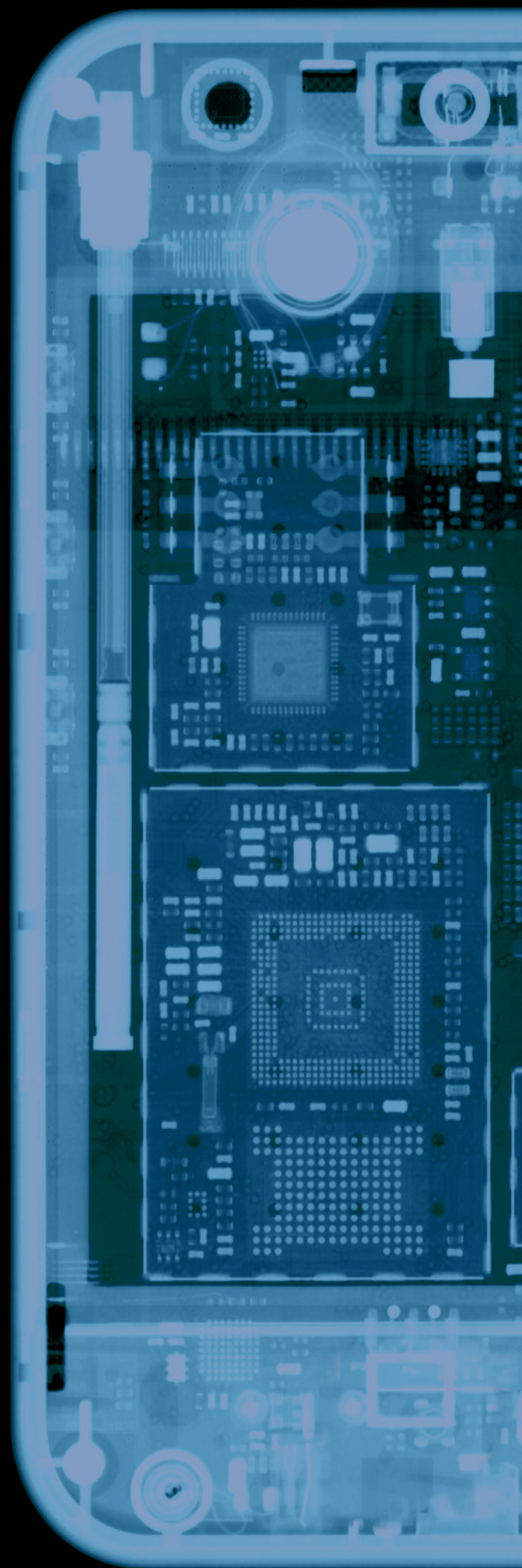




Semiconductors: As the backbone of the connected world, the industry's future is bright

Global Semiconductor
Industry Outlook 2019



About the authors



Tim Zanni is the Global and US Technology Leader for KPMG. In his role, Tim plays a key client relationship role for the largest global technology accounts. Tim's responsibilities include representing the firm in the marketplace, developing marketplace strategies, leading the growth and success of the firm's global technology industry, and ensuring that clients receive high-quality service. Tim has over 35 years of global experience and currently serves as the global lead partner for two of Silicon Valley's leading technology companies.



Lincoln Clark is the leader of KPMG's Global Semiconductor practice and a member of KPMG in the United States' Technology, Media & Telecommunications practice. He has more than 32 years of experience providing auditing and accounting services, including as lead partner for a significant number of Fortune 500 companies. Lincoln has extensive experience working with semiconductor companies on IPOs, debt financings, acquisitions, and equity financing.



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About the research

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This is the 14th edition of KPMG’s annual Global Semiconductor Industry Survey, which identifies current and emerging trends and issues affecting the world’s semiconductor companies and provides an index reflecting industry leaders’ expectations about revenue, profitability, workforce growth, spending, and other factors. In the fourth quarter of 2018, KPMG collaborated with the Global Semiconductor Alliance to conduct a web-based survey of 149 senior executives from global semiconductor companies.

The executive outlook presented in this research reflects the overall industry, with respondents from a wide range of geographies, company sizes, and industry segments. In this year’s survey, respondents from the Americas comprised 54 percent of respondents, Asia Pacific 21 percent, and Europe and other countries 25 percent. Forty-six percent of respondents represented companies with \$100 million or more in revenue; 54 percent represented companies with less than \$100 million in revenue. Respondents represented 11 different industry segments, with the largest percentage (42 percent) representing fabless semiconductor companies.

This report also provides the KPMG Semiconductor Industry Confidence Index, which measures and tracks semiconductor executives’ confidence in the industry. We calculate the confidence score from survey respondents’ single-year outlooks for their companies’ annual change in revenue, operating profitability, workforce size, capital spending, and R&D spending.

The source data for all graphs in this report is the Global Semiconductor Industry Survey. The percentages in some charts may not sum to 100 percent due to rounding or only partial results being shown.

