

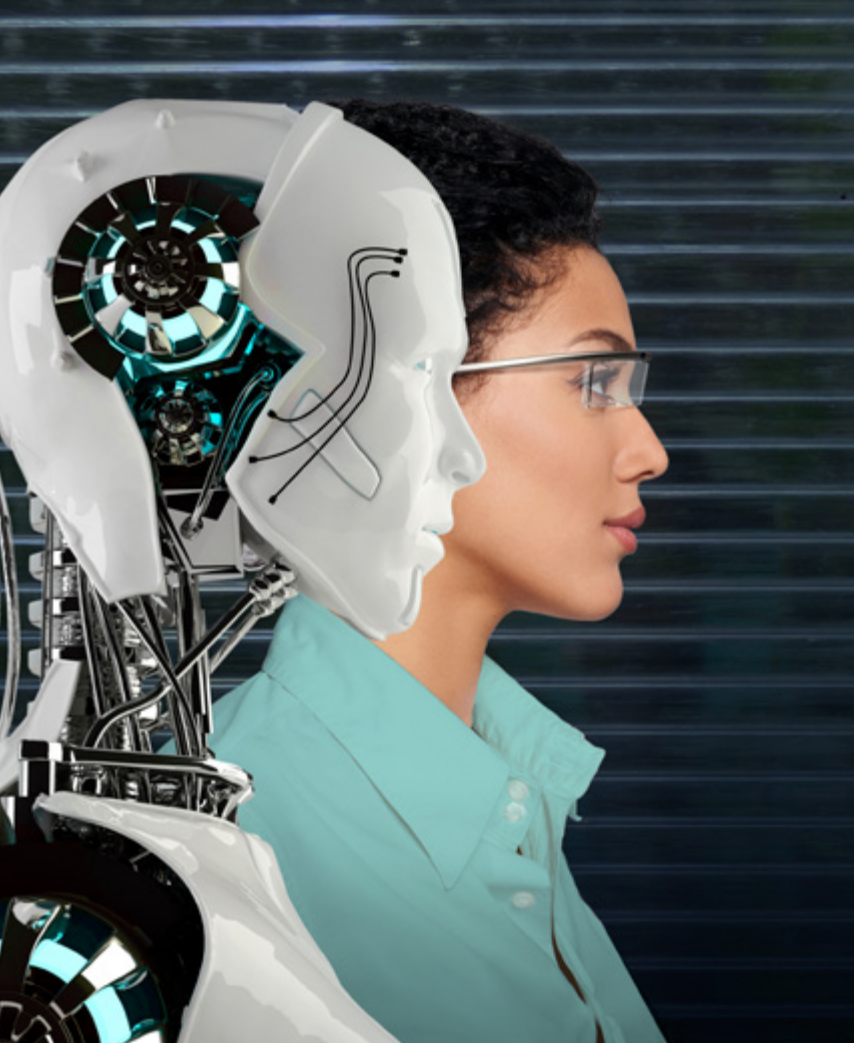


The changing landscape of disruptive technologies

**Global technology
innovation hubs**

kpmg.com/techinnovation





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Foreword

KPMG member firms recognize 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 fifth year, provides perspectives about technology innovation trends, top barriers to commercialize innovation, and insight into technology innovation leading practices.

As in prior years, we include insights from our annual survey of more than 800 global technology leaders including start-up entrepreneurs and FORTUNE 500 executives. The 2017 publication is issued in two parts, featuring the following topics:

Part 1 | Global technology innovation hubs showcases the rise of new ecosystems of incubators, accelerators, and venture capital alongside government incentives across the world. In this section, we unfold the cities and countries that are making significant strides in innovation development and provide 15 country perspectives. With stakes so high to compete in a global technology industry ecosystem, we also provide innovation management perspectives.

Part 2 | Disruptive technology trends and barriers to commercialize emerging technologies. In this issue, to be released in April, we examine the emerging technologies with the most potential to disrupt industries and transform business models. We also assess the monetization opportunities of these disruptors and adoption challenges by region and industry.

The spread of tech innovation development is being fueled by growing ecosystems as technology innovation has permeated all industries. Technology continues to enable an unprecedented rise in creativity, across the world, to solve business problems and develop new markets in ways never thought possible. At the same time, the success of Silicon Valley's entrepreneurial culture continues to incentivize countries, all over the world, to become leading technology innovation hubs. Some countries are accomplishing their objective to become a leading innovation hub, while others continue to face macroeconomic and infrastructure challenges.

Now more than ever, companies across a broad array of industries are being impacted by the rapid pace of change in digital arenas. Global and cross-industry collaborations and partnerships are key to staying ahead, as is learning how to embrace change in a nimble way to avoid the status quo for fear of failure or uncertainty.

We hope you find this publication insightful, and we welcome your suggestions for the next edition.



Tim Zanni

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

Global growth of a tenacious tech innovation ecosystem



United States and China show most promise for disruptive breakthroughs

Many countries realize innovation investment is critical to increase economic growth. The investment, development, and adoption of new technologies continues to spread out from the Silicon Valley epicenter to tech hubs around the world.

As tech innovations unfold, China is stacking up to the United States as a leading force. Global tech industry leaders indicated, in KPMG's tech innovation survey, the United States and China are the world's dominant tech epicenters—with the greatest potential to develop disruptive technology breakthroughs that will have a global impact.

The strong showing for these two mega-powers is relatively consistent with earlier KPMG surveys, although this year's poll reflects a slight uptick for China—25 percent compared with 23 percent the

prior year. China continues to make rapid gains as the country moves from manufacturing to an innovation powerhouse led by its large mobile and digitally advanced consumer and enterprise base. Visionary entrepreneurial leaders such as Jack Ma of Alibaba have become known and respected globally. Chinese tech titans, Baidu, Alibaba, Tencent, and others, are entering overseas markets, and are earmarking leading start-ups for acquisition and investment.

The results reflect a small decline for the United States—26 percent forecast it as having the most potential for leading edge advances, down from 29 percent a year ago. This slip does not reflect a declining status for U.S. tech leadership but rather the expansion of innovation across several geographies in increasingly developed digitalized markets.

Accordingly, India and the United Kingdom are seen by respondents as progressing with innovative tech hubs of their own, showing progress in the

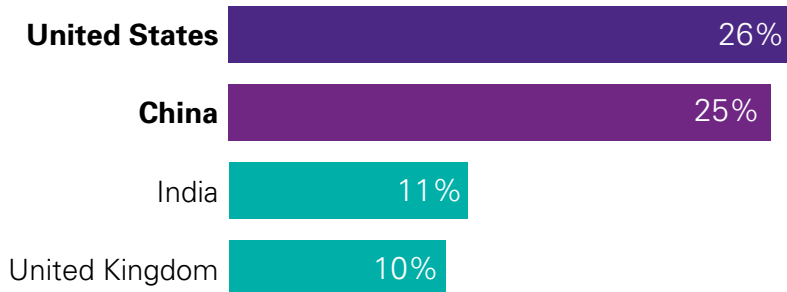
development of products and services that can break through in developed and emerging markets.

On this scale, India places third globally for the second year in a row. India's mobile-first generation and its reliance on local business models are helping India to progress. India is home to nine start-ups valued at more than \$1 billion. More and more start-ups are targeting the domestic Indian market as businesses shift from serving global markets with outsourcing.

The United Kingdom jumped significantly in the global rankings. As many as 10 percent of the survey respondents selected this country for developing potential technology breakthroughs compared with only 4 percent the prior year. Government initiatives such as Innovate U.K. are focused on driving and accelerating innovation by investing in small high-growth companies in key market sectors and providing access to cutting edge technologies.

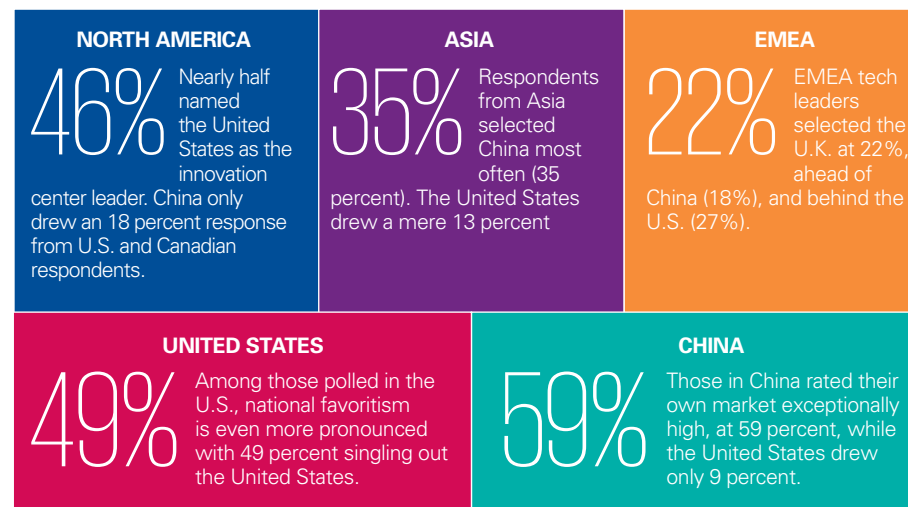
The results skew by regional responses, showing some nationalistic bias.

