge, and the country remains a target destination for thriving global companies and entrepreneurs seeking access to a diverse, highly skilled and multi-cultural workforce. Smart, early-stage investment in AI and fintech have helped Canada become a research leader in machine learning and deep learning, setting the stage for Industry 4.0.”

Anuj Madan

TMT National Industry
Leader, KPMG in Canada

Smart and early investments in AI and fintech have helped Canada’s technology sector thrive. A stellar university research community, infrastructure to support the ecosystem and a proven track record of home-grown companies achieving international success such as Shopify and BlackBerry have cemented the country’s status as a leader in R&D and innovation. Canada remains a leading destination for both global companies and innovative start-ups seeking access to a diverse and highly skilled workforce.

Toronto, Canada’s largest city, is home to a dynamic technology ecosystem with more than 4,000 active start-ups, making it one of the world’s largest innovation hubs. The city is consistently ranked among the fastest-growing technology markets in North America. According to CBRE’s report, titled Scoring Tech Talent, in 2016, Toronto added 22,500 tech jobs to its workforce.

In a further boost to the city’s technology and start-up scene, Toronto will soon be home to a new smart city initiative by Waterfront Toronto and Alphabet’s Sidewalk Labs. The project will transform a portion of Toronto’s waterfront to create a 3.3-million-square-foot mixed-use community including the new Google headquarters for Canada—a district that will be a testing ground for the combination of technology and urbanism. It would represent North America’s largest example of a smart city, an urban district that is built around information technology and uses data—about traffic, noise, air quality and the performance of systems including the electrical grid—to guide its operation.

In addition, innovation clustering has helped the Waterloo region continue to grow as one of Canada’s top-performing technology markets and become a major engine of innovation for the Canadian economy.

Canada is already home to some of the brightest minds in the field of AI and has been at the forefront of machine learning, reinforcement learning and deep learning for years. The country is quickly becoming a global hub for AI research, as support and interest grow among academic institutions, private companies, and governments. The federal government recently announced a US\$96 million investment as part of a countrywide strategy to accelerate research and commercialization of AI. Recent announcements that Uber, Google Brain and DeepMind will expand their research capacity in Canada are more evidence that Canada is the destination of choice for AI.

Canada also punches above its weight in financial technology, with more than 300 fintech companies operating nationwide today. The number of Canadian fintech companies is expected to continue to grow over the next five years, driven in part by the country’s banks and insurers that have seen their business disrupted, and are now actively pursuing their own fintech ventures or seeking partnerships and collaborations. Recent high-profile investments from large U.S. financial institutions have brought welcome attention and profile to Canada’s fintech companies, as well as much-needed support and expertise to expand into the U.S. and international markets.

There are, however, a number of emerging challenges that may temper the sector’s growth:

- **Build to flip mind-set:** Canada tends not to produce large global technology companies as founders typically opt to exit via an acquisition once achieving over US\$8 million threshold in annual revenue. Entrepreneurs need to overcome their “build-to-flip” mind-set and reach large-scale commercialization in Canada by leveraging top talent, government funding and proximity to the large U.S. market. With more than 1.9 million Canadian businesses, only a handful are ever able to go the distance and achieve true global scale. Shopify is one of the country’s most successful start-ups, and a leading cloud-based, multichannel commerce platform designed for small and medium-sized businesses. Headquartered in Ottawa, Shopify currently powers nearly 600,000 businesses in approximately 175 countries.
- **NAFTA’s impact on data sovereignty:** The renegotiation of the North American Free Trade Agreement (NAFTA) has exposed issues that could impact Canada’s technology sector, particularly cloud computing and fintech. Issues are arising over pressure for relaxed regulations on cross-border data flows and required use of local computing facilities.

Despite these challenges, Canada’s technology sector is remarkably well-positioned for growth, driven and encouraged by its early leadership in AI and fintech, a vibrant start-up community and a diverse, multicultural and talented workforce.



“Tech innovation is a national priority for China and will be a core focus in the coming decade. AI, for example, has grown significantly and China is expected to soon become a leader in this field by leveraging its deep talent and data pool. The adoption of new technologies is occurring quickly in industries such as financial services, automotive, consumer products and healthcare.”

Philip Ng
Head of Technology,
KPMG in China

The development of technology and innovation is an important aspect of China’s national development, driven by continued economic reforms and landmark initiatives such as the Belt and Road, Greater Bay Area and Made in China 2025. China is also drawing on a growing and increasingly sophisticated talent pool, which is an important enabler for tech innovation advancement.

China is at the forefront of several knowledge- and tech-intensive industries and is expected to maintain its leading position as it undergoes industrial optimization. Many disruptive business models are appearing in China, which have significantly impacted traditional industries and improved the lifestyle and experience of consumers.

A number of these companies have since grown to become market leaders such as Alibaba (e-commerce), Tencent (social networking), Didi Chuxing (transportation), and Lufax and Zhong An (fintech).

The Chinese government plays an influential role in promoting tech innovation, including the establishment of a number of national as well as provincial scientific and technological innovation awards. The implementation of the “national long-term science and technology development plan (2006 – 2020)” has also fueled science and technology growth, with local governments increasing their tech investment every year. According to the Ministry of Science and Technology’s “13th Five-Year National Science and Technology Development Plan,” China is working towards increasing the average R&D expenditure per person to RMB 500,000 (approximately US\$78,000) by 2020. This represents 35 percent increase and would bridge the gap with other developed countries.

Such countrywide policies are also promoting entrepreneurship and innovation of large corporates. For example, there are many development zones in China that are being established specifically for high-tech and innovative industries, including Zhongguancun, Zhangjiang, Chengdu, Xi’an and Shenzhen. Various incentive programs

are in place in these zones to promote tech innovation. Additionally, many incubators are being established across the country to nurture technology and innovative start-ups.

Disruptive technologies such as AI, big data, blockchain, cloud computing, IoT and next-generation communications have the potential to prosper in China. These technologies are widely used in various sectors, in particular consumer products (e.g. unmanned stores), public security (e.g. AI in facial recognition), automotive (e.g. autonomous driving), healthcare (e.g. AI and big data analytics in diagnostics and early detection) and fintech (e.g. anti-money laundering and credit approval). China’s AI development, in particular, is growing rapidly and is closing the gap with other technologically advanced countries as a result of a deep talent pool and vast amount of data available.

Tech innovation will likely continue to be a national priority for China and the core focus of many corporates operating in the country. Together with strong infrastructure support, backed by a deep talent pool, China has all the right tools to continue to drive cutting-edge technology and innovation in the coming years.



"France has built an amazing innovation eco-system, fueled by creativity and boldness, with talented entrepreneurs, tax incentives and abundant partnerships. It fosters the development of the next generation of business models and services and stimulates emerging tech solutions."

