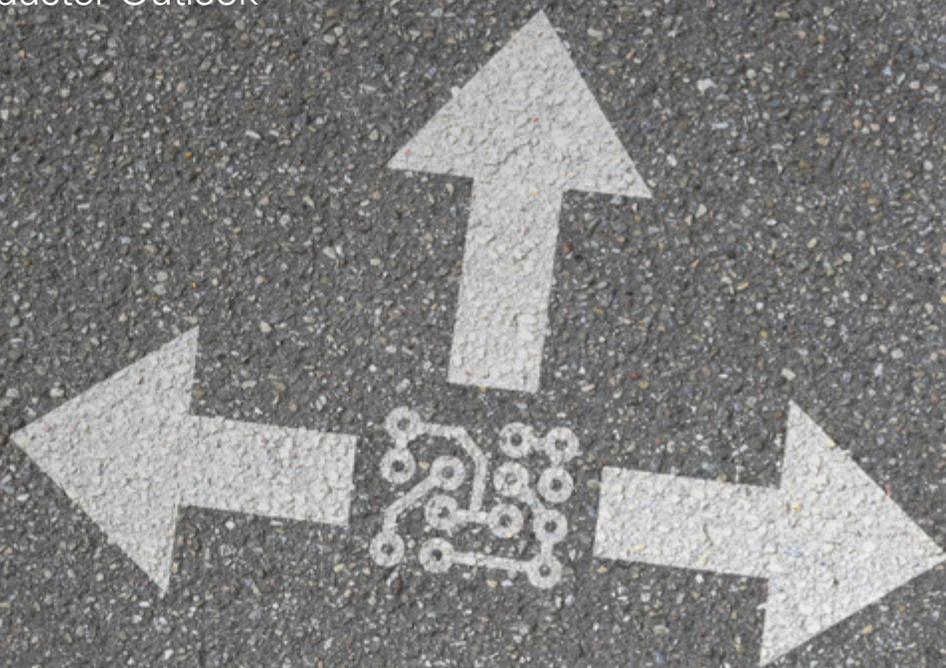




The road to growth in semiconductors

**Diversification, M&A, and
portfolio management as
strategic priorities**

KPMG Global Semiconductor Outlook







The road to growth in semiconductors

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What semiconductors can learn from the farm girl

In one of Aesop's fables, a farm girl was carrying all of the day's egg production to market in a single basket. She literally had all of her eggs in one basket. On the road, she began daydreaming and looking forward to what she would do with the money she was about to make. Distracted, she let go of the basket, the eggs shattered, and she had nothing to sell.

Restated in modern terms, the girl went down the road with only one product, stopped paying attention to her environment, and was unprepared when disruption occurred. If her product portfolio was diversified, she would have had a better chance to succeed.

Are we overstating things to make a point? Perhaps. Does the simple, centuries old business moral of Aesop's fable still apply, even to an industry as cutting edge as semiconductors? Absolutely. And semiconductor executives know it.

The top strategic priority of executives over the next three years is "diversifying into a new business area." The second is "acquisition, merger or joint venture." We believe that M&A (mergers & acquisitions) activity will continue in the industry, but with a fresh focus on acquiring adjacent technologies to spur revenue growth.

Another path to diversification lies in honing the organic R&D (research & development) process so it is properly aligned with the future marketplace. Unfortunately, we see widespread inefficiencies in R&D funding allocation. The good news is that a road out of this wilderness can be built with an integrated portfolio management process.

The sentiment to diversify is explained by the expectation of moderate revenue growth more in line with global GDP growth. This is indicative of a mature industry whose products are integrated into a wider variety of goods utilized worldwide. The imperative for semiconductor leaders now becomes developing new ways to grow the business and take advantage of the new spheres of demand such as automotive, data management and security, and all things IoT.

So the question is posed. As semiconductor companies travel the road to tomorrow's market, will they keep all their eggs in one basket? Or will they heed the lesson of the farm girl and diversify their offerings to increase their chances of success?



Tim Zanni

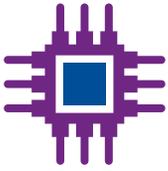
Global and U.S. Chair,
Technology, Media and
Telecommunications,
KPMG LLP



Lincoln Clark

Partner in charge,
Global Semiconductor
practice, KPMG LLP

Highlights



Industry outlook

Projections call for moderate revenue growth in 2017, and this is having a downstream impact of restrained

expectations for operating profitability and investment. Three-year outlooks are similar, indicating that the industry is maturing. The KPMG Semiconductor Industry Confidence Index score for this year reflects these sentiments.



Strategic priorities

Diversification is the top strategic priority in the industry and is closely linked to M&A, which is tied for second with talent development/

management. Most executives believe that total M&A valuations in 2017 will be bigger than 2016. ASP erosion was identified as the top issue facing the industry over the next three years, fueling the need to diversify.



Portfolio management

As revenue growth slows and R&D budgets become more constrained, it is imperative that

companies embrace effective product portfolio management. Half of the respondents said their R&D spending is not efficiently aligned with current customers and a significant portion admitted their R&D spending is not efficiently aligned with future growth opportunities.



Geographic impact

The United States re-assumed the position as the most important geographic market for semiconductor revenue

growth in both the one-year and three-year outlooks. This is driven by increased expectations for the IoT (Internet of Things) and autonomous cars. The United States also moved back into the number-one position for head count growth in the next 12 months.



Product expectations

Sensors/MEMS (microelectro-mechanical systems) jumped to the top as the sector expected to

provide the strongest growth opportunity in 2017 at the expense of the memory and other logic categories. Wireless communications continued to be the most important application driving revenue over the next three years. IoT and automotive are expected to benefit from 5G wireless network rollouts.



Technology road map

Semiconductor leaders are evenly split on Moore's law. Roughly half believe Moore's law will continue unabated or

continue with extended intervals while the other half feels that it has already ended or will end with the current technologies under development. To hedge against this, many companies aim to improve and repurpose existing technologies.

"This is an exciting time for the semiconductor industry. There are signs the industry is maturing, and that brings a new set of challenges to overcome. But we are a unique, creative group that has always attacked challenges rather than shying away from them. We embrace opportunities to evolve, master new business models, and increase the value we provide to an increasingly connected, technologically integrated world."

As president of the GSA, I thank KPMG for their continual insight and thought leadership and for this annual report on what our global semiconductor leaders are thinking across a multitude of topics. I look forward to seeing how we will innovate, push the boundaries of what's possible, and lead the way into the next Industrial Age."

— Jodi Shelton, President,
GSA (Global Semiconductor Alliance)

Semiconductor industry outlook

Revenue growth moderating

Slowing expectations describe the revenue outlook for 2017, and through 2020. While more than half of the respondents (57%) to this year's survey do predict positive revenue growth in 2017, most of these fall in the 1-5% range. These projections are in line with estimates by WSTS (World Semiconductor Trade Statistics), which, as of February 2017, was projecting revenue growth of ~3% in 2017 and ~2% in 2018.

The most glaring trend is the continued sentiment toward flat results for the next fiscal year, as 37% of this year's respondents expect no change in YOY (year-over-year) revenue growth. This was up significantly from 23% last year and 16% the year before. The concern over stagnating revenue growth is being fueled by ASP erosion and is a catalyst for the massive M&A activity over the last two years and the stated need to diversify into new business areas to grow.

Revenue projections that are closer to global GDP growth rates indicate a maturing industry and have a downstream impact on profitability and investment projections.

Profitability estimates flattening

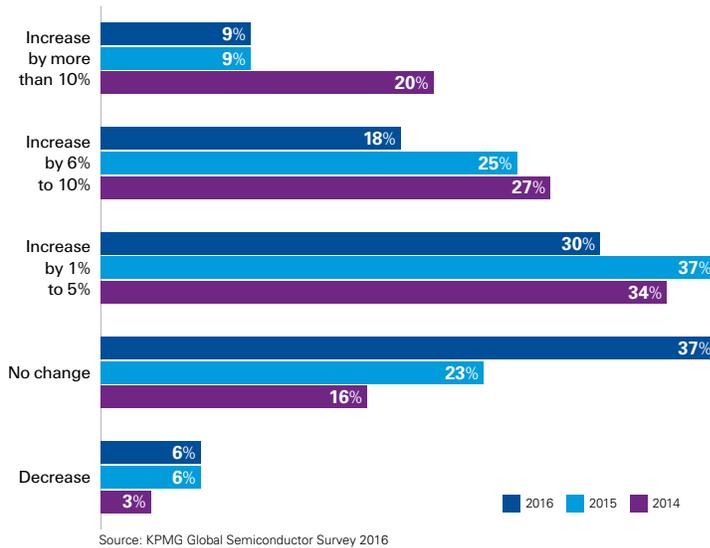
Similar to the revenue growth responses, a substantial 34% of respondents believe that operating profitability will increase by 1-5% next year. However, an even greater percentage (37%) see flat operating profitability over the next year. This again is a driver to diversify into new products and value-added services with higher profit margins.