Which country 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 Survey, November 2016

Responses by region and country:



Source: KPMG Technology Innovation Survey, November 2016

Innovation hubs

Shanghai seen as biggest up and coming leader

Technology innovation is spreading globally, fed by government initiatives, venture capital, corporate strategic investment, universities and incubators. Many cities want to be recognized as a leading global technology innovation hub. The survey revealed numerous up and comers.

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

Shanghai, China	New York, U.S.	Tokyo, Japan	Beijing, China	London, UK
 1	 2	 3	 3	 5
 6	 6	 6	 9	 9
Washington, U.S.	Berlin, Germany	Chicago, U.S.	Tel Aviv, Israel	Boston, U.S.

Respondents could enter up to three cities. Partial list of cities shown.

Source: KPMG Technology Innovation Survey, November 2016

CHINA

SHANGHAI was selected as the leading hub with a 26 percent showing contrasted with 21 percent for the capital city, Beijing. While last year it was at 17 percent, this year Shanghai is ranked first overall in the survey as a future tech leader with its strong regional position in financial markets and numerous high-tech parks in Pudong. Shanghai is bound to remain among the world's leading innovation hubs given its growing base of digital media and entertainment companies and a more pleasurable lifestyle and favorable climate that can draw top talent. Beijing continues to be regarded as a top leading tech hub ranking third. Shenzhen places 13th with a 7 percent nod as this southern city moves up fast, as hardware innovations increasingly play an important role in China's traditional high-tech manufacturing strengths.

UNITED STATES

NEW YORK CITY's Silicon Alley, named by 23 percent, up from 19 percent previously, is churning out start-ups in digital media and e-commerce while tech titans such as Google have set up bases in Manhattan. In the United States, several more cities are gaining on Silicon Valley's stature as a tech hub. Washington, D.C. was also highlighted as a next start-up capital with a large concentration of highly educated workers building a foundation for a growing startup ecosystem. The U.S. capital city was seen by 10 percent of those surveyed as a strong tech innovation hub contender. Chicago and Boston were also selected in the top 10.

JAPAN

TOKYO ranks high again in this year's survey, picked by 21 percent as the strong electronics and robotics leader gets ready to host the 2020 Summer Olympics. One of the world's most futuristic and sophisticated cities, the Tokyo government is investing \$330 million over the next five years to produce hydrogen and fuel cell-powered vehicles ready in time for the games. It is also aiming to bring 8K high-definition broadcasts to the mass consumer market by then. Japan, home to a robust robotics market, is additionally laying plans to get self-driving taxis on the street in time for the Olympics. Moreover, Japan is looking to expand its high-speed magnetic levitation (maglev) trains nationally, and to overseas markets. The new Japanese maglev became the fastest train in the world after traveling at 374 miles per hour (603 kilometers per hour) last October.

UNITED KINGDOM

LONDON has become a leading hub for tech investment, attracting significantly more money than any other major European city in 2016, according to a report released in February 2017 by London & Partners, the Mayor of London's promotional company. This research also showed the United Kingdom's technology sector drew more investment than that of any other European country in 2016. London is a major hub for big data, fintech, and a variety of digital technologies.

GERMANY

BERLIN was selected by 10 percent of those polled this year up from 5 percent a year ago. The capital city has developed into one of the world's leading innovation hubs with a dynamic entrepreneurial culture. A highly skilled and well-educated workforce boosts Berlin's status as one of the most promising cities for innovation. Government-led digital agendas that support investment in IT security and nationwide high-speed Internet reinforce it.

ISRAEL

TEL AVIV drew a 9 percent response in Israel's thriving techie ecosystem. A "smart city" initiative has made Tel Aviv the start-up city in the start-up nation of Israel. Tel Aviv's start-up hubs and lifestyle combine to draw high-tech, life sciences, and design professionals to the city. Israel's growing support for start-ups from both local and international investors give it an edge as a creative and entrepreneurial capital.

Innovation visionaries

The minds behind the most innovative companies in the world

Global tech industry leaders identified Elon Musk as the top innovation visionary in KPMG's survey, by more than double the percentage a year earlier. Elon Musk is universally known as a visionary leader and entrepreneur, whose achievements with electric-powered car Tesla Motors, high-speed transportation system Hyperloop, and space exploration project SpaceX are setting new standards in innovation and transformation.

Apple's leader Tim Cook placed second; his high marks reflect respect for his job of leading Apple's financial results and social responsibility, amongst many other successful areas. Among U.S. respondents, Cook unseated Musk for the lead.

Jack Ma, the founder of Chinese tech conglomerate Alibaba, placed third with 8 percent; up from 4 percent in the prior year's survey. Ma has built Alibaba into an e-commerce leader that has expanded into several sectors including payments, messaging, cloud, and logistics. In Asia, Ma came in first with 12 percent and in China, he led with 20 percent.

At Google, the recent restructure to fuel innovation was reflected in the positive findings for its leadership. Google co-founder Larry Page, now in a leadership role at Alphabet, and Google's CEO Sundar Pichai are tied for third place.

Respondents in Asia gave higher marks for Sundar Pichai of Google, Satya Nadella of Microsoft, and Kwon Oh-hyun of Samsung. In India, Pichai ranked highest.



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

Elon Musk

#1

Tim Cook

#2

**Jack Ma,
Larry Page,
Sundar Pichai**

#3

Satya Nadella

#6

**Bill Gates,
Mark Zuckerberg**

#7

Partial list of visionaries shown. Respondents could enter one name.
Source: KPMG Technology Innovation Survey, November 2016

Innovative companies

Google retains the lead

In parallel with high marks for Google's leadership, one in five respondents perceive Google as the leading company, globally, that is spearheading technology innovation.

Apple continues its tradition of being a top innovation leader, although a slightly less percentage named the inventive brand as tops this year, 15 percent compared with 18 percent a year ago.

Microsoft ranked third this year with 12 percent, the same place as the prior year. Innovations and investments in emerging technologies such as augmented reality and cloud-based artificial intelligence services, to name a few, continue to position the company as a key player.



IBM came in fourth place with 7 percent. In 2016 the company earned a record 8,088 U.S. patents, partly as a result of IBM's commitment to artificial intelligence and predictive analytics. IBM is the only company to have ever exceeded over 8,000 U.S. patent grants during a single year, which many see as a metric of innovation.

Amazon continues to show it is possible for an established player to beat the "innovator's dilemma" and lead the next wave of change. Amazon and Tesla tied in the fifth place. SpaceX and China's Alibaba moved higher in the list, with 4 percent each, placing 7th on the list.

Which company
is the leader
in driving
technology
innovation?

Google	#1
Apple	#2
Microsoft	#3
IBM	#4
Amazon, Tesla Motors	#5

Partial list of companies shown. Respondents could enter one company.
Source: KPMG Technology Innovation Survey, November 2016

Innovation management insights

Technology leaders of the future need to keep up with and outpace multiple geographic market forces to a much higher degree than in the past. Ultimately it is all about innovation and creating the road map to drive value and monetize new business models resulting from disruptive technologies.

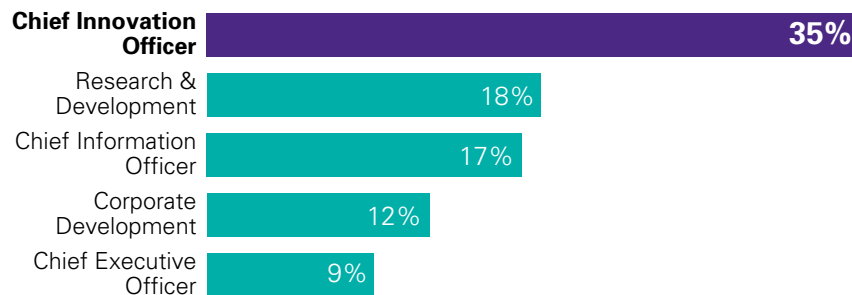
Chief innovation leadership role gains status

KPMG's survey found that more than one-third (35 percent) of the global tech industry leaders believe that the Chief Innovation Officer role is best suited to lead the innovation strategy. This finding underscores the rise of the Chief Innovation Officer as a key member of the chief executive suite and a powerful leader in formulating strategy and keeping innovation central to the corporate culture rather than bureaucratic tendencies to kill ideas.

All regions gauged the Chief Innovation Officer role as key to supercharge innovation. Compared with others, the United States ranked the highest, at 42 percent, followed by EMEA at 27 percent. Asia and China gave this role slightly more than a one-third response rate.

In most regions and countries, R&D and the Chief Information Officer ranked second and third, except in India, where the CEO role made the top three list.

Which function or role has the responsibility to drive innovation in your company?



Partial list of titles shown. Percentages do not sum to 100%. Start-ups excluded.
Source: KPMG Technology Innovation Survey, November 2016

Global leadership views to quantify the value of innovation

Measures of innovation at the corporate level can be difficult, perhaps due to the complex nature of multiple facets involved with true breakthroughs and the economic value of emerging technologies. When asked what is the top metric used by large and medium-sized corporations, as well as venture capitalists, to gauge the value of innovation, there were varying views.

