



Semiconductors: Can the surge continue?

**Electric performance in 2017
powers tempered optimism**

2018 KPMG Global Semiconductor
Industry Outlook

About the authors



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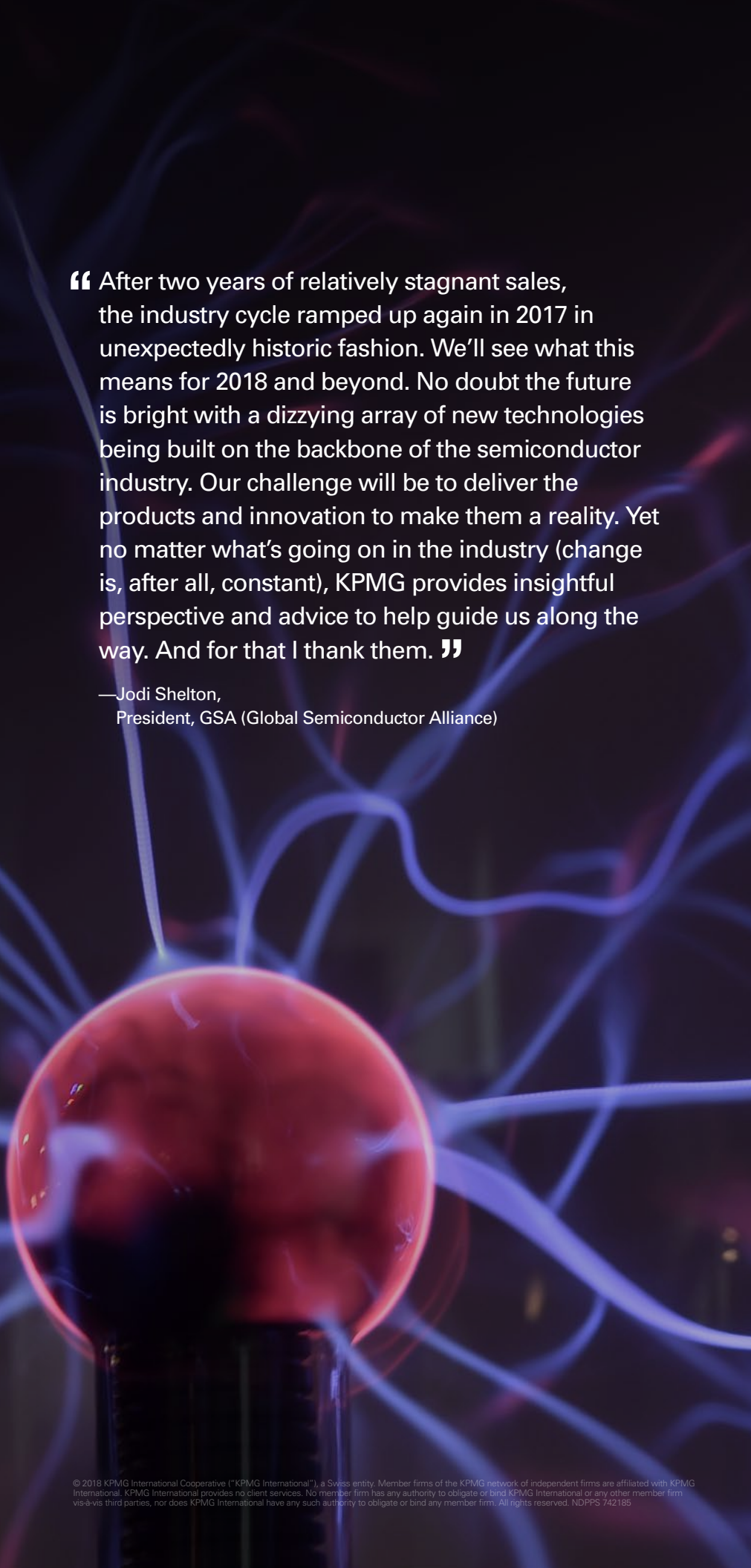
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Scott Jones is a principal in the firm's Global Semiconductor practice and member of KPMG in the United States' Technology, Media & Telecommunications practice. He has more than 15 years

of experience as a program manager in the semiconductor industry, equity analyst covering the semiconductor sector, and consultant serving technology companies. Scott has delivered performance improvement services in areas such as R&D portfolio management, financial modeling of advanced technologies, M&A strategy, post-merger integration, and operating model transformation.



“ After two years of relatively stagnant sales, the industry cycle ramped up again in 2017 in unexpectedly historic fashion. We’ll see what this means for 2018 and beyond. No doubt the future is bright with a dizzying array of new technologies being built on the backbone of the semiconductor industry. Our challenge will be to deliver the products and innovation to make them a reality. Yet no matter what’s going on in the industry (change is, after all, constant), KPMG provides insightful perspective and advice to help guide us along the way. And for that I thank them. ”

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

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Foreword

The year 2017 surprised everyone. It was an exceptional one for the semiconductor industry—more than anyone expected. High-voltage revenue gains among the biggest semiconductor players led to record-breaking industry-wide performance.

How will semiconductor companies follow such remarkable performance in 2018? How can semiconductor executives flip the right switches within their organizations to turn an unexpected spike into a prolonged surge of steady, upward growth?

For KPMG’s annual global semiconductor outlook, we surveyed executive-level insiders about their perspectives and expectations following this banner year. We asked them about what sectors, products, and geographies will drive demand; what forces will impact their strategies; and what parts of their internal businesses they will invest in or transform.

We found that while most semiconductor executives recognize it will be nearly impossible to sustain such massive growth over the long-term—that yes, 2017 was an anomaly—optimism exists about their prospects for 2018. Although they recognize the industry may be due for a correction, most still predict significant growth ahead.

The majority of semiconductor leaders said they expect their companies—and the industry as a whole—to increase revenue, largely driven by diversification into revolutionary new technology segments, such as artificial intelligence (AI), the internet of things (IoT), and autonomous vehicles. Most executives expect profitability to increase alongside revenue, as companies obtain revenue from new markets and rationalize costs in research and development (R&D) processes using cutting-edge techniques. Companies also plan to increase investment in their workforce, equipment, and R&D next year.

Leveraging findings from our survey data and insightful analysis from KPMG’s semiconductor practice leaders, this report sheds light on noteworthy industry trends, emerging issues to watch out for, and key areas of opportunity for global semiconductor companies.



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Highlights



Financial and investment indicators all increased YoY. Percent of respondents predicting an increase next year:

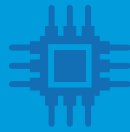
- | | |
|-------------------------------------|---------------------------------|
| 57% Industry profitability | 50% Company R&D spending |
| 63% Company revenue | 43% Company workforce |
| 58% Company capital spending | |

Top strategic priorities in the next three years



1. Diversification
2. Mergers and acquisitions/joint ventures
3. Talent management
4. Implementing disruptive technology
5. Stronger marketing and communications

Top sectors driving growth opportunities in 2018



1

Sensors/MEMS

2

Microprocessors

3

Memory

Research and development (R&D) snapshot

Only 49% say their R&D spending is aligned with market opportunities.

