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More than "Moore" to win

Optimization strategies for success in a maturing semiconductor industry

Electronics

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More than "Moore" to win

Optimization strategies for success in a maturing semiconductor industry

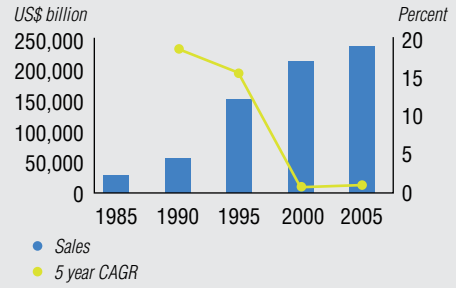
By George Bailey and Wendy Huang

The impact of higher costs and other key disruptive trends on the semiconductor industry – especially competitive landscape changes, technology convergence and greater global connectedness – mean that traditional business models just no longer work. Nor will the promises of Moore's Law be enough to provide sustained competitiveness. Future success will require innovative changes to existing business models that optimize capabilities in the areas of integration, customer centricity and collaboration.

Industry costs are skyrocketing. R&D costs are expected to rise by a compound annual rate of 12.2 percent per year between 2004 and 2010, while the industry revenue growth rate remains only 6.0 percent per year.[1] The total R&D cost for the semiconductor industry was reported to be US$45 billion in 2006 and analysts believe that it will reach US$100 billion by 2010.[2] In addition, process development costs for 32nm manufacturing could hit US$3 billion, which is twice the cost for 65nm process technologies.[3] This does not include other development costs such as new chip fabrication facilities ("fabs"), or new processes, tools and equipments.

Market indicators show the industry is, in fact, maturing. Revenue growth has slowed dramatically in the past two decades (see Figure 1), and the five-year compound annual growth rate (CAGR) for industry revenue dropped from more than 15 percent in 1990 to less than 4 percent by 2005.

FIGURE 1.
Five-year CAGR of semiconductor industry revenue, 1985 to 2005.



Source: IBM Institute for Business Value analysis of Semiconductor Industry Association/SICAS data. https://www.sia-online.org/downloads/shares.pdf.

And yet, in today's world of pervasive computing, it seems semiconductor devices, or "chips," can be embedded practically everywhere: in vehicles to monitor the need for replacement parts, in humans to detect heartbeats and brain activity, and even in growing plants to communicate needs for water or fertilizer. With no end in sight to "ubiquitous computing" and "embedded networks and controls," these examples are but the tip of the iceberg of potentially endless opportunities for the semiconductor industry.

Historically, Moore's Law offered strong hope of continual cost reduction and continued prosperity for chip makers in the face of ever-increasing demand. The1965 prediction by Gordon Moore of Intel postulated that the number of transistors on a chip would double every one to two years due to advances in technology.[4] With today's explosive use of semiconductor technology in all walks of life, the current reality is that it now takes more than "Moore" to win.

Today, rumors of mergers and acquisitions (M&As) run rampant in the chip industry. In recent years, the increased costs of staying competitive have driven many companies to increase their collaboration with peers, in forms ranging from joint development to M&A. Companies failing to properly manage their bottom-line financials are increasingly targets for takeover, especially as private equity firms take a more active role in the industry.

To better understand current industry trends and their impacts, as well as how to win in this new environment, IBM conducted the 2007 Semiconductor Industry Optimization Study (SOS). SOS looked in detail at the top 60 semiconductor suppliers by size of revenue, which includes a mix of companies. Some of the top 60 design and manufacture their own chips (Integrated Device Makers or "IDMs"), some design, but do not manufacture chips (fabless) and four top companies manufacture, but do not design chips (foundry players). Our study included face-to-face interviews, analysis of financial results and industry best practices, along with substantial secondary research.