Patents were ranked by 35 percent as the top metric, up from last year's results at 19 percent.

Revenue growth ranked as the second-leading measure, flat vs. 2015 results, when revenue increases were ranked as the top measure.

Brand image gained as one of the top metrics—33 percent this year contrasted with 20 percent in the prior survey. Business digitization may create corporate reputation challenges as we have seen with news headlines driven by cyber breaches. Social media is another important angle at a time that the consumer has more power than ever to impact brand perception. Other commercial measures such as return on investment, stock price, and number of new customers acquired were closely ranked on the scale as key metrics.

China was an exception, where revenue growth and brand reputation ranked at the top.

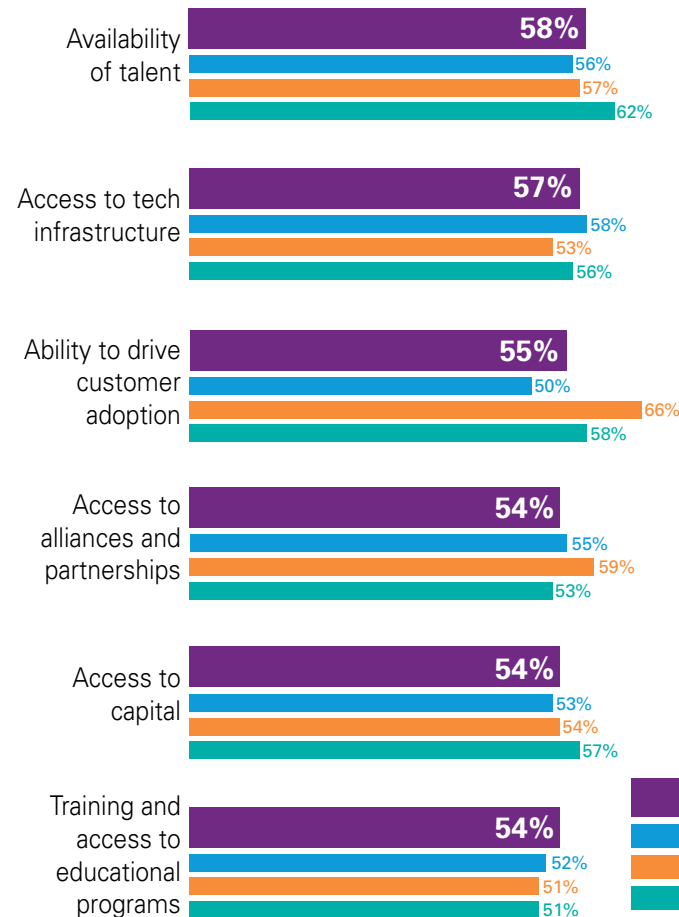
What is the top metric used in your organization to measure the value of innovation?



Partial list of metrics shown. Respondents could select up to three metrics.
Source: KPMG Technology Innovation Survey, November 2016

Key factors to enable technology innovation by region

How would you rate the importance of the following factors in enabling technology innovation? (% 4-5)



Availability of talent, trailed closely by technology infrastructure, were rated high globally as important contributors to pushing innovation forward from an idea to the global marketplace. Both of these areas skewed not quite so strongly as a year ago, followed by the ability to drive customer adoption and access to alliances and partnerships. Access to capital also drew a strong mark but again, lower than last year.

There were few marked geographic differences, either by region or by country, as each gave high marks to the top areas. Differing from the norm, EMEA gave the second highest rating to ability to drive customer adoption.

Compared with global results, China ranked customer adoption and access to alliances and partnerships higher while technology infrastructure and financial and government incentives were rated lower as factors.

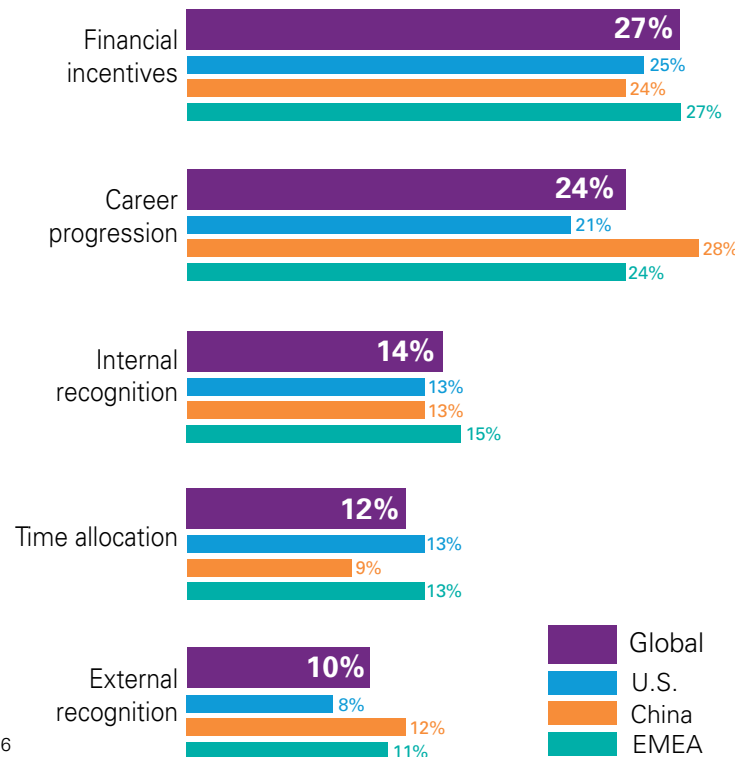
Partial list of key factors shown.

Respondents asked to rate 12 factors on a 1-5 scale, where 1=not at all important and 5=extremely important.

Source: KPMG Technology Innovation Survey, November 2016

Approach to build and sustain an innovative corporate culture

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?



Financial incentives such as a bonus or salary increase were selected as the top motivator by 27 percent this year, an increase from 22 percent last year. Career progression and promotion gained more traction this year as a leading motivator for employee innovation, with 24 percent, compared to 15 percent in 2015. Internal recognition or acknowledgment was ranked third as a means of encouraging innovation, selected by 14 percent, up from 10 percent in the prior survey.

China ranked career progression as the top motivator, with 28 percent. Canada, Germany and Japan also ranked career progression as their top approach to build and sustain an innovative culture.

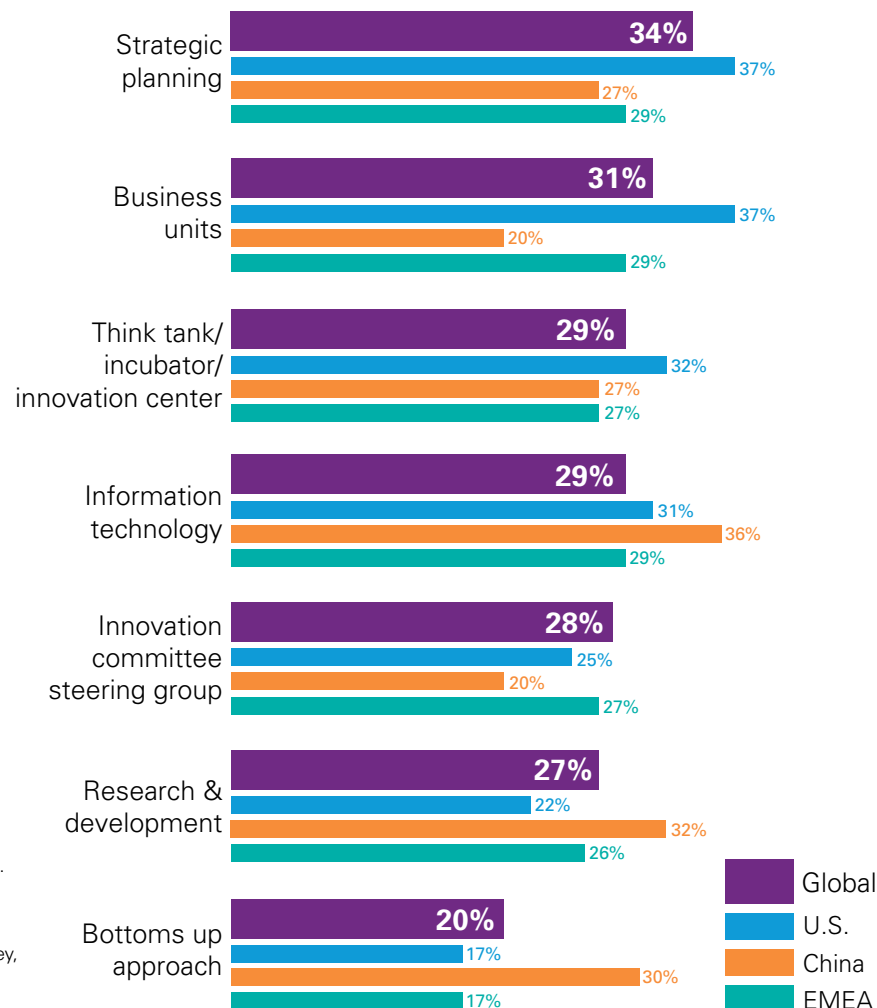
Partial list of approaches shown.