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Internet of Things

Top Application Driving Revenue



35% Disclose R&D Spend Is Not Very Efficient

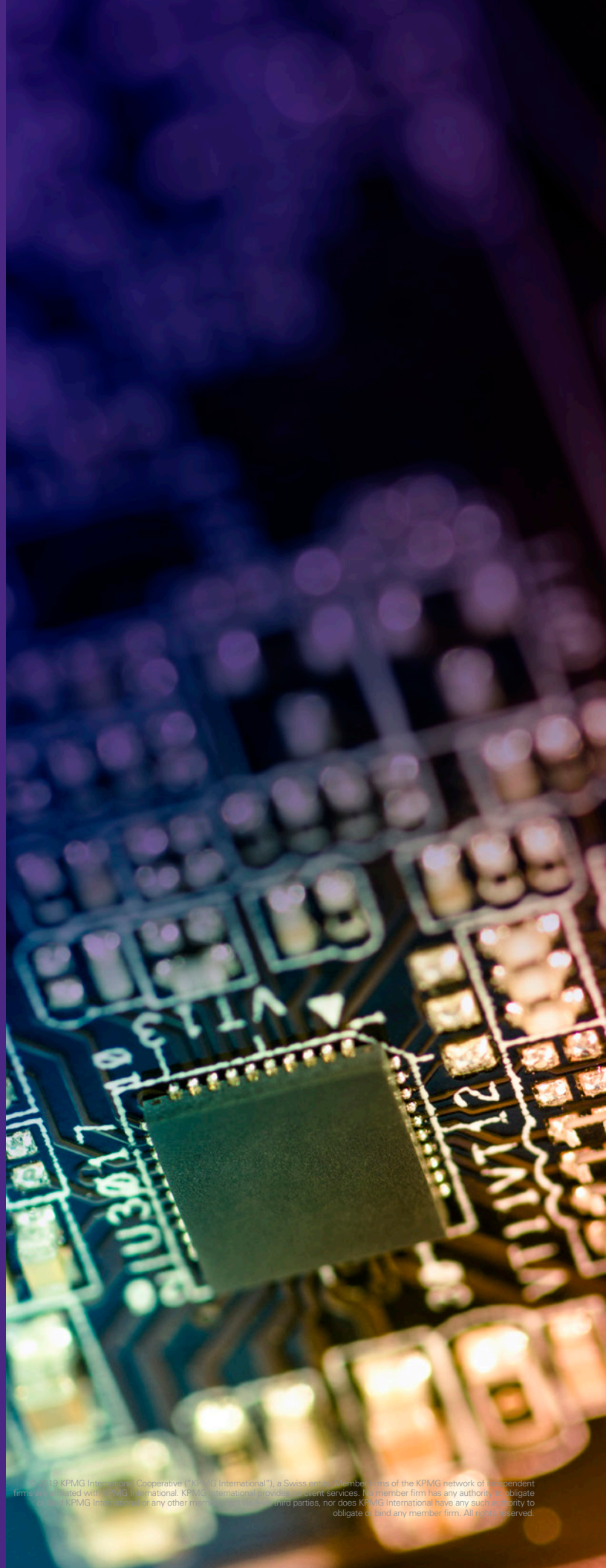


Innovation and Expanded

R&D

Top Strategic Priority

Talent Risk Is Top Threat To Growth



Foreword

The shift from a wireless to a connected world. R&D imperatives. Rapid advances in artificial intelligence. A maturing smartphone market. Global trade disputes. Talent shortages.

Welcome to KPMG's 14th annual Global Semiconductor Industry Outlook.

Each year, we distribute this report to help semiconductor CEOs, COOs, CFOs, and VPs of strategy/corporate development and members of the ecosystem understand the key trends, challenges, and opportunities in the industry. We endeavor to provide insights that can be used to prime key areas of the businesses for future success, including revenue growth, strategy, and improved operating efficiency.

KPMG, in collaboration with the Global Semiconductor Alliance (GSA), surveyed semiconductor executives from across geographies, company sizes, and industry segments about their outlook for 2019 and beyond. Our survey included questions about expectations for revenue, profitability, and workforce growth as well as future spending forecasts. We also asked respondents about the biggest demand drivers for their businesses, their planned strategic investments, the major challenges they will face in years ahead, and much more.

This year, our research included a larger contingent of emerging semiconductor businesses. Despite their smaller size, these innovative companies are making significant investments in new technologies and applications, are growing fast, and are poised to play key roles in the industry going forward. Their perspectives are essential for understanding the outlook for the semiconductor industry.

This report details key findings from the survey data as well as analysis from KPMG semiconductor practice leaders and the GSA. We hope you find this publication insightful and welcome the opportunity to discuss any of the findings.



Tim Zanni

Global and U.S. Technology
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Lincoln Clark

Partner in Charge,
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Shrikant Lohokare, PhD

Global Vice President and
Executive Director, Global
Semiconductor Alliance



Smaller firms are increasingly the source of many promising developments in the semiconductor industry. They are particularly vested in capitalizing on revolutionary technologies such as Internet of Things (IoT) and artificial intelligence (AI) for emerging semiconductor applications.”

— Lincoln Clark
Partner in Charge, Global
Semiconductor practice,
KPMG LLP (U.S.)

Detailed findings

Confidence mixed: larger companies see headwinds; emerging companies bullish

Perpetual technological disruption. Trade wars. The inevitable end of a lengthy boom cycle. Overcapacity in certain sectors.

None of these brewing challenges seemed to dampen the confidence of semiconductor executives at companies with revenues of less than \$100 million. A different story emerges in the larger companies, which after another strong year for the industry, see significant headwinds in 2019. For 2019, KPMG’s Semiconductor Industry Confidence Index for small companies (<\$100 million in annual revenue) reached 69, whereas larger organizations (>\$100 million in annual revenue) scored only 54—a 15-point difference in expectations.

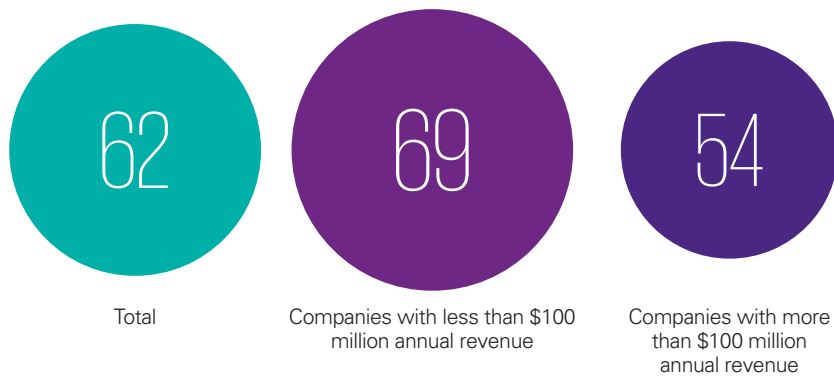
We see a clear bifurcation in confidence based on size. In all areas of the confidence index, the outlook of companies with revenues that fall below the \$100 million threshold is especially rosy. Within the semiconductor ecosystem, fabless companies are more confident than other participants, as the majority of our respondents from smaller companies are fabless. Larger companies, while still optimistic, are more tempered in their outlook, perhaps because they are more exposed to external headwinds such as the current challenges of international trade; China-U.S. negotiations; and, in several cases, slowing capital expenditures, falling memory prices, and excess inventory.

The optimism of emerging companies is in some ways logical, given that newly funded smaller companies maybe simply have more room to grow and scale. It also points to some broad industry trends. Namely, there is a huge commitment to innovation inside entrepreneurial companies. And in today’s business environment, small size affords start-ups the vision and agility to get ahead of or be “the change.” With fewer stakeholders to satisfy, and no quarterly public commitments, start-ups typically have a greater risk appetite than big companies and no existing markets to protect. In addition, processes and organizational hierarchies that tend to slow decisions have yet to be established. Small companies can also take advantage of open source platforms that make research and development (R&D) more accessible and affordable, even without the resources of established semiconductor leaders.