SOS results led to some stark conclusions for this maturing industry. No longer can competitive advantage be found solely in continued technology advancement, as espoused by Moore's Law. The growing pervasiveness of chip use across industry and society requires companies to re-examine their respective business strategies and supporting business models to properly adjust for the dynamic competitive landscape, increasing technology convergence and growing global connectedness. Only well-considered choices can lead to the stable financial results necessary for survival and success as the industry faces significant disruption.

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The seven Cs: Today's disruptive industry trends

Along with industry maturation, seven disruptive trends – we call them the "seven Cs" – are reshaping industry players, as well as their relationships within the ecosystem and shifting the value chain itself. And like the "seven seas" of Earth, these seven Cs may require special attention to navigate choppy waters ahead. These disruptive semiconductor industry forces include *complexity, commoditization* and *consumerization*, along with four others that this paper will examine much more closely: *cost, competition, convergence* and *connectedness*.

Cost: Doing business is more expensive across the board

In virtually every dimension of the semiconductor industry, costs are increasing exponentially. With each successive leading technology, the level of complexity grows in conjunction with the cost. R&D costs associated with leading technology IC design, process and equipment can be attributed to the escalating cost of semiconductor industry R&D. According to analysts, process technology R&D costs alone jumps from US$2.4 billion at the 45-nm node to US$3 billion at 32 nm.[5] A 300-mm, 45-nm wafer is about 10 times more expensive than a 200-mm, 250-nm wafer.[6]

Mask costs also jumps significantly with each leading edge technology. For instance, mask costs at 90-nm are about US$800,000 – at the 65-nm node, they reach about US$1.2 million.[7] For a 45-nm node, mask costs alone can total more than US$2 million.[8] Because most chip developments require at least two mask sets to get to production, this can put a big dent in the semiconductor suppliers' wallets.

Competition: An industry in flux thanks to China, India and private equity

The competitive landscape is constantly changing. Within ten years, it is estimated that 40 percent of today's semiconductor vendors are likely to leave the industry as a result of intense global competition.[9] The number of Chinese fabless companies increased from 15 in 1990, to an astounding 479 in 2005 and still growing.[10]

India, too, is a rising contender. India boasts 125 fabless companies that have grown from around US$1 billion to US$3 billion, and they are slated to reach US$40 billion in sales by 2015.[11] Most of these Chinese and Indian companies are not well known, but it is only a matter of time before some will become credible contenders.

Private equity activities have also intensified in the past few years. The high-profile leveraged buyouts of NXP and Freescale alone accounted for US$27 billion in 2006 (See Figure 2). The private equity playbook consists of first leveraging the strong cash position of the target company to borrow money. Next, investors restructure and improve the company's bottom line by driving inefficiency out of the business, then later either sell the company or take it public. Such deals have been able to generate returns of 30 percent to 40 percent.[12] As a result, private equity-owned companies are setting new business operation standards for all of the industry players.

Traditional semiconductor industry business models are being threatened by seven disruptive trends in particular: higher costs, competitive landscape changes, technology convergence and greater global connectedness.

FIGURE 2.
Semiconductor private equity activities.

Year	Deal	Price tag
1997	Citicorp Venture and Credit Suisse buy Fairchild from National Semiconductor.	US$550 million
1997	Texas Pacific Group buys Zilog.	US$527 million
1999	Citicorp Venture and Credit Suisse buy the semiconductor division of Harris. Renames the company Intersil.	US$520 million in cash and a promissory note of US$90 million
1999	TPG buys the semiconductor components group of Motorola. Renames it ON Semiconductor.	US$1.6 billion
2004	CitiGroup Venture Capital, Francisco Partners and CVC Asia Pacific buy part of Hynix and rename it MagnaChip Semiconductor.	US$828 million
2004	Francisco and TPG buy Smart Modular Technologies from Solectron.	US$100 million
2005	Kohlberg Kravis Roberts & Co. (KKR) and Silver lake Partners buy Agilient Technologies' semiconductor unit renaming it Avago Technologies.	US$2.7 billion
2006	Bain Capital buys Texas Instruments' sensors-and-controls business.	US$3 billion
2006	Consortium including KKR and Silver Lake Partners buys majority stake in Philips Semiconductor. Renames it NXP Semiconductors.	US$10 billion
2006	Consortium including Blackstone Group and TPG buys Freescale Semiconductor.	US$17.6 billion

