High-Tech Industry: The Road to Profitability Through Global Integration and Collaboration

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In the 1980s, the Japanese referred to semiconductors as the "rice of life," implying that the electronics industry was the foundation for achieving sustained economic growth and improvement in standards of living—much as rice has served as a staple of Asian diets over the ages. Today, semiconductors, software, and electronic devices have become pervasive across the globe, serving many needs in diverse business and consumer markets.

Despite this, however, the high-tech industry faces challenges of growing significance. Consistently delivering new products that customers like and want, increasing revenue growth and profitability, and efficiently managing a global operation are just a few of today's top-of-mind issues for high-tech CXOs. Consider the following trends:

- Long-term growth rates for the semiconductor industry have been revised downward, from approximately 10 percent in 2006 to about 6 percent today.[1] The current, difficult economic conditions suggest that semiconductor chip sales in 2009 are likely to decline below 2008 levels.

- Competitive advantages gained from innovations are increasingly short-lived. The transition from analog to digital technologies in the mid-1990s shrunk product lifecycles dramatically—from 24-plus months to less than nine months in some cases[2]—and made it easier for new products to be duplicated.

- The competitive, price-sensitive consumer electronics segment—rather than the more predictable business segment—increasingly dominates the industry, accounting for almost 70 percent of semiconductor output.[3] Even firms such as Intel have begun to refer to themselves as consumer product companies.[4] This shift makes demand forecasting for new products more difficult than ever.

- Globalization has also introduced a change in the customer mix. Emerging economies, especially in Asia, are now significant markets for electronic devices.[5] Localizing products for the Chinese and Indian markets, for example, is yet another challenge for high-tech manufacturers.

1. Gartner, 2006; "Gartner Halves 2008 Semiconductor Market Growth Estimate," Suzanne Deffree, *Electronic News*, March 3, 2008; TSMC 2007 Annual Report.
2. "Sony vs Samsung: The Inside Story of the Electronics Giants' Battle For Global Supremacy," Sea-Jin Chang, Wiley, August 2008.
3. "Application-Specific ICs: Future Industry Trends, In-Stat MDR," Jerry Worchel, Synopsys.com, 2007.
4. "Intel's Maloney on WiMAX, Notebook Challenges," news.cnet.com, September 16, 2008.
5. According to IC Insights, the communications IC market in the Asia-Pacific region is more than three times that of the Americas region (IC Market Drivers, 2008).

- Costs and risks associated with developing new products continue to increase. The estimated cost to build a new 450-mm semiconductor wafer factory is almost $10 billion—triple the price of a 300-mm wafer factory.[6]

- Electronic devices are also growing more sophisticated every year and require integration of many hardware, software, and service components into differentiated products. Companies, therefore, must collaborate with many ecosystem partners to achieve this integration.

Based on its work with multiple customers in the high-tech manufacturing sector, the Cisco Internet Business Solutions Group (IBSG) believes that these companies will need to assess and improve their business capabilities to address the challenges described above. Ongoing, effective collaboration among globally dispersed employees, and with external organizations, must become a routine way of working in all functions—from product development and supply-chain management to marketing, sales, and service management. Improved capabilities will be required to ensure that accurate business information is provided in a secure, timely, and personalized way to any decision maker who needs it—anywhere, and on any device. Geographically far-flung operations that once operated semi-independently from headquarters and each other will now need to work in a synchronized manner so that companies can operate as a single, integrated global enterprise, capturing benefits from scale economies and yet retaining agility to respond to local market requirements.

Successfully implementing new capabilities will require visionary leadership; executive sponsorship; a willingness to invest, experiment, and learn new technologies; and a culture that encourages action and change. Information and communications technology (ICT) will play a critical role in enabling new operating models based on global integration and effective collaboration.

## Five Key Trends and Implications for Integration and Collaboration

Global Diversification

The high-tech industry is among the most diverse and global industry sectors, encompassing semiconductors, consumer electronics, software, electronic manufacturing services, industrial electronics, and other categories (see Figure 1). High-tech clusters have emerged in places as diverse as Silicon Valley, Munich, Taiwan, Bengaluru (Bangalore), and Singapore. Talent is spread globally, and each cluster has developed its own source of comparative advantage (for example, semiconductor manufacturing in Hsinchu Science Park, Taiwan; nanotechnology clusters in France, Germany, and Japan; and software development in Bengaluru). Even within a single company, the value chain is geographically fragmented. At Intel, for example, integrated circuit design is completed in the United States and software development may be done in Bengaluru. Wafer manufacturing is conducted in the United States, Israel, and Ireland. Assembly, packaging, and testing may be done in Malaysia or Vietnam, and the customer may be in Taiwan.

