White Paper

Transforming China's Electronics Industry

A Roadmap for Increasing Business Value Through Collaboration and ICT Integration

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Executive Summary

Since the subprime mortgage crisis erupted in late 2007 in the United States, the global market for electronics products made in China has decreased significantly. The crisis also triggered massive factory shutdowns and increased unemployment in many coastal Chinese cities. The Pearl River Delta, a major manufacturing center in the Guangdong Province of the People's Republic of China, was hit especially hard.

As a result, senior-level government officials, strategists, and enterprise business executives in China are working to transform the country's manufacturing industry. First, they must address many questions: How can China formulate favorable government policies and invest adequately in a stimulus package to support targeted industry transformation? How can China encourage effective government, industry, and academic partnerships to enable timely transformation? How can China use advanced technologies to enable effective transformation?

These questions present major challenges to both government and enterprise organizations. To promote sustainable prosperity, industry and government leaders must move from a low-wage, production-centric model to one that emphasizes higher wages, innovation, and customers.

In this white paper, the Cisco® Internet Business Solutions Group (IBSG) analyzes current manufacturing challenges in China, along with capabilities required throughout the electronics industry value chain to support effective transformation. In particular, three collaborative business models are discussed: *production*, *innovation*, and *customer value*. Based on these models, opportunities exist to create new collaboration capabilities internally and throughout the value chain supported by Web 2.0.

In addition, the paper defines key benefits of selected value chain collaboration solutions and recommends how to design and deploy information and communications technology (ICT) architectures critical for ensuring effective collaboration.

Manufacturing Challenges in China

China: A Global Manufacturing Powerhouse by Volume, Not Value

In 2008, manufacturing accounted for less than 50 percent of China's gross domestic product (GDP), compared to less than 18 percent of GDP in the United States.[1] Foreign companies have invested billions of dollars in manufacturing, primarily for product export.[2] While Guangdong accounts for less than 12 percent of China's economic

output, the province accounts for more than 25 percent of China's foreign trade.[3] To compete, Chinese manufacturers rely on a business model of low-cost labor and thin margins. This model has enabled China to attract direct foreign investment, thereby increasing jobs and developing industrial zones along China's coast. This strategy, however, is not sustainable because it does not support long-term economic and cultural growth and environmentally friendly development. Because of this, innovation has suffered.

The industry's ratio of value-add—including component design, supply chain and global logistics integration, and customer service—to gross output in China is less than 25 percent compared to 35 percent value-add in the United States.[4] Profit margins are low and are increasingly under pressure due to the economic downturn. China has eight times less economic output per industrial laborer than the United States. Similarly, China's industrial output per laborer is four to seven times less than that of Japan, Korea, and Taiwan (other export-oriented manufacturing societies).[5]

Innovation: Moving Up the Global Value Chain

China's manufacturing industry focuses on basic R&D, scientific discovery, and technological inventions. Operational innovation in key areas such as supply chain/customer-value management is not a major focus. Technological innovation to promote internal and external collaboration across enterprises is still in the early stages of development.

China's investment in R&D has grown significantly over the years, but remains low as a percentage of GDP when compared with other developed economies. The government, therefore, established aggressive targets for innovation. From those targets, a set of growth objectives was created from 2006 through 2020:

- Increase GDP R&D investment from 1.2 percent to 2.5 percent
- Increase science and technology contribution from 39 percent to 60 percent
- Reduce dependence on foreign technology from more than 50 percent to less than 30 percent
- Increase China's patent ranking to the top 5th percentile worldwide; today, 75 percent of countries are earning more patents than China

Investing in China: Best Practices of Multinational Corporations

R&D investment strategies of foreign multinational corporations (MNCs) provide a valuable reference for developing innovation capabilities within China's manufacturing industry. Using investment dollars appropriately will help position the industry and quicken its transformation. Foreign MNCs typically take a three-phased R&D investment approach in China, according to analysis from PRTM, Inc., a U.S.-based management consulting firm.