Source: Harbert, Tam. "Private equity chips away at semiconductor industry: Investors see stable cash flows and need for consolidation." Electronic Business. December 1, 2006. http://www.edn.com/article/CA6395971.html

Convergence: Semiconductors are the common "fabric" binding digital content

Convergence happens when common technology creates growing overlaps to create new consumer value. Convergence and pervasiveness are now redefining the market, as boundaries among application categories are dissolving. This blurs the lines of chip application and business offering mixes.

One area in which convergence trend has been most visible is with mobile handsets increasingly adopting the capabilities of PCs. While the product functionality is converging, semiconductor suppliers continue to introduce more brands, more platforms and more feature sets. As a result, it becomes increasingly difficult for semiconductor suppliers to find new high-volume semiconductor application that they need to offset the exponentially increasing costs associated with keeping up with technological advancement.

Connectedness: A flatter world brings people closer

It seems that nearly everything today is becoming interconnected. From the social networking and user-created content of Web 2.0, to the ever-increasing number of mobile telephone and Internet users worldwide, people want to connect and "talk." The total number of worldwide Internet users surpassed 1 billion in 2005 and is estimated to reach 2 billion by 2011.[13]

Worldwide mobile phone sales are also expected to reach one billion in 2009, with an estimated 2.6 billion mobile phones in use.[14] Even companies like SanDisk, makers of NAND-based flash storage card products that are used in various consumer electronics products, are increasing focus on developing mobile platforms.

"[In] the next two to three years everything will be wireless, every kind of devices would be wirelessly connected to everything else and therefore the distinction between a cell phone or an MP3 player is going to be somewhat blurred."

– Eli Harari, CEO of SanDisk [15]

When it comes to semiconductors, the race for "smaller, faster and cheaper" is still on, but the traditional focus on product and technology innovation alone is not sufficient to survive the seven Cs – especially skyrocketing costs, dynamic competition, digital convergence and greater global connectedness.

Emerging types of industry players

Companies' responses to the industry disruptions of the seven Cs will ultimately determine whether they win big or lose big. Chip production increasingly resembles a gourmet restaurant kitchen, where numerous chefs line up to add just the right spices to the mix; no longer can one company single-handedly bring value to the end user.

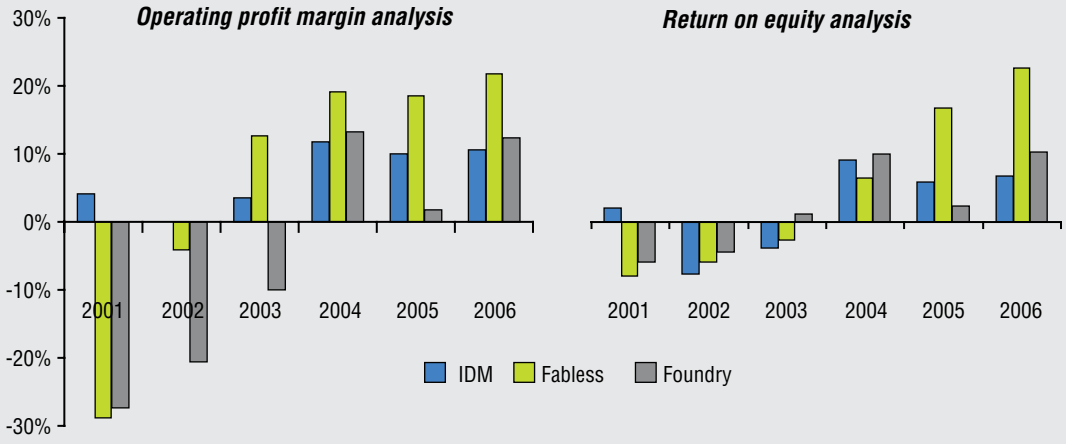
Ultimately, the increased cost of doing business will force companies to re-examine their current business models to remain competitive. Although the number of suppliers is increasing drastically – especially within the Indian and Chinese markets – the top 50 semiconductor supplier companies comprise 84.5 percent of the market.[16]