One-third say over 10% of R&D spending is on failed products.

Methodologies being used to improve R&D efficiency

- | | |
|---------------------------|--------------------|
| 1. Zero-based budgeting | 3. Modular designs |
| 2. Data & Analytics (D&A) | 4. Agile |



Applications driving company revenue in the next year

- | | |
|----------------------------|-----------------------------|
| 1. Wireless communications | 6. Automotive |
| 2. Internet of Things | 7. Cloud computing |
| 3. Wireline communications | 8. Robotics/drones |
| 4. Consumer electronics | 9. Security |
| 5. Industrial | 10. Artificial intelligence |



Top industry issues in the next three years

- | | |
|-----------------------------|------------------------------------|
| 1. ASP erosion | 4. Moore's law/scaling |
| 2. Diverse customer demands | 5. Production capacity constraints |
| 3. High cost of equipment | 6. Cross-border regulation |

Detailed findings

Expectations

Expect gains in revenue and operating profitability

Fifty-seven percent of semiconductor executives expect annual operating profitability of the industry to increase over the next year, up from fifty-one percent in 2017. Unlike previous years, smaller companies (under \$5B) are generally more confident than larger companies. Smaller companies expect to be faster at wholesale innovation and going-to-market with chips that enable emerging applications for self-driving cars, connected devices, smart cities, and more.

Respondents are more optimistic than last year about their company's revenue growth, with thirty-seven percent expecting one-to-five percent revenue growth (compared to thirty percent last year) and twenty-six percent expecting even higher percentages (the same as last year). Among those who do expect a revenue increase next year, the average predicted increase is seven percent. While respondents overall do not expect revenue growth to match 2017 actuals, the findings show broad-based optimism that the length of the current upcycle is showing few signs of reversing in the next three years.

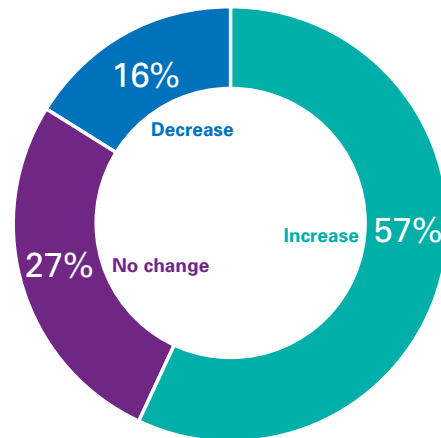
Business investment up

Our survey indicates semiconductor companies will continue to spend on capital equipment at historically high levels. The number of respondents who expect an increase in capital spending has increased by thirteen percentage points, the biggest increase of all the financial and investment factors we ask about in the survey. Among the respondents, smaller companies are especially bullish. Key drivers of expectations for increased investment in equipment include demand for memory capabilities in smartphones and cloud platforms.

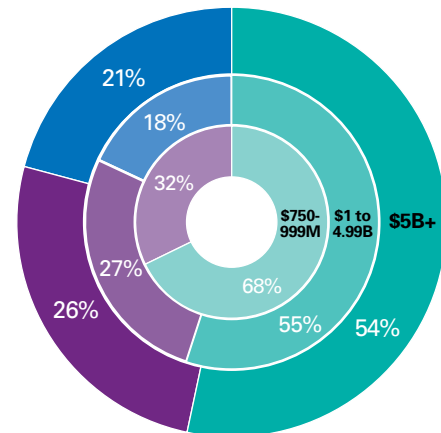
More respondents than last year (fifty percent compared to forty-one percent) plan to increase R&D spending in their own companies in 2018. As revenue grows, R&D spending is also likely to grow (at least in terms of absolute dollars, if not overall percentage). If companies do not increase R&D spending, they may be unable to update and replace mature products, diversity product portfolios, or feed cutting-edge markets, like the newest smartphone models, AI technologies, and connected devices.

Finally, forty-three percent of respondents expect their company's global semiconductor workforce to increase in the next fiscal year, up six percentage points from our 2017 survey. Companies will need to add headcount to support their ramp up of engineering and design activities.

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



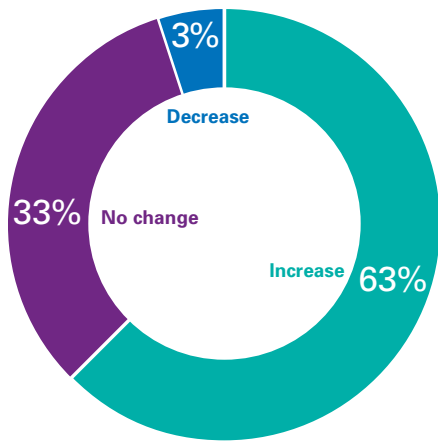
What is your estimate for the change in the annual operating profitability of the global semiconductor industry over the next year? (by revenue)



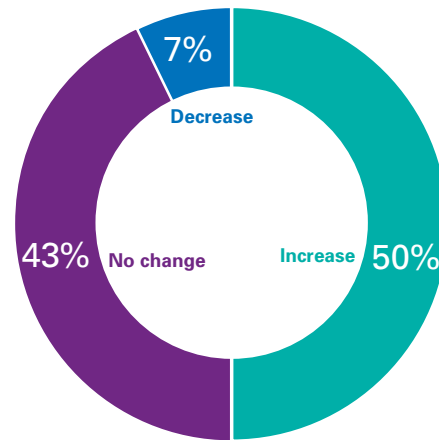
Source: KPMG Global Semiconductor Survey 2017

● Increase ● No change ● Decrease

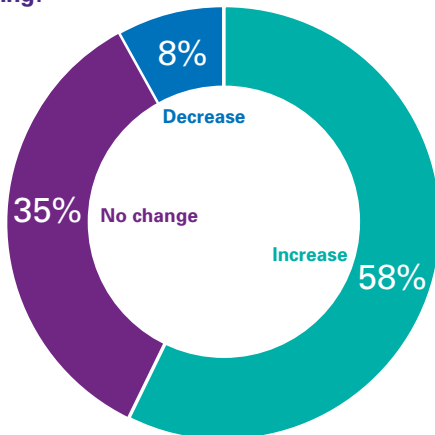
What is your outlook for your company's semiconductor revenue growth in the next fiscal year?