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6. "TSMC May Raise Prices for High-End Chips," Baker Li, Reuters, May 27, 2008.

This diversification and fragmentation has resulted in more complex processes, systems, and organizational structures. Improved integration and synchronization of global operations and effective utilization of scarce resources are top priorities at many companies.

Figure 1. The High-Tech Ecosystem
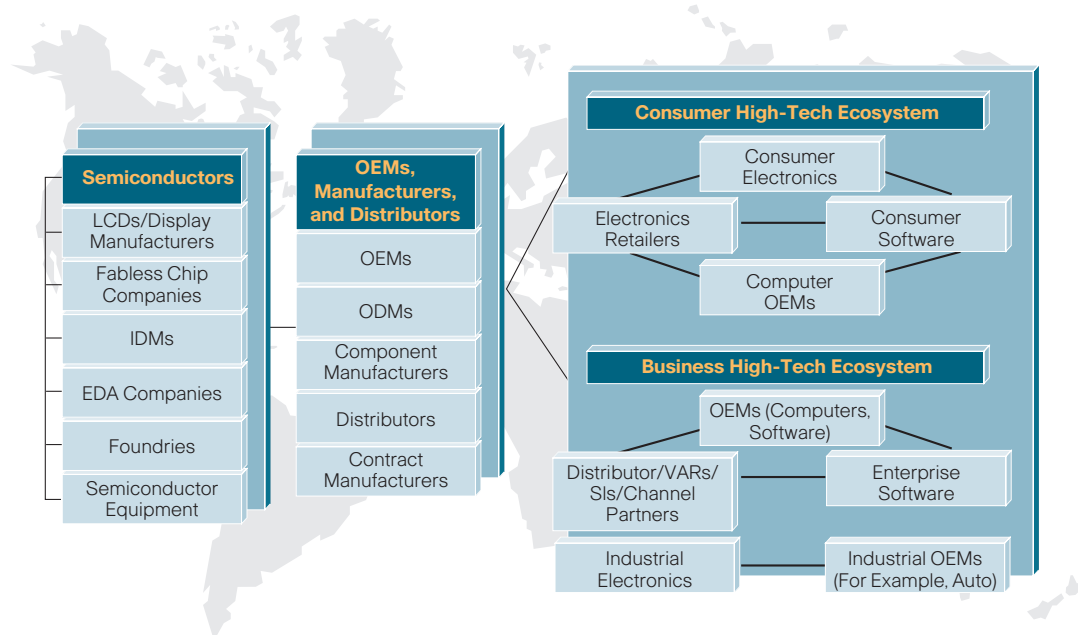
Connectivity-Based Business Models

Product-based success in the high-tech industry has been short-lived.[7] The success of high-tech companies today increasingly depends on providing services, content, and Internet connectivity around their products. Examples range from consumer gaming devices and Blu-ray DVD players to expensive MRI machines, "smart" electricity meters, and semiconductor wafer fabrication equipment. This trend is likely to accelerate with the forecast growth of "cloud computing" applications.[8] Internet connectivity has improved integration among OEMs, service providers, and customers, and has enabled efficient monitoring and support, remote software upgrades, better spare-parts logistics, usage-based billing, and insight into how a product is used. Communications service providers such as AT&T and others are offering new services (for example, home monitoring services) to consumers based on a "Connected Life" concept.[9]

Still, apart from a few well-known examples (such as Apple iTunes, and mobile phones in general), most high-tech companies have not quite figured out how to build a profitable business around Internet connectivity of their products. Many business model-related challenges need to be addressed, as described in Table 1.

7. "The Dangers of Product-Driven Success: What's the Next Growth Act?" Adrian Slywotzky and Richard Wise, Mercer Management Consulting, 2003.

8. See "The Big Switch: Rewiring the World, from Edison to Google," by Nicholas Carr (W.W. Norton & Co., 2008) for an excellent discussion on this topic.

9. "Connected Life: Transforming Service Providers into Experience Providers," Cisco Internet Business Solutions Group, February 2007. Connected Life is based on a convergence of communications, devices, applications, and content to provide new connected experiences (education, information, entertainment, etc.) to consumers anytime, anywhere, and on any device.