Even with so many semiconductor suppliers, the industry is so capital-intensive that it's increasingly difficult to make a significant impact in the marketplace. As a result, the number of new entrants that are significant enough to be called out by iSuppli has dropped sharply, from 25 in 2002 to just two in 2006.[17]

For the top 60 semiconductor suppliers, our analysis shows that return on equity ranged from a low of -67.5 percent to a high of 46.2 percent in 2006.[18] Operating profit margin also fluctuated widely for this group: from a low of -14.9 percent to a high of 51.6 percent.[19] During this period, sales growth for this group was the most volatile measurement of all, ranging from a low of -9.5 percent to a high of 102.2 percent.[20]

As the fabless model gains increased momentum in the marketplace, the traditional integrated device maker (IDM) model remains under pressure to transform. Since 2003, fabless players achieved higher operating profit margin than both IDMs and foundry players; in 2005 and 2006, fabless players doubled IDM and foundry players in return on equity (see Figure 3).

FIGURE 3.
Operating profit margin and return on equity analyses.



Source: IBM Institute for Business Value analysis of Thomson financial data.

Three major roles emerge for IDMs

With the imminent industry shake-out, we believe three different types of IDM players will emerge: Super Suppliers, Alliance All-stars and Market Creators (see Figure 4).

FIGURE 4.
Three emerging types of IDM players.

Super Suppliers	Self-sufficient and powerful. Super supplier can continue to operate its own game by being a big influencer in the industry.
Alliance All Stars	Suppliers that form alliances not only to create new value proposition in the marketplace, but also to fight the rising cost of R&D and manufacturing.
Market Creators	Suppliers that focus on core competencies and remain focused on differentiating their business offerings in the marketplace.

Source: IBM Institute for Business Value.

Super Suppliers – This category describes suppliers that can continue to "operate its own game" by being a big influencer in the industry. Today, Intel is the only IDM that fits this description. Unlike other IDMs, Intel has the luxury to buy up value chain players to build and strengthen its vertical integration model. Through its global investment arm, it can help shape the greater ecosystem in which it operates.

Since 1991, Intel Capital has invested US$4 billion in more than 1,000 startups in over 30 countries.[21] Two recent examples include purchasing London-based social network site Bragster for a reported US$3.5 million and making substantial investment in UK-based FREEDOM4 Ltd, formerly known as Pipex Wireless Ltd, to accelerate Intel's strategic mobile WiMAX deployment.[22]

Three types of integrated device makers (IDMs) are expected to emerge: The Super Suppliers, Alliance All Stars and Market Creators.

"We try to make sure that all the relevant players in the ecosystem are ready about the same time."

– Arvind Sodhani, president of Intel Capital[23]

Alliance All-Stars – This group consists of suppliers that form alliances, not only to create new value in the marketplace, but also to fight rising R&D and manufacturing costs. Some Alliance All-Stars are also beginning to embrace the fab-lite strategy, a model in which they no longer maintain their own manufacturing operations for components with chip structures above a specific size.

Examples of Alliance All-Stars include Freescale, IBM and Infineon, each of which is focused on nurturing collaboration with partners as a core competency. When it comes to developing new technologies, Alliance All-Stars would share the costs and risks of designing new manufacturing processes by forming alliances. The alliance approach allows each partner to later incorporate the co-designed processes into its own manufacturing environments. One major benefit of this collaborative innovation approach is that Alliance All-Stars can continue to retain competency across the entire semiconductor manufacturing value chain without having to invest in the entire manufacturing capability.