In total—taking into account all company sizes—respondents expressed some degree of confidence in nearly every metric that feeds the index. The lone exception was executives’ outlook for their companies’ expected annual change in operating profitability. We attribute the reticence on 2019 profitability to the current stage of the industry cycle, which has been in a significant expansion mode for a number of years. While semiconductor companies are investing in R&D now for growth, they realize they’re unlikely to realize the return on those investments for several years. In addition, small companies are not yet managing for Wall Street expectations or have significant revenues, so it’s not surprising to see lower expectations for increases in profitability among those respondents where investment is still the critical measure.

The KPMG Semiconductor Industry Confidence Index measures and tracks semiconductor executives' confidence in the industry. We calculate the confidence score from survey respondents' single-year outlooks for their companies' annual change in revenue, operating profitability, workforce size, capital spending, and R&D spending.

Semiconductor Industry Confidence Index



Source: KPMG Global Semiconductor Industry Survey findings, 2019



Companies are optimistic about the industry's future due to the many opportunities created by the connected world.

Internet of Things (IoT) and the connected world ecosystem poised to propel the industry

There are already more than 26 billion connected devices in use, and with more added to the IoT every second, that number is expected to nearly triple by 2025.¹ The International Data Corporation (IDC) forecasts worldwide technology spending on the IoT to reach \$745 billion this year and \$1.2 trillion in 2022.²

With an eye toward growth, semiconductor executives are betting big on IoT. For the first time in our survey, respondents ranked IoT—including connected homes, smart cities, industrial IoT, and personal wearables—as the most important application driving semiconductor revenue over the next fiscal year, followed by wireless communications (the previous number one). Artificial intelligence made a big move up the list this year. Automotive rose two spots in the rankings this year to the number four position.

For the first time, IoT ranked as the top application driving revenue over the next year (percentage represents those who selected important/very important on a 1-to-5 scale).

Applications driving revenue over the next year	2018		2017	
	%	Mean	%	Mean
Internet of Things (IoT)	64%	3.9	63%	3.8
Wireless communications (including smartphones and other mobile devices)	60%	3.8	75%	3.9
Artificial intelligence/cognitive/deep learning	56%	3.8	43%	3.2
Automotive	58%	3.7	55%	3.5
Consumer electronics	50%	3.5	59%	3.5
Cloud computing	49%	3.5	43%	3.4
Industrial	48%	3.4	59%	3.5
Security (including biometrics)	47%	3.4	45%	3.2
Data centers/storage	44%	3.4	24%	2.9
Augmented reality/virtual reality	32%	2.9	37%	3.2
Power technologies	30%	2.9	21%	2.6
Robotics/Drones	28%	2.9	45%	3.2
Wireline communications	24%	2.8	60%	3.6
Medical devices	28%	2.7	21%	2.6
Personal computers	19%	2.5	29%	3.1

1=Not at all important and 5=Very important

Source: KPMG Global Semiconductor Industry Survey findings, 2019

¹ IoT connected devices installed base worldwide from 2015 to 2025 (Statista, 2019)

² 2019 International Data Corporation (IDC) Worldwide Semiannual Internet of Things Spending Guide

Respondents' views of data centers, another big gainer from last year, also point to the massive potential of IoT to the semiconductor industry. Data centers/storage experienced a significant uptick since last year's survey, representing continued expectations for data center buildouts to support a cloud infrastructure. Broader IoT connectivity will increase the number of sensors and the amount of data gathered by consumers and businesses, and there will be more data storage needs along with it. We expect to see more chip investments concentrated in powering the servers used in smaller cloud and edge computing infrastructure, rather than just mega data centers, which have been prevalent in recent years.

In addition, respondents named sensors/MEMS as the sector that will provide the highest growth opportunity for the industry. Sensors/MEMS have numerous consumer applications in IoT, from checking a person's heartrate on a wearable device to monitoring energy usage in a smart home. Industrial IoT (IIoT) is also a significant chunk of the IoT market, contributing to the continuing importance of the sensors/MEMS sector. For example, IoT products that use sensors/MEMS are necessary to produce detailed 3D maps crucial for meteorology, mining, city planning, autonomous driving, and more.

“

As the industry undergoes massive change, semiconductor companies are looking to the future, making bets on the sectors and applications that hold the most promise in an expanding industry ecosystem, including emerging markets like IoT, 5G, AI, and automotive.”

— Shrikant Lohokare, PhD
Global Vice President and
Executive Director, Global
Semiconductor Alliance





Key takeaway

For the first time in our survey, respondents ranked IoT—including connected homes, smart cities, industrial IoT, and personal wearables—as the most important application driving semiconductor revenue over the next fiscal year.

Semiconductor companies—especially smaller companies—saw opportunities ahead for sensors/MEMS, which are ubiquitous and commoditized technologies that don’t require a large-scale or leading-edge foundry to manufacture. Seventy-two percent of all respondents and nearly 80 percent of small companies ranked them as the top growth sector for the industry in 2019.

Interestingly, while IoT ranked number one in terms of importance, it isn’t necessarily translating into expected revenue in 2019. IoT wasn’t seen by our respondents as a revenue producer—yet. On average, they expected only 21 percent of revenue to come from IoT over the next fiscal year, ranking seventh overall. However, that number grows to 25 percent when we look three to five years out, pointing to the expected timeframe for current investments and design wins in IoT-optimized chips to pay off. Understanding the lead time for design wins and the lengthy product lifecycle of many technology products, respondents are clearly focusing on populating the future revenue pipeline.

Sensors/MEMS firmly ranked as the top growth opportunity sector for 2019 (percentage represents those who selected high/extremely high on a 1-to-5 scale).