Marie Guillemot

Head of TMT,
KPMG in France

For some years now, the French tech ecosystem has been focused on developing highly skilled engineers and bold entrepreneurs, open innovation and VC to capitalize on emerging technologies and create a culture of innovation.

French tech embraces all industry verticals and is challenging mature business models. From start-ups, small and medium-sized enterprises (SMEs) to global leaders, and from clusters to institutions, all the forces in this innovation ecosystem are accelerating. The appetite by SMEs for agile innovation and alliances with start-ups is increasing. Large enterprises have already undertaken profound digital transformation initiatives, from operating models to the customer front lines. During the last few years, many of these enterprises have launched partnerships, corporate investments and incubation programs with start-ups to foster agility and innovation codevelopment.

In 2014, the government started French Tech to facilitate and showcase the country's tech credentials. Initially, 13 French cities were designated as high-tech hubs and the number has grown since. French innovative companies are at the cutting edge of tech and new business models and have become more visible today internationally under the "French Tech" or "French Fab" banners. In addition, French Tech promotes French entrepreneurs at big industry events like the Consumer Electronics Show (CES). In 2018, for the third year in a row, France was the most represented country outside of the United States at CES, illustrating France's dynamism in terms of innovation.

Key enterprise players have made investments in emerging technologies. Healthcare started earlier, followed by telecoms, automotive, financial services, energy, and consumer markets. Other industries are catching up rapidly with innovative projects around smart cities and Services 4.0. In every sector, IoT and AI apps are critical to enhance relevancy and customer experience and to optimize efficiency. Services 4.0 addresses how emerging technologies are creating new opportunities to redefine service and support functions.

The French business climate and CEOs' confidence index are more positive than they have been in the last decades. France is also getting more attractive for foreign investors and tech companies. The well-recognized and business-oriented STEM (science technology engineering mathematics) education environment provides high potential for the technology industry and other segments such as digital AI.

Last year, the recently elected President Emmanuel Macron reiterated his support to a pro-entrepreneurship environment, with a push to foster innovation and growth. The tax rules for entrepreneurs, R&D credits and investments in nonlisted SMEs are confirmed. They support capital flows into tech companies, investments in cutting-edge technologies, or investments by global tech leaders in France through labs and innovation hubs. In addition, a state plan for digital has been launched.

In parallel with the blooming of innovative projects across industries, French tech leaders are expanding continuously, focusing on algorithms and data. They develop know-how, assets and new services mainly in AI and cybersecurity areas. In the very near future, blockchain-based services will enable more disintermediated identifications for transactions and services. In December 2017, the French government opened the door for trading unlisted securities using blockchain digital ledgers with the adoption of new rules aimed at improving Paris's image as a center for financial innovation.

IT services firms are becoming architects of digital solutions. They are growing in excess of 20 percent year-on-year. Software is at the heart of any business model enabling new offerings and optimized services to customers. Digital and innovation are the number one priority on the CEOs' agendas. Therefore, cloud services, digital labor and robotic process automation (RPA) solutions are key levers of operational efficiency.

Data protection is also a key challenge for any industry, and privacy is a barrier for new usages. As such, both remain high on the CEOs' agenda. Today, cybersecurity represents a small percentage of the IT spend; the forecast is for cybersecurity spend to continue to grow.

Disruptive technologies question business models, organizations and competence profiles. Consequently, forward-thinking executives are revisiting corporate strategy to understand how disruptive technologies are impacting suppliers, partners, employees and customers and how they can create incremental value.

The priority for the next decade is humanity-centered design. A new approach to create technology that also takes into account the product's impact on a personal and social scale. Think humanity centric, from technology to humanity. Products that take into account the impact that a particular feature might have on a psychological and personal scale. Products that for example will foster face to face interaction and a less competitive and addictive environment.



“As an industrial nation, driving transformation in Germany creates great chances for IoT and Industry 4.0. The link between research institutes, developing tech companies and transforming global players from different industries keeps Germany agile and flexible for new challenges and the implementation of disruptive technologies. With high standards in data security and privacy, Germany is expected to play a major role as a hub for internet-based and innovative business models.”

Peter Heidkamp
Head of Technology,
KPMG in Germany

“Made in Germany” still stands for quality, less so for innovation. But German CEOs have realized that increasing customer demand for innovations requires action and that innovative business models lead to new opportunities and growth. A change of the rather conservative mind-set has begun.

Innovation does not originate from tech companies only. Germany has strong global players in industrial manufacturing, life science and automotive sectors, to name just a few, which are currently transforming their businesses in large digitalization programs. One of the biggest German traditional manufacturing and conglomerate companies has recently established a “Digital Factory” division and now also develops hardware, software and technology-based services in order to support other manufacturing companies worldwide. Germany’s most known steel and metal distributor managed to transform a traditional business model in a conservative market by developing new business units, one for innovations and one for VC in order to invest in disruptive start-ups within their industry.

This transformation builds the foundation for the development of new products and solutions, mostly within their industry and less visible to the public. One of the most innovative and promising areas for innovations are smart factories or Industry 4.0. Based on the IoT, leading German technology companies employ some 10,000 software developers globally who drive innovation based on their core competency and successfully transform their industry. A big advantage and distinguishing factor is the close cooperation and interchange of the companies with excellent German research institutes, as well as hundreds of universities of applied sciences.

An increasing number of start-ups in the German market have a strong disruptive impact making established business models and intermediaries redundant. For instance, a banking start-up cuts out brick and mortar banks and offers all services (including savings, insurance, etc.) via smartphone or further, an e-commerce platform that provides excellent delivery and personal services. Corporations have a demand for such out-of-the-box thinking and agile businesses, and have initiated collaborative platforms to trigger innovation.

One of the barriers of commercializing tech innovations, however, is still the conservative mind-set, which is anchored in both companies and population. There is a demand for stability, privacy and security, which leads to a comparatively low risk affinity. Furthermore, there is a low availability of investors willing to invest in start-ups. Since late 2015, VC investment has stagnated at US\$500 million each quarter. This stagnation could change according to the new cybersecurity guideline of the European Union as attacks like WannaCry or Petya have scared companies and customers. Therefore, EU-based companies have to meet minimum requirements set in the Networking and Information Security Directive. Higher specifications for data security and privacy are an opportunity for German technology companies to benefit from already implemented high standards and a reputation of “Made in Germany.” Trust in German cybersecurity may increase the likelihood to invest in German companies including start-ups.

With various incentives from the German government such as the High-Tech fund for start-up foundation or workspaces for the Industry 4.0 transformation, Germany can play a major role as a hub for IoT innovations or smart factories.



"Hong Kong is an ideal location for companies to meet with a diverse range of investors, business partners and other important stakeholders. Consequently, many tech companies and start-ups see Hong Kong as an ideal springboard to either expand globally or into the Mainland. With continued government and private sector support, Hong Kong has all the right characteristics to become a preferred location to develop innovative business ideas and for technology investment."