Maintaining investment spending

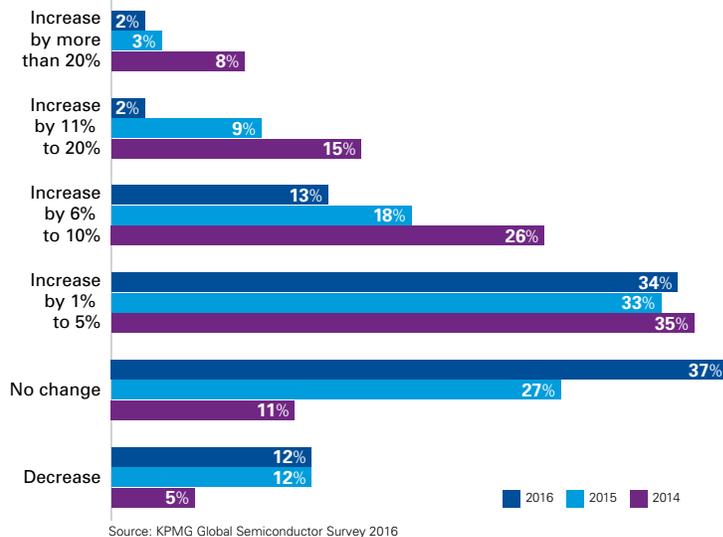
Looking at projections for different investment categories, the impact of moderate revenue growth is clear. The outlook for R&D spending, workforce growth, and capital spending all reflect the same paradigm shift seen for revenue growth and operating profitability. That is, the single largest response for each category is "no change" YOY.

However, these responses perhaps warrant an extra level of analysis. While the impact of low revenue growth cannot be ignored, one should also consider the

What is your outlook for your company's semiconductor revenue growth in the next fiscal year?



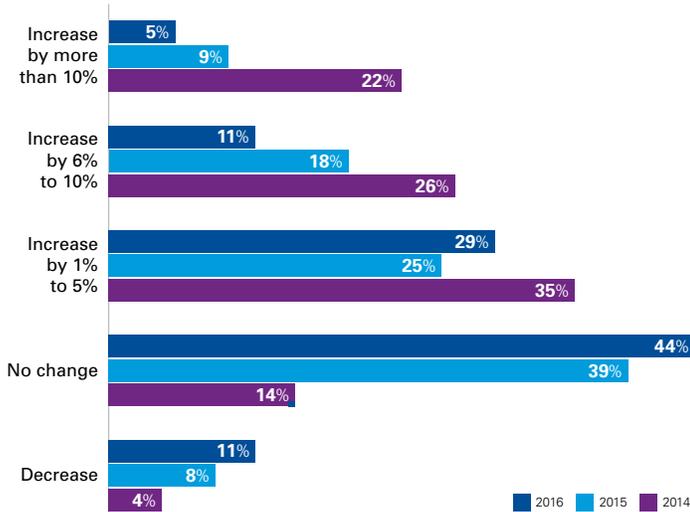
What is your estimate for the change in the annual operating profitability of the global semiconductor industry over the next year?



high level of M&A activity and resulting postmerger integration taking place. If M&A is becoming an increasingly popular tool of choice to redesign R&D functions, then this thinking would reflect a decrease in organic R&D spend. The danger lies in lowering the investment level too much. An entire technology cycle can be missed in the time it takes to identify an acquisition

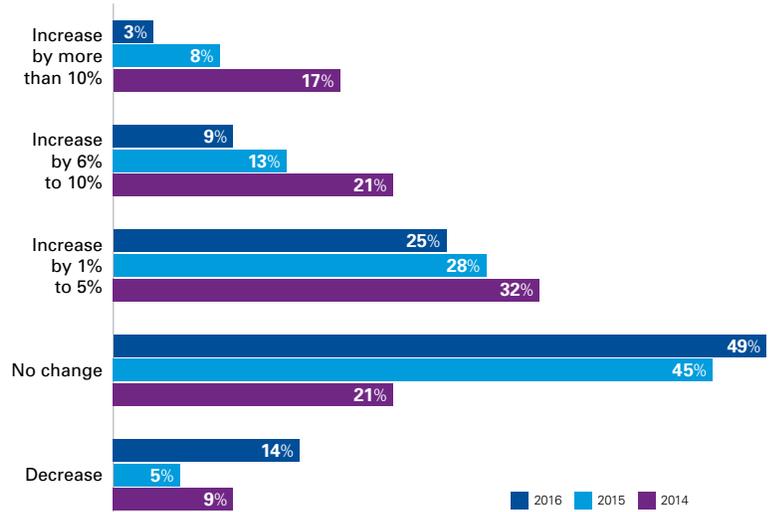
target, negotiate and close the deal, and integrate R&D organizations. Organic R&D should still be funded in order to capitalize on future growth opportunities and complete designs at the 10 and 7 nanometer level. But in the environment of shrinking R&D budgets, efficient portfolio management is paramount. There is great

What is your outlook for semiconductor-related capital spending by your company for the next fiscal year compared with your company's current-year spending?



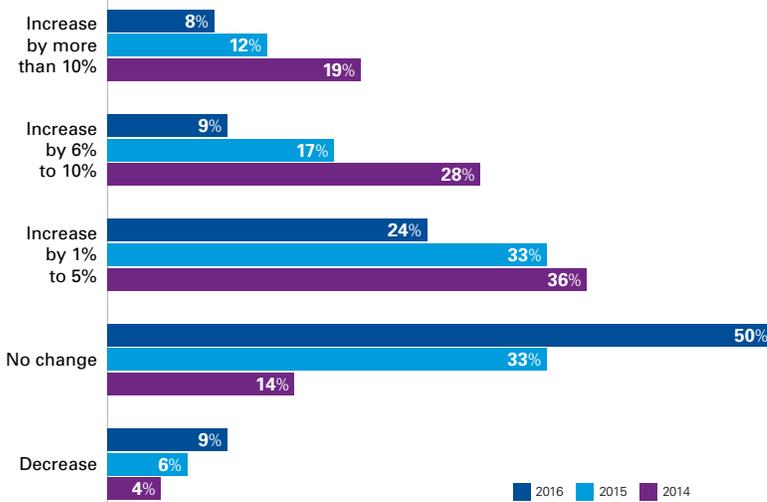
Source: KPMG Global Semiconductor Survey 2016

During the next fiscal year, do you expect your company's global semiconductor workforce to increase or decrease?



Source: KPMG Global Semiconductor Survey 2016

What is your expectation for the change in semiconductor R&D spending by your company for the next fiscal year over the current year?



Source: KPMG Global Semiconductor Survey 2016

opportunity in this area, and it is discussed further on page 14.

On the topic of workforce, it is noteworthy that while the percentage of respondents expecting "no change" went up compared to last year, the percentage expecting a decrease in their company's head count went up significantly from 5% in last year's

report to 14% this year. This represents the largest uptick in the "decrease" response across all survey questions and is a result of both the lower revenue projections and the need to realize postmerger synergies.

Forty-five percent of industry leaders still project some degree of increase in capital spending next year, which is encouraging.

However, similar to other investments, an increasing amount expect capital spending to be the same. Considering the unprecedented levels of M&A activity in the last couple of years, and the increasing cost of debt, it is understandable that many respondents are thinking about working capital restrictions.

Three-year industry outlook

Traditionally, in our Global Semiconductor Industry Survey, the three-year outlooks for revenue growth, operating profitability, R&D spending, and capital spending are optimistic even when the one-year outlooks are less so. Previously, when there was a downturn in the short-term outlook, it was always countered by a more optimistic midterm outlook.

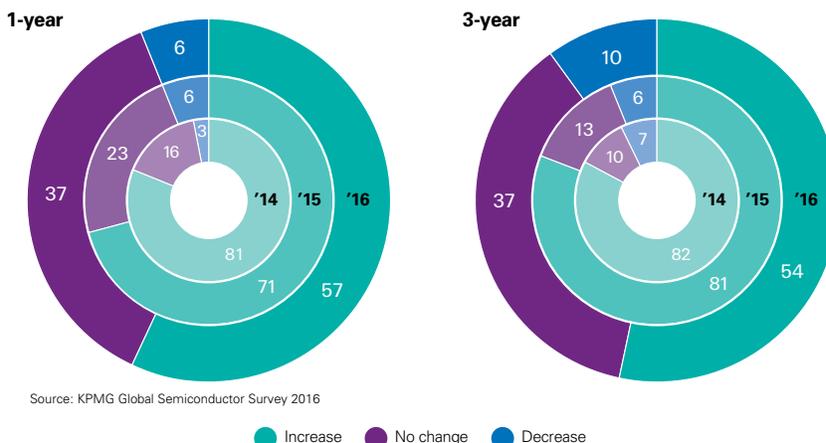
In this year's survey, the three-year outlooks have shifted to almost match the one-year outlooks. This further conveys the realization by the surveyed executives that the industry is maturing and transitioning into the late expansion or contraction stage, which is discussed later.

The key findings from this year's three-year outlook questions are as follows. Previous years are also shown for comparison:

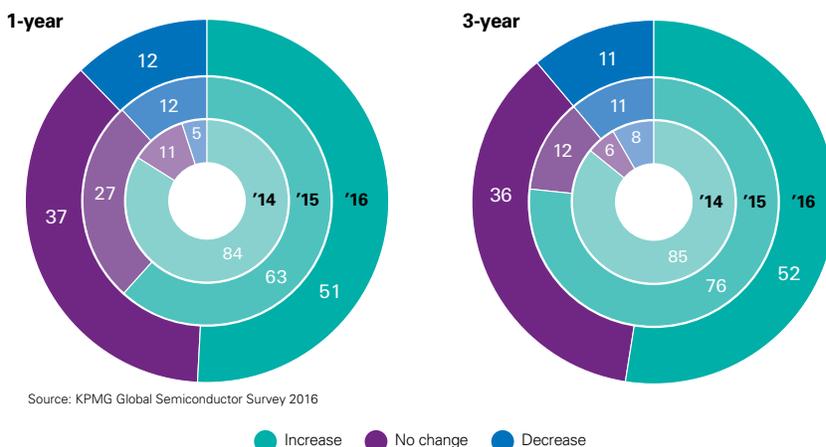
- 54% of respondents expect their company to have positive revenue growth in three years, where 57% expect positive revenue growth next year.
- 52% of respondents expect the global semiconductor industry to have increased operating profitability in three years, compared to 51% that expect this next year.
- 45% of respondents expect their company to increase R&D spending in three years. 41% expect an increase next year.
- 39% of respondents expect their company to increase capital spending in three years, compared to 45% that expect an increase next year.