Growth opportunity sectors	%	Mean
Sensors/MEMS	72%	3.8
Analog/RF/mixed signal	57%	3.6
GPUs	52%	3.5
SoC	46%	3.4
Optoelectronics	40%	3.2
Emerging NVM	35%	3.2
ASIC	34%	3.2
Flash	32%	3.0
MPUs	28%	3.0
Microprocessors	19%	2.9
DRAM	19%	2.7
Discretets	17%	2.6
Other logic	13%	2.7

1=Extremely low and 5=Extremely high

Source: KPMG Global Semiconductor Industry Survey findings, 2019

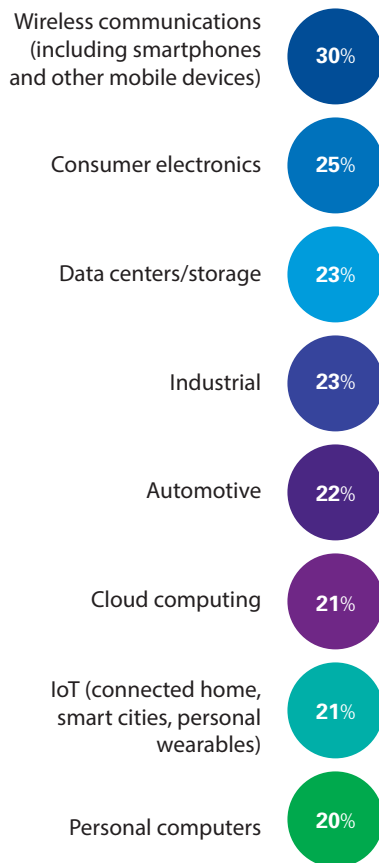
Wireless pays today's bills; 5G will mark a new dawn

A sign of market maturity and saturation, wireless communications was knocked off its perch (by IoT) as the most important application driving semiconductor revenue, and it fell to third (behind automotive applications) in respondents' three-year outlooks.

For years, a major driver of the wireless communications market has been unprecedented increases in smartphone adoption. Today, with mobile device end-user penetration nearly tapped, there's less room for growth in this area.

But let's be clear: Wireless is still a healthy market. Wireless communications still took the second spot as the sector driving growth in the semiconductor industry, and respondents predicted it will comprise 30 percent of their revenue over the next fiscal year, the most of all applications.

Wireless communications is still expected to provide the highest average percentage of company revenue over the next year.



Source: KPMG Global Semiconductor Industry Survey findings, 2019



We see more concentrated local area, campus-type deployment as the first wave of 5G. This will enable use cases to be tested and new business models to be refined.”

—Tim Zanni, Global and U.S. Technology sector leader, KPMG LLP (U.S.)



Key takeaway

As the key component of a connected world, wireless communications will continue to be a key revenue driver for semiconductor companies.

That wireless applications are the primary driver of the current semiconductor business is a clear lifecycle story; the wireless market is well established and currently producing revenue based on investments made in years prior.

Advances in wireless technology also hold opportunities for semiconductor companies, as they contribute to the growth of other emerging technologies that are crucial to the industry outlook. For example, the ongoing rollout of 5G networks, albeit currently on a small scale, likely increases the optimism of the semiconductor industry about IoT, smart city, and autonomous vehicle applications. The next generation of wireless technology, 5G offers exponentially faster speeds and more reliable connections on mobile devices. Technology leaders see 5G as a transformational technology that will drive the transition from a smartphone-based wireless world to an IoT world where an enormous array and number of devices are connected. Poised to change the face of wireless communications by enabling the hyperconnectivity between people and things, development of 5G is well underway.

Our survey revealed positive expectations by the semiconductor industry for the coming launch of worldwide 5G. Although sensors/MEMS are heavily exposed to the device market, respondents nonetheless named them as the industry's greatest growth sector, likely due to their importance in IoT products, which is expected to multiply many times over with the advent of 5G.



Artificial intelligence spurs chip innovation

As artificial intelligence continues its transformational impact on the world, the opportunity for semiconductor manufacturers is enormous. If IoT and 5G will enable the connected world, then AI will make sense of it.

People already use AI software every day—when a smartphone assistant helps with daily tasks, an online shopping site suggests a product, an email system filters spam, or a social media site tags a photo. On the business side, organizations in nearly every industry are embedding data-driven technology across the enterprise to automate, accelerate, and enhance business processes and decision making. Industrial applications abound, too, allowing manufacturers to automate processes such as factory inspection, site monitoring, and product assembly.

Already, AI drives a notable share of the semiconductor revenue stream. In the next fiscal year, respondents ranked AI as the third most important application driving revenue, a significant jump from last year's results. They also ranked GPUs, which are heavily used in AI and data-center-related products, as the third most important sector.

And the race to develop a winning AI chip is only heating up. The newest waves of AI technology—cognitive computing and machine learning—must process and analyze vast amounts of unstructured data, requiring tremendous processing power. Only cutting-edge chips with smaller node sizes can provide the kind of high-performance computing the next generation of AI technology will require.

This AI revolution is sparking a wave of innovation throughout the semiconductor industry. While the largest percentage of respondents' companies reported they are continuing to develop or market larger node chips (such as sensors for connected devices or consumer IoT products), a full one-quarter of respondents' companies are developing 14nm chips or smaller. In addition, the sub-10nm technology node was expected to have the greatest impact of all production technologies over the next five years.

Respondents ranked AI as the third most important application driving revenue.



Although only the top players may have the resources to profitably develop the next generation of chips, other players are pivoting to focus on enhancing existing technology that's perfectly suitable for many of the market's needs. For these innovative companies, technological change is an opportunity, not a threat. ”

—Chris Gentle, Partner, Global Semiconductor practice, KPMG LLP (U.S.)