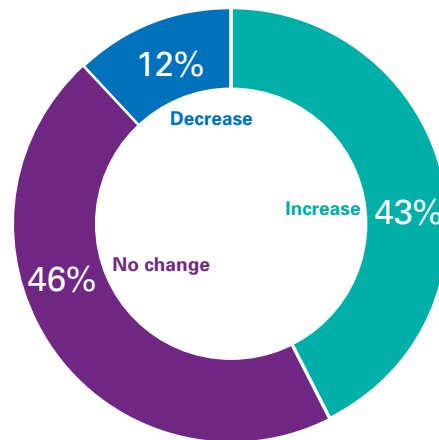
What is your expectation for the change in semiconductor R&D spending by your company for the next fiscal year over the current year?



What is your outlook for semiconductor-related capital spending by your company (both equipment and software) for the next fiscal year compared with your company's current year spending?



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



Source: KPMG Global Semiconductor Survey 2017

“The responses to every one of these questions is more optimistic than last year’s survey. Yet given the historic performance in 2017, we interpret these responses as ‘tempered optimism.’ Nobody is expecting a repeat of 2017, but 2018 should be a successful year in its own right.”

—Lincoln Clark

Partner in charge, Global Semiconductor practice, KPMG LLP (U.S.)

Confidence growing

KPMG calculates the Semiconductor Industry Confidence Index based on survey respondents' single year outlooks for revenue growth, operating profitability, workforce, and capital and R&D spending. This year, we found a more positive outlook for the global semiconductor industry. The index score increased after two years of decline.

In addition, the short-term one-year and long-term (three-year) expectations across the key measures that feed the index—expectations for revenue, profitability, and business investment—are all trending positively, with three-year outlooks rosier than one-year outlooks in almost all cases. The fact that the individual pillars of the index are all trending upward indicates that while industry insiders do expect slower revenue growth compared to 2017, they still see continued growth ahead.

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Semiconductor Industry
Confidence Index

It is worth noting that despite the bump, our confidence index still lies in the 40s—a seemingly unexpected finding after such a tremendous 2017 for the industry. We think this figure reflects tempered expectations after what nearly any expert in any industry would categorize as unsustainable 2017 performance. Indeed, the laws of supply and demand mean the price of memory—the sector that grew the fastest in 2017¹—will eventually have to drop. Respondents may also be concerned that unsustainable levels of capital spending—capital overspending—will cause an immediate contraction when there is a softening in the revenue cycle, spurring excess capacity and marking the beginning of the sort of boom or bust cycle the industry has experienced in the past.

In addition, the strength of the index score in prior years may have been driven by confidence in established technologies like personal computers (PCs). Today, revolutionary technologies such as AI and IoT, are increasingly driving the industry, and there are still many unknowns about how those emerging innovations will play out over time.

Finally, confidence may be a factor of scale. After all, not everyone participated equally in the 2017 industry expansion. If you look closely at where semiconductor industry revenue growth was concentrated in 2017, it was really driven by a handful of the largest memory and logic companies. These companies have benefited disproportionately in current trends and have a better outlook for the future as far as being able to diversify. Meanwhile, smaller companies may have a more tempered outlook for 2018, moderating the overall confidence index.

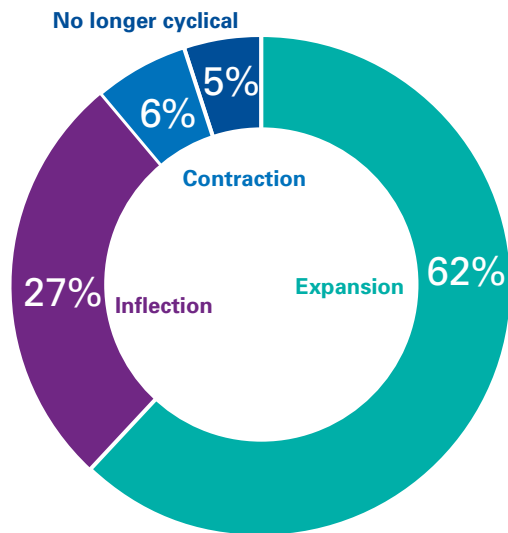
¹ Memory Devices Boost Chip Forecast... Again (EPSNews, October 13, 2017)

New industry wave

Are we entering a “new wave” semiconductor industry? The significant majority of executives (62%) think we are in an expansion stage of the industry cycle in 2018, and more respondents than last year think we are in an early expansion stage, perhaps of a multi-year expansion. This finding reinforces the view that the industry is still in a strong upcycle and may reflect the fact that semiconductor leaders are taking a future-oriented approach and considering new end markets beyond the PC, such as AI, IoT, and autonomous vehicles. In addition, despite its historic year, memory companies likely do not see any coming reduction in sales in the sectors they are feeding, given booming demand for smartphones, data centers, and autonomous vehicle technologies.

It is also possible that the convergence of different semiconductor end markets, such as software, technology, and automotive, is driving an overall industry expansion. Even semiconductor business units inside the largest platform technology powerhouses may ultimately become bigger players than some stand-alone chip manufacturers. Analysts also predict that sales of semiconductor materials specifically for AI programs, like those inside autonomous vehicles, will increase more than 60 times over within five years, surging from \$500 million last year to \$30 billion.²

What stage of the industry cycle best describes 2018?



Source: KPMG Global Semiconductor Survey 2017

² How Nvidia Surprised AI Experts Twice this Week (FORTUNE.com, December 8, 2017)

China still pursuing long-term semiconductor leadership

Measuring by region, we found that executives in China are generally more bullish across the investment categories that feed the confidence index: capital spending, workforce spending, and R&D spending. This makes sense given that China—one of the world’s largest consumers of semiconductors thanks to its booming telecommunications and electronics supplier businesses³—needs to develop or acquire intellectual property to achieve its goals of becoming a global semiconductor leader.⁴ To catch up to the competitors and remain on track with the Made in China 2025 program, China will need to invest heavily to buy up smaller players, build factories, and staff engineers and designers. Early support from China’s National IC Investment Fund (or Big Fund) largely targeted manufacturers and M&A initiatives, while going forward it will focus much of the \$30 billion in its next capital raise on three sectors: memory, compound semiconductors, and IC design applied to IoT, 5G, artificial intelligence, and smart vehicles.⁵

³ Chips on their shoulders (The Economist, January 23, 2016)

⁴ China poses a threat to US dominance in semiconductor industry (South China Morning Post, May 12, 2017)

⁵ China raising \$30 billion for Big Fund’s second phase (EENews Europe, December 5, 2017)

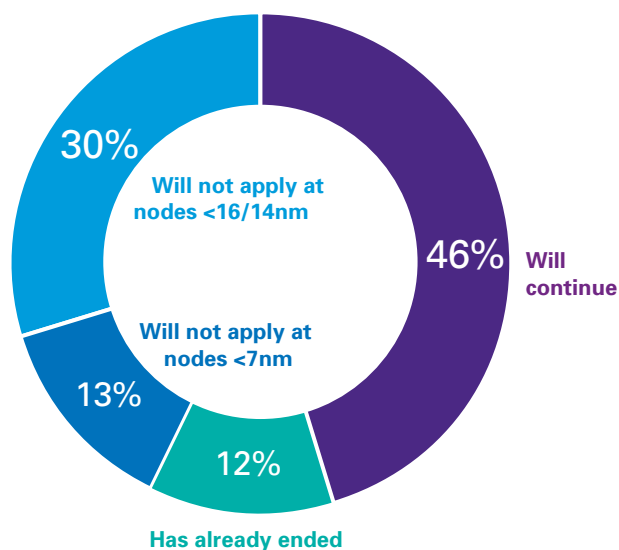
“The evolution of technologies that demand semiconductors, for example IoT, automotive, and artificial intelligence, is still on the lower end of the hockey stick. This potential is driving the sentiment that the semiconductor industry still has a ways to go in the current expansion cycle.”