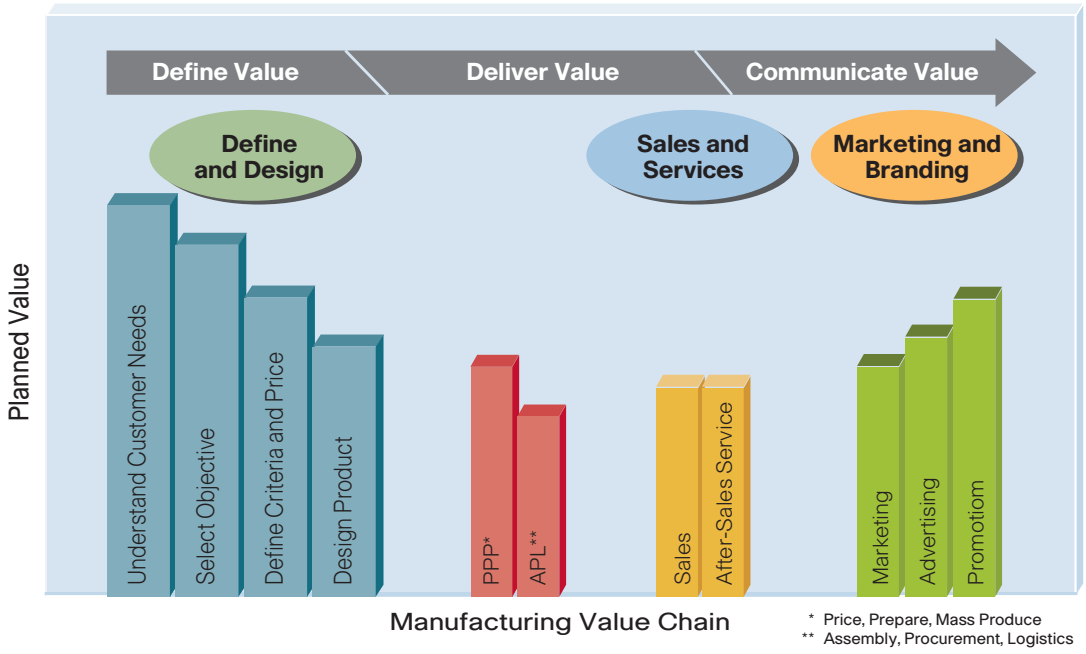
1. Phase 1 is **cost efficiency**. During this phase, foreign MNCs focus on selling products locally from their existing product portfolios. The main objective is to achieve cost savings in engineering, testing, and quality management, while enjoying tax benefits and government incentives.

2. Phase 2 is **maximizing local value**. During this phase, MNCs sell differentiated and new products designed for the Chinese market. One key benefit is increased penetration of localized products; another is that MNCs use the same basic designs to develop products for markets outside China, such as Europe, Japan, and the United States. While this model serves multiple markets, key resources and contributions stem from China. Assessing local and global talent during Phase 2 is a key differentiator in improving resources and productivity for better global collaboration.
3. Phase 3 is **global innovation**. In this phase, MNCs focus on local talent and breakthroughs in technology and platforms to create products for the global market. Income from local patents other than those created to improve China's manufacturing processes is critical during this stage. It is also during Phase 3 where R&D teams should contribute 20 percent to 30 percent of time-to-market (TTM) improvements for global R&D projects.

Responding to the Paradigm Shift

The global manufacturing industry is changing value chain profit margins by placing increased pressure on Chinese-based manufacturers to alter their current business models from low-cost, low-margin to an approach that supports innovation and collaboration along the value chain. Figure 1 details the global manufacturing value chain. Value varies, depending on which phase of the process the manufacturer is in. For example, "assembly production logistics (APL)" generates the least amount of value, compared with "promotion."