Percentages do not sum to 100%.

Source: KPMG Technology Innovation Survey, November 2016

Innovation incubation no longer just in R&D

Where is innovation spotted and nurtured in your company?



Partial list of areas shown.

Respondents could select up to three areas.

Percentages do not sum to 100%.

Start-ups excluded..

Source: KPMG Technology Innovation Survey, November 2016

Asked how innovation is spotted and nurtured within their company, the highest percentage (34 percent) went to strategic planning followed by several other areas, including business units, information technology, think tanks, etc.

Differing from the global tally, China rated information technology and research and development to a higher degree at 36 percent and 32 percent respectively, making them China's two top answers. China also judged a "bottoms-up approach" as a more important area (30 percent) for spotting and nurturing talent than did the global pool (20 percent).

The United States rated strategic planning, business units, and think tanks as its top three, and to a greater degree than did other geographic markets. Those in China scored innovation committees and steering groups as well as business units lower than did other regions.

Tech innovation country perspectives

- Australia
- Canada
- China
- Germany
- India
- Ireland
- Israel
- Japan
- Korea
- Russia
- Singapore
- South Africa
- Taiwan
- United Kingdom
- United States



A real push for core innovations

Australia's Prime Minister, Malcolm Turnbull, widely welcomed by the technology community, delivered on his promise to support innovation shortly after he assumed office in late 2015. His government introduced a range of initiatives, including a National Innovation & Science Agenda (NISA), branded as "The Ideas Boom," a Cybersecurity Strategy and an expansion of the scope and aims of the Department of Industry, Innovation & Science.

Key initiatives include a range of tax breaks for start-ups and investors, enhancing collaboration between universities and business, increasing the take-up of STEM subjects in the education system, establishing Data61 within the Commonwealth Scientific and Industrial Research Organisation to foster new technology-centric industries, and opening entrepreneurial "landing pads" in Silicon Valley, Tel Aviv, Berlin, Shanghai, and Singapore.

Cybersecurity has come into increasing focus over the last year, with greater government investments in this sector. Even so, KPMG's Australian CEO Survey shows that 78 percent of Australian leaders believe they are still not fully prepared for a cyber event.

More positively, the same KPMG survey shows that Australian CEOs are putting a priority on fostering innovation, implementing disruptive technology, and managing ecosystems of partnerships/alliances.

In the private sector, a growing number of large enterprises are establishing their own venture capital funds and/or contributing to the start-up community through incubators and other channels, particularly in the fintech space. Importantly, as a beacon for many young entrepreneurs, Atlassian, which is regarded as the standout global technology growth success story from Australia, listed on the NASDAQ with a market capitalization of more than \$5 billion.

Another important development in 2016 was the creation of the IoT Alliance Australia. This new association has attracted widespread support from a strong cross-section of major corporates, industry bodies, universities, government, and eminent individuals. The Internet of Things is a particularly relevant and promising technology for Australia, with extraordinary potential in industries with Australia-specific challenges including water, energy resource management, food and agribusiness, transport, mining and coastal/land surveillance, for example, for early alert of bush fires.

Another area of increasing local expertise is quantum computing. Several Australian universities are now heavily invested in this area and making a major contribution on the world stage. This can be expected to accelerate as the Square Kilometer Array (SKA), a multibillion-dollar, multinational telescope project, is built in Western Australia. When completed, the SKA will produce 10 times today's global internet traffic and will inevitably put Australian scientists at the forefront of quantum computing. Another significant ongoing development is the enabling infrastructure of National Broadband Network (NBN), which has made significant progress in the last year and is on target to be completed in 2020.

Various challenges remain, however, in particular, Australia's reliance on importing talent for many technology skills and shortage of early and growth stage funding for entrepreneurs. Additionally, Australia has a poor track record of collaboration among academia, research centers, and enterprises in developing and commercializing technology.

While the National Innovation Science Agenda announced a myriad of measures to address these challenges and remove regulatory impediments, many of them are yet to come into force.

"Australia has a unique combination of geographic, socioeconomic and political factors, which allow it to bridge and potentially exploit the best elements of technology and innovation from advanced western economies and the exciting, new powerhouses of Asia."

Kristina Kipper

National Sector Leader
Technology, Media &
Telecommunications,
KPMG Australia

Leadership in disruptive technologies commercialization

Canada may not always be the first to apply disruptive technologies. But all signs suggest Canada will be a leader in commercialization. While Canada has certainly produced some valuable innovations, the country is more often viewed as the place where great ideas are commercialized and grown. Eventually, disruptive technologies will become a key differentiator for Canadian businesses.

Disruptive technology is driving change across multiple sectors in Canada. In the financial services sector, for example, significant investments in fintech start-ups across the country are helping established players leverage emerging technologies into their business and operating models. In the advanced manufacturing sector, new government investments, and academic initiatives are leading to advances in machine learning, advanced manufacturing, robotics, AI, and the Internet of Things.

At the same time, adoption and commercialization of disruptive technologies is also moving forward with the opening of significant Canadian cloud data centers by prominent organizations in Canada. This is helping accelerate commercialization of disruptive technologies by allowing organizations with data sovereignty requirements a controlled setting to set up cloud environments quickly and cost effectively. Indeed, Canada is recognized as a market where new innovations can quickly be tested without the usual capital expense required to assess these disruptive technologies.

Canada will need to overcome ongoing challenges, however, particularly related to skills and corporate capability. Currently, only 7 percent of Canadian organizations have a dedicated chief digital officer in comparison to the global average of 19 percent, according to the recent KPMG/Harvey Nash Global CIO Survey. This finding suggests that Canadian corporations could be doing more to adopt and embrace disruptive technologies.

Skill shortages have also hampered the adoption of disruptive technologies at Canada's leading corporates and enterprises. However, many organizations are now finding creative methods to nurture talent by leveraging innovation hubs such as the Communitech Hub in Waterloo, which had traditionally focused purely on the technology start-up community. Organizations are also leveraging innovation centers such as MaRS discovery, Ryerson DMZ, oneleven.com, and others to support joint development of innovative projects. Start-ups located at these centers help to accelerate the adoption of innovation within these organizations.

With continued investment from national and global organizations, as well as an increase in disruptive technology startups, Canada will be a key contributor to the development, adoption, and commercialization of disruptive technologies in the coming years.

"Canada appears to be a safe environment to try new innovations, however, Canada needs to increase its leadership position in the area of innovation development. Talent continues to be a concern in the Americas, including Canada, to drive the innovation agenda in our country."

Yvon Audette Advisory
National Service Line
Leader, IT Advisory,
KPMG in Canada

In the forefront of tech innovation advances

China continues to be at the forefront of global innovation, and companies here are adapting to, as well as driving, change in a rapidly evolving and vibrant market.

China is transforming from an investment-intensive, export-led model of growth to one driven by consumption and innovation. Through the use of disruptive technologies such as cloud computing, the Internet of Things, smart industrial robotics, Data & Analytics, and enhanced automation, Chinese companies are capturing new business opportunities.

China's CEOs are focused on growth, strengthening their capabilities, and readying their businesses for a very different future, through transformation, advanced technology, and more specialized talent. They recognize the importance of creating a culture of innovation and collaboration. In a recent KPMG global survey, China's CEOs identified new product development, increasing data analysis capabilities, the Internet of Things, machine-to-machine technology, and the industrial internet as top focus areas for further investment in the next three years.

In the consumer space in China, mobile commerce has exploded and is ahead of the United States and United Kingdom, with an exponential rise in the use of smartphones. China is witnessing a mobile evolution as its consumers lead the global transition to mobile commerce. The meteoric rise in online and mobile transactions points to a Chinese consumer that is increasingly sophisticated, hungry for information, more likely to spend, and keen on accessing a greater variety of products.

With high consumer engagement on online platforms, social media in China is also becoming an essential and influential tool for brands to keep consumers updated about their products and services, as well as to win new customers.

China is also leading in the fintech space, where nontraditional financial institutions use technology and innovation to provide better financial services and risk management. A recent KPMG ranking of the top fintech companies in China highlighted firms with specialties in a wide variety of fields including IT, data analytics, capital markets, risk control, business operation, finance and tax management, venture capital, and entrepreneurial guidance.

The 50 leading fintech companies in China are proactively exploring and adopting advanced IT technology (such as big data, risk modeling, cloud computing, and blockchain) to increase efficiency in financial services through disruptive innovation. They are relying on technology-driven solutions to develop major breakthroughs that can help solve some of the biggest issues facing the financial services sector.

These innovative companies are pushing forward China's reform in the financial sector. A new ecology of the financial industry is taking shape and these innovators will play important roles in a new generation of financial services.

Meanwhile China's 13th Five-Year Plan (FYP) has identified innovation as one of five new tenets of the country's economic and social development around which policies will be designed and implemented during 2016–2020. The FYP charts an ambitious course for China's economic and social development over the next five years. Fostering greater understanding of the FYP is important for China to attract foreign investment in new sectors where foreign capital, technology, and experience is sought—as a catalyst of innovation and an enabler of China's economic transformation.