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

Opinions remain mixed regarding the outlook for Moore’s law, the theory that the number of transistors that fit on a microchip will double approximately every two years, enabling chips to get smaller and faster over time. Consistent with last year’s survey, almost half (forty-six percent) of respondents believe Moore’s law will continue. Our view is that it will have the most applicability for chips over 10 nanometer; for smaller chips, the benefits of scale will disappear and its sole purpose will be to drive speed of performance, not cost savings.

Regardless of how long Moore’s law still applies, to keep up the rapid pace of innovation customers have come to expect, it is clear semiconductor companies will need to ramp up R&D—especially companies that are prioritizing AI as a key revenue driver. Our respondents say AI is the biggest at-risk technology if Moore’s law ends, given the slowing of computing power growth that would accompany its demise.

Which of the following best describes your perspective on the outlook for Moore’s law?



Source: KPMG Global Semiconductor Survey 2017

Chip security demands attention

Cyber threats shift as fast as the winds and strike as hard as a thunderbolt. Never was this clearer than the early weeks of 2018, when the semiconductor industry was bombarded with news of major security problems in certain hardware.

In early 2018, it became public that researchers last year discovered a major security flaw in certain chips, the processors inside almost all PCs, tablets, smartphones, and servers—components generally thought to be secure. Analysts soon showed that the bug existed in processors built by more than one company.

The vulnerabilities could allow cyber attackers to bypass current security protocols and read data stored in memory, including sensitive personal and business information.⁶ Programmers quickly demonstrated how such a cyber attack could work, succeeding at accessing machine memory to steal protected passwords.⁷

As tech giants scrambled to apply software patches to their data center infrastructure, a new issue arose: the planned fix slowed down the performance of impacted computing devices.⁸

How should the industry respond?

Fortunately, cyber security was a strategic priority for semiconductor executives even before the latest firestorm of chip security holes were discovered. “Minimizing cyber security risk” rose eight spots between KPMG’s 2016 and 2017 surveys, from #17 up to #9. Since the latest survey was conducted in October 2017—before the recent chip vulnerabilities became public—the increasing priority placed on cyber security initiatives was likely as a response to the proliferation of chip-using, connected IoT devices, automobiles, and data centers.



Minimizing cyber security risk rose eight spots between KPMG’s 2016 and 2017 surveys, from #17 up to #9.

Source: KPMG Global Semiconductor Survey 2017

Of course, should we re-survey our audience today, we expect cyber security to rank significantly higher on semiconductor executives’ agendas. We urge semiconductor companies to confront the reality that chips are vulnerable. Hardware can be breached, and will have a waterfall impact as it spreads outward to devices in the technology ecosystem.

Hardware-based security starts by integrating security at the transistor level. As such, semiconductor companies will need to build cyber security in from the beginning by including it as a core element of the chip product design stage.

Finally, semiconductor companies will need to constantly reassess both security vulnerabilities and defenses, as cyber threats are always evolving and becoming more sophisticated. January 2018 proved that.

⁶ All About That Big Chip Security Weakness: QuickTake Q&A (Bloomberg Technology, January 3, 2018)

⁷ Understanding Those Alarming Computer Chip Security Holes: ‘Meltdown’ and ‘Spectre’ (FORTUNE, January 4, 2018)

⁸ Intel Says Major Security Bug Also Affects Competitors ARM and AMD (FORTUNE, January 3, 2018).

Strategic priorities

Strategic priorities splinter

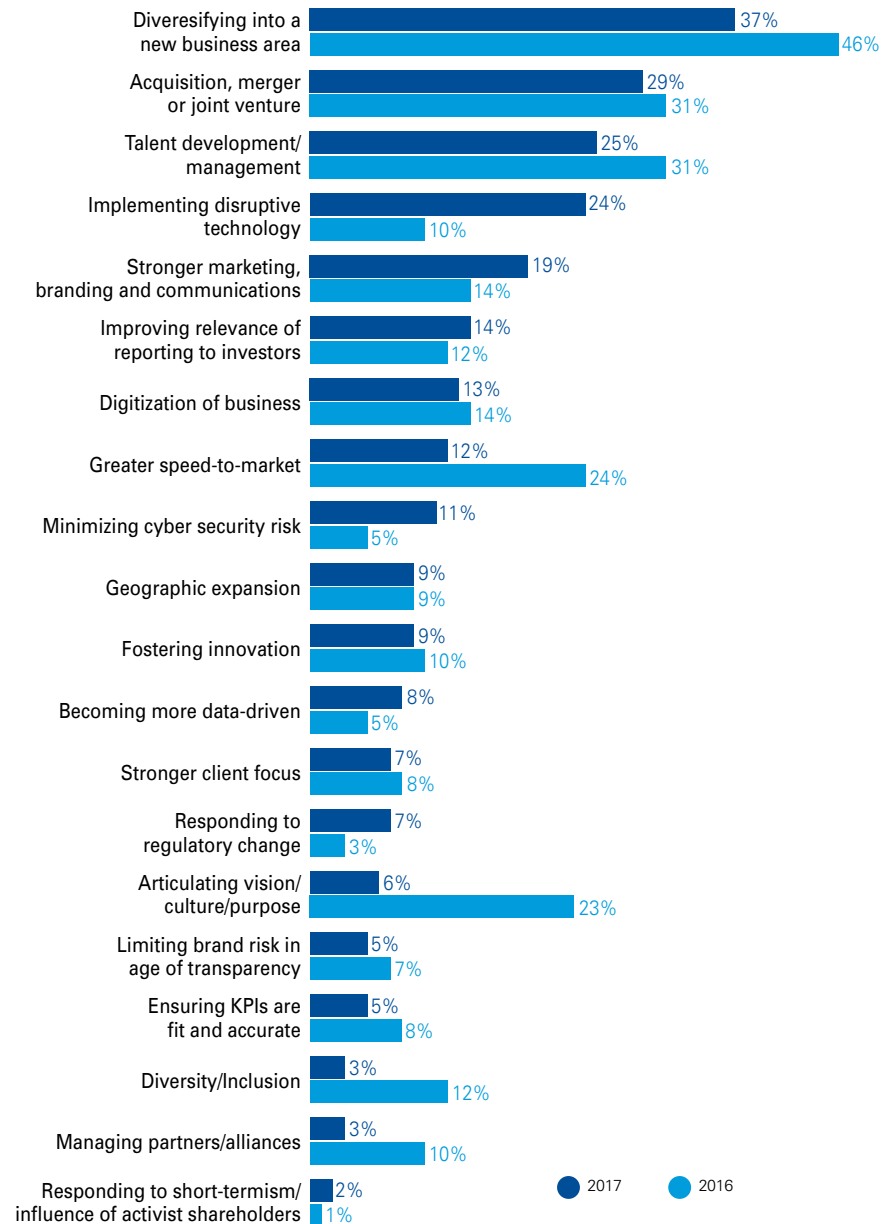
Given the rapid pace of technological change in today's hyper connected and digitized world, it is not shocking that diversifying into a new business area is again cited as the top strategic priority for semiconductor executives over the next three years. Demand for more and more powerful chips continues to increase outside of traditional end markets.