"You can't be the leader by yourself anymore. The technology is just too complicated and expensive."

– John Kelly, Sr. VP of IBM Research[24]

Market Creators – These suppliers focus on core competencies and aim to differentiate their business offerings in the marketplace. Like some Alliance All-Stars, Market Creators are beginning to embrace the fab-lite strategy and to outsource much of their manufacturing.

Given that considerable capital investment will be needed to move to 32-nm manufacturing and beyond, this "asset-light approach" is of critical strategic importance, especially to companies with strained balance sheets. As process technology becomes less differentiated, *market-specific system know-how* – an ability to understand the end-product and how different chips integrate with one another – is fast becoming the true competitive advantage.

As Market Creators focus more on design and less on manufacturing, their business models will begin to resemble the fabless model. Companies like Sony, AMD and Texas Instruments have publicly announced their fab-lite strategies; however, they have not clearly defined their new business models and transition strategies. Only time will tell which industry participants will emerge as true Market Creators.

"It's really about what the customer wants and what the end customer experience is going to be."

– Phil Hester, CTO of AMD [25]

Considering the "To fab or not to fab" question

In the 1990's, the cost of building a fab reached above the US$1 billion mark.[26] Today, it would cost a company US$5 billion or more to build 300mm wafer fabrication facilities, with additional operation and maintenance costs.[27] It is becoming increasingly non-profitable for a company to have its own fab, except in cases where a very broad product offering caters to different customer segments and the economies of scale can justify the fab's operating costs.

IDMs must not assume that having a fab is a competitive advantage. In fact, some fabless players have fared well without a fab. Unless IDMs can show that owning fabs will translate into higher profitability, they will likely face shareholder pressure to pursue fab-lite or fabless strategies.

When making this decision, some key questions for IDMs include:

1. *Investment.* Do you have the investment capacity (US$4 billion or more over two years)?

2. *Research.* Do you have in-house research capability to support on-going research in the semiconductor designs, materials and process technology needed to remain competitive?

3. *Demand volume.* Do you have the volume necessary to keep the fabs fully utilized?

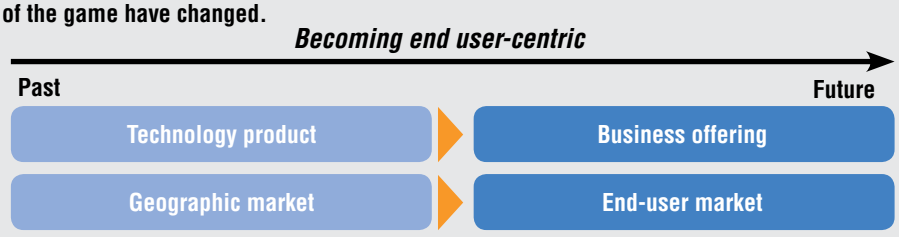
Recommendations

With the seven Cs and so much resulting industry volatility, the proven strategies of the past may bring failures in the future. For ages, innovation has been a technology-led affair, with most big breakthroughs coming out of giant and secretive research labs. It was an era when big corporations in developed countries accounted for most R&D spending.

Our study has shown that higher R&D spent doesn't help ensure better performance in terms of growth, profitability or shareholder returns. The game is changing from individual to "ecosystem" competition. No one player can make it alone. What's more, in order to tap into the next growth wave of the industry, the traditional model of focus on technology products and geographic markets will need to be make room for a new business model, which emphasizes providing the right mix of business offerings to a new set of end-user markets (see Figure 5).

As companies navigate in today's rapidly changing global business environment, their ability to shift direction and introduce business model innovation is proving to be a critical success factor. In the IBM 2006 Global CEO Study, which was based on interviews with 765

FIGURE 5.
The rules of the game have changed.



Source: IBM Institute for Business Value.