“China's economic transformation is spurring the creation of new drivers of growth, new industries, new institutions, and new opportunities in the technology and innovation space.”

Egidio Zarrella

Partner,
Head of Clients
& Innovation,
KPMG China

Mastering digital transformation

Germany is the economic powerhouse of Europe with a strong export industry, traditionally driven by high-quality engineering products. More than 80 percent of German CEOs are confident about the country's economic development over the next three years, according to KPMG's recent study "CEO Outlook."

Besides well-known global players from the automotive, software, engineering, or chemicals sector, Germany's backbone is the so-called "Mittelstand." Hundreds of medium-sized and often family-owned businesses are operating as specialists and as "hidden champions" in B2B niches and have proven their ability for ongoing technological innovations.

One of the reasons for Germany's success is a highly skilled workforce and availability of talent. In particular, subjects like mechanical, electrical, and information engineering are increasingly popular among students. Germany also has an internationally recognized educational school system, with nine universities ranked within the top 100 in the world.

Germany's capital city Berlin has developed to be one of the world's leading innovation hubs, with a great entrepreneurial culture and hundreds of startups. Nationally, Germany has over 1,200 start-ups, with an average of 14.4 employees and external capital of 1.1 billion Euros. Additionally, expenses for research and development reached a record high of over 83 million Euros in 2016. Moreover, from 2017 to 2020, the federal government wants to invest 1.3 billion Euros in broadband expansion and 1.7 billion Euros in microelectronics.

In this period of digital transformation, the German government has created a strategic "Digital Agenda," pushing the country's innovation potential to ensure growth and employment, supporting the development of a nationwide high-speed network, and improving IT-Security to generate trust within the society. Lastly, the annual national IT-Summit has brought together relevant stakeholders to drive and promote innovation networking.

Compared with other countries, data privacy and security is seen as especially crucial to Germans. Even though sometimes regarded as a burden by companies, this attention might become a differentiating success factor: Personal data is highly respected, treated securely, and only analyzed upon individual approval. Strict policies regulate the exchange and usage of data. Legal violation leads to immediate prosecution.

By focusing on B2B and on the innovation power of the "Mittelstand," the so-called "Industrie 4.0" became a rising star in Germany's economic development. This concept is a unique approach in combining traditional production with the latest information and communication technology. Due to the fact that Germany has around 15 million jobs related to production, this approach is central to the government led "Digital Agenda," with direct government investments estimated at around 100 million Euros.

"Being the economic powerhouse of Europe, Germany is in an excellent position to master the digital transformation. The combined innovative strength of large global players, young start-ups in Berlin and medium-sized niche specialists is a great chance for Germany to define its role with the 'Industrie 4.0' concept in the world's future economy. The challenge is to fundamentally change existing business models."

Peter Heidkamp
Head of Technology,
KPMG in Germany

Embracing a digital future

India has all the ingredients to become a global driver of innovation—led by a strong market potential, a significant pool of talent, and an underlying culture of frugal innovation. Several initiatives launched by the government, such as Skill India, Digital India, and Make in India, have given entrepreneurs the right platform to develop stronger skills, and improve information infrastructure and mobile connectivity. Among many other initiatives, Startup India is fostering a culture of entrepreneurship and innovation.

Today, Indian consumers are pushing businesses to change from brick and mortar models to online media, and increasingly, to a mobile-first environment. Start-ups are advancing innovations to lead to a true digital economy. Innovations in India are paving the way of entrepreneurship with a strong start-up ecosystem and uber innovation in payment systems and mobile wallets.

Start-up ecosystem: In the past few years, India has gained recognition for its entrepreneurial activities. In fact, with over 4,000 digital start-ups, India is the third largest start-up market globally and expected to be ranked second by 2017. This current growth in the start-up ecosystem is driven chiefly by such key factors as ability to attract talent, capital acquisition, progressive policy environment, and, finally, the scope of growth and innovation.

Innovation in payment systems and mobile wallets: Mobile wallets have seen significant adoption among consumers due to their ease of use and versatility. In fact, the rate of adoption of mobile wallets has been so fast that the user base has outnumbered debit and credit card holders within a short span of time. The scope of mobile wallets is evolving further, integrating across social transactions like gifting, and expected to become one of the key frontrunners for digital purchase processes in the future.

Technology disruptions are fueling the digital transformation scene in India. India has achieved early success in the digital revolution since becoming a global powerhouse for software development and information services. The world is on the verge of a fourth industrial revolution that will impact all economic sectors and change our ways of living. India is facing a great opportunity to address this change by leveraging product engineering, big data analytics, Internet of Things as well as cloud and unified communications, all of which are increasingly becoming mainstream activities.

“Indian start-ups are reversing the image of India from a risk-averse nation by taking it to the forefront of innovation. Rich diversity underlined by a strong pool of talent and the new set of government initiatives are also expected to drive innovations in India.”

Akhilesh Tuteja

National Head – Technology sector, KPMG in India

A pro-business and start-up leader

Ireland is one of the youngest, most dynamic and tech-savvy countries in Europe. It is the business location of choice for household names, entrepreneurs, and start-ups as well as for ambitious individuals and their companies. The Irish economy entered its fifth year of economic expansion in 2016 and has the fastest rate of growth in Europe with increases in consumer spending, tax revenues, building and construction, and expansion in both manufacturing and services sectors.

In 2016, Ireland achieved first place in a number of IMD World Competitiveness rankings: flexibility and adaptability of its people, finance skills; and attractiveness of investment incentives for foreign investors. Ireland also ranked seventh out of 128 countries in the 2016 Global Innovation Index.

Ireland is a fully committed member of the European Union, guaranteeing access to an EU market of more than 500 million people and complete labor market flexibility. The list of successful companies that have chosen Ireland proves that smart decision makers value its pro-business policies, exceptional people, and reputation as a highly attractive place to work and live.

Corporate tax rates have been one of the principal elements of the favorable enterprise environment in Ireland since the 1950s.

The Irish tax regime is open and transparent and complies fully with the Organisation for Economic Cooperation and Development (OECD) guidelines and EU competition law. Ireland offers a transparent corporation tax regime, with the lowest rate in Western Europe of 12.5 percent, accompanied by a growing network of international tax treaties. The country also has an OECD-compliant knowledge development box, an attractive 25 percent R&D tax credit, relief for expenditure on intellectual property, and an attractive holding company regime.

“Ireland is the location of choice and a gateway to Europe for successful businesses. A winning combination of talented people, attractive business taxes, commitment to the EU and an exceptional track record sets Ireland apart. We are home to entrepreneurs, innovators, and business leaders in every sector from fintech to pharma. They choose Ireland for many different reasons but they each have one thing in common—a desire to succeed in a business friendly European environment that is great for business and great for living.”

Anna Scally

Partner, Head of Technology,
Media and Telecoms,
KPMG in Ireland

A cybersecurity and fintech hub

With a population of just over 8.2 million, Israel enjoys the highest density of startups, venture capital investments, and largest R&D spending per capita in the world. Of Israel's GDP, 20 percent is generated by the high-tech industry with more than 8,500 companies and 35 global R&D centers. Google, Facebook, Intel, and Microsoft are among more than 300 multinationals to open branches in Israel, and claim that the key to success lies with the country's local talent.

One of the main reasons behind the number of start-ups and investments is the generous government support offered in Israel with a special emphasis given to high-tech companies and R&D activities. The Israeli government has, over the years, established many incentives to encourage and support investment in technology oriented companies and projects, in addition to providing tax relief to both companies and investors. The Office of the Chief Scientist, of Israel's Ministry of Economy, encourages technological innovation and entrepreneurship via their Grants Program. Top global VC involvement amounts to approximately \$4 billion annually.

Israel's mandatory military service provides early training in sophisticated technologies that increases the talent and knowledge within the country—definitely a key factor that distinguishes Israel from others in driving technology and innovation.

Israel's focus on national security is where cybersecurity, one of the most disruptive technologies in Israel, has the greatest monetization opportunities. Since 2012, 66 new cyber start-ups have been established annually on average. Moreover, in 2015, \$540 million in capital was raised (an increase of 20 percent compared to 2014), 40 cyber R&D centers were opened in Israel by foreign companies, and a total value of \$1.2 billion came from Israeli cyber exits (a 40% increase from 2014). Israel's cybersecurity expertise has become so valuable that global investments in the local industry are tremendous.

Another disruptive technology in Israel is fintech innovation. Over time, Israel has developed a strong fintech ecosystem with more than 500 fintech companies, which raised last year more than \$400 million. This market contains a deep talent pool and companies that are ready to expand geographically. The fintech sector continues to grow impressively, attracting more entrepreneurs and increased funding from local and global investors.

Israel has a great deal of fundamental experience and knowledge in technologies that are becoming more relevant to the world of fintech. Israeli entrepreneurs know how to apply this knowledge and experience, which in turn, has created a world-known legacy of successes. Lastly, global and Israeli financial institutions (both banks and credit card companies) have always been open to innovation and cocreating with local fintech companies.