Figure 1. Value Proposition Along the Entire Manufacturing Chain

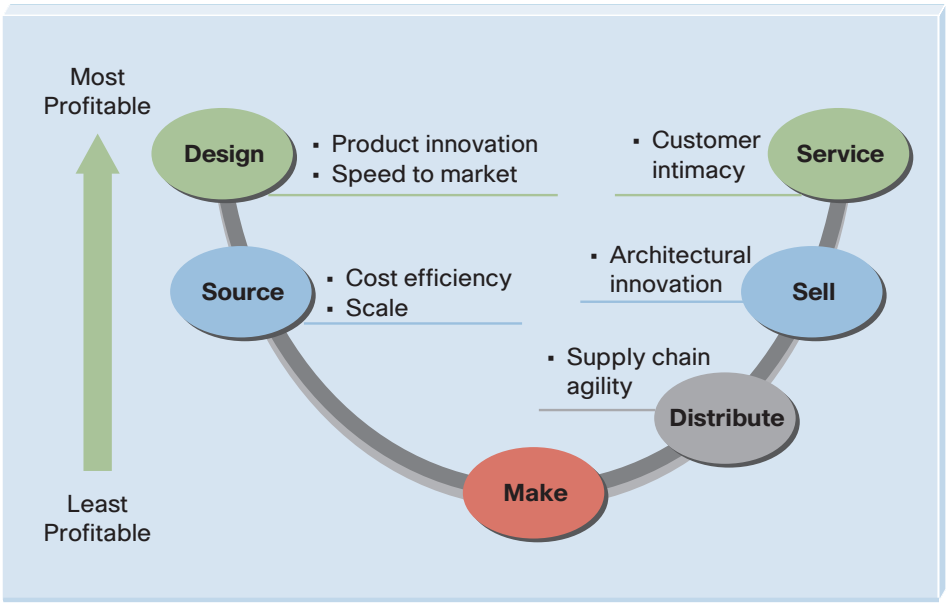


Source: Analysis from Cisco IBSG and McKinsey & Company, Inc., 2009

Due to the global recession and continuous paradigm shifts in manufacturing, long-term growth in China's manufacturing sector is forecast to shrink from 12 percent in 2008 to 8 percent in 2009, with margins under continued pressure, according to research from PRTM. Chinese manufacturing companies are small in comparison to their global counterparts. According to PRTM, there are only 29 Global Fortune 500 manufacturers in China compared to 37 in Germany and 153 in the United States.

Challenges in regard to strategy and execution—especially in R&D, product lifecycle management (PLM), and access to intellectual property—remain critical. Chinese manufacturing companies must move up the value chain in terms of design and customer experience (often referred to as customer-value management). Using the "smile curve" hypothesis,[6] Figure 2 illustrates how companies can increase this value through innovation in the areas of components/parts design and solutions/services. More profits are derived from these areas, whereas fewer profits are derived solely from making product.

Figure 2. Industry Value Chain Profit Curve



Source: Cisco IBSG, with input from "Sony vs. Samsung: The Inside Story of the Electronics Giants' Battle for Global Supremacy," Sea-Jin Chang, John Wiley & Sons, Inc., 2008

Organizational Barriers to Change

Companies structured in a "siloed" fashion—business units operate independently or under different leadership, or are dispersed across geographies—hinder collaboration and holistic processes. Many parts of the electronics manufacturing value chain in China operate in this manner, focusing on low-cost manufacturing processes and standard components instead of innovation.

In addition, manufacturers lack state-of-the-art capabilities in ICT and collaboration technology, along with cross-functional collaborative experience in product lifecycle management, R&D, production, supply chain management (SCM), sales and service, and marketing and brand management.

Collaboration Issues Within the Electronics Value Chain

Many issues regarding the value chain may potentially emerge, impacting manufacturing revenue and GDP in China and surrounding regions, such as Taiwan, Korea, and Japan:[7]

- **Product design:** low product-launch success rate, ongoing product quality issues and defects, and high design and collaboration costs
- **Sourcing and procurement:** few supplier collaboration capabilities to build strategic sourcing relationships, and fewer value-add procurement practices
- **Manufacturing and logistics:** limited visibility into shop-floor processes, inventory across the value chain, and SCM; lack of wireless connectivity for data capture
- **Order fulfillment:** decrease in salesforce productivity, slow response to urgent customer queries, missed cross-sell or up-sell opportunities, and deficient order delivery status
- **After-sales service:** delays in problem resolution, high call center costs, and an increase in service issues and return material authorization costs

These issues will affect inventory carrying costs—from raw materials to finished goods—along the value chain. Once inventory is reduced, costs will lessen, too. Inventory reduction can be achieved through better visibility and control of the value chain. By using a global collaboration platform, a large Chinese contract manufacturer, for instance, could manage inventories better by making decisions together with key component suppliers (based on real-time market demand) and conducting iterative forecasts to support design, procurement, and order-fulfillment processes.