Business model innovation can happen by bringing about change to one or more of the following: the industry model, the enterprise model and the revenue model.

corporate and public sector leaders worldwide, we found that the financial outperformers put twice as much emphasis on business model innovation as underperformers. We also found that business model innovation had a much stronger correlation with operating margin growth than other types of innovation.[28]

Neither the CEOs we spoke with, nor a review of the current literature, provided a clear definition of business innovation. Nor did either reveal what type of business model innovation yields the best results. To find those answers, we conducted a follow-up study that identified three distinct approaches to business model innovation: via revenue models, enterprise models and industry models (see Figure 6).[29]

1) *The Industry Model* approach involves innovation in the "industry value chain." This can be accomplished via: moving horizontally into new industries (for example, Virgin's focus on superior skills in consumer management), redefining existing industries (such as Apple's iTunes) or developing entirely new industries or industry segments (such as Google and other search engine companies).

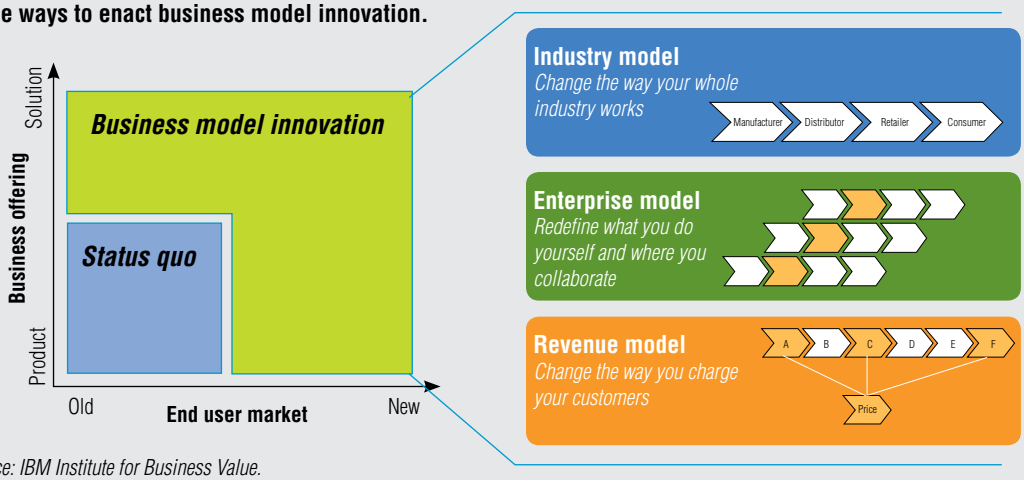
2) *The Enterprise Model* approach involves innovation in the structure of the enterprise and the role it plays in new or existing value chains. This approach focuses on redefining organizational boundaries.

3) *The Revenue Model* approach involves innovation in how companies generate revenues by reconfiguring offerings (product/service/value mix) and/or by introducing new pricing models. This approach leverages customer choice and preferences, as well as new technologies.

These approaches to business model innovation can either be used alone or in combination.

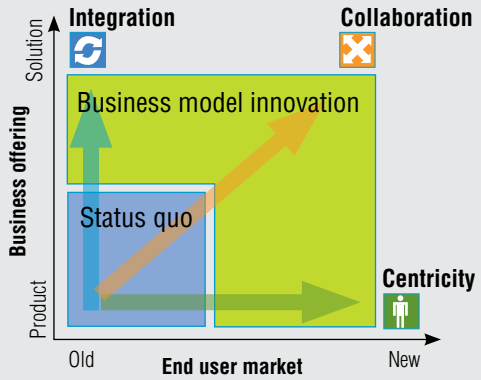
Choosing the right course of business model innovation is only one part of the equation. Business capabilities must also be developed to optimize the ability and likelihood of succeeding to innovate innovating successfully. These capabilities include the abilities to center on end-user needs, collaborate and integrate (see Figure 7).

FIGURE 6.
Three ways to enact business model innovation.



Source: IBM Institute for Business Value.