Importantly, even though midterm growth and profitability confidence are decreasing, companies need to be careful not to pull back too much on new product development capabilities. This is the engine of future growth and should not be jeopardized in favor of short-term financial gains. If anything, these muted three-year outlooks reinforce the need to become more efficient with R&D spending through disciplined portfolio management.

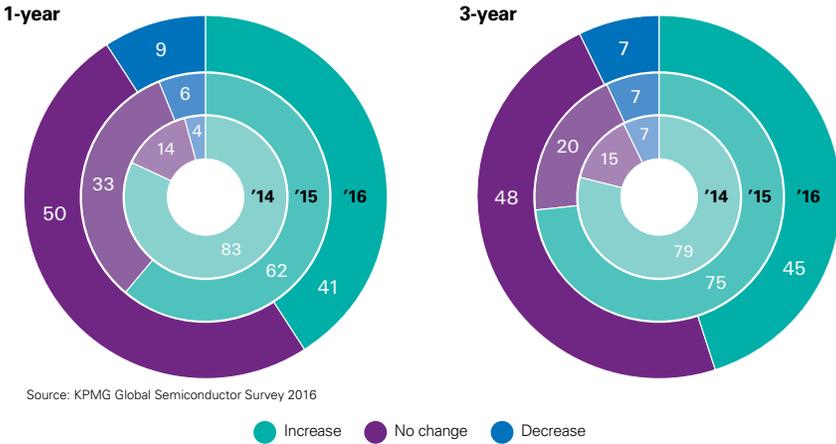
What is your outlook for your company's semiconductor revenue growth in the next one and three years? (Values in percent)



What is your estimate for the change in the annual operating profitability of the global semiconductor industry over the next one and three years? (Values in percent)



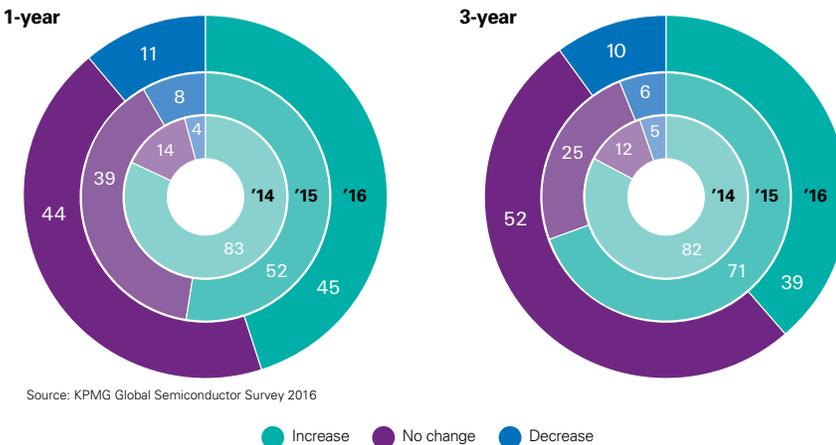
What is your expectation for the change in semiconductor R&D spending by your company, one and three years from today? (Values in percent)



“Aside from the downstream impact of single-digit revenue growth, many companies will also be focused on integrating their newly acquired R&D and design capabilities, as well as assimilating their combined workforces over the next year rather than on increasing investment levels.”

— Tim Zanni, Global and U.S Chair, Technology, Media and Telecommunications, KPMG LLP

What is your outlook for semiconductor-related capital spending by your company (both equipment and software) one and three years from today? (Values in percent)



KPMG Semiconductor Industry Confidence Index



KPMG calculates the Semiconductor Industry Confidence Index based on respondent answers to the one-year outlook questions on revenue growth, operating profitability, R&D spending, workforce growth, and capital spending. An index score above 50 represents an optimistic outlook and a score below 50 signals a pessimistic outlook.

The index score for the next year is 41. This is a little surprising and can be partially explained by the timing of the survey, which was in September 2016— before the industry started its fourth quarter rally.

The score of 41 is driven mainly by the shift to “no change” responses across all of the above referenced questions. Confidence is understandably muted when industry insiders predict low single-digit revenue growth, slowing operating profitability, and lower investment levels.

The bright side is that as the industry matures and evolves, it also has a path to recapture growth through a combination of diversification and efficient portfolio management.

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“We do not feel that the industry outlook is as much of a negative scenario for 2017 as a 41 index score would intuitively suggest. It shows, from an executive sentiment and perception perspective, that expectations for the upcoming year are perhaps more realistic than they were a year ago and reflect the single-digit revenue growth expectations of a maturing industry.”

— Lincoln Clark, Partner in charge, Global Semiconductor practice, KPMG LLP

Strategic priorities



Diversification is top priority

Nearly half of the executives surveyed see diversification into a new business area as their number-one strategic priority over the next three years. M&A tied for the number-two spot with talent development and management. Frankly, M&A is one mechanism frequently used to diversify. Since multiple responses were allowed for this question, we feel that diversification and M&A are closely interwoven as strategic priorities.

Some diversification focus areas for semiconductor companies include the automotive segment, the IoT space, and the security market. But diversification can also mean a broader move into a different business model such as offering solutions in enterprise data storage and networking.

Diversification can also extend to organically developing value-added capabilities. Solutions could include algorithms for capturing and analyzing the chip data or providing the software and professional services to support interaction and integration with various systems and applications. Companies pursuing this path can position themselves as end-to-end solutions providers with potential for greater growth, as semiconductor technology is incorporated into an increasing array of industries and end products.

Talent development and management tied for the number two strategic priority. More than in many other industries, M&A has recently been undertaken to obtain intellectual property (IP) and gain access to engineering talent. That makes it imperative to defend and retain key members of your workforce.

Of the following (above), what are the top three strategic priorities for your organization over the next three years?

Partial list of responses

“Expanding your capabilities to become a full-service solution provider, focusing on high-margin services, is a viable long-term strategy to combat ASP erosion. As everyday products become increasingly complex and connected, there are perpetual growth opportunities.”

— Chris Gentle, Senior Partner, Global Semiconductor practice, KPMG in the U.S.

The need to retain key personnel also explains the relatively high rankings among semiconductor executives for “articulating vision/culture/purpose” and “diversity/inclusion.” We believe that merged companies are drivers behind “articulating our vision/culture/purpose.” With the scale of some of the mergers recently, successfully melding two or more cultures is critical to postmerger success.

As a point of comparison, the top strategic priorities of global semiconductor executives differ somewhat from overall global technology CEOs. In KPMG’s 2016 Global CEO survey data, technology CEOs ranked these as their top strategic priorities:

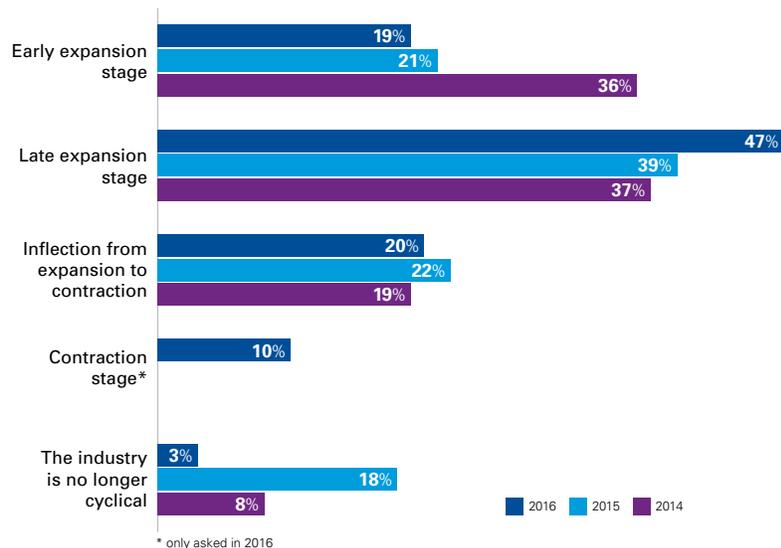
- #1 – Stronger client focus (or to better meet customer needs)
- #2 – Tied between minimizing cybersecurity risk, fostering innovation, and talent development/management

M&A is integral to growth

The strongest sentiment among semiconductor executives is that the industry is in the late expansion stage. This is followed by a contingent (combined 30% of respondents) that sees the industry at the inflection point or already in the contraction stage. Given such perspectives, many companies increasingly see M&A as the only way to drive real revenue growth, giving a new emphasis to the “make vs. buy” question with many landing on the “buy” answer.