Table 1. Issues for Consideration in Developing a Connectivity-Based Business Model

Challenge	Description
Value proposition	· What are the tangible benefits of Internet product connectivity to customers? · What is the incentive for customers to allow Internet connectivity to their assets? · How will Internet connectivity help differentiate from the competition?
Reliability	· How reliable are services offered through Internet connectivity?
Security	· How secure is customers' data? How will customers control and manage access to their assets?
Complexity of the solution	· How simple is the Internet connectivity solution to install and maintain? · Will it require special software (e.g., software agents) to be installed on the product? · Is the solution interoperable with older, "legacy" products (current install base)? · Will it require the customer to buy additional hardware? · Who will manage and maintain connectivity over the product's lifecycle?
Intellectual property protection; ownership of proprietary content	· How will the customer receive compensation for any proprietary content that is shared?
Intellectual property ownership	· Who will have ownership of any new ideas/innovations that result from a connectivity-based business?
Network bandwidth	· Will there be adequate network bandwidth to support Internet connectivity applications that include interactive, high-definition video? (This is an issue in emerging economies such as India and China.) · What is the cost of this additional bandwidth?

Source: Cisco IBSG High-Tech Manufacturing Practice, 2009

Companies such as Applied Materials, FEI Company, Fujitsu Siemens, and Philips Healthcare are exploring ways to improve their current remote-connectivity-based service models by addressing some of the challenges described above.

Going forward, high-tech companies will need to take this connectivity-based business model further and build ecosystem communities centered on their products to harness the collective intelligence of community members for innovation and profitable growth. This will require investments in appropriate Web 2.0, security, and collaboration technologies.

Consumer Dominance

The consumer segment, which accounts for 70 percent[10] of semiconductor output, now impacts every company along the high-tech value chain. The implications are significant: The consumer electronics market is extremely competitive and price-sensitive. The transition to digital technology has resulted in modular designs and the use of ASSPs[11] (application specific standard products) for integration into platforms for branded devices. As a result, the device design cycle and pace of innovation have accelerated to avoid commoditization and loss of market share.

Demand forecasting in consumer electronics is very difficult—success or failure of a new product depends upon fickle consumer tastes, fashion trends, actions of competitors, promotions, seasonality, and availability of complementary services and content. Often there is no historical demand data upon which to base forecasts. The need for effective, real-time collaboration across the value chain and on a global scale has become critical, from upstream design activities (such as reuse of intellectual property and standard components) and manufacturing (ramping up production to meet demand spikes), to downstream consumer demand management (by using visibility to early sales information, real-time demand, and inventory data to revise forecasts on a weekly basis).

Ecosystem-Based Innovation

Innovation is the lifeblood of a high-tech company. As mentioned before, rapid product commoditization is a constant challenge for high-tech companies.

Results from a recent survey conducted by the Consumer Electronics Association indicate that most new product innovations are duplicated within one year.[12] Spending on innovation has increased, but many companies are dissatisfied with the return on innovation investment.[13] Companies are increasingly dependent on partnering within the industry ecosystem to develop and introduce new products because of the increasing complexity of new products (software, embedded systems, digital content, and specialized components), fast time-to-market requirements, the need for flexibility to make changes rapidly along the product development cycle, and regulatory requirements that vary by country. The ability to collaborate effectively—both internally among functions and geographic locations, and externally with ecosystem partners—is high on executives' list of priorities.

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10. "Application-Specific ICs: Future Industry Trends, In-Stat MDR," Jerry Worchel, Synopsys.com, 2007.

11. "Semiconductor Industry Trends: Increasing Market Complexity Drives Need for Collaboration and CRM," Mario Morales, IDC Analyst Connection, November 2007. Examples of ASSPs include various microcontrollers, digital signal processors, biometric sensors, and other System-on-Chip (SoC) solutions.

12. "The Business of Consumer Technologies: What the Future Holds," Shawn Dubravac, www.CE.org

13. "Innovation 2008: Is the Tide Turning?" The Boston Consulting Group.

Company examples include Nokia and TSMC. Nokia has developed a network of nine satellite design studios in various target geographies such as Brazil, China, and India. Design teams collaborate with local partners (for example, Shristi in India) as well as across the global studio network to develop new lines of phones.[14] TSMC recently announced an "Open Innovation Platform" to improve collaboration among customers, EDA (electronic design automation) software vendors, and chip architecture IP providers. TSMC hopes to make it easier for customers to access various design tools, foundry data, and factory process models to accelerate chip design cycle time and improve time to market.