But it is significant that responses to this question are more mixed this year, indicating the numerous opportunities available to the semiconductor business. Implementing disruptive technology made a particularly large jump as semiconductor players seek to transform R&D and operations to get to market more quickly and in more areas and to operate more nimbly.

While product diversification is the top strategic priority, respondents (to a different question) also name "expansion of product offerings and increased differentiation" as the biggest obstacle in achieving an optimized supply chain. It's important to remember that growth outside of a company's core competency in order to increase revenue can present new challenges in other parts of the business.

Talent management also remains high on the list of strategic priorities, holding the number three spot. A number of external trends are keeping talent development in the spotlight. For one, U.S immigration reform may spark a war for talent in the U.S., requiring companies to manage their workforce more closely. Second, as semiconductor companies engage in mergers and acquisitions, they risk losing their people and Intellectual Property (IP) unless they take smart steps to protect both. Another growing concern is the tech giants luring away semiconductor talent to develop their own in-house silicon capabilities. Finally, as semiconductor companies embed AI in the enterprise, they must be more sensitive than ever to its impacts on jobs and human capital.

What are the top three strategic priorities for your organization over the next three years?



Multiple responses allowed

Source: KPMG Global Semiconductor Survey 2017

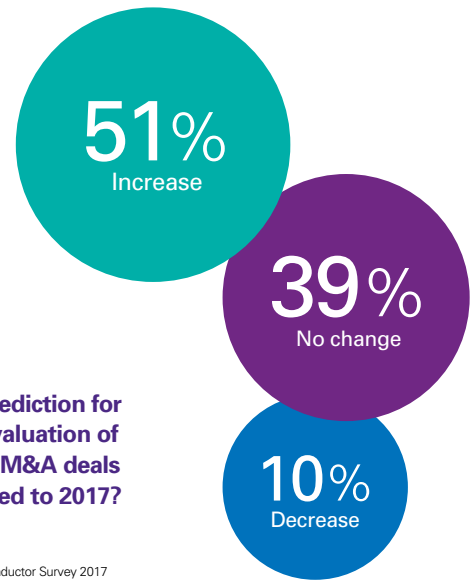
It was very surprising that articulating vision/culture/purpose and diversity/inclusion declined so much in the strategic priority rankings this year. Across all industries, and particularly in technology, culture and diversity issues assumed the spotlight and greater importance in 2017. We expect this will continue for the foreseeable future. In KPMG's 2017 Global CEO Outlook, the number of CEOs who cited reputational and brand risk as a top concern rose dramatically. In 2017, this was the third most important risk for CEOs (out of 16 in total). In 2016, it did not even break into the top 10.⁹ Every company now operates in a fishbowl and bad actors can swiftly cause reputational and financial harm. All companies should reinforce an environment of integrity and acceptance with their employees and not take it for granted.

Deal market is the real deal

M&A is often a key mechanism used to diversify businesses. Second on the list of top strategic priorities is completing an acquisition, merger, or joint venture.

Many semiconductor leaders still see deals as integral to near-term growth. Mergers, acquisitions, and joint ventures can help chipmakers stay ahead of industry change as the technologies that rely on semiconductors evolve and emerge at blistering speed. In fact, half of respondents believe the valuation of semiconductor deals will still increase (recognizing that we conducted our survey before Broadcom's unsolicited takeover bid for rival chipmaker Qualcomm, a

What is your prediction for the aggregate valuation of semiconductor M&A deals in 2018 compared to 2017?



Source: KPMG Global Semiconductor Survey 2017

potentially transformative deal which will create a company of unprecedented scale in the industry).¹⁰

Several factors are driving M&A activity, led by revenue growth. We expect the top companies in the industry to have a lot of cash on hand, and this may be particularly so for U.S. companies following recent tax reform. Leading semiconductor firms and other cash-laden buyers may make a push to acquire adjacent technologies.

⁹ Source: 2017 Global CEO Outlook, KPMG International

¹⁰ Broadcom plans \$100bn unsolicited bid for Qualcomm (*Financial Times*, November 3, 2017)

“Even though semiconductors are the building blocks and enable most modern technology, executives realize that even they can be disrupted. No industry is immune. Technology convergence and the fact that innovation can come from all corners is making semiconductor leaders even more proactive and forward-thinking.”

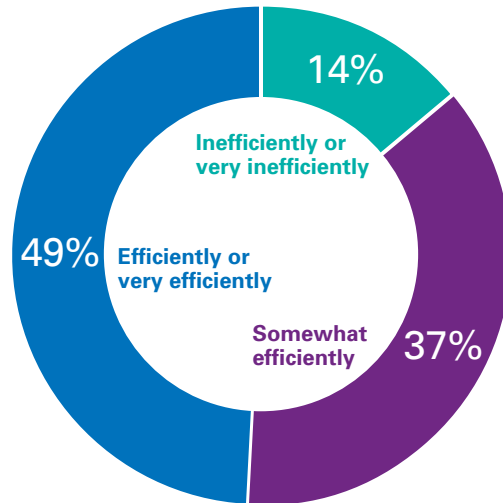
—Tim Zanni
Global and U.S. Chair, Technology, Media & Telecommunications, KPMG LLP (U.S.)