Anson Bailey
TMT Leader,
KPMG in Hong Kong

Hong Kong's ambition to transform into a world-class smart city has led to the creation of a holistic strategy that aims to promote technology and innovation. The development blueprint seeks to enhance Hong Kong's attractiveness to businesses and talents as well as inspire continuous city innovation and sustainable economic development.

Building on its traditional strengths as an international financial hub, efforts are being made to allow easy and stable capital markets access for high-growth companies, in particular biotech firms. The Hong Kong Stock Exchange, for example, is expanding its listing regime to facilitate companies from emerging and innovative sectors to go public. Pre-revenue biotech firms and issuers from higher-growth industries that have weighted voting rights structures, where holders of certain classes of shares can have superior voting rights or other privileges, will soon be able to list on the city's exchange under the revised rules.

This focus on supporting the development of emerging industries can also be seen in the proposed development of the Lok Ma Chau Loop—a stretch of land situated along the border with Shenzhen—into an innovation and technology park. This is part of a broader collaboration between Hong Kong and Shenzhen to create an international IT hub within the Greater Bay Area, which aims to connect the technology industry, R&D, manufacturing and marketing with other innovative industries.

Hong Kong has also taken steps to foster its fintech industry. This opportunity is multilayered, from the development of new products by existing major institutions, through to start-ups and major new credit groups from the Mainland. Main areas of focus include cybersecurity, payment and securities settlement, digital identification and know-your-client utilities, wealthtech and insurtech, and regtech. In addition, the government plans to formulate, by the end of 2018, a framework to facilitate the wider adoption of an application programming interface within the banking sector in order to stimulate collaboration between financial institutions and technology firms.

Ultimately, technology and innovation need to be built upon a strong pool of talent, and Hong Kong has been actively attracting top overseas scientific research institutions to set up in the city. Several globally renowned institutions including the Massachusetts Institute of Technology and Karolinska Institutet have launched innovation nodes and research platforms, which is testament to Hong Kong's conducive R&D environment. Such collaborative efforts are likely to not only cultivate international talent but also raise the standard of Hong Kong's own technology talent. With its blend of Chinese and Western cultures, and well-developed educational system, Hong Kong is becoming a prime location to nurture top-notch scientific research talent.

Hong Kong's role as a "super-connector" between China and the rest of the world is also a crucial factor. This unique positioning is likely to help attract Mainland and international companies to establish their operations in the city.

India

Start-ups helping to redefine economy



“Start-ups are at the core of India’s transition journey towards becoming a leading innovation hub in the world. With a young and dynamic pool of entrepreneurs and skilled workforce, India is likely to become a focal point to generate innovative ideas in the near future.”

Akhilesh Tuteja
Head of Technology,
KPMG in India

India is racing to become an innovation hub for global businesses. India moved up the rank to 60 on the Global Innovation Index (GII) in 2017 as compared with 66 in 2016. Recognized as one of the emerging innovation centers in Asia, many large and global enterprises are opening innovation facilities here. Additionally, several global players have set up R&D centers in India. In 2016, approximately 950 multinational corporations (MNCs) were in India and collectively set up 1,200 R&D hubs, according to consulting firm Zinnov’s annual report on global in-house centers (GICs).

Indian start-ups are playing a crucial role in driving the innovation wave in the country as they continue to disrupt existing business models. India has already established itself as one of the fastest-growing start-up ecosystems in the world, securing its position as the third-largest start-up ecosystem amidst fierce competition from countries such as the United Kingdom and Israel. In 2017, the country added 1,000 start-ups, taking the total number of technology start-ups to nearly 5,200. Bengaluru, Delhi and Mumbai are the three key entrepreneurial hubs in India comprising 80 percent of total start-ups.

India witnessed a rapid increase among business-to-business start-ups focused on verticals like healthtech, fintech, e-commerce and aggregators. In 2017, the fintech start-up base was poised to reach 360 with 31 percent growth over the previous year, according to the NASSCOM Strategic review report, 2017. Driven by the digital initiatives and the demonetization of high currency notes, fintech and security products gained further importance. Within fintech, the use of AI, robotics, and smart technologies is more likely to grow.

Healthcare tech-based start-ups also witnessed a significant growth in the country, with an estimated base of 320 in 2017, according to the NASSCOM Strategic review report, 2017. These emerging businesses received a total funding of US\$160 million in the first

half of 2017, with an increase of 129 percent over the previous year. The areas of health information management and aggregation/e-commerce have matured on the back of development in detection of anomalies, disease monitoring, and telehealth/telemedicine. Tech innovation and collaboration have acted as a catalyst for start-ups that eventually help redefine the Indian economy.

Several large Indian enterprises are stepping up their efforts to engage with start-ups to foster a culture of innovation and disruption, as young companies provide unique solutions and have the ability to quickly adapt to sudden changes in the market environment.

In order to promote entrepreneurship and make India a leader in the start-up and entrepreneurship ecosystem around the world, the government has launched the Start-up India Mission, run by the Department of Industrial Policy and Promotion, promoting bank financing for start-ups and offering incentives. The Indian government also has launched Atal Innovation Mission (AIM) to further promote a culture of innovation. AIM serves as a platform for the promotion of leading innovation hubs, start-up businesses and other self-employment activities, particularly in technology-driven areas. To foster innovation, the country launched the new Intellectual Property Right (IPR) policy in May 2016 to increase predictability, clarity and transparency in India’s IP regime. The new IPR policy is expected to help achieve effective protection of patents that can encourage MNCs to launch their products in India.

Easy access to other Asian markets and access to a proficient lot of start-ups has allowed the country to become an innovation epicenter for young entrepreneurs. Large corporations and industries in India are now interested in the start-up ecosystem, and are ready to take on the role of mentorship to help founders flourish and sustain growth in the future.

Ireland

A pro-business and start-up star



“The list of successful entrepreneurs and companies that have chosen Ireland includes many of the most dynamic, forward-thinking and innovative people and organizations in the world. They have chosen Ireland for various reasons, but they all have a shared desire to succeed in a business-friendly, dynamic European environment with an exceptional track record.”

Anna Scally

Head of Technology & Media, KPMG in Ireland

Ireland is one of the most dynamic, tech-savvy and business-friendly locations in Europe with an unwavering commitment to innovation and an exceptional record of sustained economic growth over several years. The facts speak for themselves. Ireland is ranked 10th in the world in the GII. Ireland is also the world’s second-largest exporter of software, and 16 out of the top 20 global technology firms have strategic operations in Ireland, including Microsoft, Google, Apple and Facebook. They chose Ireland for talent, track record, technology infrastructure and an attractive 12.5 percent corporate tax rate.