Collaborative Business Models Require Different Capabilities

Success based only on product cannot support sustainable growth.[8] The success of China's electronics industry depends increasingly on providing converged product, content, and services on a connected and collaborative platform. Three fundamental business models[9] are operating in the Greater China region:

1. **Production-centric collaboration—**procurement, planning, manufacturing operations, quality management, logistics, and fulfillment
2. **Innovation-centric collaboration—**R&D, product development, lifecycle management, and integration across innovation, manufacturing, and customer service
3. **Customer-centric collaboration—**customers' needs, product design, marketing and segmentation, brand management, demand planning, capacity optimization, order management, billing, after-sales service, and customer-value performance metrics and reporting

Opportunities To Create New Collaboration Capabilities

Internal Collaboration Supported by Web 2.0

Preliminary evidence, based on conversations between Cisco IBSG and a large electronics manufacturer, indicates that product development and supply chain integration could drive innovation and business value. Business strategy and product-line planning must align with supply chain strategy and planning. New product development and introduction must support strategic sourcing and supply chain design. Product lifecycle management must integrate closely with supply chain execution. Collaboration—from strategy and development to execution—requires proper organizational design, with support for data management and systems integration efforts. In other words, collaborative product development and supply chain execution can supercharge a company's innovation engine, with greater value derived from working together than from working in isolation.

Value Chain Collaboration Supported by Web 2.0

Recent developments in connectivity and collaboration capabilities have increased efficiency throughout the value chain and decreased transaction costs. This has led to stronger collaboration among ecosystem partners, supported by outsourcing of extensive business processes, applications, and infrastructures. Cisco IBSG identified a number of additional opportunities that will enable manufacturers to apply collaboration-based capabilities to the supply chain:

- Web-based communities/hosted services, such as social networks, wikis, and blogs
- The Internet as the computing platform
- Internet-related services as valuable tools for customer relationship management and sales-related activities. eBay, Yahoo!, Alibaba-Taobao, and Baidu are examples of such services.
- Connecting operations through global sourcing and production, modern logistics, SCM, and more to facilitate current global sourcing of production resources and help Greater China enterprises become worldwide production centers
- Performing product design and service capabilities on an innovative collaboration platform with other business partners. By effectively applying collaborative technologies, companies can control value and growth within the value chain.

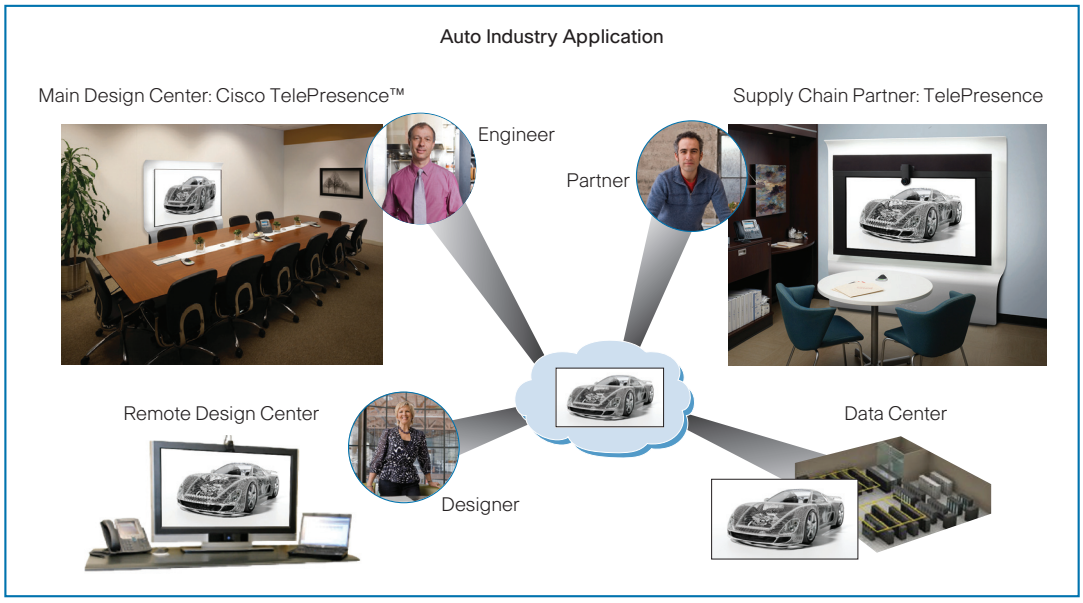
Collaboration Solutions

Chinese electronics companies operating under the three business collaboration models described earlier should consider adopting the following collaboration *solutions* to meet their objectives:

1. Production-centric—secured wireless platform; real-time video supported by unified communications technology; video telephony to improve internal order tracking and problem resolution processes, and to enhance quality management

2. **Customer-centric—**integrated audio-, video-, and web-conferencing platform to collaborate with customers and ecosystem partners, providing timely order fulfillment and better customer service.
3. **Innovation-centric—**product lifecycle management, remote visual networking (real-time and 3-D visualization), telepresence, security, and virtual-team-meeting capabilities based on an IP network that enables users to locate experts both in-house and throughout the value chain, share knowledge, and solve problems. This type of model could transform global R&D interactions (see Figure 3) by enabling designers to collaborate on CAD models remotely and in real time, while the full data set remains secure.

Figure 3. Innovation-Centric Collaboration Based on Deep Computing Virtualization (DCV) Technology



Source: "Deep Computing Virtualization," Cisco Solutions, 2008

ICT Architecture Supports Effective Collaboration

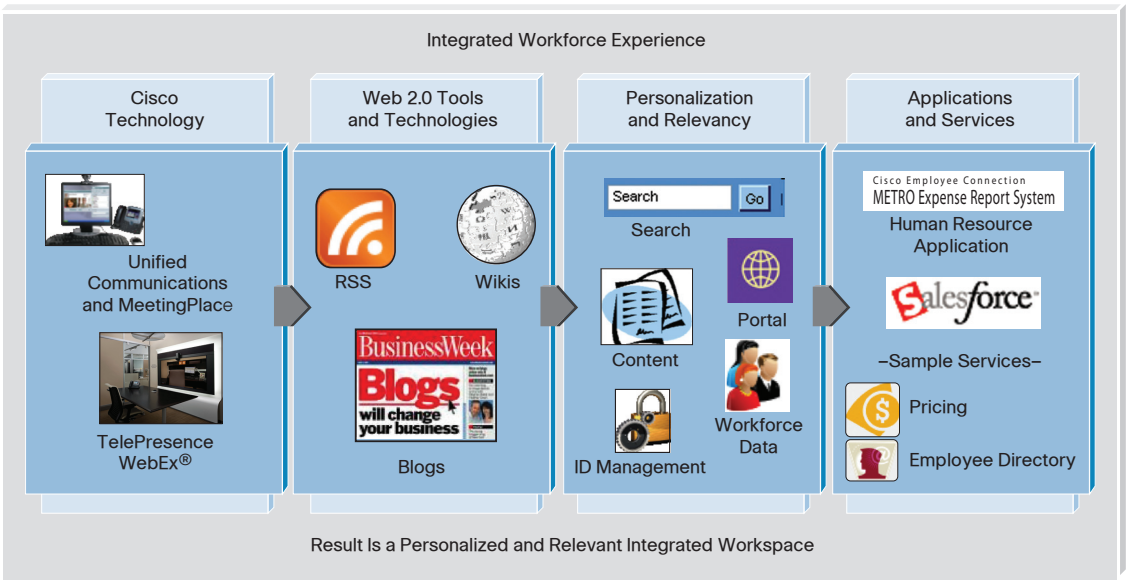
The importance of value chain collaboration has increased due to effective ICT infrastructures and solutions being adopted in China. Chinese enterprises must develop proper ICT roadmaps to support ongoing transformation. Cisco IBSG recommends the following steps to effectively design ICT architectures and deploy ICT-enabled business capabilities:

- Align business and IT using ICT as a strategic enabler
- Engage CIOs as strategic partners in transforming, not managing, the cost center
- Extend the value chain by including partners and suppliers in ICT planning and implementation
- Adapt business processes with innovative ICT capabilities to create innovative business models

- Define business and ICT architectures to link required business, IT, and network capabilities
- Embrace Web 2.0 technology to create collaborative communities

A next-generation collaborative ICT architecture can transform Chinese enterprises from production-centric to customer- / innovation-centric. The result is an integrated workforce that can collaborate effectively with ecosystem partners along the value chain (see Figure 4).