Reimagining R&D

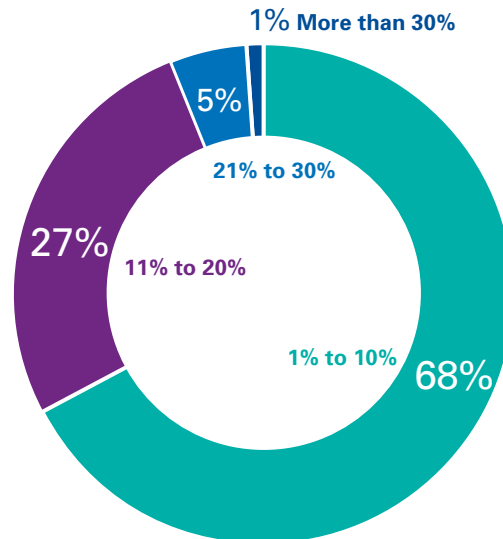
As we mentioned earlier, fifty percent of survey respondents plan to increase R&D spending next year to sustain the breakneck pace of innovation that has driven the industry for the past 50 years. But it's how they do it that truly matters. Our survey results show that in fifty-one percent of companies, there is room for improvement in aligning R&D spending to market opportunities. In addition, one-third of companies waste more than ten percent of their R&D spending, with some companies wasting more than twenty percent. We always expect some innovation dollars in such a fast-moving and competitive industry to never to make it to market, but especially high failure rates are difficult to swallow.

Many semiconductor companies are implementing data and analytics and Agile methodologies to improve the R&D and product development process efficiency, enabling them to go to market with more profitable products, capture more market share, and earn more revenue. More than half (fifty-four percent) of respondents are using data and analytics in R&D and forty-five percent are incorporating Agile development, a technique more often seen in the software space, into hardware product development efforts. Other popular techniques used to improve R&D efficiency are zero-based budgeting (ZBB) and modular designs. We also found that once AI is embedded into the R&D function over the next three years, 39% of respondents said that R&D headcount will increase. These increased innovative resources will need to be guided by an efficient R&D process.

How efficiently is your R&D spending aligned with market opportunities?



In the last three years, what percentage of your R&D spending has been allocated to programs that never made it to market?



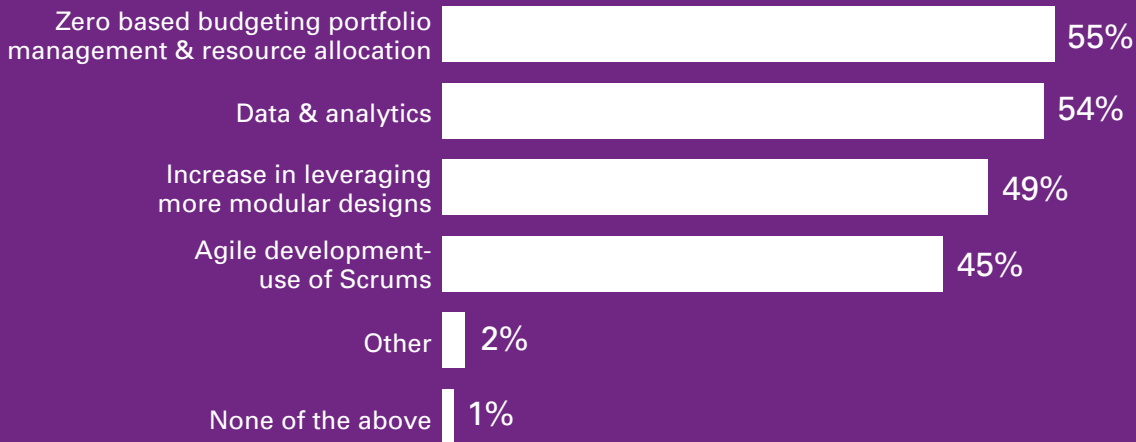
Source: KPMG Global Semiconductor Survey 2017

Creating next-generation R&D

With semiconductor R&D costs rising, there is no time to waste in evolving the R&D process. Incorporating D&A and Agile methodologies into the R&D process can yield better return on investment (ROI), bring focus to future markets, and become a competitive advantage. We recommend four immediate actions:

- 1 Assess your current product development methodologies and your data sources and uses
- 2 Determine the essential data points within the product development process
- 3 Build an adaptable platform for data analysis
- 4 Establish a baseline of performance. Read our complete insights in *Evolving the D&A of semiconductor R&D*.¹¹

What methodologies are your R&D organizations leveraging to improve R&D efficiency?



Multiple responses allowed

Source: KPMG Global Semiconductor Survey 2017

¹¹ Evolving the D&A of semiconductor R&D (KPMG International, 2018)

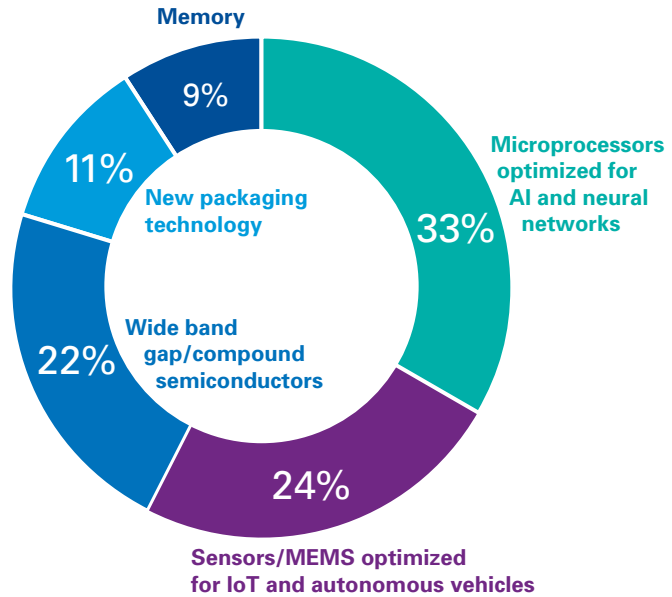
Opportunities

Sensors/MEMS, microprocessors in the spotlight

If you had \$500 million to invest in the semiconductor industry, what sectors would you invest in? The clear leader among our respondents is microprocessors. These products remain critical pieces of common electronic, automotive, computing, consumer, and media devices and are only poised for further growth as the AI and the IoT markets move beyond the early stages of development. Indeed, current trends in venture capital show a significant amount of start-up funding going into chipsets to support AI, neural networks, IoT, and autonomous vehicles.¹² Semiconductor companies are betting heavily on the AI revolution and the connected age, anticipating the role their industry will play in creating chips and producing enough memory and computing power to support both. Memory, which is driving so much revenue growth right now, actually ranks lowest. Executives may believe the memory segment has been bled dry, given the level of investment that has already gone into it.

Similarly, sensors/MEMS (like last year) are expected to provide the highest growth opportunity in 2018 for the industry, followed by microprocessors. But we also see more bunching of responses this year, indicating increasing opportunities across a breadth of other sectors, including memory, optoelectronics, and analog/RF/mixed signal.

If you were a financier and had \$500M to invest in the semiconductor industry, what segment/technology would you invest in?