Access to talent is cited as “by far the most important factor” influencing founder location decisions in Europe, according to The State of European Tech Report 2017. The report shows that Ireland’s tech ecosystem continues to expand. Ireland has the fastest-growing tech worker population in Europe and the report rankings point to the strength of the country’s resident tech workforce. Meanwhile, Ireland’s winning position is reinforced by the fact that the country leads the EU in capital invested per capita.

Adding to Ireland’s strong appeal, the country was named first for skills and innovation in the EU Commission’s 2017 Fact Sheet and Eurostat research that found Ireland has the highest proportion of high-growth enterprises in the EU. These rankings reflect the nation’s growing reputation for innovation, a key source of competitive advantage for businesses located here. Ireland’s workforce was additionally named first for flexibility and adaptability in IMD’s 2017 Global Competitiveness Yearbook, holding that accolade for many years. Ireland’s workforce is also ranked number one for attitude to globalization, which is so important for building global companies.

Not surprisingly, innovation thrives in Ireland. A highly educated workforce is energized by the fact that Ireland has the youngest population in Europe with almost half of its population under the age of 34. Ireland has a skilled, educated, young and multicultural talent pool with, for example, the third highest proportion of math, science and computer graduates in the 20–29 age group in the EU.

From search and social to games, e-commerce and online payments and more, tech innovation thrives in Ireland. Investors, founders, companies and employees enjoy a stable, secure, competitive and English-speaking entrepreneurial environment. Ireland has a strong appeal to dynamic individuals and businesses attracted by pro-business policies, some of the highest quality of life scores worldwide, and easy connections to the rest of Europe, North America and Asia.

Importantly, Ireland is a strongly committed member of the EU and the Eurozone with guaranteed, long-term access to an EU market of 500 million people. Ireland’s tax regime is open and transparent and fully complies with Organisation for Economic Co-operation and Development (OECD) guidelines and EU competition law. Ireland has the lowest corporation tax rate in Western Europe combined with an extensive network of international tax treaties. The country also has an OECD-compliant knowledge development box, an attractive 25 percent R&D tax credit, relief on expenditures on intellectual property and an attractive holding company regime.



"Israel's expertise in the fields of data collection and analysis has been powering most of its best-known technology verticals, such as cyber, fintech, automotive, digital health, agtech and even gaming. As more and more multinational corporations and investors are exposed to Israel's innovative culture and 'can do' theme, they establish local innovation centers to immerse themselves within this ecosystem and drive back innovation to their HQ."

Arik Speier
Head of Technology,
KPMG in Israel

Already a world-renowned center for innovation, and facing increasing competition from upcoming innovation sources like China, some European countries and, of course, the United States, Israel still manages to retain its innovation aura.

A home for more than 300 non-Israeli R&D centers, Israel has seen a resurgence of interest in its technology potential in the last few years. Since 2014, more than 90 multinational companies have opened an innovation center or an R&D center in Israel. The majority were the result of an acquisition of an Israeli start-up, but many companies established an independent innovation center without prior acquisitions.

A little more than half of these innovation and R&D centers were established by U.S.-based companies, but as Israel has been in the spotlight for global innovation for quite a few years, the diversity of multinationals operating within it has expanded. Canadian, British, Chinese, Japanese, European and South American conglomerates have also flocked to join the Israeli tech scene by opening a local center.

Beyond its strong foray into the fintech vertical, two major tech verticals recently emerged in Israel, placing it in a very good spot for continued supply of talent and technology to global companies.

The first is the automotive sector. In 2017, Israel saw its largest M&A deal ever (not just in the technology sector, but overall), with the acquisition of Israeli-based Mobileye by Intel for US\$15 billion. The acquisition was not only enormous in deal size, but also an important declaration by Intel, as the company announced that Mobileye's Israeli R&D center will be the base of all of Intel's autonomous vehicle activities.

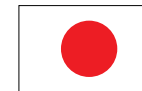
There are hundreds of automotive-related start-ups currently operating in Israel, with more than 40 R&D and innovation centers of multinational companies such as GM, Daimler, Hyundai, SAIC, Renault, Ford, Sony, HERE and others. Smart transportation companies including Waze (acquired by Google), Moovit, Gett and

Via originated from Israel. Investors and companies continue to expand their investments in Israeli automotive technology, with recent examples such as the acquisitions of cyber company Argus by Continental and GPS tech company EXO by Lear.

Israel's automotive claim to fame is based on the country's established pool of "data talent"—excellence in data and analytics, sensors, image and video processing and analysis, communications and more. These capabilities were developed in the Israeli army and academia, and were either commercialized to form consumer-oriented products or, in most cases, brought together teams of bright minds who later went on to establish their own ventures.

This "data talent" is also, in some respects, the catalyst for the emergence of another strong vertical in Israel—agtech. As a country with limited natural resources, a challenging climate and lack of friendly nearby trading routes, Israel has created an agriculture ecosystem that not only supports its own inhabitants, but also has managed to become one of its leading export areas. Israeli flowers, fruits and vegetables are being sold worldwide, Israeli technology helps in producing more milk from cows and Israeli microirrigation technology is being used in many countries. It was only natural that Israeli expertise in the "data sciences" would result in new innovations in that space.

There are currently more than 500 Israeli technology companies working in the agtech space, many of them in the "precision agriculture" space (using data to increase yield, combating pests, managing water and fertilizer use, and more). Companies such as Taranis, Prospera, FieldIn, CropX and others have emerged and are recognized. The lack of local investors in that space, however, poses a major problem, and not all companies have the ability to reach non-Israeli investors to fund their next round.



"Although companies have high expectations about AI and RPA business transformation, many continue to struggle to identify the most effective solution for their business. KPMG in Japan is uniquely positioned to provide insights on AI and RPA technologies by leveraging KPMG's global network and at the same time translating the insights into a Japanese setting as business practices are often significantly different."

Keita Yamane Head of TMT,
KPMG in Japan

RPA is driving tech innovation and facilitating an effective solutions to labor issues that are unique to Japan. Broadly, the current trend is for companies to consider using robotics due to fundamental disruption in their business model or pressure in response to a political agenda and regulations.

Japanese banks are seeing a fundamental disruption in their business model nationally. The three major Japanese banks have recently announced that they will be cutting a collective total of more than 32,000 jobs in Japan over the next few years. Historically, the banks have seen great success in serving commercial and retail customers through an extensive network of branches in prime locations. The branches are staffed with well-compensated bankers, tellers and staff who have provided immaculate personal service that is well known in Japan, and have dealt with routine remedial tasks full of paperwork. Negative interest rates, availability of electronic money including virtual currency, and platforms for remote banking on handheld and other devices have led to legacy branch networks dealing with costly and heavy labor forces. Robots are expected to be an effective solution to fill the gaps as jobs are replaced and to effectively handle routine tasks.