To collaborate effectively with ecosystem partners, companies need to:

- Integrate and rationalize disparate collaboration tools for simplification and ease of use
- Implement tools suitable for secure internal and external collaboration
- Personalize tools for better alignment with roles and jobs
- Deploy technology enablers for the capture and dissemination of new insights and knowledge

Complex Supply Chains

High-tech industry supply chains span the globe and often include thousands of suppliers, manufacturers, logistics companies, and other participants. Product variety is also high, ranging from "build-to-stock," fast-moving consumer electronics goods sold through retailers such as Best Buy, to "engineer and configure to order" high-end systems sold through a lengthy, consultative process. Rising oil and commodity prices, emerging markets, new competitors, and other factors are forcing many companies to rethink their supply-chain strategy.

Matching supply and demand in each market and product segment, while balancing costs with customer service objectives, is an extremely complex activity. Sales and operations planning may now include teams of geographically and organizationally dispersed people who need to analyze a significant amount of information and collaboratively make decisions on supply-chain plans. Information accuracy and visibility are critical to effective collaboration in both planning activities (such as demand and supply planning) and execution activities (such as customer order fulfillment and inventory replenishment). The ability to make accurate, up-to-date information available in a timely manner to the right decision makers is essential for achieving excellence in supply-chain management.

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14. "Nokia's Global Design Sense," *BusinessWeek*, Inside Innovation, August 2007.

A Business Capability "Trifecta"

Cisco IBSG believes that high-tech companies would benefit from assistance with three important challenges:

- **Complexity in global processes, systems, and organizational structures.** If not managed, complexity increases costs, dilutes scale, and lowers agility in response to changing market conditions.

- **Developing differentiated and profitable business models around remote connectivity.** Most high-tech companies have not figured out how to build a differentiated and profitable business around remote connectivity of their products (beyond providing remote diagnostics and basic break/fix services).

- **Harnessing the ecosystem's capabilities for competitive advantage.** Companies are looking to develop capabilities for collaborating effectively with the ecosystem across the business—from innovation and product development to marketing, supply-chain management, and customer service.

Significant benefits are at stake, as summarized in Table 2.

Table 2. Capabilities for Profitability and Growth

Capability	Benefits
Manage complexity and build both scale and speed advantage	· Reduced costs and increased profitability through more efficient business processes · Improved customer satisfaction · Global integration · Improved employee morale and productivity (employees can be more effective at their work) · Better quality of management decisions
Create profitable new business models based on remote product connectivity	· Improved customer intimacy · Efficient scaling of employee capabilities · Reduced cost of service delivery · Differentiation from competition · Enhanced innovation capability · Improved linkages within the ecosystem
Effectively apply distributed expertise and knowledge to projects and business situations anywhere in the world	· Better utilization of business ecosystem relationships · Enhanced innovation capability · Improved ability to scale and increase speed of market/event response · Greater ability to share and disseminate knowledge

Source: Cisco IBSG High-Tech Manufacturing Practice, 2009

ICT—Enabling Global Integration and Collaboration for Profitability and Growth

Information and communications technology (ICT) will be critical in assisting businesses to address the challenges described above. Advanced and emerging networking technologies provide a platform for companies to build new business capabilities based on integration of global processes and operations, secure and effective collaboration, and timely access to the right information.

Economies of scale in a global operation can result from (a) scaling of resources, especially subject-matter experts, to increase revenue without a proportional increase in costs; (b) applying ecosystem partner capabilities—sourcing the best partner capability in any given geography without a proportional increase in costs; and (c) consolidating and centralizing business information and enabling secure access to anyone who needs it.

"Speed advantage" results from enabling better and faster management decisions in business processes, which, in turn, result from improved access to key people, better collaboration capabilities, and timely access to the right information.

Cisco, for example, is using collaboration, video, and virtualization technologies to apply its distributed assets (people and information) quickly to specific needs (customer, project, or event) anywhere in the world. Newer technologies allow Cisco to capture economies of scale while demonstrating agility in response to customer and market requirements.

Cisco's i-zone and I-Prize programs, and Dell's Ideastorm community website,[15] demonstrate how companies are using connectivity and Web 2.0 technologies to harness the extended ecosystem for innovation.

Table 3 summarizes the impact of applying ICT to manage complexity in global operations, build connectivity-based business models, and harness capabilities of the ecosystem.

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15. Cisco's i-zone is an open wiki for employees to post and seek ideas, as well as to receive the latest information on Cisco innovation. I-Prize is based on a version of i-zone that was opened to the general public for a contest to capture the best ideas for commercialization. Please refer to http://blogs.cisco.com/innovation/ and http://www.cisco.com/web/solutions/iprize/index.html for more information. Dell's Ideastorm (www.ideastorm.com) is a website and online community that allows registered users to add ideas and promote or comment on existing ideas. Both are examples of social networking tools being used by companies to tap into the collective wisdom of communities for innovation.