FIGURE 7.
Three key optimization areas.



Source: IBM Institute for Business Value.

Centricity: Strengthen connections with both customers and end customers

As the manufacturing of chips becomes less of a marketplace differentiator, semiconductor suppliers, especially IDMs, need to go beyond the manufacturing to understand what customers are making and demonstrate systems "know-how." To do so, the go-to-market approach needs to take a more intimate form. The traditional marketing department function of conducting marketing studies, establishing demand and developing product lines to address demand will no longer work. Instead, companies must engage with customers early on during the R&D phase and incorporate customer input throughout the product development lifecycle process.

Cultivating the ability to truly understand what customers and end users are thinking and where the market is going is important; however, cultivating the ability to transform the organization and ways to do business based on the understanding of customer, end user and market needs is the key competitive advantage. Being a customer-focused enterprise is not about just the company strategy; it is primarily about the execution.

Infineon: Becoming a customer-focused enterprise

Infineon Technologies AG engages in the design, development, manufacture and marketing of semiconductors and system solutions addressing three central challenges to modern society: energy efficiency, connectivity and security. In 2003, Infineon set out to transform from a traditional product business into a complete solutions business and focused on acquiring new competencies while continue to capitalize on its competitive advantages.[30]

To build stronger customer relationships and become a customer-focused enterprise, Infineon reorganized itself into smaller, relatively independent business units. Business units were instructed to work closely with systems makers in core market areas like cellular to resolve technology problems at the R&D level.[31] It also redefined market segments more specifically to match customer needs. For instance, Wireless was divided into Wi-Fi and Bluetooth.

By working closely with its customers, Infineon has been more successful at translating customers' ideas into actual products, systems and solutions. As a result, Infineon reached number one in power semiconductors, access products for broadband communication and in high-frequency solutions for wireless communication.[32]

Collaboration: Aim for radical collaboration by thinking and acting "big"

To meet the demanding needs of the customer while addressing the escalating financial and intellectual capital needed to remain in the business, ecosystem collaboration is no longer a luxury, but a necessity. Going it alone is not only risky but also impossible, given that semiconductor suppliers are becoming more and more dependent on multi-enterprise supply chain and fulfillment networks to meet customer needs. Therefore, to meet customer

Along with selecting the right course of business model innovation, semiconductor companies must hone essential business capabilities, including the abilities to center on end-user needs, collaborate and integrate.

needs and also stay financially viable, many companies have embraced collaborative innovation – sometimes even collaborating with potential competitors.

To establish effective collaborative capabilities, companies should focus on fully utilizing many helpful collaborative tools (for example, Web 2.0 tools) available today to enhance information sharing among ecosystems. They should also readjust company strategy and individual performance goals to make collaboration a required part of how business is done. By combining resources (both financial and intellectual), companies are no longer bounded by their own limitations. The power of many can help meet increasingly challenging industry demands.

Integration: Tighten ecosystem integration to bring differentiated value to the end customer

As end-devices become increasingly complex – for example, consider the transition from the first mobile phone (the Motorola "Brick") to smart phones like the Apple iPhone – companies rely on others in the ecosystem to integrate new technologies more effectively and provide one seamless solution for end customers. Semiconductor suppliers can no longer afford to push pre-designed chips to potential buyers. Truly addressing end customer needs requires a broader, system-focused view – a "holistic design" approach. They can no longer restrict themselves to their original core fields of expertise, and they must learn to how to integrate ecosystem style.

Different types of integration can be achieved, based on the level of financial participation and risk. The level of integration can range anywhere from adopting an arm's-length contract to pursuing M&A that helps build vertical integration capabilities. Companies should first take a deeper look at customer needs and then determine which ecosystem integration approach to undertake.