Other companies are seeing a significant disruption in their business model through the political agenda and regulations as well. One of the socially popular political agendas is the work-style reform bill that is currently being considered to amend the labor standards law and other regulations in Japan. A prime focus of the bill is cutting the chronically long working hours put in by corporate employees for Japanese companies that are accustomed to this practice. The proposed legislation will restrict an employee's overtime to 45 hours per month and 360 hours per year with an option to extend to 100 hours per month during busy season and 720 hours per year if an agreement is reached by the management and labor union. This poses a significant issue for many of the Japanese businesses that are prone to high overtime such as advertising, media, consulting and food services. Given the low abundance of the labor force due to the aging population and high labor demand, robotics technology is seen as an effective solution to address low remedial tasks and to free up more time for employees.

According to a study performed by the Ministry of Economy, Trade and Industry in Japan, unless RPA and AI are implemented, by 2030, the labor force and Gross Domestic Product (GDP) will decline by 5,740,000 people and 222 trillion yen (US\$2 trillion), respectively, over and above the expected decline in population. It seems clear that the use of AI and RPA is inevitable in Japan.

Korea

Preparing for the Fourth Industrial Revolution



“Korean companies dominate the global market in the manufacture of memory semiconductors and LCD and OLED flat-panel displays. Having major technology hardware manufacturing factory demand from nearby China, Japan and Taiwan, the success is expected to continue. This creates an ecosystem which gathers raw material suppliers and manufacturing equipment makers closer together and fortifies current strengths. Successful and prompt convergence of various technologies including AI, IoT and robotics will be key to success.”

Seung Yeoul Yang

Head of TMT,
KPMG in Korea

Korea’s political landscape has always been seen as unstable and unfavorable to the Korean economy due to North Korea’s pursuit of nuclear weapons and ICBMs (intercontinental ballistic missiles), which have raised concerns among neighboring and faraway countries. In addition, deployment of a U.S. Terminal High Altitude Area Defense system within Korea at the wake of North Korea’s nuclear weapon threat has raised tensions and harmed relationships with neighboring China, Korea’s biggest trade partner. This issue has negatively impacted Korea’s trade with China in certain industries, but not in technology industries where the two countries are intermingled for cooperation and competition.

The technology industries of Korea continue to be one of the main engines of the export-driven Korean economy with its competitive edge in electronics devices and parts manufacturing. The technology industry’s growth outperforms all Korean industries, and technology industry exports represent one-third of Korea’s exports. Korean companies invest a significant amount of resources in R&D. Expenditures in R&D in 2015 were 4.2 percent of GDP, which put Korea as one of the countries investing the most in R&D activities and boosted the competitiveness of Korean technology companies on a global scale. Large Korean companies are leading the manufacture of memory semiconductors, LCD (liquid crystal display) and OLED (organic light-emitting diode) flat-panel displays, flat-panel TVs, and smartphones. In particular, the memory semiconductor manufacturers are enjoying an unprecedented boom resulting from a significant increase in demand from the use of semiconductors in many more smart devices and processing of big data.

While Korea is leading the globe in electronic device and parts manufacturing, Korea continues to have relative weakness in the software industry. A heavy reliance on a number of large companies for technology company exports, which is close to 90 percent, puts pressure on Korea to diversify its technology industries and foster an environment where small and medium-sized companies with creative ideas can grow and compete globally.

To overcome this shortcoming, the Korean government launched the Presidential Committee on the Fourth Industrial Revolution, “I-Korea 4.0” to help promote a new economic growth engine for the country by expanding industries’ productivity and competitiveness with intelligence, innovation, inclusiveness and interaction. The Korean government plans to allocate US\$2 billion for R&D projects through 2022 to prepare for this Fourth Industrial Revolution. The government plans to assist companies in constructing an exclusive communications network for IoT, providing wavelength for 5G services, developing services with converged information and technologies, and improving software technology for software companies to be a major global player. The results should lead to high-quality living for the Korean people.

Korea has been very successful so far in the technology industry with its competitiveness in manufacturing hardware. The country is expected to continue its success with a prompt response and transition to the Fourth Industrial Revolution where AI, robotics, IoT and past successful experience matters, alongside companies hungry for innovation and government support. The 2018 Olympics successfully showcased 5G and autonomous vehicles innovation.

Russia

Pushing a digital economy forward



"The Russian government is keen to stay competitive in technology as Russian companies have been and continue to be successful in technological development. Russian companies are uniquely positioned in their strength in software and talent. We will see how the government will drive the digital economy agenda in the next 12 months as well as the creativity and entrepreneurship of Russian companies. All these factors may position Russia as a global technology industry leader."

Yerkozha Akylbek

Head of TMT,
KPMG in Russia
and the CIS

In 2017, President Putin introduced the new doctrine of digital economy and encouraged the business society to present ideas on digitalization in varying aspects of daily life. According to this plan, the hope is to see a minimum of 10 big high-tech enterprises within the next seven years in Russia. Further, the goal is to see that higher education systems can meet the demand for IT specialists.

Russia plans to actively use more new technologies, including blockchain, in eight main areas: government regulation, information infrastructure, R&D, human resources and education, information security, state management, smart city and digital healthcare.

Apart from the state-supported digital economy initiatives, the Russian IT, technology and e-commerce sector has been booming over the last years. This sector is the only one that is showing double-digit growth and the only industry in Russia that is competitive worldwide, aside from military and oil and gas.

Russia's top tech companies include its biggest search engine Yandex, the largest social network VK (ranked 15th, as of September 2017 in Alexa's global Top 500 sites), and e-commerce platform Ozon. Key highlights in 2017 include the merger between Yandex, Taxi and Uber operations in Russia and some CIS countries. In December 2017, Sberbank and Yandex completed the transaction on setting up the biggest platform, Yandex.Market.

Disruption and technology are seen as drivers for different sectors such as IoT and blockchain. One of the main challenges in 2017 was cryptocurrency and related opportunities through Initial Coin Offerings, and technologies and solutions on blockchain.

Russian entrepreneurs themselves maintain a reasonably stable level of confidence in Russia's ability to deliver substantial breakthroughs in bringing innovative technologies to the market and in creating local services that will find global demand. Despite various restrictions and sanctions as well as technical, infrastructural and financial issues, entrepreneurs continue to manifest optimism and believe they can benefit from these opportunities.



“Singapore is well on its way to become a ‘Smart Nation’ by 2020 but the innovation process is challenged by a talent shortage. In the near future, a lack of talent could pose a threat to Singapore’s ambition to be innovative. Even though automation will take some of the strain off its limited manpower, Singapore will have to look across its borders to attract talented innovators.”

Juwanus Tjandra
Head of TMT,
KPMG in Singapore

The city-state of Singapore, with its affluent population, high quality of education and a clear government agenda is all set to become a ‘Smart Nation’ by 2020. It possesses all the right ingredients for innovation and introduction of new and disruptive technologies.