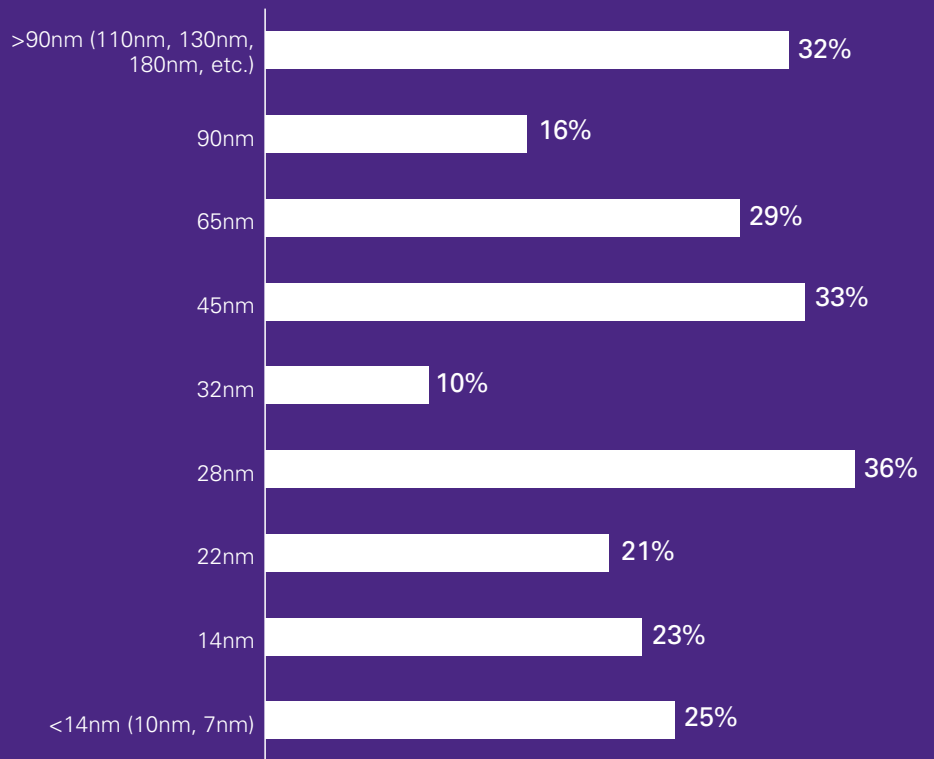


Key takeaway

While AI is demanding innovation at the smallest nodes, other components of the connected world will continue to utilize existing nodes, allowing more market participants.

Despite the enormous cost of production for R&D, small node size isn't a barrier to entry for small fabless companies that are focused on design. That's because capital is flowing to promising AI hardware start-ups. Qualcomm, Intel, Micron Technology, and Nvidia are all investing hundreds of millions of dollars in AI start-up ventures.³ Numerous start-ups have raised more than \$100 million in financing and total venture capital investment in AI chip technology measures in the billions of dollars.⁴

Companies are still taping out their products across a variety of node sizes.



Multiple responses allowed.

Source: KPMG Global Semiconductor Industry Survey findings, 2019

³ Qualcomm sets up \$100 million fund to invest in AI startups (Reuters, Nov. 28, 2018)

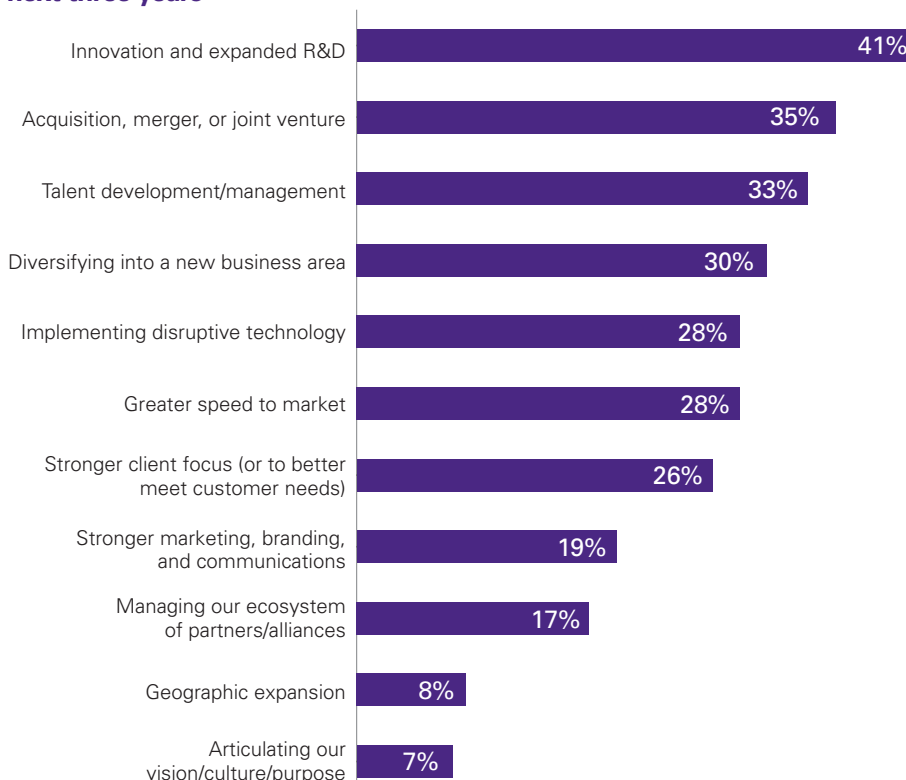
⁴ A VC View Of The AI Landscape (Semiconductor Engineering, Nov. 15, 2018)

R&D is the top strategic priority

The explosion of emerging technologies spur chipmakers to develop new and improved products and solutions. Challenging market conditions push them to diversify into new business areas. Established tech giants and platform companies that develop in-house chip designs threaten traditional semiconductor businesses, unless they raise their game.^{5,6}

In a highly competitive and rapidly evolving industry, semiconductor companies of all sizes feel the pressure to innovate. Innovation and expanded R&D topped the list of strategic priorities for our survey respondents. Rising R&D costs also ranked as the number one industry issue in our survey. Seventy-eight percent of companies expect their companies' R&D spending will increase in the next fiscal year, and nearly 30 percent of respondents reported their companies' will invest more than one-quarter of this year's revenue in R&D.

Top strategic priorities for semiconductor companies over the next three years



Up to three responses allowed. Partial list shown.