Figure 4. Integrated Workforce Experience (IWE) Supported by Cisco Architecture



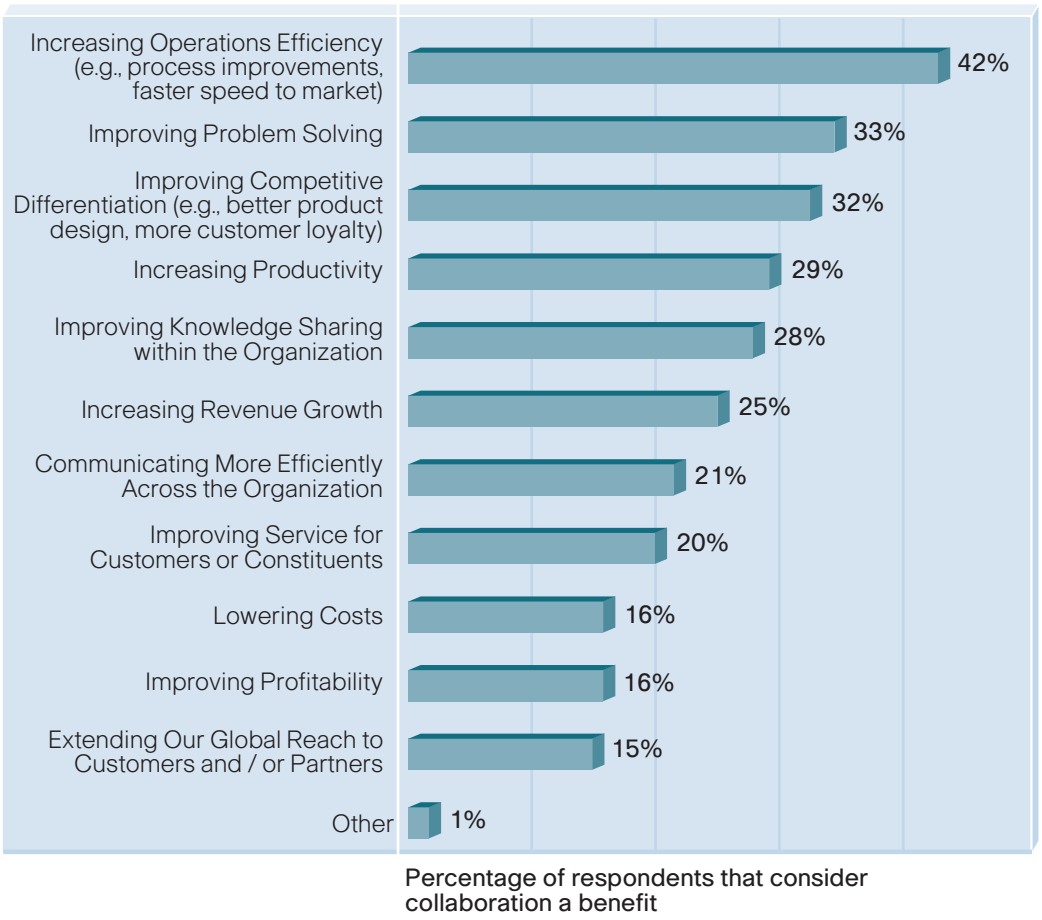
Source: "Cisco IWE Technologies & Applications Architecture," Cisco, 2009

Potential benefits of a customer- / innovation-centric enterprise include significantly reduced TTM; improved productivity and innovation among researchers, scientists, designers, and engineers; improved product quality and virtual project management structure; enhanced security and protection of intellectual property; and reduced operations and network costs.

Collaboration Supports Effective Industry Transformation

Electronics is among the most diverse and globally integrated industries in the world. Some sectors such as consumer electronics are extremely competitive and price-sensitive; forecasting demand is difficult. Such diversification and specialization have resulted in more complex processes, systems, and organizational structures across regional value chains. Therefore, real-time collaboration across the value chain is critical, as shown in Figure 5.

Figure 5. Tangible Benefits of Collaboration



Source: Economist Intelligence Unit, 2007

Other benefits include improved product forecasting, reduced inventory, and enhanced manufacturing quality. The benefits of real-time value chain collaboration are further illustrated through the following case references.