Singapore is also experiencing a surge in VC fund-raising, reflecting growing interest in Southeast Asia’s start-ups. Being a regional financial hub, innovation in Singapore is focused on fintech innovation. Other disruptive technologies such as RPA, AI and cybersecurity are not being forgotten.

In recent years, a large number of innovative businesses such as Grab (ride-sharing, payments), Garena (gaming), Lazada (marketplace) and Razer (hardware) have grown up in the start-up-friendly economy of Singapore.

Owning a car in Singapore is relatively expensive so the use of ride-sharing platforms is widespread. Heavy competition between two big players, Uber and Grab, is benefiting consumers.

What makes Singapore unique in the region is the significant role of its government incentives and regulatory support for promoting innovation. The Monetary Authority of Singapore (MAS), for example, is the key driver behind the country’s evolution into a leading fintech hub. It has put a lot of emphasis into the development of blockchain technologies, with high expectations for successful pilot projects heading into 2018. Blockchain technologies, however, are not the only big-ticket fintech focus in Singapore.

Regulatory tech or regtech is also a high priority—from using AI to make workflow processes more efficient to finding ways to provide real-time or near-real-time monitoring of transactions. MAS has committed approximately US\$170 million over the next five years to attract financial institutions to set up their innovation labs in Singapore.

In healthcare, many initiatives are supported to improve healthcare while keeping it affordable. Examples include implementation of robotics in patient treatments, online healthcare apps and automation of administrative work.

Besides being a regional finance and healthcare hub, Singapore acts as a tech hub, hosting regional headquarters of large tech multinationals such as Google, Facebook and Amazon.

Beyond fintech, other initiatives abound to turn Singapore into a ‘Smart Nation.’ The National Research Foundation will likely be investing over US\$110 million into a new national program aimed at boosting Singapore’s AI capabilities over the next five years. Called AI.SG, the initiative will see Singapore-based research institutes partner with AI start-ups and companies developing AI products to expand knowledge in the space, create tools, and develop talent to power the country’s AI efforts.

In a further boost, a National Cybersecurity R&D Program seeks to develop R&D expertise and capabilities in cybersecurity for Singapore. A five-year US\$98 million funding initiative is likely to be available to support research efforts into both technological and human-science aspects of cybersecurity.

Another crucial disruptor in Singapore is automation, and this probably has the greatest monetization opportunities. For instance, the local Port of Singapore Authority is automating its container handling. Under the ‘Smart Nation’ flag, most Singaporean banks are currently automating back-office and certain front-office processes such as customer support. In transport, all new trains on Singapore’s Mass Rapid Transit system are driverless.

Singapore’s drive towards adopting autonomous vehicle technology, alongside other applications such as driverless campus buses, truck platooning systems and unmanned road sweepers, is underway.



“Good news is coming in the next few years mainly focused on the growth of venture capital and entrepreneurship. The development of a tech innovation ecosystem driven by international VC’s and big companies’ investments in start-ups and innovation labs will be the engine to spur the cultural changes that promote entrepreneurship.”

Luis Buzzi

Head of Innovation,
KPMG in Spain

Spain is one of the world’s most innovative countries, ranking 28th out of 127, according to data provided by the GII.

Tech innovation focus is a strength of the country’s R&D ecosystem:

- Solid foundation in R&D based on infrastructure, research centers and support services that are among the finest in the world.
- Leadership in advanced technology in the sectors of telecommunications, energy, appliances, banking, defense industries and flight control systems.
- Status of universities and other innovation centers as benchmarks that are heralded across the globe.
- Establishment by many foreign multinational firms of their own production facilities and centers of excellence in Spain due to high quality of life and access to qualified resources at reduced cost.

But this solid position is not aligned with internal entrepreneurship, where Spain is not in the top position. Only 5.7 percent of the workforce is interested in entrepreneurship (Spain ranks 27 of 28 of developed countries). Several key factors contribute to this situation: high degree of bureaucracy, high tax rates, lack of flexibility in labor regulation and restricted access to VC and bank loans.

In addition, cultural factors have a high influence. Schools and universities could do more to promote entrepreneurship, and only 25.6 percent of the population see opportunities there. Entrepreneurship is widely seen as a major risk in professional career development. A cultural challenge is the perception that an entrepreneur is not likely to achieve a high social status. At this time few Spanish entrepreneur role models exist to inspire and mentor the next generation of leaders. In this regard, Spain’s leading business schools are playing a key role in encouraging entrepreneurship.

The digital business models that are most developed in Spain are in the business-to-consumer market and in social networks. Amazon is the fastest-growing e-commerce platform in Spain; 70 percent of people surfing the internet buy something and 40 percent buy almost once a month. Travel and leisure markets focus a big portion

of interactions not just on e-commerce but also on related knowledge sharing and social networking. Spain has more than 19.5 million people connected on social networks. The top five are Facebook, YouTube, Twitter, Spotify and WhatsApp.

The high use of smartphones in Spain to surf the internet is empowering disruptive models related to fintech, proptech (property and real estate technology), e-health and other fields. This has led to a fast-evolving innovation status:

- 77 percent of Spain’s start-ups are in seed phase and 55 percent are less than 3 years old.
- The top five technologies developed by start-ups are fintech, augmented reality, design, IoT and geo positioning.
- Product development is based on software development (33 percent), services business models (27 percent), software as a service (17 percent), manufacture of IoT devices (11 percent) and others (12 percent).
- The main business models are business-to-business 33 percent, business-to-consumer 35 percent, business-to-business-to-consumer 22 percent and business-to-government at 5 percent.

Obtaining funds to develop businesses is still the main issue to growth and accelerated business: 57 percent use the entrepreneur’s own funds, 24 percent is from family and friends, and only 15 percent comes from equity funds, the residual coming from bank loans or access to capital markets.

The government tries to support this lack of funding capacity. There are numerous financial and tax incentives for activities in certain industries deemed to be a priority due to their potential for growth and impact on the Spanish economy. The Autonomous Communities in Spain (a first-level political and administrative division created in accordance with the Spanish constitution) grant similar incentives in most of these industries. But the government and public institutions like universities or research centers still do not have a relevant VC strategy for start-ups.

Taiwan

Jumping hurdles to get to new tech



“Along with the worldwide tide of technology change, the Taiwanese government is aware of the importance of the challenges and threats, and focuses on AI development and application, and other emerging technology sectors with the vision of ‘small place with big strategy.’ The hot problem for the Taiwanese government and companies to solve is how to integrate hardware, software and the platform economy effectively. Taiwanese companies are still struggling with the acquisition of world-class talent, intellectual property protection and investment in environment optimization.”