Source: KPMG Global Semiconductor Industry Survey findings, 2019

5 Amazon launches machine learning chip, taking on Nvidia, Intel (Reuters, Nov. 28, 2018)

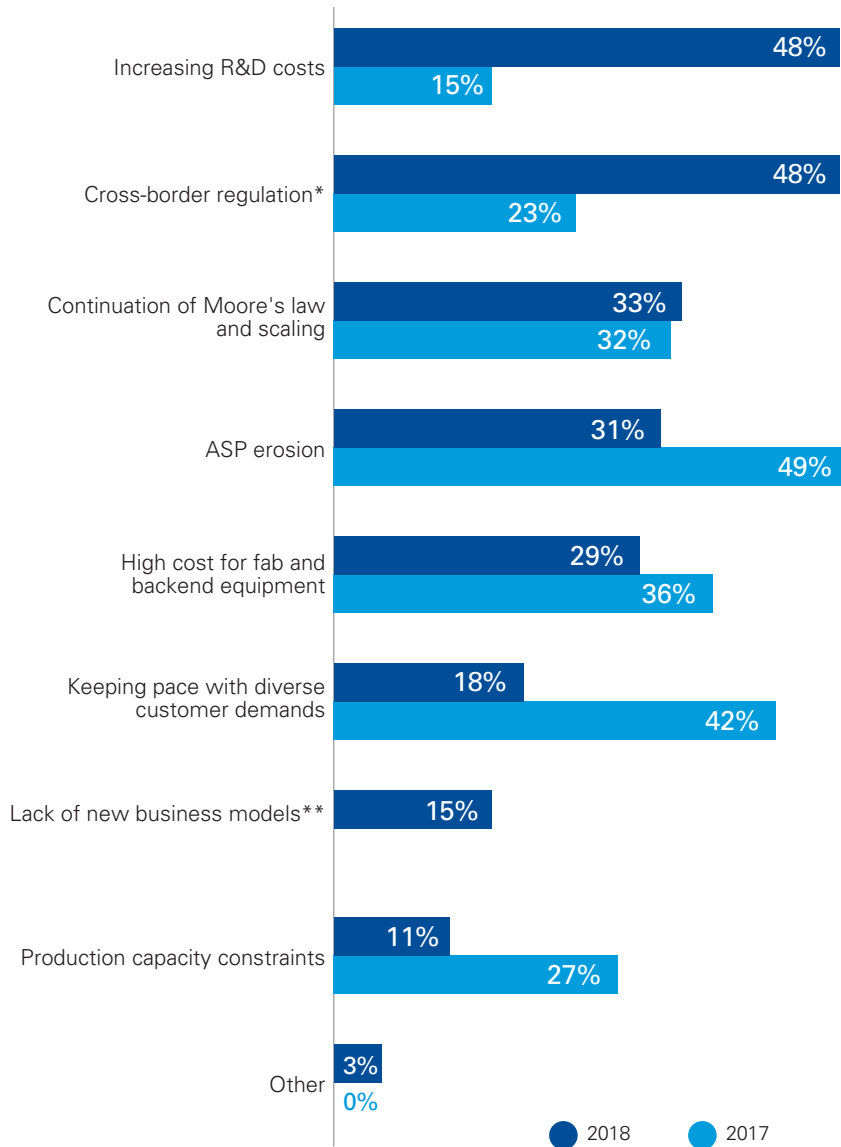
6 Apple Is Buying a Chunk of One of Its European Chip Suppliers in a \$600 Million Deal (Fortune, Oct. 11, 2018)



The spotlight is on innovation in the semiconductor industry. Access to promising IP is becoming the basis of competition. But R&D costs are shooting up. Chipmakers are looking to recover costs and raise the return on innovation by increasing speed to market and scaling R&D into adjacent markets.

—Scott Jones, Principal, Global Semiconductor practice, KPMG LLP (U.S.)

Biggest issues facing the semiconductor industry during the next three years



* 2018: Cross-border regulation, tariffs, new trade policies
2017: Cross-border regulation

** Not asked in 2017

Multiple responses allowed

Source: KPMG Global Semiconductor Industry Survey findings, 2019

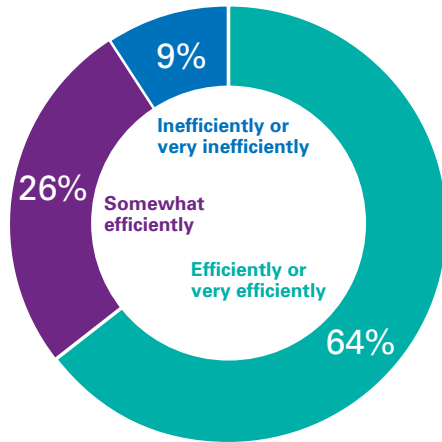
For recently funded companies, for which R&D is their reason for being, cost to execute innovation is a big deal. Newly funded start-ups with leading-edge designs need to invest not only in the hard to find and retain talent to design it but also in the software required to support the innovation. These incremental costs add up, pushing the price of R&D to record levels.

With the slowing of Moore's law, chipmakers need different ways to achieve more processing power. Larger manufacturers ranked implementing disruptive technology and diversifying into new business areas high on the list of strategic priorities—both of which require R&D investments.

The widespread emphasis on industry innovation means semiconductor businesses are very focused on making R&D more efficient and effective. A majority of companies (64 percent) said their companies' R&D spending is aligned with market opportunities. And we saw an uptick in companies admitting high failure rates of R&D programs, a sign that companies are implementing R&D improvement and product development portfolio cleanup. Forty-two percent of respondents—up from 33 percent in 2017—said more than 10 percent of their companies' R&D spending in the last three years was allocated to programs that were canceled or never made it to market.

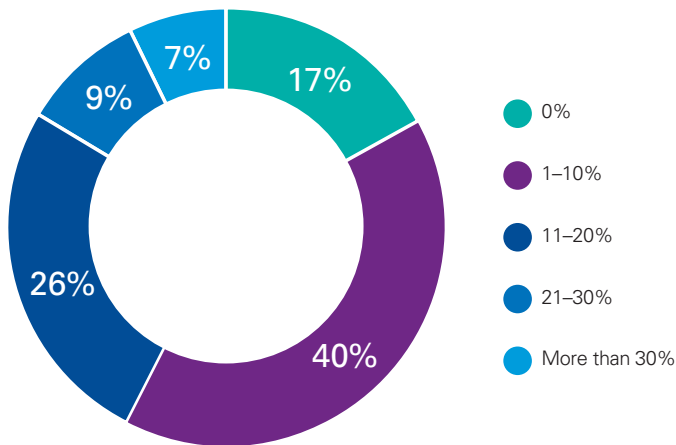
R&D spending alignment

Majority feel their R&D spending is efficiently aligned with market opportunities



Source: KPMG Global Semiconductor Industry Survey findings, 2019
Does not equal 100% due to rounding

Percent of R&D spending in the last three years allocated to canceled or stalled programs



Source: KPMG Global Semiconductor Industry Survey findings, 2019
Does not equal 100% due to rounding

R&D efficiency is challenging for companies of all sizes. Small firms may lack formalized processes for spotting and valuing high-potential innovations and may be more likely to fund doomed products. However, as they grow, sizable, highly diversified companies may lose the visibility and control over investments that small firms with just one or two products in the pipeline enjoy. This is driving established companies to make corporate acquisitions a larger part of their growth strategies. These industry leaders are focusing on buying up emerging competitors and tucking their intellectual property into their portfolios, with the dual goal of taking some of the risk out of R&D and warding off potential disruptors.