Case References

Client Cases

During recent discussions between Cisco IBSG and a large Chinese white goods and electronics manufacturer, the company expressed an urgent need to improve PLM and sales-order-fulfillment processes to sustain profitability, delivery, and productivity. The manufacturer understood how critical these business process improvements were to its transformation objectives. These initiatives, however, would not give the company a competitive advantage over major domestic competitors, and would not help differentiate its product branding from that of global competitors. Since half of the manufacturer's product value is determined during product design, collaboration is a critical capability that must be developed as a long-term strategy.

Cisco IBSG suggested a number of steps the manufacturer could consider to meet its objectives, including:

- Collect market and competitor data during the production design phase
- Coordinate and conduct analytical discussions with cross-functional or value chain partners
- Consider planned testing and quality reporting before making milestone decisions

By taking these steps, the company can establish an environment based on knowledge sharing and expertise—necessary elements for defining product value. Effectively deploying collaborative design practices and supporting platforms is essential to ensure transformational success.

Today, the manufacturer is working with external design houses to increase resource capacity, and intends to design and implement a collaborative work environment to enhance virtual teaming. Unified communications and Web 2.0 tools will enable the company to improve sales and channel productivity.

In a second example, a leading semiconductor company implemented Cisco TelePresence (an ultra-high-definition video collaboration system) and Unified Communications capabilities not only to improve cross-functional collaboration among its Taiwanese headquarters and sales and customer service offices in San Jose, California, but also to collaborate with key suppliers across the value chain to forecast, plan, and allocate resources. The company estimates that it can realize tremendous business value and cost savings in one to two years using collaboration solutions.

Cisco Case

Cisco specializes in using IP-based solutions to manage its partner ecosystem across the value chain:

- 95 percent of production is outsourced to global contract manufacturers
- A wide range of products—from IP phones, commercial switchers, and routers to advanced technologies such as Cisco TelePresence—is *configured* to order, not built to order
- Solutions address a broad array of customers—from consumers and enterprises to global markets—and continuous acquisitions (more than 130 to date)

Cisco's manufacturing organization evolved through three phases:

1. Stand-alone functional excellence
2. Enterprise integration
3. Transformational and externally focused, collaborative supply chain. The transformation process started with Cisco's intranet and then migrated to other process elements, including an extended factory via contract manufacturers, a virtual factory with order fulfillment and dynamic replenishment, web-enabled supply chain visibility (electronic hub), and a networked virtual supply chain for lean customer value chain management.

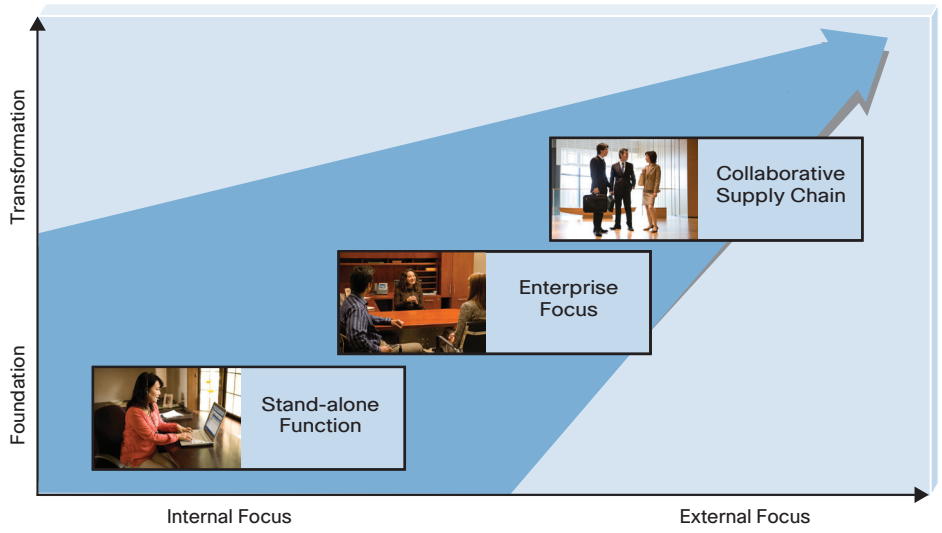
Cisco uses collaboration, video, and virtualization technologies to quickly apply distributed assets (people and information), addressing specific needs around the world. The company's value chain collaboration objectives are to increase alignment across the extended supply chain through higher-quality interactions, and to improve and enhance the flow of real-time data.