IBM: Pursuing collaborative innovation via an "open ecosystem"

IBM Microelectronics Division is a top maker of application-specific integrated circuits (ASICs) and static SRAM chips, and a major supplier of chips for communications applications, including wireless phones and networking equipment. It also offers extensive contract manufacturing, or foundry, services, through which it manufactures chips for other companies. For IBM, collaborating in an "open ecosystem" was not an option – it was matter of survival.

In 2003, IBM's Microelectronics Division had just "lost US$1 billion in 2002 and was on its way to losing US$252 million in 2003."[33] Investors wanted IBM out of the microelectronics business; however, IBM viewed keeping up with leading-edge chip technology as its key competitive advantage in the development of powerful servers.[34]

To keep up with the rising cost of technology innovation development while running a profitable business, IBM built its "open ecosystem" strategy, also known as Common Platform Alliance. Currently, IBM has an "open ecosystem" of chip R&D with three Manufacturing Alliance Partners, which include Chartered, IBM and Samsung, and four Joint Development Partners, which include Freescale, Infineon, STMicroelectronics and Toshiba.[35] This alliance has enabled the IBM division to keep generating cutting-edge technology for its servers and at the same time, make a profit despite a cyclical downturn in the chip industry.[36]

NXP: Generating new business through nurturing a struggling ecosystem

NXP, a newly independent semiconductor company (founded by Philips), focuses on providing semiconductors and associated software that aims to deliver better sensory experience in the areas of mobile communications, consumer electronics, security applications and others. As part of its growth strategy, NXP set its eyes on India's entry-level wireless handset market (such as handsets that are priced between US$60 and US$149), which is the largest wireless handset market segment in India, accounting for 40 percent of the total Indian wireless demand.[37]

To win the market share battle in this highly competitive market, NXP is working to boost the Indian manufacturing ecosystem for wireless handsets and products for new applications, such as near-field communications, mobile TVs, point-of-sale terminals, GPS navigation systems, mobile payment and fixed-wireless terminals.

Lacking a venture capital arm, it began investing in companies that will set up electronics manufacturing units in India and also are potential customers for its semiconductors. In addition, NXP hopes to boost the weak Indian manufacturing ecosystem by working with the Indian Banks Association and others to develop mobile-payment systems. It has actively engaged some Taiwanese ODMs ("Original Design Manufacturers") by providing Indian market information, helping them in field trials and validation in the country, and even hosting their travel to India.[38]

A self-assessment for chip makers

Industry participants will need to take stock of their current situation in the maturing semiconductor environment. Thinking through answers to the following questions can help companies identify ways they can begin to adapt their own business models in order to stay competitive amid great change on many fronts.

Strengthen connections with both customers and end users

- How do you segment your customers in order to understand their specific needs?
- How much user-based research does your company currently incorporate into product design and development? Why and how does this process need improvement?
- To what extent does your company's product influence a customer's buying decision?

Aim for radical collaboration by thinking and acting "big"

- How does your company view information sharing outside the organization, and what must you do to make it more feasible and more likely?
- To what extent does your company have formal or informal relationships with adjacent value chain partners? In which areas can you see the greatest need for tighter connections and communication?
- How can you build the support among your company's employees – across all levels of the business – that is necessary to enact "collaborative innovation?"

In the maturing industry, companies should assess their current situation in order to look beyond the expected benefits of Moore's Law, and plan to make innovative business model changes that can optimize their capabilities.

Tighten ecosystem integration to bring differentiated value to the end customer

- How much of the value chain does your company perform directly, versus relying on others?
- How well does your company understand the economics of each part of its operations?
- What is your company's plan to foster a strong reputation for working fairly with business partners?

Conclusion

The effects of the seven Cs are forcing semiconductor players to move away from traditional business models and re-evaluate what industry roles can offer the greatest returns. The old race of smaller, faster, cheaper every two years alone will not ensure success any more. To achieve sustained competitiveness, they'll need to look beyond the expected benefits of complying with Moore's Law, and make innovative business model changes that can optimize their capabilities, particularly in the areas of customer centricity, collaboration and integration.

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