"Israel continues to be—and to foster—an attractive hotbed for investors and corporates to further explore new technologies as well as establish global R&D centers. In addition, Israel persists in staying ahead and recognizing the newest trends while continuously bringing the market cutting edge technologies, such as cyber, autonomous car technologies, and fintech."

Arik Speier

Partner, Head of
Technology Practice,
KPMG in Israel

Preparing for the tech marathon

The Abe cabinet launched its first “Work Style Reform” conference to bring about change in Japanese work habits, addressing the large wage gap between temporary workers and regular full-time employees, long hours of work, along with broad economic and social repercussions.

A recent study has shown that despite Japan holding the third largest nominal GDP in the world, the Japanese white collar workers rank 16th in the world for “degree of sophistication” in tasks. The Japanese white collar workers’ long hours at work do not reflect a disproportionately higher productivity compared to other countries. This imbalance shows the importance for employers to make productivity improvements.

To address the productivity issue, coupled with political pressure and negative social stigma associated with long working hours, Japanese companies are at various stages of integrating Robotic Process Automation (RPA) to bring cost-efficiency to the white collar work environment.

RPA will not involve a machine similar to industrial robots but rather a virtual robot that resides in software programs. If implemented, RPA will read the document, automatically extract necessary information, and make an entry into the Enterprise Reporting Package. Similar to industrial robotics replacing blue collar workers, RPA will likely replace nonsophisticated white collar workers in the future.

The Japanese government is also eyeing automation for the upcoming Tokyo Olympics in 2020. Given that the Olympic competition will be held mostly in Tokyo, traffic congestion will need to be addressed for smooth transfer of visitors between various venues. To realize this goal, the Japanese government has established a task force to develop a concept of Advance Rapid Transit (ART). ART is a next-generation transportation system in which automated buses run in priority lanes while installed priority sensing traffic lights help to time bus operations, bringing traffic delays to a minimum.

The most notable technology supporting ART is “Dynamic Mapping” technology, a three-dimensional mapping technology that is being developed through a program sponsored by the Cross-ministerial Strategic Innovation Promotion Program of the Japanese government. Dynamic maps are based on a concept of hierarchy of interactive maps that include information that is stratified based on a sequence of predictive events that are organized and fed into the business operation. The dynamic map in a hierarchy will recognize traffic light colors and pedestrian movements that will occur within one second, process accident and traffic congestion information occurring within one minute, spot weather patterns and lane closures occurring within one hour, and record lane and building structures within one month. This depth of three-dimensional information will enable buses to operate with precision as designed.

“The Japanese government is keen to stay competitive in technology as Japanese companies have been and continue to be successful in technological development. Japanese companies are uniquely positioned in their strength in hardware technology, such as sensor devices. We would like to see large Japanese conglomerates establish an ecosystem to support Japan’s many great start-ups in early to mid-stages to further propel Japanese technological development.”

Eiichi Fujita

Technology Lead Partner,
KPMG in Japan



Making smarter digital life experiences a priority

Korea remained strong in the advanced electronic device manufacturing market. Korea's annual export of technology products is more than USD 170 billion a year led by global technology leaders. Samsung Electronics, LG Electronics, and SK Hynix have been the leaders in smartphones, memory chips, and flat panel display; however, for two consecutive years Korea's electronic device production, in terms of monetary value, is expected to decrease. Korea needs a new path for future growth.

There were two significant events in 2016. The first one was the Go match between Google Deep Mind's AlphaGo and the renowned professional Go player Sedol Lee. Unlike chess, which was mastered by IBM's Deep Blue in 1997, Go had been considered a game that an artificial intelligence could not master due to incomparable number of complex moves the game has compared to chess. However, AlphaGo defeated Sedol 4-1 with its massive computational power, big data, and deep machine learning, which resembles human learning. This shocked Koreans and led them to pay more attention to artificial intelligence, cognitive technology, big data, and robots as disruptive technologies. Though lagging behind the leading companies in the United States and Japan, large and small Korean companies including Naver are investing in this field of artificial intelligence to narrow the gaps and to be the fast followers, which Korean companies are good at.

The other event was the Samsung Galaxy Note 7 failure. By many, the Galaxy Note 7 was believed to be the best smartphone ever with iris scanner for personal identification and a waterproof body. However, Samsung had to cease the Galaxy Note 7 marketing and production after the battery explosion incidents. Samsung

has been a successful company leading with its innovation speed and execution which fitted the nature of the technology industry where disruptive technologies easily make obsolete yesterday's bestselling products. This incident made many Korean and global companies assess their "safety-first" execution. In addition, the Korean economy has a better understanding of the risk in relying heavily on star players.

As part of building a sustainable economic ecosystem, the Korean government is supporting start-ups in various ways including the creation of a start-ups hub in Panky Techno Valley, south of Seoul, where large and small technology companies are already clustered and have the support of crowd funding for start-ups and the enablement of M&A activities. In addition, start-ups have close access to domestic and export markets via large Korean global leaders who need new technologies development.

Korean companies spend a considerable portion of their revenue in R&D. Technology companies spend approximately 1.8 percent of GDP on R&D expenditures, which provides the foundation for development of disruptive technologies and R&D workforce for startups.

Korea's technology industry structure where global leaders and start-ups are collaborating in the development of disruptive technologies and introducing products to global market will continue as long as Korean companies invest large sums in R&D. The Korean education system also needs to continue to provide high-quality researchers and engineers to the industry although domestic and global political instability may influence the global economy adversely.

"The historic game between AlphaGo and Sedol Lee confirmed again the importance of software development including artificial intelligence, cognitive technologies, big data, IoT, and other various fields to Korean companies. With an already strong Korean technology manufacturing industry, investment in and development of the software industry will further contribute to the sustainability of the Korean economy by providing customers with smarter life experience."

Seung Yeoul Yang

National Head,
Technology, Media and
Telecommunications,
KPMG in Korea

Perseverance and growth within a challenging environment

The overall level of economic uncertainty and turbulence has not significantly affected the Russian technology industry growth driven primarily by export software development, e-commerce, and cloud solutions.

Overall, the industry seeks for cutting-edge solutions in information security, business efficiency, and risk management areas. Having a rich pool of talented scientists and researchers, the country lacks business-oriented innovators, which, along with difficulties with funding, excessive regulatory burden, and complexity of technologies, make the industry growth pattern more complicated.

The entrepreneurial way of thinking which is fundamental for the industry is yet to become a trend. Although the Russian government launched a number of incentive programs aiming to boost the innovative trend, small and medium-sized companies experience complications with access to long-term funding and knowledge and cannot leverage from an innovation network as it is not sufficiently developed. The lack of a top-to-bottom innovation management approach causes the insufficiency of practicality for certain market players dealing with commercialization of innovations. Apart from this, most market players plan to remain private in the foreseeable future.

The market challenge has forced entrepreneurs to look for new technology drivers to transform business. These are most likely to be Internet of Things, biotech, and new computer physical base (quantum and nano computing). This will entail a shift in consumer trends that are likely to crystallize primarily in the life science and retail sectors by means of marketplace platforms and digital health developments.

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 the technical, infrastructural, and financial issues entrepreneurs may face, they continue to manifest optimism and believe they can benefit from these opportunities.

"Creativity and entrepreneurship itself cannot be developed by government or any external impact. An innovation-friendly ecosystem, mentoring, legal and finance information, and access to infrastructure are of vital importance for the creation of an environment where a start-up can succeed. These factors, as well as the culture that encourages the entrepreneur, can help transform the country's innovations landscape and position Russia as a global technology industry leader."

Yerkozha Akylbek

Partner, Head of Innovations and Technology, KPMG in Russia and the CIS



Singapore is uniquely placed in South East Asia (SEA) as a city-state with a supportive regulatory environment, high quality education system and a clear government agenda to promote an innovation economy.

Singapore has focused on developing high quality intellectual property and becoming the Information, Communication and Technology leader in the region.

Singapore is the largest producer of startups in SEA. In 2015 alone, total funding for startups exceeded US\$1 billion with the biggest rounds of funding for ride-hailing platform Grab and Lazada, an e-commerce online shopping company.

Over the last two years, 210 fintech firms have also commenced operations in Singapore aligned to its positioning as an established financial hub. Fintech start-ups in Singapore benefit from a technology advanced population, high financial inclusion, high debit/credit card penetration, low taxes, and efficient procedures to set up businesses as well as government/private grants and tax incentives.

In support of fintech firms, the Monetary Authority of Singapore published its 'regulatory sandbox' guidelines to encourage and enable experimentation of solutions that utilize technology innovatively to deliver financial products or services.

In terms of government backing, Singapore-based early-stage technology start-ups have access to the Early Stage Venture Fund where the National Research Foundation matches, on a 1:1 basis, seed funding by selected venture capital firms.

SPRING Singapore has also set up the Capability Development Grant and the Capability Voucher scheme to support SMEs in technology innovation and to redeem R&D-related services to upgrade their operations. Other schemes for SMEs and Large Local Enterprises released by the Singapore Economic Development Board includes the Research and Incentive Scheme for Companies and the Initiatives in New Technology.

In the new Research Innovation Enterprise 2020 Plan, the government has committed S\$19 billion to supporting the country's R&D efforts over the next five years.