Samuel Au
Head of TMT,
KPMG in Taiwan

Taiwan is continuously fostering innovation to adapt to disruptive technologies. The vision is to gain the title of ‘Silicon Valley of Asia,’ by proactively focusing on IoT, biotech, green energy, ‘smart’ machinery and defense. With its engineering expertise, Taiwan has become the hardware technology industry leader, and it is credited with 70 percent of the total production of integrated circuits in the world.

Taiwan, however, seems less ambitious about entrepreneurship, based on statistics of start-ups, based on statistics of start-ups cited from startupranking.com. This difference can be attributed to the local culture where people are risk averse, and to strict regulations in certain areas of business.

Although the Taiwanese government and financial industry are aware of the trend of fintech development and the impact resulting from disruptive innovation on the financial sector ecosystem, the government is still conservative in dealing with and regulating the changing nature of business and hybrid market models. Despite hurdles, notable start-up companies have emerged that concentrate on developing fintech, creating business opportunities through cooperation with high-tech companies that integrate AI, cloud computing, big data and blockchain. They are gradually forming a commercial platform to facilitate interaction between market participants and stakeholders in this system.

The technology industry is rapidly evolving including innovations in 3-D sensors, AI, IoT, robotics, and quantum computing. These innovations are transforming the most fundamental levels of businesses to process decision making more efficiently and effectively than ever. As manufacturing evolves into a service industry, with a wealth of manufacturing experience and the advent of big data, Taiwan’s semiconductor manufacturers have been undergoing transformational change, and treating innovation as a core value. The large electronics manufacturers have been able to combine big data, industry 4.0 and IoT to improve efficiency and the bottom line.

Taiwan can prove to be quite competitive given its market size and understanding of the Mainland China market. Yet strict regulations and unfavorable tax rules are a cause of lack of investment, as well as talent shortage in disruptive innovations. To overcome these challenges, the government can develop more flexible regulations and consider how to come up with an extensive development strategy to open the market and promote innovation in business sectors.

United Kingdom

A magnet in Europe for tech



“The U.K. tech sector continues to go from strength to strength, with robust performance by mature tech companies and spectacular investment by VCs in emerging U.K. tech firms. There can be no room for complacency however, and in that context, it is heartening to see the government continue to state its view that the tech sector is at the heart of its industrial strategy. This will be vital to ensuring the United Kingdom stays at the forefront of emerging technologies and remains attractive to tech investments.”

Tudor Aw

Head of Technology,
KPMG in the U.K.

The U.K. tech sector had another strong year in 2017 despite considerable macroeconomic headwinds caused by the U.K. General Election and ongoing Brexit negotiations. Tech companies in the United Kingdom have largely shrugged off these concerns to post robust earnings growth and generate strong cash flows that have seen continued investment in R&D and acquisitions. Examples of the health of the U.K. tech sector include the fact that a new tech company was formed every hour in 2017, and Arm Holdings reported a 24 percent increase in its U.K. workforce over the last year, increasing the number of its R&D facilities from 9 buildings to 11.

Of particular note has been the record level of VC investment in the U.K. tech sector—at US\$4 billion, this represented almost twice the level seen in 2016 and this was more than the combined investment seen in Germany, France, Spain and Ireland. London’s vibrant tech scene continued to enhance its reputation as a magnet for both tech talent and investment among European cities with some US\$3.4 billion of venture capital investment—four times as much as the next largest city, Paris (US\$785 million) and more than the total investment in the next nine European cities.

Key factors behind the record level of investment in U.K. tech firms include availability of talent, London’s finance and services industry, multiculturalism, favorable time zone, language, stable legal system, fiscal/tax incentives, a mature ecosystem of advisors and first-class universities (U.K. institutions taking the top three places in Europe and seven out of the top ten).

Importantly, the government has reaffirmed previous policy that it sees the tech sector at the heart of its industrial strategy. Developments during the year included:

- Committing an additional US\$32 billion to R&D to stimulate innovation
- Committing US\$695 million to invest in AI, 5G and full fiber broadband infrastructure
- Investment of US\$750 million to support the growth of electric cars and charging points.
- Regulatory innovation to encourage the fintech sector and establish the United Kingdom as a clear leader in digital innovation.
- Creating a new US\$3.5 billion fund via the British Business Bank to ensure more fast-growth businesses have access to the capital they need to become the next U.K. unicorn
- Helping pension funds to finance the United Kingdom’s scaling digital businesses
- Funds of US\$104 million to develop digital skills distance learning courses and improve connectivity on trains.

United States

The tech industry global outpacer



“The United States continues to be the place where there is a passion for innovation, defined by aggressive competition and the belief that anything is possible without fear of failure. From a corporate perspective, the C-suite has a greater focus on the economic and social power resulting from tech innovation and the importance to maintain the trust of key stakeholders to deliver their value proposition.”

Tim Zanni

Global and U.S. Technology Sector Leader, Chair of Global and U.S. TMT Line of Business

The United States technology industry continues to drive economic value as key platform companies lead as the most valuable companies in the world. These companies are making big investments in AI, IoT, robotics and other technologies that have great influence on the way business and consumers engage with the world.

Technology and social issues impacting the sector – In the United States, key technology industry players have gained great economic and social power and are facing important issues. Regulators, businesses and consumers want more transparency about how emerging technologies work and the impact of technology on society. In addition, social media’s bad actors, a lack of diversity in the workforce and continued cybersecurity breaches have impacted the reputation of the technology industry. The U.S. technology industry ecosystem has demonstrated its resilience and these critical challenges are inspiring industry leaders and the next generation of entrepreneurs to solve these issues. Corporate culture and transparency continue to be key to market leadership.

The United States and China outpace other countries in tech innovation – Globally, these nations are in fierce competition for ideas, market leadership and economic power. The lure of the U.S. market is attracting major China tech giants although nationalistic reputations need to be overcome. Figuring out the right strategy to sell to U.S. consumers is a new challenge for some of these companies and there are already success stories, including drone maker DJI.

More investment is foreseen among the key players between the United States and China. AI is the hottest area of technology right now, with major tech companies competing for talent. As examples, in the last six months the following investment announcements have been made:

- The Google AI China Centre, the company’s first such center in Asia, will be located in Beijing.
- Baidu announced it has opened a second R&D facility in Silicon Valley as it doubles down its efforts to recruit global talent in the areas of AI and autonomous driving.

— The Global Innovation Exchange in Bellevue, Washington state was announced. This technology graduate program is a partnership between the University of Washington and China’s technology school, Tsinghua University. Microsoft invested US\$40 million in the program and helped attract Tencent, Baidu and Alibaba to have a presence in this city.

Innovation hubs continue to gain momentum across the United States – Many cities in the United States are implementing the start-up playbook that Silicon Valley developed as a model for economic growth. New York City continues to rise as the East Coast counterpoint to the Valley’s innovation success.