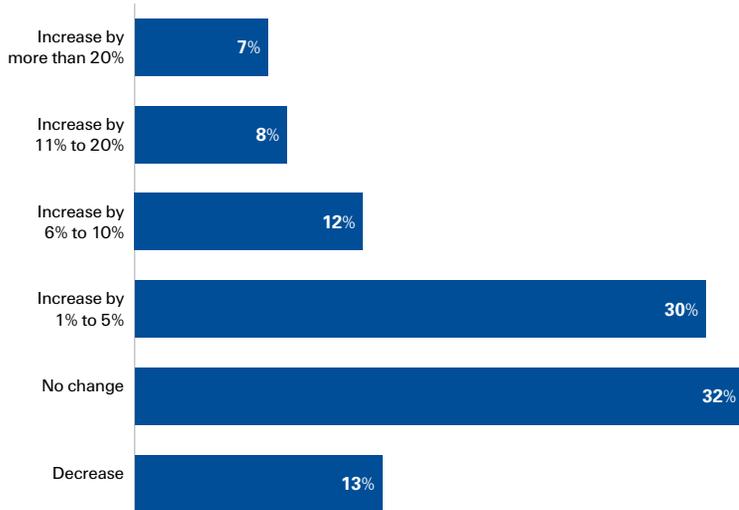
So it is not surprising that the majority (57%) of respondents said that total M&A valuations will increase in 2017 compared to 2016. While the actual number of deals may decline due to significantly fewer semiconductor targets than when the cycle began, the valuations may increase YOY as semiconductor companies increasingly diversify by acquiring companies with adjacent technologies.

What stage of the industry cycle best describes 2017?



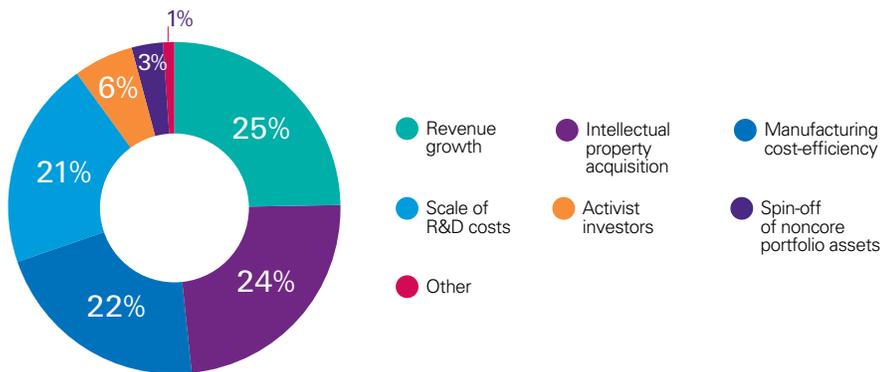
Source: KPMG Global Semiconductor Survey 2016

What is your prediction for the rate of change in the aggregate valuation of semiconductor M&A deals in 2017 compared to 2016?



Source: KPMG Global Semiconductor Survey 2016

What is the key factor driving M&A activity in the global semiconductor industry?



Source: KPMG Global Semiconductor Survey 2016

“The 2017 deal environment has several things going for it. Corporations continue to have record amounts of cash on their balance sheets and interest rates remain relatively low. M&A continues to offer companies the fastest route to enter new markets and acquire needed technology. Technology is key to driving growth for all organizations in today’s disruptive environment. Tech is needed to expand capabilities, products, and services.”

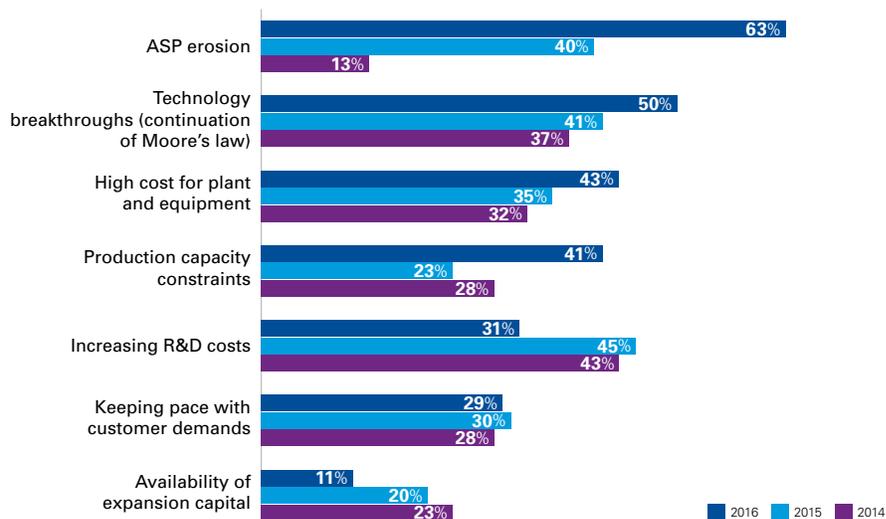
— M&A Spotlight on:
The 2017 deal environment,
KPMG in the U.S., January 2017

It is also noteworthy that from a timing perspective, since executives responded to the survey in September 2016, several large deals were announced in late 2016 that may have been expected by our executive respondents in 2017.

Regardless, M&A activity is clearly continuing, and the primary driver in the semiconductor industry is still the fundamental need to grow revenue. As discussed, this revenue growth can come from a newly acquired adjacent technology offering (i.e., diversifying into a new business area) or from an acquisition that is more in line with the existing product portfolio. The drivers of “manufacturing cost efficiency” and “scale of R&D costs” both received significant upticks in responses, showing that there is more than one conductor on the M&A train. And while a minor driver, “activist investors” also have been a catalyst for some deals and restructurings.

While a lot of discussions have centered on why M&A is so rampant in the semiconductor industry, we also wanted to ask about the postmerger integration experience of our respondents. Revenue growth is the top driver of M&A activity, but failure to achieve the projected level of revenue growth is also a top challenge for executives. And while manufacturing cost efficiency was only a minor driver of M&A, actually achieving those manufacturing cost synergies was the leading obstacle to meeting business case objectives.

What do you see as the biggest issues facing the semiconductor industry during the next three years?



Source: KPMG Global Semiconductor Survey 2016

ASP erosion is top industry issue

ASP erosion is solidly rated as the top overall issue facing the industry during the next three years and has had a meteoric rise since the 2014 survey. The impact, though, varies at the company level.

Companies with ultimate end customers in the consumer market, where there are pricing battles on smartphones, tablets, PCs, and other electronics see constant ASP pressure. Sensors are another product that have seen margin pressures in recent years, and companies producing such sensors are more vulnerable to ASP erosion impacts.

Companies working with more leading-edge, higher-margin technology and designs, such as those serving the needs of data centers, are less prone to ASP erosion. But since these companies represent a smaller subsection of the industry, it stands to reason that ASP erosion ranks as the leading industry issue overall and is contributing to the lower revenue projections discussed earlier.

To counteract the impact of ASP erosion (i.e., slowing revenue growth), companies should embrace the strategies of diversification and realizing operating and R&D efficiencies through effective portfolio management, which some companies have started and is reflected in the lower ranking of “increasing R&D costs” in this year’s survey.

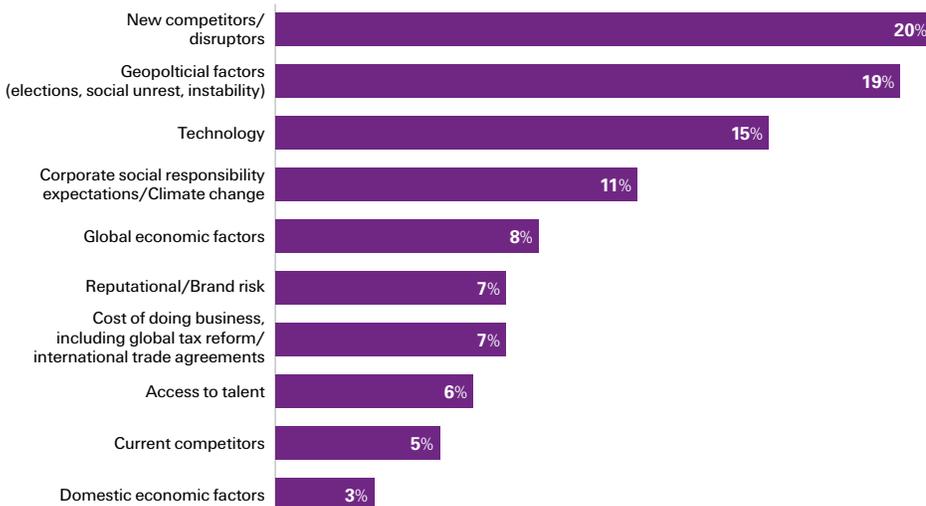
New competitors will have the biggest impact

The number-one executive concern over company growth over the next three years is the impact new competitors/disruptors will have. We see two primary sources for these new competitors. One will be the eventual rise of indigenous Chinese semiconductor companies birthed from the Made in China 2025 program that will be halfway through its run in 2020. The second potential source of new competitors are the current tech giants that are exploring their own silicon capabilities. Due to the sheer scale at which these companies currently operate,

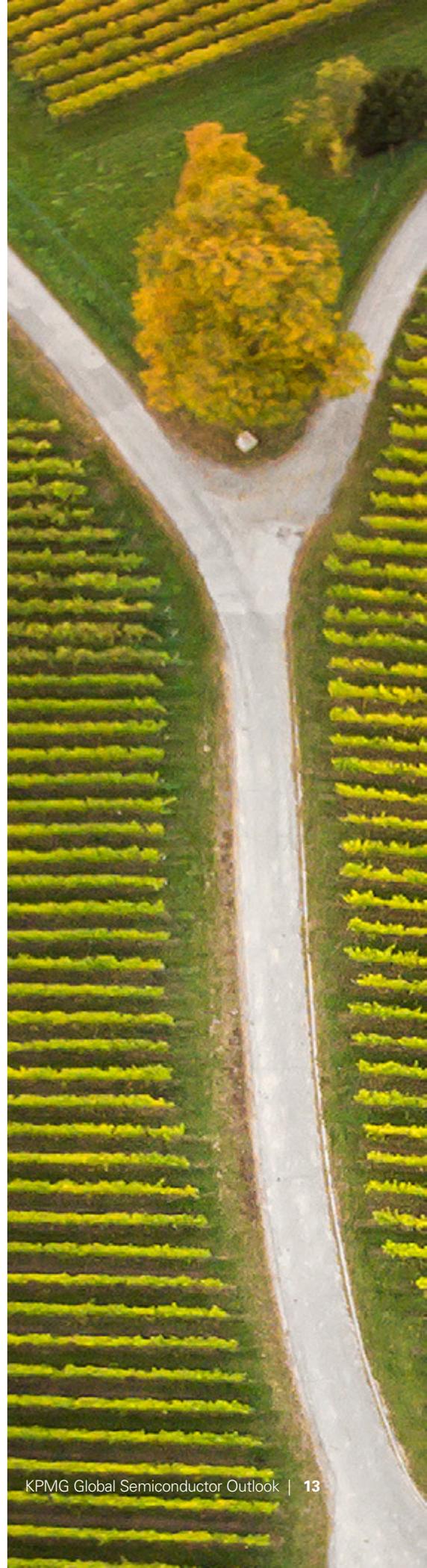
if these divisions prove viable but are deemed not in line with the core portfolio, they could be spun off into independent semiconductor companies in the future.