To support the continued drive for innovation, the Singapore Government announced in its 2017 budget the plan to set-up the Global Innovation Alliance program for Singaporeans to gain overseas experience and collaborate with counterparts in other innovative cities in selected overseas markets to establish Innovation Launch pads.

The city-state has not only attracted start-ups, but large technology multinationals such as Facebook, LinkedIn and Google which have established their regional headquarters in Singapore. The ability to experiment at a low cost with a concentrated population and a technologically advanced city makes Singapore a desirable location for these multinationals.

In fact, this has been the premise for NuTonomy launching the world's first commercial driverless car in Singapore and Rocket Internet establishing Lazada marketplace to tap into the nascent online consumer market in this region.

The Singapore government is striving to be the world's first Smart Nation and has already deployed smart sensors to analyze traffic congestion and crowd density, enabling the ability to reroute buses at rush hour and avert traffic jams.

According to the Committee on the Future Economy, Singapore must remain open and connected to the world, help its people acquire skills for jobs of the future and ensure companies scale up for a challenging climate through innovation and transformation.

People and companies must stay nimble and adapt amid rapid technological change, subdued global growth and rising anti-globalization.

"Singapore has a strong ecosystem resources and capabilities in place to drive innovation. This includes a large pool of allocated investment capital and R&D, corporate backing of over 7000 corporations which consider Singapore as their base, world class institutes of higher learning, and a strong and stable government. This has demonstrated a commitment to encouraging innovation and entrepreneurship through a combination of financial tools and regulatory frameworks."

Juwanus Tjandra

Partner, Management Consulting, KPMG in Singapore



Positioning as tech hub of the future

South Africa continues to be a leading technology player in Africa with standards that have long rivaled those in the developed world and a stable economic environment coupled with a developed IT outsourcing, technology, and telecom sector.

The country is also home to an active technology start-up community that is drawing investor attention. South Africa will quickly see entrepreneurial success stories as interest and investment in local companies heats up with a supportive ecosystem of technology incubator hubs in Cape Town and Johannesburg backed by large local and global corporate players.

While many foreign venture capital funders have yet to discover the untapped potential in these markets, rapidly increasing international interest in the future is foreseen. Several underlying positive factors contribute to South Africa's culture of digital innovation and entrepreneurship and tech leadership in the region.

In addition to high levels of mobile and broadband penetration, South Africa is the continent's most developed IT-Business Process Outsourcing (BPO) market, with a vibrant ITO sector as well as BPO players that serve the large domestic and offshore markets.

Another distinguishing factor of the South African market is that shoppers here view security and protection of personal data as crucial—one reason why South Africans fear shopping online. Tech companies have addressed some of these issues by making technology-based transactions simpler, with fewer steps, but enhanced security. Furthermore, South Africa has enforced the Protection of Personal Information Act as a means to safeguard collecting, processing, storing, and sharing personal information.

Some of the most exciting technology disruptors in South Africa are:

Artificial Intelligence: A number of companies are involved in Data & Analytics, but they are still in the descriptive phase of reporting and visualizing. IBM has an instance of Watson in South Africa and, based on global trends, we might see some collaborations amongst other firms in the corporate and healthcare sectors leverage the power of Watson's AI capabilities.

Cryptocurrency: All South African banks are doing proof of concepts on blockchain, in an effort to avoid fintech companies getting ahead of them, but it is also an offensive move as banks explore working without their current big in-house systems. It was predicted a year ago that large financial institutions would spend \$1 billion on blockchain within 24 months.

Robotics: Automation is spreading in sectors such as banking, healthcare, and mining, where the level of error in certain tasks needs to be eliminated while costs are driven down. A number of local organizations have been using robotic process automation to improve operations. There are also known use-cases of robotic process automation in the financial services sector—used for a number of companies that have deployed IoT initiatives and are now leveraging the data produced by these sensors to streamline their operations. The use of drones has also exploded in the country. Sectors in the forestation and agricultural industries, as well as organizations with stock-pile intensive operations are leveraging the power of drones to increase coverage, efficiency, and safety for staff-workers. KPMG in South Africa uses drones to perform maintenance on their solar panels—powering the entire campus—of their Johannesburg offices.

"Tech innovation hubs are gathering momentum and offer phenomenal potential when it comes to the numerous technology areas where South Africa is a regional leader."

Frank Rizzo

Partner, Technology Sector
Lead, KPMG in South Africa

Moving from chips to IoT

Responding to rapid change in the international industrial environment and to challenges posed by the transformation of Taiwan's economic development from an efficiency to innovation model, the Taiwanese government has opted to upgrade Taiwan's economy by focusing on innovative research-based industries and an Asian Silicon Valley. Five key strategic industries are highlighted: Internet of Things, Biotech/Medicare, Green Energy, "Smart" Machinery, and National Defense. The government's vision is to link domestic demand and commercialization by leveraging Taiwan's existing high-tech manufacturing sector with international capital, human talent, and start-up teams so that Taiwan can work with multinational companies to jointly develop business opportunities presented by emerging industries and new business models.

Many key components of innovative businesses are built on the strong competitive foundation of the semiconductor sector. These five strategic initiatives will become an important way forward for Taiwan's semiconductor capacity.

Because innovation within Taiwanese companies is mainly driven by technology rather than market demand, most Taiwanese companies are locked in a position as market followers. For Taiwan's semiconductor industry to regain growth momentum and worldwide competitiveness, it should not only grasp the pulse of the economic cycle and seize market share but also collaborate with brand partners that can bear the costs of new product experiments and the risk of technological failures.

Taiwanese companies are also struggling to break into the new Internet of Things industry. Their ability to innovate is to no avail before the architectures of smart home, smart cities, and smart factories are yet to be determined. In order to escape from innovation as an intermediate product maker, Taiwanese companies are attempting to move up and down the supply chains and proactively engage in innovation on their own initiative rather than taking instruction from clients.

Taiwanese companies are well known for quick reaction to changing market requirements as well as constant optimization of production processes. However, there are many semiconductor product specifications required for the new generation of innovative industries that are totally different from the traditional 3C technologies. In order to design products that meet consumer demand, such as sensors and chipsets, upstream and downstream supply chain integration is needed to get past entry barriers of innovation and deal with disruptive applications such as the Internet of Things.

Through supply chain alliances and vertical integration, semiconductor industries can establish platforms in modular systems to achieve innovation progress and gain economies of scale. This reduces the costs of innovation and increases the success rate. The future of these platforms will be defined by the government and the private sector. The government continues to play an important part in the infrastructure investments and R&D incentives to continually seek innovative business models.

"Undoubtedly the OEM/ODM business model where Taiwan IT players are at their best is becoming less and less viable as profit margins keep declining. Taiwan companies are thinking how to convert innovation into Taiwan's growth engine with such projects as the 'Asian Silicon Valley.' The Taiwanese government continues to provide incentives and relaxed business regulations to foster growth of tech start-ups, but it may take some time to see results in funding, technology, and talent."

Samuel Au

National Head of
Technology Media and
Telecommunications,
KPMG in Taiwan

Tech sector continues to power on despite Brexit uncertainties

2016 has been a tumultuous year for the United Kingdom with Brexit causing great uncertainty pre- and postreferendum result. Prior to the referendum, a survey of United Kingdom Tech businesses showed that they were 70 percent in favor of a Remain vote so Brexit is clearly a blow and disappointment to the sector. Despite the uncertainty presented by Brexit, the United Kingdom tech sector has shown its resilience by continuing to perform well with trading holding up and investment continuing strongly.

Confidence in U.K. Tech companies is exemplified by the fact that the United Kingdom ranked second only to the United States in terms of the number of tech exits in 2016. It was also the year that saw the United Kingdom experience two of its largest-ever Tech M&A deals with Softbank's £24 billion purchase of ARM plc and Micro Focus plc's £6.6 billion acquisition of HPE's software division. This confidence in the U.K. tech sector has been further reinforced by recent announcements from U.S. Tech giants Google and Facebook to hire more staff in the United Kingdom, Apple is moving to a new London HQ, which will be one of its largest offices outside of the United States, and IBM is planning to open four new U.K. datacenters.

The strength of the U.K. tech sector should not however, be taken for granted. It has therefore been encouraging to see the government's new industrial strategy include the tech sector as one of its priority sectors. In particular, the government's announcement of a £2 billion R&D fund for emerging tech such as AI and Robotics will make a key difference.

Despite Brexit, the core attributes that have made the U.K. tech sector so strong and attractive remain in place, including an amazing talent base that has a long track record of creativity; great infrastructure and facilities; first class universities; a stable legal system; appropriate fiscal incentives; time zone advantages; and an ecosystem of advisers that support the needs of tech companies.

"Technology underpins the competitiveness and development of almost every sector. It is a key battleground for most economies and the United Kingdom must ensure it is a leader in this field. The government's £2 billion R&D fund for emerging tech, such as artificial intelligence and robotics, is therefore hugely encouraging and will make a real difference to the United Kingdom being seen as a tech destination of choice for scientists, entrepreneurs, investors, and tech companies."