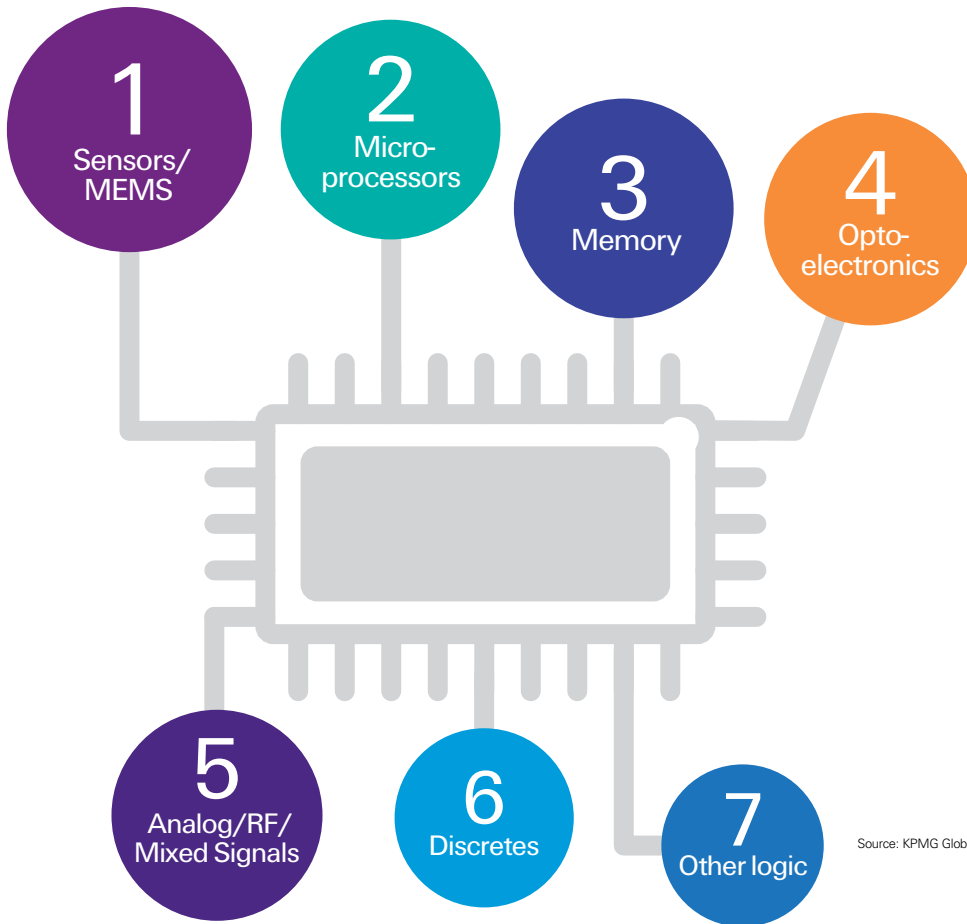
Source: KPMG Global Semiconductor Survey 2017

“Even though memory was the engine that drove 2017 revenue, respondents ranked it third in terms of growth opportunity for 2018. This could be due to anticipated supply catching up with demand during the year.”

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

¹² Back To The Future: Chip Makers Are Putting The Silicon Back In Silicon Valley (Forbes.com, August 3, 2017)

How would you rate each of the following in terms of growth opportunity in 2018 for the semiconductor industry?



Source: KPMG Global Semiconductor Survey 2017

Chips wanted for wider variety of applications

You can't leave home without it: Anyone glued to their smartphone screen for hours on end will not be surprised that the most important application market driving semiconductor revenue is wireless communications, including smartphones and other mobile devices, as was the case last year. However, again, our findings show the end uses of semiconductor products becoming

more diverse. There is a more even distribution in target application markets this year. Wireless communications, IoT, wireline communications, consumer electronics, industrial, automotive, cloud computing, robotics/drones, security, and AI and all ranked as "very important application markets" that will drive revenue over the next year. AI, it is worth noting, was barely even on the radar last year. IoT could produce results based on sheer volume. Also, cloud computing made a huge jump as consumers continue to demand more

storage space for photos, e-mails, music, and other personal data. Clearly, there are no longer just a few end markets driving the industry; now there are ten or eleven that are really important. More flexible chips and systems are required to cater to a greater number of technology applications; so as emerging technology starts to go mainstream, semiconductor companies will need to become more efficient in R&D.

How important are each of the following application markets in driving your company's semiconductor revenue stream over the next fiscal year? (percentage who selected important/very important on a 1 to 5 scale)

APPLICATION MARKETS	2017		2016	
	%	Mean	%	Mean
Wireless communications including smartphones and other mobile devices	75%	3.9	84%	4.1
IoT including connected home, smart cities, personal wearables	63%	3.8	56%	3.6
Wireline communications	60%	3.6	56%	3.4
Consumer electronics	59%	3.5	61%	3.5
Industrial	59%	3.5	60%	3.5
Automotive	55%	3.5	65%	3.5
Cloud computing	43%	3.4	27%	3.0
Robotics/Drones	45%	3.2	44%	2.9
Security including biometrics (2017) Biometrics and security (2016)	45%	3.2	48%	3.2
Artificial Intelligence/Cognitive/Deep Learning	43%	3.2	18%	2.9

1=Not at all important and 5=Very important. Partial list shown. Source: KPMG Global Semiconductor Survey 2017

Global markets

The United States and China, the traditional semiconductor powerhouses that dominated sales for the greater part of the decade, will maintain their position as the most important geographic areas for semiconductor revenue growth three years from now, according to our survey. But both countries are considered less important than they were one year ago. Predictions for declining sales in both countries may relate to new or anticipated trade restrictions between them¹³. High expectations for revenue growth in China may also continue to source from its intent on indigenizing its semiconductor industry and relying less on imports.

In addition, other countries are starting to come on strong. As consumer technology use increases around the world and global technology business hubs spring up in emerging markets, respondents expect to sell more chips in Taiwan, Japan, Korea, India, and Brazil in the near future. With less dependency on two large markets, semiconductor companies will need to broaden their targeting and pursue opportunities in previously untapped regions more aggressively.

¹³ Semiconductors face China-US trade restriction risks (Oxford Analytica Daily Brief, May 12, 2017)

Challenges

Range of issues keeps execs up at night

Despite the rosy outlook of this year's survey respondents, there is a lot on their minds. A range of challenges are converging as top-of-mind issues for their businesses, including average selling price (ASP) erosion, keeping pace with diverse customer demands, the high cost of fabrication and back-end equipment, the continuation of Moore's law and scaling, and production capacity restraints.

ASP erosion remains the biggest issue facing the industry, perhaps due to the view that prices for memory (the segment currently carrying the day) will eventually have to flatten out as more facilities are built to pump out memory, there is an influx of supply, and excess inventory builds up.

