Andrew Baker

Executive perspective: Vincent Roche, CEO of Analog Devices, on the next wave in semiconductors

The CEO of a multinational technology firm discusses the state of innovation in the semiconductor industry.

Aaron Aboagye, Abhijit Mahindroo, and Nick Santhanam

The semiconductor industry is at another crossroads: growth is slowing, the cost of innovation is rising, and several disruptive technologies and business models are poised to affect the industry. But the industry has already transformed itself many times over the past 30 years—embracing global models and markets, producing faster (and smaller) connectivity components, and developing new kinds of engineering, marketing, and sales talent. "The companies that will thrive in the future are those that can become bilingual—understanding not just technology but also business," says Vincent Roche, president and CEO of Analog Devices (ADI), a multinational technology firm that produces analog, mixed-signal, and digital-signal processing devices. "The companies that don't sense change, or that sense change but don't respond, or that learn from change but don't adapt quickly or effectively enough, will lose out." Mr. Roche recently sat down with Aaron Aboagye, Abhijit Mahindroo, and Nick Santhanam from McKinsey's global semiconductor practice to discuss where the industry has been, where it is going, and how companies can continue to adapt.

McKinsey on Semiconductors: *You've witnessed significant changes during your tenure at ADI. How do you see the industry and ADI evolving over the next five or ten years?*

Vincent Roche: To my mind, all semiconductor companies face two perennial questions: how to manage increased complexity in products, processes, and business relationships, and how

to react to the pace of innovation. These will continue to be the main themes for many years to come—not just for device companies but also for our customers.

ADI mirrors the broader semiconductor industry in many ways. We are an almost 50-year-old company, and our first 25 years were all about "big iron"—the IBM mainframe era and industrial measurement and control technologies. The second 25 years or so has ushered in the digital communications and consumer eras, and we have capitalized on this to grow from $300 million to $3 billion in annual revenues.

We are in an auspicious period now—a third wave of evolution—where we are combining many products and technologies to do bigger things for our customers while also managing the resulting complexity. It's analogous to the post-Cambrian explosion. The industrial, healthcare, automotive, and energy sectors are realizing big gains due to pervasive sensing, processing, and communication technologies. Meanwhile, we are seeing a tremendous reduction in the number of hardware engineers, especially analog engineers, at our customers' sites, and we are increasingly expected to fill that need by delivering more complete solutions. As a player at one node of the emerging ecosystem, we need a deeper understanding of how to successfully interact and cooperate with all the other nodes to make a difference.

McKinsey on Semiconductors: *Can you comment about the Internet of Things and the swirling attention around big data? What do these trends mean for customers, and by extension, semiconductor players?*

Vincent Roche: Personally, I think the term Internet of Things is overused. That said, many of our customers are realizing that, because of the ubiquity and power of communications technology and the extreme affordability of computing, there is a lot more they can do beyond building basic industrial machines, cars, network gear, or other hardware. They can connect their products to the cloud, capture vast amounts of useful data, and potentially redesign their business models to create new sources of revenue around analytics. These trends will be real game changers, and ADI is embracing the opportunity to highlight our expertise in connecting the physical and digital domains. Our company and other semiconductor players have a real growth opportunity here, because the devices we produce and sell can make it easier for our customers to collect information, perform sophisticated analysis, and do things differently as a result.

McKinsey on Semiconductors: *Many semiconductor players have become successful by leading device-level design in the industry. Now we hear companies talking more and more about software and system-level offerings. What are the implications of this trend?*

Vincent Roche: Compared with other industries, semiconductor players, in aggregate, are investing more in R&D and getting less in return. We are adding more complexity and sophistication to our offerings—for instance, embedding software and algorithms and increasing the functionality of integrated circuits and systems-level offerings. And as I mentioned, there has also been some expectation on the customers' part that we will provide certain hardware-engineering tasks and support capabilities. However, we are still figuring out how to get paid for these basic innovations and the other extras that customers expect for free.

Semiconductors are still the foundation of innovation in the market for information and communications technologies. At the end of

the day, no matter what our customers want to do in the cloud or with sophisticated data analytics, they still need the silicon as a foundation—and not just for incremental innovation but for real breakthroughs. The differentiating features in most automobiles today, for instance, are a result of the innovations that semiconductors enable. For a long time, a chip company was a chip company, but what does it look like now? We have to accept software development and systems engineering as critical domains in our work flow, and we have to organize ourselves around these needs. We have a road map for systems and software development at ADI, and it has become an important part of the innovation conversation happening in the company.