Also ranking highly are geopolitical factors. When the survey was fielded in September 2016, the Brexit vote and impact was top of mind and the U.S. presidential election process was still underway. Specifically with the U.S. presidential election impact, there is a nationalistic discussion around retaining investment, manufacturing, and head count in the U.S., as well as conversations around different tariffs and taxes on imports.

Which of the following do you expect to have the biggest impact on the growth of your company over the next three years?



Source: KPMG Global Semiconductor Survey 2016



Portfolio management

Widespread R&D inefficiencies

These new questions were designed to get executives thinking about how efficiently they are investing their R&D dollars and how well (or not) they are aligned with today's and tomorrow's opportunities. As revenue growth slows and semiconductor R&D budgets become more constrained, it is imperative that companies embrace effective product portfolio management.

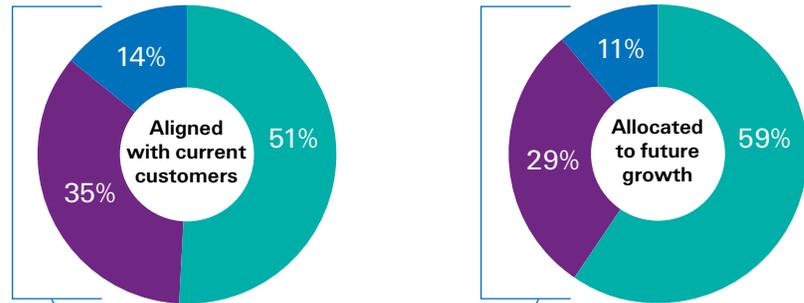
Half (49%) of the respondents said their R&D spending is not efficiently aligned with current core customers/products.

Separately, a significant portion (40%) admitted that their R&D spending is not efficiently aligned with future growth opportunities.

We see tremendous opportunity in these results to both positively impact today's bottom line and better position companies for future success. In addition to deciding where and how to invest, companies must develop and execute on a product roadmap that can be delivered on time to maintain and grow market share. Without proper discipline, chasing multiple incremental opportunities or investing in "me too" products can delay key programs and snowball into multiple generations of delayed products. This can lead to market share loss or more aggressive price discounting, compounding the risk of generating fewer margin dollars to fund future R&D investment.

As R&D costs rise and revenue growth slows, the successful companies will embrace disciplined portfolio and investment planning aligned to end-market needs. But how does one start implementing effective portfolio management and an integrated planning process?

How efficiently is your R&D spending aligned with your current core customers and products and allocated to future growth opportunities?

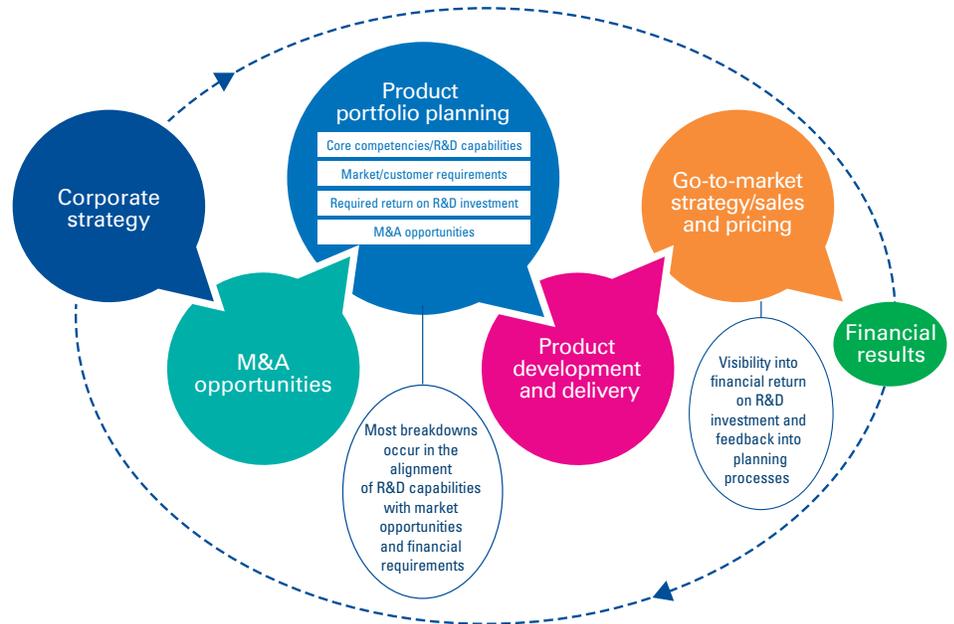


Source: KPMG Global Semiconductor Survey 2016

40% to 49% indicate R&D is not efficiently aligned

● Efficient or very efficient
 ● Somewhat inefficient
 ● Inefficient or very inefficient

Developing an integrated planning process



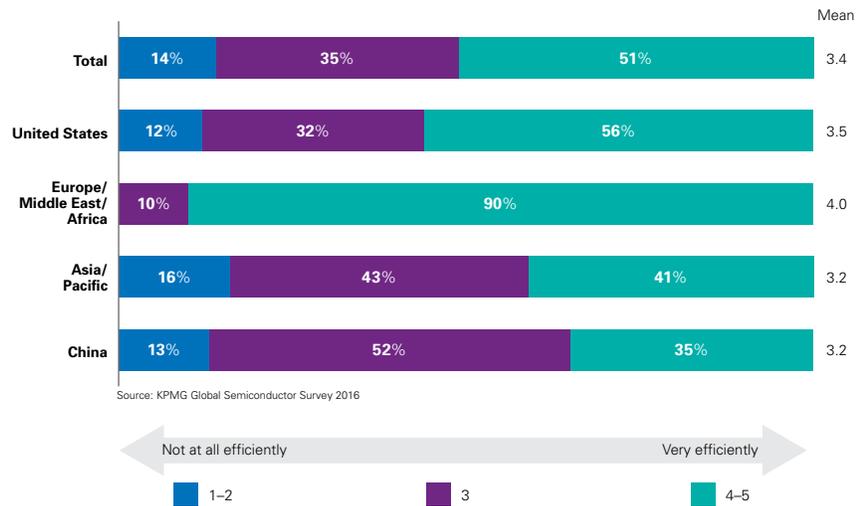
The areas of greatest importance are alignment of R&D investment with market needs, allocation of the proper resources, and clear financial requirements for the programs to meet. The integrated planning process requires input from sales and marketing, R&D, operations, and finance. The process should capture market requirements within a specified time frame based on end-market customer feedback and should align with the R&D organization's ability to deliver.

Once the portfolio management team has aligned internal R&D capabilities (and external M&A targets) with opportunities from the marketing organization, they can provide management with a list of potential programs the company should pursue to address market needs. After financial requirements and analysis, management can rank the potential programs based on the company's strategic priorities and expected ROI (return on investment). Once program execution begins, management should make sure the programs with the highest priority are fully resourced and brought to market on time.

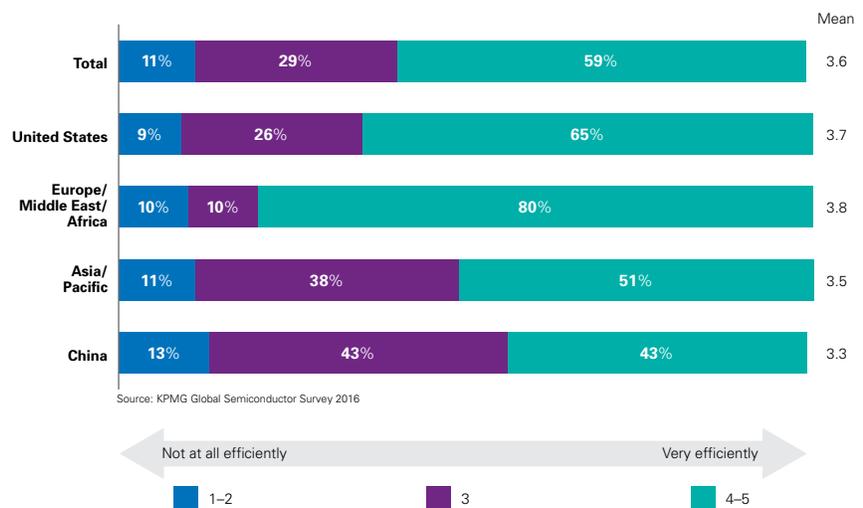
Linkages between the marketing, R&D, and finance organizations are important to align the company's strategy with its go-to-market approach. The proper channels must be in place to ensure alignment at key junctures of program development and execution. This enables the organization to course-correct if changing market requirements impact a program's business case. Identifying these changes early can make the difference between being on time to market for a program and missing market windows and sustaining heavy losses on an investment.