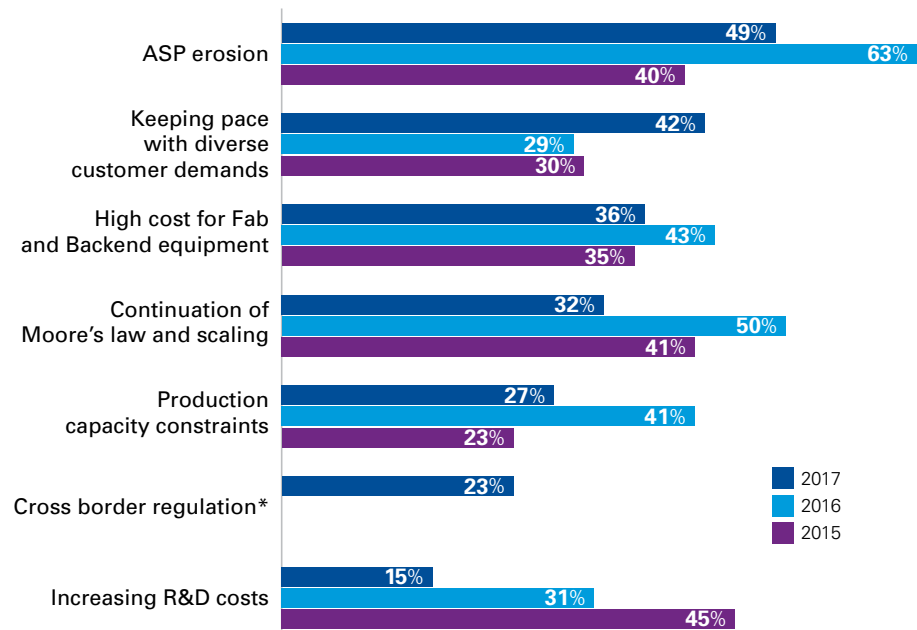
Keeping up with diverse customer demands is the second most common industry issue cited (forty-two percent) and made the biggest jump up the list since last year's survey. This finding is consistent with the emphasis by semiconductor companies to diversify into new sectors, applications, and geographies to seize emerging opportunities outside of traditional sales channels.

Cross-border regulation was a new response option in this year's question and it debuted strong with 23% of respondents naming it as one of the biggest issues facing the industry in the next three years. This is not surprising given the global nature of the supply chain and the evolving landscape of trade deals and tax reform.

The phenomenon of "increasing R&D costs" has dropped from the number one issue just two years ago to seventh

in this year's survey, as other challenges have become more important to respondents. It is also possible that the record sales growth in 2017 allayed this particular concern in this year's survey, but this response dropped in the 2016 survey as well. Maybe the aggregate infusion of zero-based budgeting, D&A, Agile methodologies, and other techniques to make R&D more efficient have reached the point of sufficiently mitigating this issue in many respondent's eyes.

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



*Not asked in 2016/2015 Multiple responses allowed
Source: KPMG Global Semiconductor Survey 2017

Summary

The semiconductor industry appears to be in an expansion phase with significant runway in front of it. Revenue projections for 2018 are healthy. The majority of survey respondents say their company will increase R&D and capital investment next year. Very few respondents predict their workforce will contract.

The top strategic priorities (diversification, M&A, and talent management) remain consistent, although to a lesser degree than last year. Implementing disruptive technology and minimizing cyber security risk understandably climbed in the rankings this year. Conversely, the external-focused greater speed to market and the internal-focused articulating vision/culture/purpose and diversity/inclusion categories surprisingly ranked much lower than last year.

A variety of new applications including IoT, automotive, AI, cloud, and robotics/drones are rising in importance and

demanding increasingly complex semiconductor products. While this is good for growth, it is also challenging companies to become more disciplined in how they:

- Spend their R&D dollars
- Target companies (semiconductor or adjacent technologies) for acquisition
- Design security into their products and systems

ASP erosion is still seen as the top industry issue for the next three years but by a slimmer margin than last year. Keeping pace with diverse customer demands jumped to number two this year, and we speculate it will remain highly ranked for the foreseeable future. Also of note is that cross-border regulation debuted on the issues list this year.

Next steps

We believe there are several important topics that semiconductor leaders need to pay attention to in 2018:

- 1 Product and system security.** As chips are used in a growing amount of connected devices that represent entry points into a network, cyber security is imperative. This mandate only increases as certain technologies such as autonomous vehicles and medical robots move closer to reality. Cyber security needs to be ahead of the bad actors and a priority from the initial design stages.
- 2 R&D efficiency.** Diverse customer demands and emerging technologies are straining R&D organizations and budgets. Only half of our survey respondents said their R&D spending was efficiently aligned with market opportunities. Companies must be disciplined in identifying and pursuing the most profitable product portfolios. Incorporating D&A and Agile methodologies are ways to improve R&D efficiency.
- 3 Culture.** Companies must remain vigilant as they continue to integrate operations and cultures from all the M&A over the last few years. And even if integration is not currently occurring, a diverse, integrity-oriented, and inclusive corporate culture must be constantly communicated and nurtured. This is required for all technology companies in today's environment and is just smart business. It also impacts the ability to retain and manage talent, which is a top strategic priority.

Related insights



Evolving the D&A of semiconductor R&D

Semiconductor CFOs, strategy, and corporate development professionals should incorporate D&A and Agile methodology into the R&D process. This can yield better ROI, bring more profitable products to market faster, and become a competitive advantage.



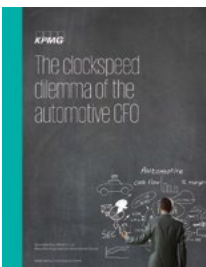
The right to win in semiconductors

In the face of rising costs, semiconductor companies must focus their R&D investment more efficiently. By consistently differentiating its products and demonstrating market leadership, a company earns the “right to win” in the industry.



I see. I think. I drive. (I learn)

An advanced form of artificial intelligence, deep learning is accelerating to the point of transforming the development of self-driving cars. It is steering an exciting new course for the automotive industry. There are risks. There are threats. There are unknowns.



The clockspeed dilemma of the automotive CFO

Soon, auto company revenue will result more from service around cars (mobility-as-a-service), which demands an entirely different business model. CFOs have a critical role to play in overseeing this transformation and ensuring the future of their companies.

How KPMG can help

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 work side-by-side with semiconductor clients of all sizes to look beyond today’s pressing business challenges and anticipate the strategic choices that will best position them for both short- and long-term success.

About the research

This is the thirteenth edition of KPMG’s annual Global Semiconductor 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 2017, Forbes Insights, on behalf of KPMG, conducted a Web-based survey of one hundred-fifty senior executives from global semiconductor companies. Respondents from the United States comprised fifty-one percent of the survey. China respondents accounted for fifteen percent, and the rest of Asia Pacific twenty-four percent. Europe and other countries comprised ten percent.

Executive sentiment is reflective of industry leaders as eighty-three percent of survey respondents were from companies with \$1 billion or more annual revenue. Companies with less than \$1 billion annual revenue accounted for seventeen percent of respondents. The source data for all graphs in this report is the 2017 Global Semiconductor Survey. Select results from prior survey years are also included. The percentages in some charts may not sum to one hundred percent due to rounding.

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