McKinsey on Semiconductors: *Semiconductor companies are facing ever-rising R&D costs and high-risk returns. How can executives successfully manage this challenge and continue to innovate?*

Vincent Roche: At ADI, we believe that "superior innovation makes for superior results." We invest nearly 20 percent of our revenue in R&D, and as long as we're growing, we believe that figure is appropriate. We need to bring more thoughtful risk into the company, pick the places where we play carefully, work closely with customers, and get better at getting rewarded for managing the increasing design complexity. The best, most innovative products we've launched over the

Vincent Roche

Education
Holds a BS in electrical engineering from Limerick University

Career highlights
Analog Devices (1988–present)
CEO (May 2013–present)

Vice president of strategic market segments group (2009–13)

Fast facts
Began his career at ADI in 1988 as a senior marketing engineer in Limerick, Ireland, and has served in various leadership roles ever since

years have been the result of collaborative innovation with our customers—applying the best technologies imagined by our engineers toward solving customers' most critical challenges. This approach has kept us relevant in the marketplace. We are careful to strike a balance between being customer-centric and technology-forward.

As we do this, we do need to be thoughtful about the amount of R&D and ideation we do internally versus externally. I think it was IBM's John Kelly who once said, "The world is now our lab." That is a striking and important statement. In addition to their own efforts, companies need to develop external relationships—with academic institutions, industry bodies, and other companies—to create new technologies. This holds true for early-stage product development as well as latter-stage initiatives.

McKinsey on Semiconductors: *Over the past decade, venture-capital funding and start-ups focused on semiconductors seem to be declining. Is this an issue? What can the industry do to deal with this?*

Vincent Roche: The industry needs to go beyond an incremental approach. We need to tap into new sources for ideas and breakthrough research, and start-ups can help in that regard. Venture-capital firms have been smitten by faster returns on software or Internet ventures, but there are indications that venture-capital investments are beginning to swing back to semiconductors.

Hardware-development cycles are longer and costlier than ever. But if we are truly an industry focused on the long term, thinking about the next couple of decades, we have a responsibility to help manage this problem. By providing funding and advice, and by collaborating in university research, we can help to improve the odds of start-up success.

McKinsey on Semiconductors: *Semiconductor players are increasingly looking toward mergers and acquisitions as a source of growth and competitive advantage. But post-merger integrations are often troubled. In your experience, what is the secret of a successful deal?*

Vincent Roche: The industry is in an acquisition cycle, so as long as capital remains cheap, you'll continue to see companies in our industry pursuing new deals. There really is no magic bullet for succeeding in M&A, but you do need to be clear about why you're pursuing the deal. Are you simply responding to overactive investors? A smart merger or acquisition is one where, in five years' time, you are more relevant to your customers and bringing more capabilities and innovative products to bear. The deal has to make you more competitive for the long term. You should imagine a conversation in which customers and share-holders come back to you five years down the road saying, "The combination of those two capabilities was really beneficial, and we're glad you did it."

Executives also need to be discriminating about their choice of targets. For instance, if innovation is built into the DNA of your company, you will need to pay special attention to culture: Is the target company's culture compatible with your own? How quickly can new technologies and capabilities be integrated? That was an important consider-ation in our recent acquisition of Hittite Microwave. The executives there shared a very similar mind-set and culture with ADI—they were very focused on innovation and developing new technologies and products for customers in markets that were of

strong strategic interest to us. They were close geographically, also in Massachusetts, which helps a great deal. In an opportunity-rich and resource-constrained environment, such as we are in right now, it certainly helps to get more scale, but you need to make sure the conditions are right.

McKinsey on Semiconductors: *With the rise of online giants, semiconductor companies are no longer the natural top choice for electrical engineers and computer-science majors. What will it take to continue attracting top-tier talent to the semiconductor industry?*

Vincent Roche: Just this morning, I met a group of bright, young engineers from Asia, Europe, and the United States, who are just beginning their careers at ADI. We talked about their aspirations, what is happening in the world, in the industry, and with technology. If that group of people is any indication, I am very bullish on the future of our company and the industry. They are very passionate about the work, and they want to innovate and make an impact on the world.

We are attracting the brightest people from great colleges worldwide. Although the big Internet companies have been grabbing the headlines and a lot of the engineering talent, I believe the pendulum is swinging back.

Analog, in particular, is a specialized craft. We train our people in foundational, core skills by exposing them to the greatest minds in our field. They go through multiple cycles of learning and stay with us a long time. I really think we are in great shape on the people front.

McKinsey on Semiconductors: *What would you like your legacy to be at ADI?*

Vincent Roche: We are a 50-year-old enterprise, and it is my goal to develop and position ADI to thrive for the next 50 years. We will need to continually innovate, relative to our past and relative to the market. We will need to increase our fluency in both the technology and commercial domains.

I am a student of evolutionary theory, and I think great companies have the same attributes as great societies, cultures, and nations—they sense, they learn, and they adapt. They don't just focus on competitors; they find mutually beneficial opportunities to cooperate.

Additionally, I have been privileged to work with two industry legends—Ray Stata and Jerry Fishman—who built our business. I stand on the shoulders of giants, and I hope to leave a legacy that they would also be proud of.

Aaron Aboagye (Aaron_Aboagye@McKinsey.com) is a principal in McKinsey's New Jersey office, **Abhijit Mahindroo** (Abhijit_Mahindroo@McKinsey.com) is an associate principal in the Southern California office, and **Nick Santhanam** (Nick_Santhanam@McKinsey.com) is a director in the Silicon Valley office.