Responses by geography

How efficiently is your R&D spending aligned with your current core customers and products?



How efficiently is your R&D spending allocated to your future growth opportunities?



“Companies with poor R&D efficiency usually do not suffer from an inability to innovate. Rather, they just lack the business processes to deliver the right technology at the right time at the right cost.”

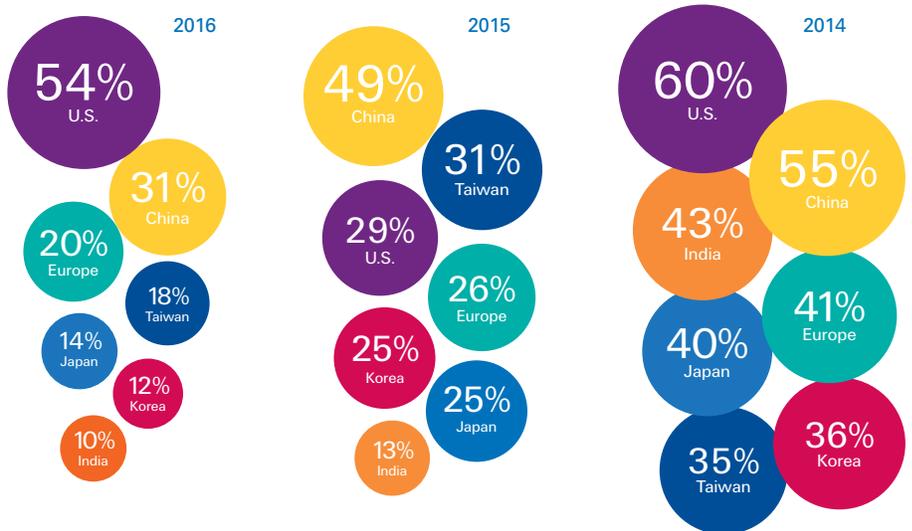
— Scott Jones, Managing Director, Strategy practice, KPMG in the U.S.

Geographic impact

United States returns to the top in revenue and head count outlooks

Industry executives again view the United States as the most important geographic area for revenue growth in 2017 and through 2020, having been briefly surpassed by China and Taiwan in last year's survey. China's ascension last year can be attributed to the excitement and halo effect of the Made in China 2025 program announcement in May of 2015, as well as the positive outlook on the Chinese economy. Fast-forwarding to a year later, there is now the understanding that Made in China 2025 is indeed a 10-year program, and the government will need time to build up the industry, particularly on the supply side. The perception of China's economic slowdown also undoubtedly played a role in China's drop in this year's survey. A final contributing factor may be the recent blocking of planned acquisitions by China-led entities, further impeding China's ability to indigenize the industry in a short time frame. Regardless, it is surprising that China dropped this significantly—by 18 percentage points—in one year.

“What is the importance of the following geographic areas in terms of semiconductor revenue growth for your company in the next fiscal year?” (Chart shows the percentage of respondents that rated each country an 8 to 10 on a scale of 1 to 10.)



Source: KPMG Global Semiconductor Survey 2016

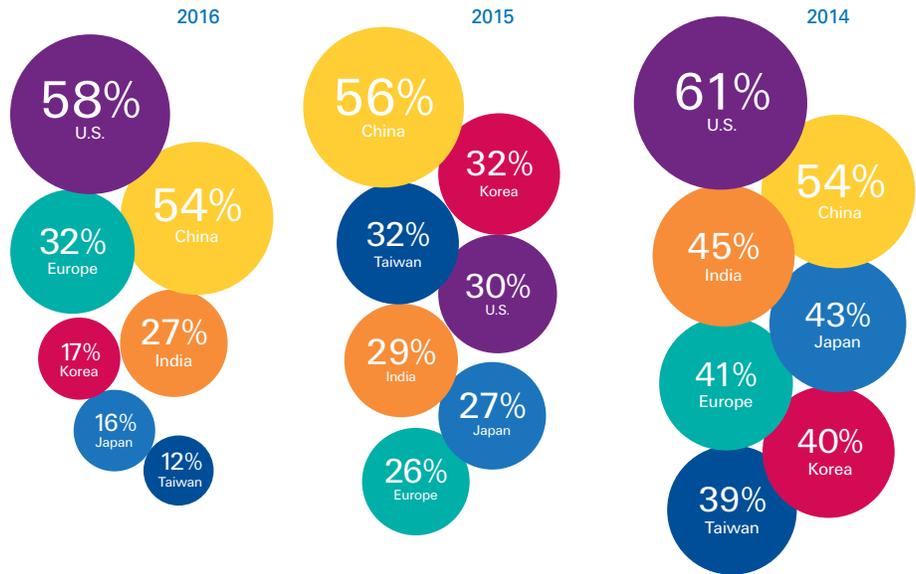
In this year's survey, the order of geographic importance was not as evenly distributed as the last couple of years, where respondents focused relatively equally on all the traditional regional markets. The resurgence of the United States can be partially attributed to the steady, if unspectacular, future economic growth forecasts.

The three-year revenue outlook is similar to the one-year outlook with the United States reassuming the most important role in place of China, albeit to a lesser degree than the one-year outlook. This indicates that any concerns over China's economic performance are short-term.

The reascension of the United States can be further explained by the product expectations discussed in the next section. IoT and automotive climbed into the second- and third-most important positions for applications that will drive semiconductor revenue over the next one to three years. These categories rely on large populations with significant disposable income and the United States certainly matches this profile.

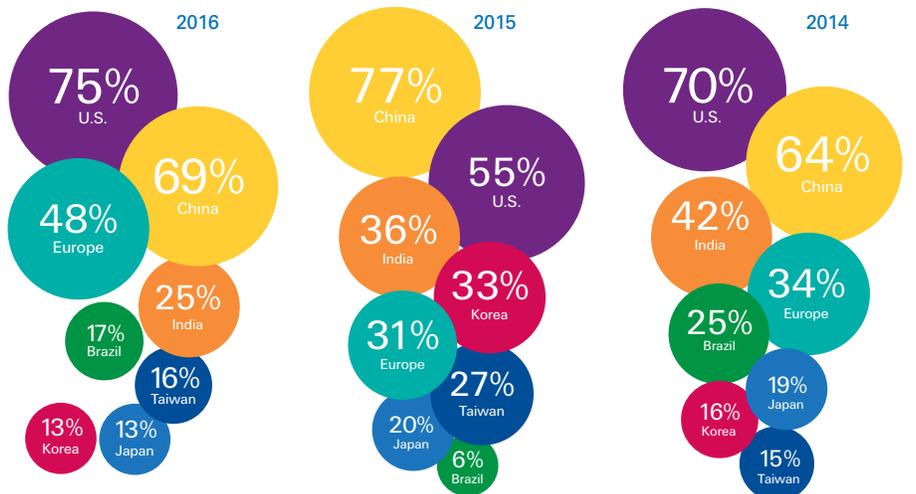
Expected head count growth indirectly follows the revenue pattern. The United States moved back into the number-one position as the top market for head count growth in the next 12 months, surpassing China. As noted above, there was a lot of excitement last year surrounding China that has been replaced this year with the realization that creating a native semiconductor industry will take time.

What is the importance of the following geographic areas in terms of semiconductor revenue growth for your company three years from today? (Chart shows the percentage of respondents that rated each country an 8 to 10 on a scale of 1 to 10.)



Source: KPMG Global Semiconductor Survey 2016

Which will be the top three markets for head count growth in the semiconductor industry during the next 12 months?



Source: KPMG Global Semiconductor Survey 2016

Product expectations

“The strong interplay between applications and sectors is evident as the top four applications each create a demand pool for sensors. One might have expected that automotive would score a bit higher, but then one must realize that self-driving cars are not going to be deployed on roadways en masse in 2017.”

— Chris Gentle, Senior Partner, Global Semiconductor practice, KPMG in the U.S.

Sensors/MEMS highest growth sector

Sensors/MEMS made a big jump in this year’s survey to the clear number-one sector expected to provide the strongest growth opportunity in 2017. This was at the expense of memory and other logic categories, which declined the most in this year’s report.