In parallel, the continuing efforts on effective portfolio management might be driving the industry to finally cut development projects without good prospects to make it to market, thus driving up the percentage of projects that never made it to market.



Notwithstanding current trade actions, China's booming electronics and telecommunications markets—a leading consumer of semiconductors—is once again seen as a big buyer, and non-Chinese chipmakers are optimistic of selling into those markets in the foreseeable future.

—Lincoln Clark, Partner in Charge, Global Semiconductor practice, KPMG LLP (U.S.)

U.S. and China remain key geographic markets

A global trade war, and the resulting geopolitical and economic uncertainties it brings, did not diminish the importance of U.S. and China markets in the eyes of semiconductor executives. The majority of respondents ranked these two major economies and traditional semiconductor powerhouses as most important to their companies' three-year revenue growth, far outranking all other geographic areas.

Further, China is considered significantly more important than it was one year ago, when respondents were concerned about a potential market slowdown following an era of double-digit GDP growth.

The increase in importance may also be attributed to a perspective that China's commitment to indigenize its chip industry—a multibillion-dollar strategy of the Chinese government through the Made in China program⁷—as unattainable. China's goal to rely less on semiconductor imports was in part predicated on the ability to buy intellectual property and form joint ventures, but such transaction activity have been largely prevented as the U.S. seeks to correct its trade imbalance with China through tariffs and invokes national security concerns on most M&A with a China flavor. As a result, China is likely to continue to deploy revenue for chip imports.

Although semiconductor businesses will continue to depend on the U.S. and China for revenue, the industry may be right to proceed with caution, given the ongoing trade crisis. One-third (33 percent) of executives cite a return to territorialism as one of the top threats to their businesses. For companies with \$100 million or less in revenue, which have greater barriers to entry to Chinese markets, return to territorialism was tied as the No. 1 threat to growth with talent risk. Respondents also rank cross-border regulation, tariffs, and new trade policies as a leading issue facing the semiconductor industry during the next three years. In our 2017 survey, cross-border regulation ranked below five other more pressing industry issues.



Key takeaway

Although the U.S. and China have increased their importance for driving future industry revenue growth, companies should be careful not to overly rely on just two markets in their business model.

⁷ <http://english.gov.cn/2016special/madeinchina2025/>

Supply chain challenges ease

In a time of slowing GDP growth and overcapacity in some sectors, such as memory, it's becoming a buyers' market for chip companies. And as pressure to scale and expand production on chip manufacturers decreases, so do the obstacles to achieving an optimized supply chain.

The survey's current year demographic group that is skewed toward smaller companies is responsible for this finding. Respondents from small companies were much more likely than those from large companies to say they were satisfied their supply chain is optimized. Start-ups are primarily focused on development and engineering and, therefore, inherently less worried about supply chain issues. In addition, the overall survey results indicate many semiconductor companies—both large and small—are busy with early stage innovation. Focused on R&D and design, optimizing the production run is still far from their minds.

The traditional large semiconductor leaders, however, have a broader range of supply chain risks to manage since they operate with a global presence, a deep network of suppliers, and fully developed end processes.

The percentage of respondents reporting supply chain obstacles dropped for every category. Most strikingly, 21 percent of respondents (compared to only 3 percent one year prior) said they are satisfied their companies' supply chain is optimized.



The largest companies in our survey were most concerned with the impact to their supply chain from expanding connected world products and their inability to respond to disruption.



Lack of talent is a top concern for the semiconductor industry. Venture-backed start-ups are staffing up, and established semiconductor businesses are hiring new talent to propel their shift from products to services.”

—Tim Zanni, Global and U.S. Technology sector leader, KPMG LLP (U.S.)

War for talent threatens growth

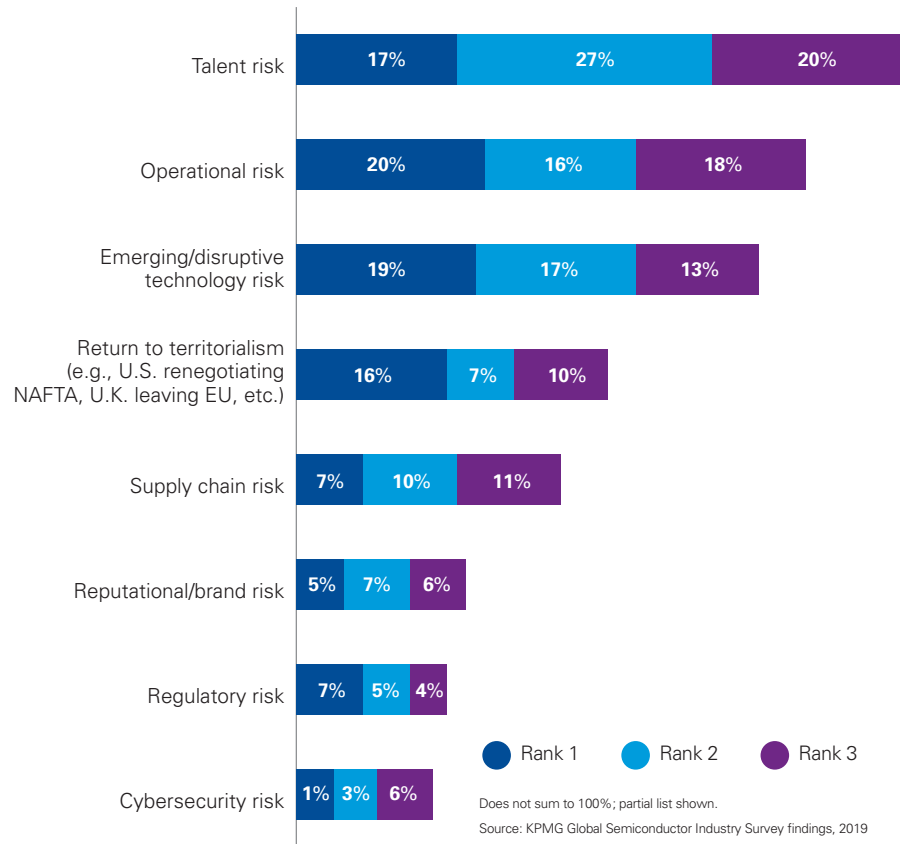
As semiconductor leaders see growth opportunities, their biggest concern lies in how to operationalize their growth strategies. Twenty percent of survey respondents cited operational risk as the top threat to their organization’s growth.