The spread of innovation across many U.S. hubs is fueled by corporate and VC investments. In 2017 U.S. VC investment reached a record US\$84.2 billion, according to the Venture Pulse report issued by KPMG International. Aided by a strong fourth quarter, including three US\$1 billion plus megadeals, VC investment in the United States in 2017 was the strongest since the dot-com era. Total deal value in the United States during the fourth quarter rose to US\$23.75 billion, up from US\$21.24 billion in the third quarter. VC and corporate investor interest in healthtech and biotech grew significantly in 2017.

As the tech industry landscape evolves, disruptive technologies and new business models are triggering a formal reevaluation of enterprise value. It is no longer enough to dominate in one sector; the tech leaders of tomorrow are moving rapidly into other sectors and gaining market share. Five U.S. tech sector companies lead with over US\$3 trillion in market capitalization.

The economic power of platform companies is spreading throughout the United States. New investments announced by Apple, Amazon and other key players will likely drive the creation of new tech hubs across the United States. The impact on the local communities remains to be seen.

Conclusion

This year's survey highlights the rise of a multitude of tech innovation hubs around the world striving to become the new tech leaders. The United States placed as best in class for technology advancements on a number of scores—countries, cities, executive leaders—in the global survey.

While Silicon Valley's tech dominance has been underscored, a decentralization of power is occurring. In the United States, eight cities made the cut as potential rivals to Silicon Valley in the future. No other country came close to that number, though China excelled with four cities, including Shanghai in first place.

The rise of Asian tech economies is contributing to an increasing shift in power from the western world to the Far East. The biggest change agent is China. The Middle Kingdom retains its status as the number one challenger to the United States, with its fast-moving entrepreneurial edge, massive digitally advanced markets and government investment. Japan has established itself as the world's robotics leader, a status that is likely to be highlighted in the 2020 Olympics in Tokyo. Under new government leadership, India is uncovering an innovative edge, much of it centered on Bangalore, and led by VC and angel investment in start-ups.

Where the next new ideas will come from depends on which markets can best leverage their natural advantages and assets such as state-of-the-art tech parks, quality education systems and government incentives to spur innovation. It also relies on which businesses can best apply innovation principles in their corporate culture to create economic value. The C-suite is the corporate nerve center to align innovation and commercial results, which are the hallmark of an effective corporate strategy.

It is no longer enough in today's corporate environment to dominate in one sector. The global tech leaders of tomorrow are moving rapidly into a broad number of diverse businesses that are far from their original corporate mission. Platform companies are at the forefront of this trend.

The world is increasingly becoming a magical mix of emerging technologies that is revolutionizing the way we live and work. Maneuvering through this maze of advances and staying ahead will continue to challenge the next generation of global leaders.

"The ecosystem for emerging technological breakthroughs continues to grow on a global scale. This ecosystem is increasingly supported by more incubators, corporate and government investment in start-ups and new ideas, and consolidated strength among a core group of tech titans. As tech innovation continues to spread to more cities, the hope is a better future for all across life, society and the environment."

Tim Zanni

Global and U.S. Technology Sector Leader,
Chair of Global and U.S. TMT Line of Business

"Many factors affect a city's perception as an innovation hub, including favorable government policies and incentives, accelerators, tech parks, corporate investment, state-of-the-art infrastructure and, in all cases, at least a few highly successful and wildly popular success stories."

Tim Zanni

Global and U.S. Technology Sector Leader,
Chair of Global and U.S. TMT Line of Business



Survey demographics and methodology

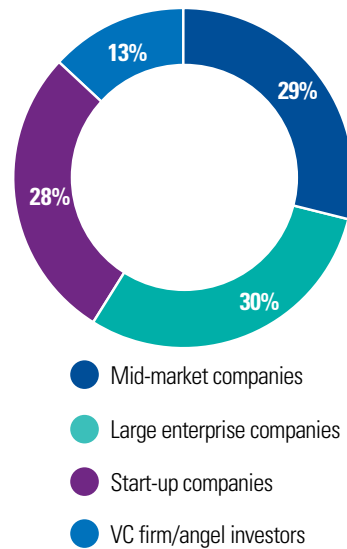


Source: KPMG Technology Innovation findings, March 2018

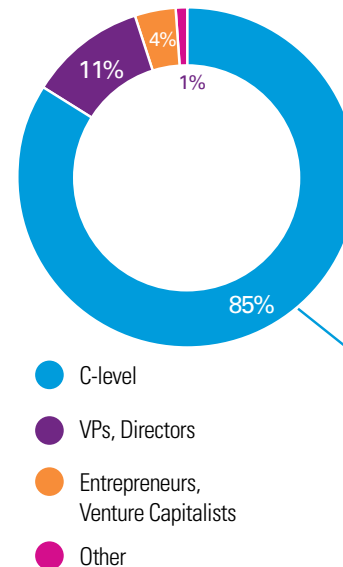
The KPMG Tech Innovation Survey, now in its sixth year, included 767 business executives in the technology industry. Most are C-level (85 percent). Fifteen countries/regions are represented. The web survey was conducted from November through December 2017.

Q: Which of the following best describes your organization and your title?

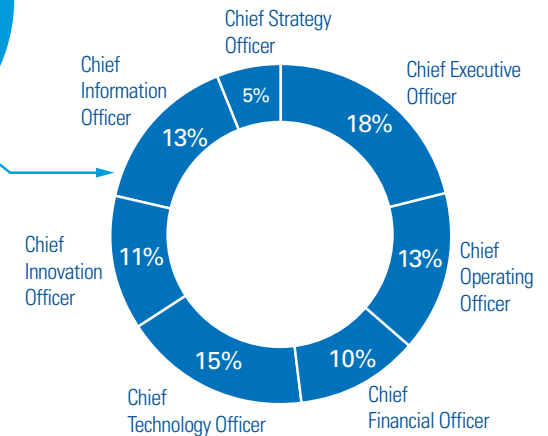
Organization type



All titles



C-level titles



Only C-level titles shown. Does not sum to 100%.

Source: KPMG Technology Innovation findings, March 2018

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An experienced team, a global network

KPMG professionals combine industry knowledge with technical experience to provide insights that help technology industry leaders take advantage of emerging business opportunities and proactively manage business challenges. The KPMG network of professionals has extensive experience working with global technology companies ranging from the Fortune 500 to pre-IPO start-ups. They aim to anticipate the short and long-term opportunities of shifting business, technology and financial strategies.

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KPMG Technology Innovation Center

KPMG firms recognize the importance of innovation. In 2012, KPMG in the U.S. launched a global Technology Innovation Center to identify and evaluate the impact of disruptive technologies. The center connects leading technology industry thinkers including entrepreneurs, Fortune 500 technology executives and KPMG member firm professionals.

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