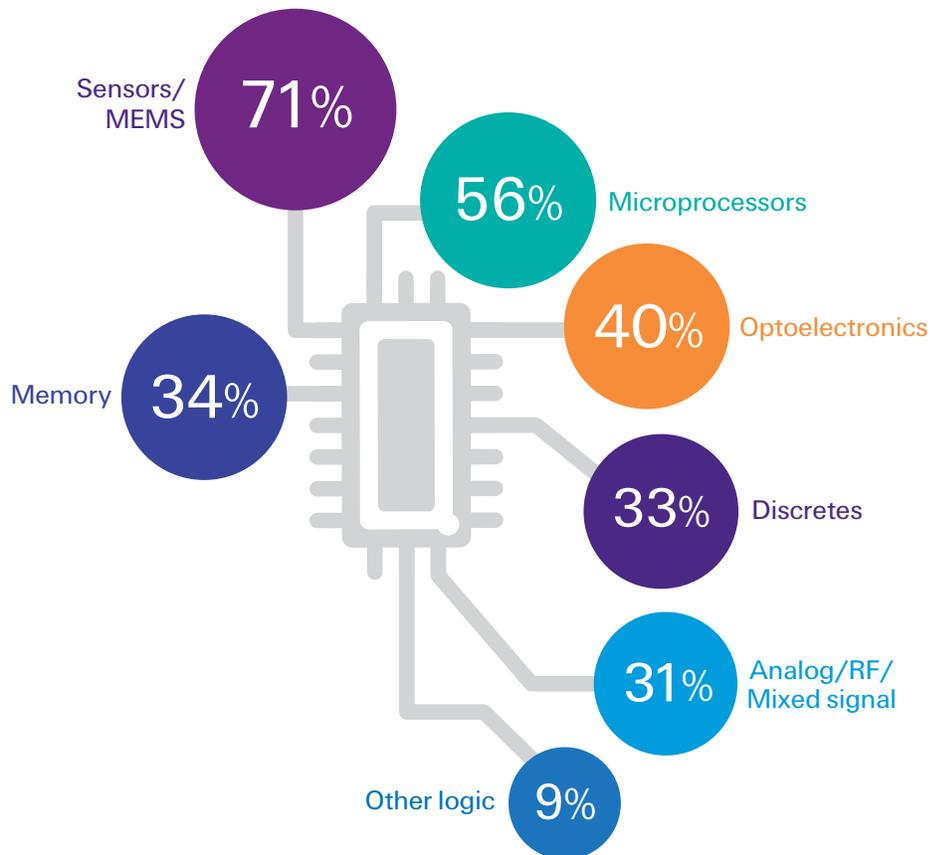
The importance of sensors should not come as a surprise given the enthusiasm over IoT and autonomous cars and their ecosystems. This will provide initial revenue opportunities in the United States. As discussed earlier, this also helps explain why the United States returned to the top position in terms of geographical revenue importance. A potential drawback regarding sensors is that while production is projected to increase from a volume

standpoint, they frequently come with lower price points. This may be a contributing factor to ASP erosion in the industry for the foreseeable future.

Wireless communications most important application

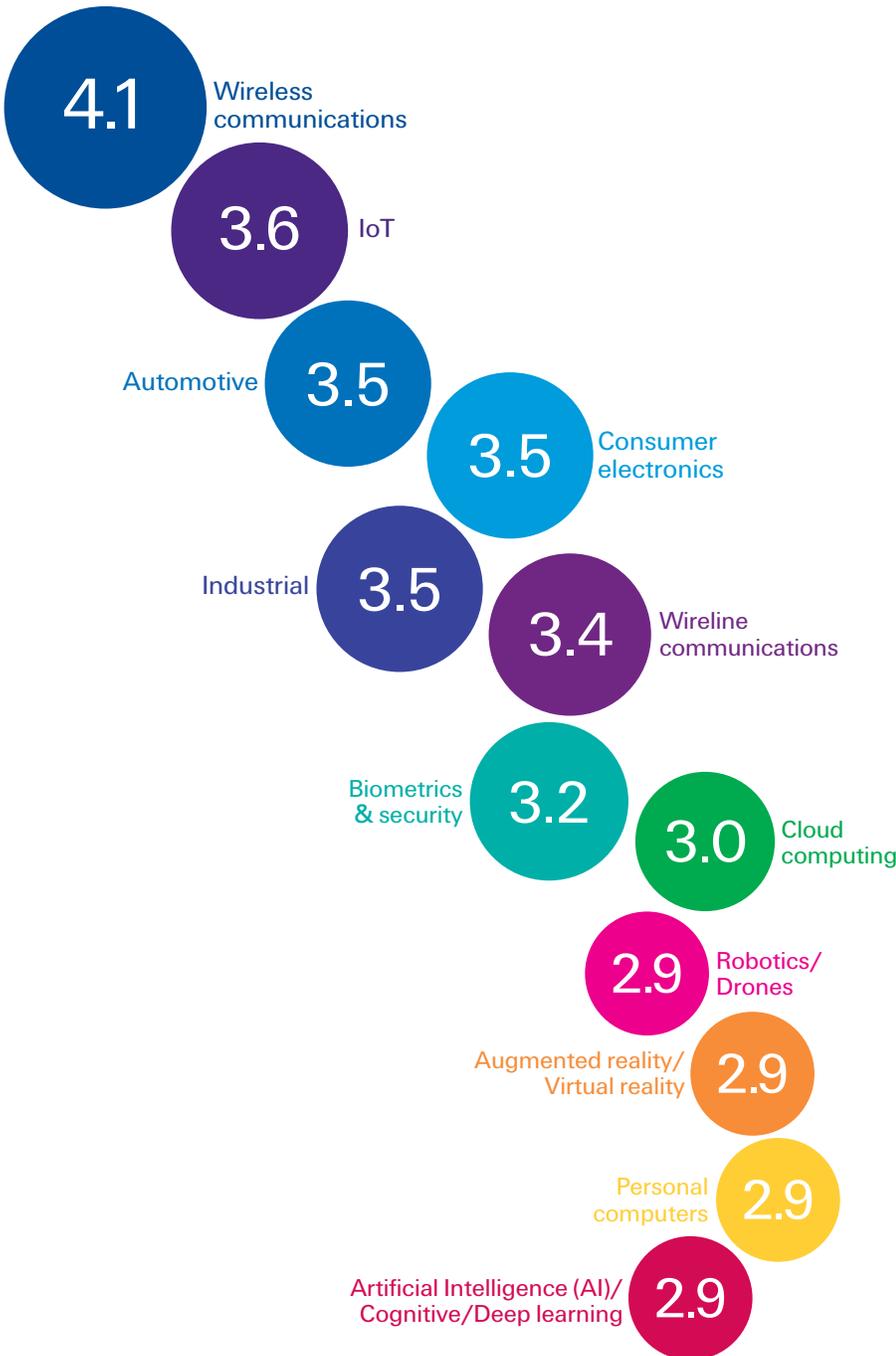
Wireless communications, including devices and network infrastructure components, continued by an even wider margin to be the most important application driving revenue over the next year and three years from now. Globally available 5G wireless networks are on the horizon and are poised to deliver exponentially faster speed and responsiveness than 4G networks.

Which of the following sectors will provide the strongest growth opportunity in 2017 for the semiconductor industry? (Chart shows the percentage of respondents that rated each sector a 4 or 5 on a scale of 1 to 5.)



Source: KPMG Global Semiconductor Survey 2016

How important are the following application markets in driving your company's semiconductor revenue stream in 2017? (Chart shows and ranks top applications based on the statistical mean of responses.)



Source: KPMG Global Semiconductor Survey 2016

5G technology is expected to increase device battery efficiency and duration as well. As much as earlier generations of wireless technology have transformed business and society over the last 20 years, such advanced 5G capabilities will enable a new era of innovation in just about every other application market, and potential use cases have been well documented.

One trickle-down effect is that the capabilities and ecosystems of IoT and autonomous cars will expand accordingly. As a result, IoT took a step forward into the number-two position this year. Automotive came in a close third. Keep in mind, as the IoT and automotive sectors gain volume, sensor production will increase and those lower price points could extend the ASP erosion phenomenon.

Consumer electronics, industrial, and wireline communications all rated well. Cloud computing (for example, data centers) and artificial intelligence (AI) are high-margin products where performance is a key differentiator. However, a smaller number of companies compete in this space, and that is reflected in the respondents' lower ranking of their importance.

Several applications that ranked further down the list this year were also recently identified by the U.S. President's Council of Advisors on Science and Technology (PCAST). Technical areas such as AI, biotechnologies, robotics, and virtual reality are of interest to the U.S. semiconductor industry, and PCAST recommends that these technical areas be explored and possibly developed within a 10-year timeframe⁽¹⁾.

⁽¹⁾ Source: President's Council of Advisors on Science and Technology, Report to the President: Ensuring Long-Term U.S. Leadership in Semiconductors, January 2017



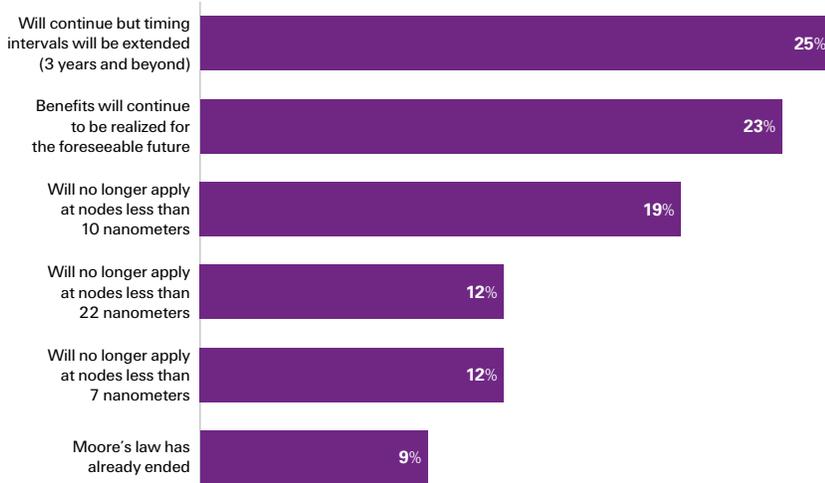
Technology road map

Moore's law and future production technology

Semiconductor leaders are almost evenly split on their opinion of Moore's law. In aggregate, 48% believe Moore's law will continue or just continue with extended intervals. 52% feel that it has already ended or will end with the nanometer technologies currently being developed.