The question facing the semiconductor industry is no longer: “Where do the opportunities lie?” The question is: “How do we align our resources and operations to realize very real growth opportunities in emerging areas?”

Of course, talent directly impacts operations. Sixty-four percent of respondents named talent risk as one of the top three threats to their organizations’ growth. Among companies with revenues less than \$100 million—where losing a single engineer can stall a project—talent risk was far and away the most common issue. Talent development and management also ranked high on the list of strategic priorities for larger semiconductor companies.

Risks threatening growth

Talent risk poses the greatest threat



Growing businesses—especially those aspiring to be hubs of innovation—need the best people. Leaders with novel ideas and strategic vision—working with employees with the unique skills to execute—are often what set high-potential start-ups apart from the rest.

The semiconductor industry is no exception. The talent competition is fierce. Companies are trying to grow, but there is a finite amount of talent in the current market. There are more high tech jobs available than people to do them, but importing talent is only getting more difficult and universities are not yet producing enough capable workers.

The heavy focus on R&D almost certainly contributes to the view on talent risk. There are only so many innovators with the requisite skill sets to design and deploy newer technologies, and everyone seems to want them.

The industry-wide shift to a more service-oriented business model also contributes to the perspective on talent risk. Recognizing that components can be commoditized, many semiconductor businesses are investing in software and related services to build more holistic, platform-based solutions that meet a broader range of customer needs.

To enable this vision, software designers and engineers are the real prize. According to SEMI, there are more than 10,000 job openings in the global semiconductor industry, but the current talent pool isn't a fit for positions in high-tech segments.⁸ A Research and Markets report also found a lack of qualified engineering and technology talent in the semiconductor industry.⁹

Newly funded companies face unique challenges when it comes to acquiring talent. It's difficult for small companies to compete with big ones on salary and other compensation in expensive marketplaces. Further, competition for talent also includes the large platform tech giants, who are luring away great people for their own forays into the chip business.



As the connected world requires an increasingly diverse set of products and software, the skills gap will compound and the war for talent will become more intense.

⁸ Growing the semiconductor workforce (Semiconductor Engineering, July 12, 2018)

⁹ Global Semiconductor Capital Equipment Market 2019–2023 (Research and Markets, Dec. 18, 2018)

Next steps: Where to go from here

Several strategies and focus areas can help companies in the semiconductor ecosystem position themselves for future growth:

Embrace the connected world.



The future drivers of the industry reside in:

IoT (including industrial, connected homes, smart cities, and personal wearables)

5G networking (both wireless components and back-end infrastructure)

AI systems requiring tremendous computational power, data centers, and cloud infrastructure

Automotive, as vehicles evolve into computers and infotainment systems on wheels

Monetizing these will undoubtedly result in additional customer requirements and potentially more complex supply chains. Leading companies will seize these opportunities and strategize ways to secure future revenue streams. Challenges presented by these emerging applications can be solved by investing in innovative solutions with long-term benefits. Examples could be incorporating data and analytics (D&A) into product portfolio management, introducing blockchain into the supply chain, or expanding software and services to support core products.

Make product and cybersecurity part of corporate DNA.

The explosion of connected devices means more potential entry points into vulnerable networks. Add to this the increasing probability that governments will start enacting new or enhanced data privacy laws aimed at technology companies. To say that security should be a basic requirement starting at the product design phase does not go far enough. It's not just an IT or product issue; this is a critical business issue best managed at the board and executive level. Championing security processes, training, and controls across every facet of the organization will help organizations safeguard products, customers, and ultimately, the brand reputation.

Increase R&D efficiency.

Increasingly diverse customer demands can easily spread R&D budgets too thin. A significant amount of survey respondents believe their R&D spending is not very efficiently aligned with their market opportunities. Further, about one in six respondents also disclosed that more than 20 percent of their R&D spending goes to products that never make it to market. By implementing an objective, structured, D&A-enabled methodology to product management and R&D allocation, semiconductor companies will be able to better identify and pursue the most profitable products.

Proactively address the talent and skills gap.

The diversification of applications using semiconductor products, coupled with a need for accompanying software and services, has created more open positions than the current talent pool can meet. Exacerbating the issue is that nontraditional semiconductor players like platform tech giants are developing their own capabilities and have the resources to attract top talent. The semiconductor industry has the opportunity to work with governmental workforce development programs to focus investment in STEM, create new internship and apprenticeship models, and engage populations traditionally underrepresented in the industry including women and certain minorities. Exploring internal programs to retrain and right skill the existing workforce can also allow semiconductor companies to deploy talent to the areas of greatest growth.

About KPMG and the GSA

KPMG Global Semiconductor practice

Technology now touches virtually every aspect of our daily lives. The semiconductor industry is poised to capitalize on the digitized and connected world—if they make the right bets to manage unexpected disruptions and capture emerging opportunities. KPMG’s Global Semiconductor practice is here to help semiconductor companies navigate this new world and come out ahead. Our international network of professionals works side by side with semiconductor clients of all sizes to look beyond today’s pressing business challenges and anticipate the strategic choices that can best position them for both short- and long-term success. For more information, please visit kpmg.com/semiconductors.

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KPMG’s Global Strategy Group works with private, public, and not-for-profit organizations to develop and implement strategy from “innovation to results,” helping clients achieve their goals and objectives. KPMG’s Global Strategy professionals develop insights and ideas to address organizational challenges such as growth, operating strategy, cost, deals, and transformation. Learn more at kpmg.com/strategy.

Global Semiconductor Alliance (GSA)

GSA is where leaders meet to establish efficient, profitable, and sustainable semiconductor and high technology global ecosystems encompassing semiconductors, software, solutions, systems, and services. It is a leading industry organization that provides a unique, neutral platform for collaboration, where global executives interface and innovate with peers, partners, and customers to accelerate industry growth and maximize return on invested and intellectual capital. GSA has an impressive global footprint representing over 30 countries and nearly 300 corporate members comprising top companies in the semiconductor industry. The global membership ranges from the most exciting emerging companies to industry stalwarts and technology leaders—representing 75 percent of industry revenues. To learn more about the GSA, please visit www.gsaglobal.org.

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