Tudor Aw

Technology Sector Head,
KPMG in the U.K.

Tech revolution morphs to fourth stage

Five of the top six world's largest companies are U.S. tech companies with over \$2.5 trillion in market cap. The U.S. platform companies are leading the tech evolution with big investments in artificial intelligence, the Internet of Things, and other technologies which will have great influence on the way business and consumers engage with the world.

The U.S. tech landscape is morphing into a fourth transformation, as revolutionary new innovation surfaces. Face and voice recognition are going to become part of consumers' lives in the United States and help to provide stronger privacy protection. Mobile communications, banking, and commerce are all adopting biometrics to make online transactions more secure.

Excitement over software innovations is leaning now toward advances in hardware and the Internet of Things. Devices that are seamlessly connected through the cloud from the home to workplace are here now and will be widespread soon. Lighting, air conditioning, TVs, and music are all controlled by smart home gadgets that are increasingly common in suburbs, cities and towns. Entire cities are getting on the IoT grid, with traffic-monitored street lights and tools for minimizing congestion during rush hours.

Robotics and automation in manufacturing continue to increase efficiencies. Corporate leaders are already embracing the cost-savings functions of routine tasks that robots can handle quite well and in service industries also increase customer satisfaction.

The start-up boom in the United States continues to thrive. U.S. fundraising increased from \$35.2 billion in 2015 to \$41.6 billion in 2016. While actual investment in start-ups has decreased slightly in recent quarters, the continued rise in fundraising activity and optimism from tech and investment leaders signal confidence in the United States as a commanding tower to generate ideas, create job opportunities, and advance the economy. Despite a thawing IPO market in the United States, venture-backed tech companies are finding exits through a surge in acquisitions and mergers.

Meanwhile, the dominance of the United States in science and technology is a given currently, but is increasingly challenged by the rise of China and other countries. At the same time, the lure of the massive Chinese market continues to attract major American tech giants. Figuring out the right strategy for China remains a struggle.

The United States remains the clear champion of tech innovation worldwide. But the gap between this most developed tech world and others is starting to narrow. Corporate leaders and government alike are keen to keep America great.

"Silicon Valley and the San Francisco Bay Area have a unique tech ecosystem, culture, and opportunities that are not easy to replicate. More cities, companies and industries in the United States understand the importance of being part of this ecosystem and have a presence in the Bay Area. In the tech industry ecosystem partnerships are key to staying ahead."

Tim Zanni

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



Innovations come from practically anywhere in the world at a pace that requires a futuristic outlook to stay ahead.

A photograph of the Golden Gate Bridge in San Francisco, California. The bridge's iconic red-orange towers and suspension cables are visible, extending from the left side of the frame towards the right. The bridge deck is partially obscured by a thick layer of white fog that fills the lower half of the image. In the far distance, the Transamerica Pyramid is visible through the haze. The sky is a pale, overcast blue.

Conclusion

Silicon Valley is going global.

As markets and regions transform with emerging technologies, talent, and capital, there is a shift from the West to the East. Most noticeably, China is rising, in position to get ahead. India, too, is ascending while Japan has long been a contender. Counterbalancing this trend, the United Kingdom is progressing with a tech and start-up agenda even while Brexit proves a challenge to retain its status as Europe's leading tech market.

New locations are getting on the tech map with the United States in the forefront with numerous cities: New York, Washington DC, Chicago, and Boston. Key Asia hubs are also rising to the top including Shanghai, Tokyo, Beijing, and Shenzhen. In Europe, London, and Berlin are highly regarded as innovation hubs and have come up the ranks for disruptive technological advances. Tel Aviv continues to be the start-up city in the world's start-up nation.

Tech industry leadership, from the startup world to the FORTUNE 500, has spread from West to the East although the United States has a decided edge with Elon Musk, Larry Page, Tim Cook, and Bill Gates all rated highly. More leaders from Asia in particular are pinpointed in the rankings, most notably Jack Ma from China's Alibaba.

Company leadership is extending from Silicon Valley to new markets but Valley-based Google, Apple, Tesla, and Facebook continue to win kudos. Google's recent restructure to fuel innovation is paying off while Tim Cook has kept Apple at the forefront. Facebook is racing to stay ahead of fast-changing social media habits globally. Turning eastward, Samsung from South Korea is considered a strong leader despite recent smartphone products setbacks while Chinese networking and telecom company Huawei also gets high marks.

Managing innovation well continues to be a challenge for small and large business alike. The role of the chief innovation officer is gaining in importance for setting and implementing strategies for the future, and today it is gauged more crucial than other functions such as R&D and even the CEO role. In the race for innovation leadership, patents are being looked at as an ever-more important measure of truly new ideas, even more so than revenue growth. For employee motivation, the key is cash—and it has replaced career progression as a leading incentive.

Staying on top of these fast-moving trends in an increasingly global landscape requires flexibility and mindfulness from the C-suite to shift resources to forge ahead rather than protect the status quo and to push the best ideas through to reach customers. Whether a company is mid-market, large, or a start-up, getting the right mix of talent, capital, and entrepreneurial style to embrace new technologies is a must for survival.

Now that innovation can come from practically anywhere in the world and more rapidly than ever before, it requires a futuristic outlook to stay ahead and dream up and commercialize tomorrow's technologies successfully.

Many countries want to achieve the status as a leading innovation hub and realize the importance of becoming part of Silicon Valley's ecosystem. Key to their country's success are Silicon Valley's opportunities for partnerships and learning the magic of its leadership.

"What we have seen emerge over time is the result of countries and cities striving to replicate and build on the Silicon Valley tech innovation blueprint and their increasing degree of success. The spread of tech innovation development is being fueled by growing ecosystems as technology innovation has permeated all industries and become a strategic business imperative for cross-industry leaders."

Tim Zanni

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

Survey demographics and methodology

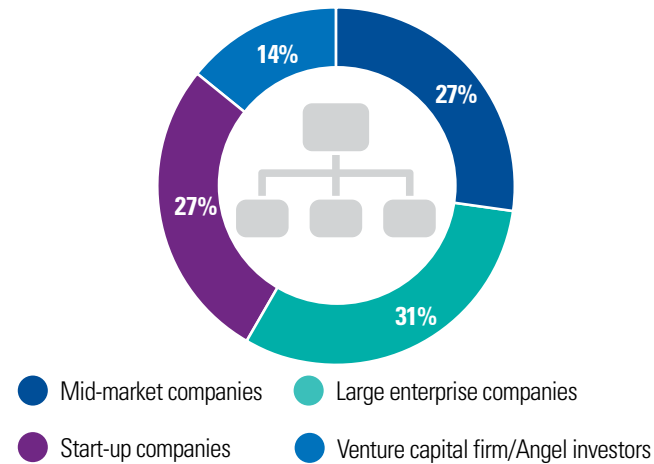


KPMG's technology industry innovation survey, now in its fifth year, included 841 global technology industry leaders. Most are C-level (86%).

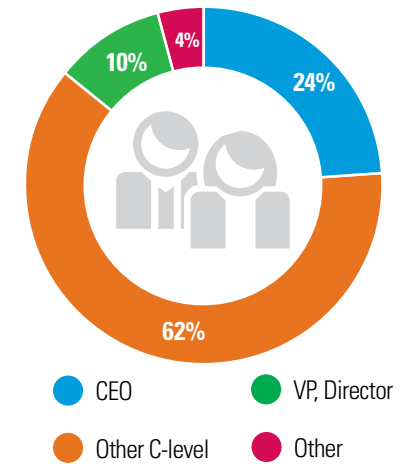
The survey spanned the Americas, EMEA and Asia-Pacific markets. Fifteen countries are represented. The web-based survey was conducted September-November 2016.

Which of the following best describes your organization, your title?

Business size



Title



May not sum to 100% due to rounding.

Source: KPMG Technology Innovation Survey, November 2016

About KPMG International

KPMG: An experienced team, a global network

KPMG's 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. Our network of professionals have extensive experience working with global technology companies ranging from the FORTUNE 500 to pre-IPO start-ups. We aim to anticipate the short- and long-term opportunities of shifting business, technology, and financial strategies.

KPMG is a global network of professional services firms providing Audit, Tax, and Advisory services. We operate in 152 countries and have 189,000 people working in member firms around the world. The independent member firms of the KPMG network are affiliated with KPMG International Cooperative ("KPMG International"), a Swiss entity. Each KPMG firm is a legally distinct and separate entity and describes itself as such.

KPMG Technology Innovation Center

KPMG recognizes the importance of innovation. In 2012, we launched a global Technology Innovation Center to identify and evaluate the impact of future disruptive technologies.

The center connects leading technology thinkers including entrepreneurs, FORTUNE 500 technology executives, venture capitalists, and KPMG member firm professionals. This publication is sponsored by the Technology Innovation Center.

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The Pulse of Fintech

KPMG's quarterly reports evaluate the most recent global trends in fintech investment. The publications provide insight and analysis on worldwide fintech activity.



Global and cross-industry collaborations and partnerships are key to staying ahead, as is learning how to embrace change in a nimble way to avoid the status quo for fear of failure or uncertainty.

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