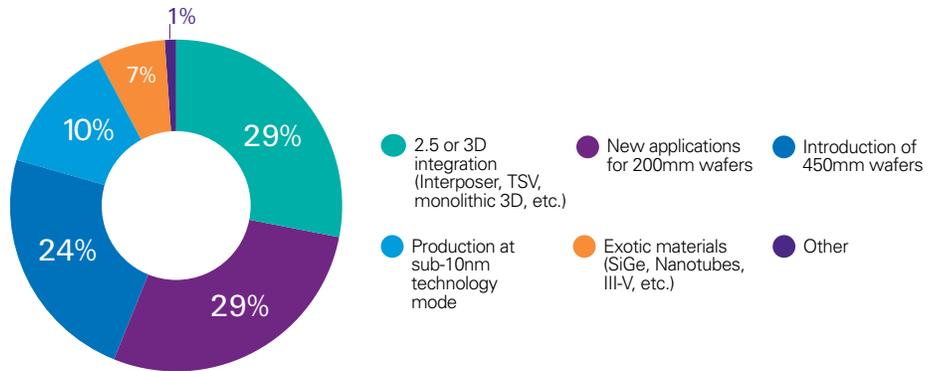
One paradigm that is harder to refute is that the innovation cycle is becoming extended and the process to develop the next breakthrough technology is a long and costly one. Not only has this fueled the recent M&A cycle, but companies are also revisiting existing technologies to see if they can be improved and repurposed in a cost-effective manner. When asked which production technology will have the greatest impact in the next five years, semiconductor leaders chose existing technologies—2.5D/3D integration and 200mm wafers—as the top two. This is consistent with the current theme of companies looking at alternatives to traditional scaling based on Moore's law and increasing their return on investment from R&D on existing production nodes. The first "new" technology—the introduction of 450mm wafers—was ranked third despite the disputed ROI on this technology and the capital investment cost that will be required at fabrication facilities.

Which best describes your perspective on the outlook for Moore's law?



Source: KPMG Global Semiconductor Survey 2016

Thinking about the future of production technology, which will have the greatest impact on the semiconductor industry in the next five years?

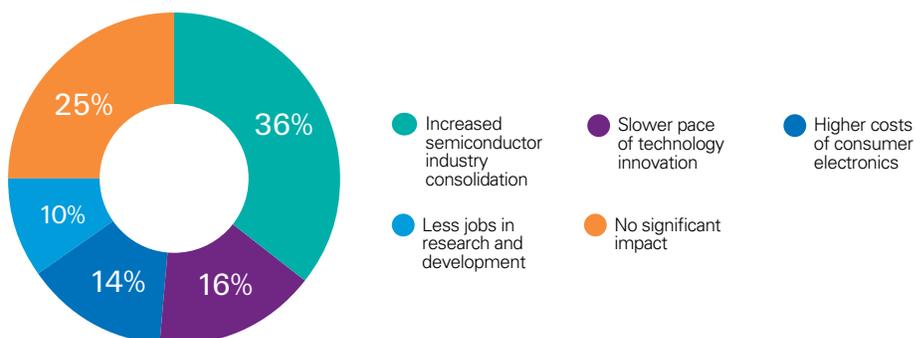


Source: KPMG Global Semiconductor Survey 2016

“The number of respondents that feel Moore’s law has already ended has been declining. Two years ago, 16% thought it had already ended. This percentage dropped to 13% last year and then again to 9% in this year’s survey. So to paraphrase American novelist Mark Twain, perhaps the reports of Moore’s law’s death have been greatly exaggerated.”

— Lincoln Clark, Partner in charge,
Global Semiconductor practice,
KPMG LLP

What is the largest threat to the economy associated with the potential end of Moore’s law?



Source: KPMG Global Semiconductor Survey 2016

If all this is indeed a harbinger of Moore’s law actually ending someday, we asked what the largest economic impact would be. Unsurprisingly, if Moore’s law ends and innovation becomes harder to achieve in-house, companies will opt to acquire outside IP and R&D teams. So increased consolidation was identified by respondents as the number-one economic impact. Despite the potential ramifications we can see of increased consolidation, workforce attrition and lower pace of innovation due to fewer competitors, the second highest response from industry

leaders was that there would be no significant economic impact if Moore’s law ended.

Perhaps if such a paradigm shift eventually rocks the semiconductor industry, nobody today can accurately predict the true impact. This brings our discussion full circle. With the overall industry technology road map unclear, the path to growth for semiconductor companies lies in diversifying into adjacent, complementary technologies as well as becoming more efficient with the product portfolio management process.

Conclusion and next steps

The semiconductor industry is maturing. ASP erosion will continue to challenge revenue growth for the foreseeable future. Investment projections for R&D, capital spending, and workforce are cautious. In response, semiconductor executives must develop new ways to grow the business. Remember the farm girl!

Diversification can be achieved through a combination of M&A and efficiently managing the R&D pipeline for future products. Companies should consider diversifying into adjacent, complementary technologies or evolving markets.

M&A valuations are expected to increase and acquisitions of new IP and R&D teams are a key component in any diversification strategy. Becoming more efficient with organic R&D spending so it is aligned with current products and future opportunities that have the greatest ROI is a mandate. Effective portfolio management can be achieved through a disciplined, integrated planning process.

Where are the future opportunities in the industry? From a sector standpoint, sensors/ MEMS offer the highest growth opportunity. For applications, wireless communications will continue to drive revenue as the rollout of 5G wireless networks ramps up over the next few years. IoT and automotive are coming on strong and the U.S. should be the first market where those gains are realized. Consumer electronics, industrial, and wireline communications rate strongly as well.

Opinions are mixed on if, or how long, Moore's law will continue, and some companies are opting to repurpose existing technology for the greatest short-term impact. In the long term, however, successful companies will balance their "make vs. buy" decisions and grow via a combination of acquiring new, complementary products and services along with efficient investing in their existing R&D portfolios.

There are several steps that semiconductor companies should consider to better position themselves on the road to future growth and success:

- 1 Decide what new or complementary technology categories** match their strategic plan
- 2 Determine with a disciplined methodology** which specific current and future products and programs have the highest ROI
- 3 Decide if the best strategy** is to acquire the technologies through M&A or develop it with in-house R&D resources
- 4 Deploy resources according to the strategy**
- 5 Eliminate or divest products, programs, and even business units** that do not meet the requirements for the new core portfolio

"Looking ahead, new policies being proposed by the Trump Administration in the United States will surely be on the mind of semiconductor executives in 2017, including:

- Renegotiation of foreign trade agreements***
- Tax reform***
- Retention of American jobs***
- Regulatory consideration of foreign investment***
- Immigration and visas."***

— Tim Zanni, Global and U.S
Chair, Technology, Media and
Telecommunications, KPMG LLP

How KPMG can help

KPMG Global Semiconductor practice

Our network of professionals has extensive experience working with global semiconductor and technology companies ranging from the FORTUNE 500 to pre-IPO (initial public offering) start-ups. In addition to providing Audit, Tax, and Advisory services, KPMG firms aim to go beyond today's challenges to anticipate the potential long- and short-term consequences of shifting business, technology and financial strategies. KPMG continues to build on our member firms' successes thanks to our clear vision, values, and more than 189,000 people in 152 countries. We have the knowledge and experience to navigate the global landscape.

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KPMG's Restructuring professionals assist clients with developing and implementing solutions to improve earnings, stabilize cash flow, preserve liquidity, and right-size the balance sheet.

KPMG's Transaction Services professionals provide M&A support across the entire transaction life cycle from predeal strategy and evaluation to completion and postdeal integration. Our team in member firms throughout the KPMG network also provides divestiture support from carve-out to separation assistance. We combine industry, accounting, and data-driven transactional knowledge to help you realize the expected value of strategic transactions by working with you to identify and assess the value drivers of the deal and the associated risks. In that way, we can help you enhance the value created in a purchase or divestiture.

About the research

KPMG's annual Global Semiconductor Survey identifies current and emerging trends and issues affecting the world's leading semiconductor companies and provides an index reflecting industry leaders' expectations about revenue, profitability, workforce growth, spending, and other factors influencing the global semiconductor industry. This is KPMG's 12th edition of the Global Semiconductor Survey.

The Web-based survey was conducted in September 2016. Participants included 153 senior executives from leading global semiconductor companies. Respondents from the United States comprised 50 percent of the survey. China respondents accounted for 15 percent, and the rest of Asia/Pacific 27 percent. Europe and other countries comprised 8 percent.

Executive sentiment is reflective of industry leaders as 82 percent of survey respondents were from companies with \$1 billion or more annual revenue. Companies with less than \$1 billion annual revenue accounted for 18 percent of respondents.

The data source for all graphs is the 2016 KPMG Global Semiconductor Survey.

Note that percentages in some charts may not equal 100% due to rounding.

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Tim Zanni is the Global and US Technology Leader for KPMG. In his role, Tim plays a key client relationship role for the firm's largest global technology accounts. Tim has over 35 years of global experience and his 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 our clients receive exceptional service. Prior to his global role, Tim served as the Silicon Valley managing partner for seven years and before that, a leadership role in KPMG's New York office. He is a graduate of KPMG's Chairman's 25 Leadership Program and has served as a coach for KPMG's Lead Partner Academy. Tim has also worked in KPMG's executive office in the Department of Professional Practice, which helps KPMG professionals and their clients address and resolve complex accounting, reporting, and SEC-related issues. Tim is the current host and former moderator of KPMG's Audit Committee Roundtable series and current moderator of KPMG's Audit Committee Chair Peer Exchange.

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