Table 3. ICT as an Enabler of Profitability and Growth

Opportunity Area	Requirements	Applicable ICT	Business Impact
Complexity · Processes · Systems · Organization	· Ability to reach the right people and information (internal and external) at the right time · Simple, personalized, easy-to-use tools and collaboration methods · Ability to share and disseminate experiential knowledge effectively	· Core routing and switching products · Unified communications · Web-based conferencing and collaboration solutions · Telepresence · Digital signage and other business video applications · Next-generation data center architectures based on virtualization technologies	· Reduced costs and increased profitability through more efficient business processes · Improved customer satisfaction · Global integration · Improved employee morale and productivity (employees can be more effective at their work) · Better quality of management decisions
Connectivity-based business models	· Reliable and secure connectivity to end-customer assets · Flexible connectivity configuration based on end-customers' needs · Scalable connectivity solution across the ecosystem	· Core routing and switching products · Information and network security · Ethernet-to-the-Factory · Telepresence · Web-based conferencing and collaboration solutions · Unified communications	· Improved customer relationships and service · Efficiently scaled employee capabilities · Reduced costs of service delivery · Differentiation from competition · Enhanced innovation capability · Better linkages within the ecosystem

Table 3. ICT as an Enabler of Profitability and Growth (Continued)

Opportunity Area	Requirements	Applicable ICT	Business Impact
Harnessing capabilities of the ecosystem for competitive advantage	· Ability to securely and reliably communicate and interact with ecosystem on global basis · Ability to organize and centralize information for accuracy and easy access · Ability to reach the right people and information (internal and external) at the right time · Simple, personalized, easy-to-use tools and collaboration methods · Ability to share and disseminate experiential knowledge effectively · Enhanced innovation capability	· Core routing and switching products · Service-oriented network architecture · Advanced security solutions · Advanced mobility solutions · Unified communications · Advanced video solutions · Web-based conferencing and collaboration solutions	· Better utilization of business ecosystem relationships · Enhance innovation capability · Greater ability to scale and increase speed of market/event response · Increased ability to share and disseminate knowledge

Source: Cisco IBSG High-Tech Manufacturing Practice, 2009

Next Steps/Getting Started

Companies can get started on developing a capability deployment roadmap for integration and collaboration by following a structured approach:

- Assess and prioritize business needs and identify specific "pain points" related to global business processes, employee productivity, global operations, product development, and customer relationships.

- Clearly articulate objectives. Is the objective, for example, to improve the ability of globally dispersed product development teams to collaborate? Or is it to build capabilities that will improve the utilization of expert customer support engineers? Or perhaps the objective is to simplify how a global customer can place an order to be fulfilled anywhere in the world.

- Analyze the current state, including developing an understanding of baseline costs, metrics, process performance, organizational culture, and potential sources of resistance to change.

- Understand and analyze the organization's receptivity and readiness to accept new technologies that will change how work is done, alter roles and responsibilities, and require employees to develop new skills.

- Define the required business and technological capabilities. A business case typically guides prioritization in implementation of capabilities.

The recommendations required to address the challenges described will always be accompanied by changes in corporate culture, mindset, and ways of working. As with any transformation effort, executive sponsorship and cross-functional (IT and business) participation are essential during the entire effort. Another important factor to keep in mind is the ease of use of recommended technologies. If a new technology is not easy to use or accessible when and where employees need it, then user adoption will not be adequate and the change effort will be at risk of failure.

Complexity in global operations, intense competition for acquiring and retaining customers, increased costs of innovation, and the need for increased speed in conducting business all have made it difficult for high-tech companies to sustain profitable growth year after year. Advanced ICT offers great potential for enabling companies to address emerging business challenges. Next-generation data centers and converged IP networks today enable secure, high-quality voice communications, on-demand and real-time video, timely and accurate data availability, and improved workforce productivity—capabilities that can be configured to meet a company's unique business requirements. Benefits from successful implementation of technology enablers will put high-tech companies firmly back on the road to profitability and growth.

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More Information

The Cisco Internet Business Solutions Group (IBSG), the global strategic consulting arm of Cisco, helps CXOs and public sector leaders transform their organizations—first by designing innovative business processes, and then by integrating advanced technologies into visionary roadmaps that address key CXO concerns.

For further information about IBSG, visit http://www.cisco.com/go/ibsg