Cisco plans to achieve these objectives through the following initiatives:

- Improve supplier interactions with supply and demand synchronization, collaborative designs, proposals, negotiations, and reviews
- Increase business performance for logistics optimization, delivery, quality, and new product introductions
- Enhance core systems and processes for demand and collaboration planning, cost management, and product data and risk management
- Employ Cisco technologies, including internal supply chain wikis and blogs, Cisco WebEx, Cisco TelePresence, Websphere Portal, and C-Vision

Cisco's supply chain roadmap is further illustrated in Figure 6.

Figure 6. Cisco Supply Chain Management Transformation Roadmap



Source: "Customer Value Chain Management," Cisco Manufacturing Operations, 2008

Next Steps

Strategy for Large Enterprises

Cisco IBSG believes that most large enterprises in China's semiconductor, white goods, consumer electronics, and industrial electronics industries (such as automotive) will soon adopt the collaborative enterprise and value chain strategy described in this white paper to improve innovation, customer value, and production integration.

Once companies engage their transformation initiatives—such as aligning business and IT strategies, designing enterprise architectures, and deploying or improving

specific processes—they must assess the level of maturity of company functions to ensure successful collaboration and integration at certain levels of the enterprise. Companies must strategize, design, and implement effective collaboration capabilities with value chain partners to enhance competitiveness and productivity.

Strategy for Government and Small and Medium-Sized Businesses

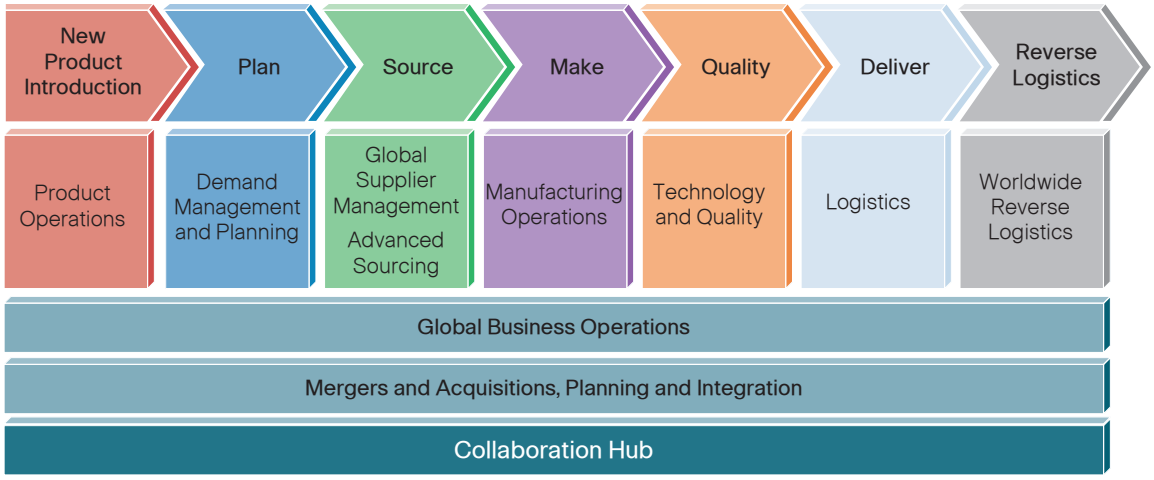
Many Chinese electronic component suppliers in the Pearl River Delta and Yangtze River Delta regions are small and medium-sized businesses (SMBs). They need special attention and support from regional and city governments to enable continuous transformation and sustainable growth.

Regional governments could provide policies, budgets, and tax incentives to encourage SMBs and large enterprises to participate in a collaborative supply chain hub (or center) to take advantage of Web 2.0 capabilities that support value chain transformation for all ecosystem partners. Once this "digital community" is established, data format exchange standards must also be established so that stakeholders can submit and share data. Technology vendors should support standards, solutions, and ICT infrastructure developments.

In the long run, ecosystem partners—governments, large enterprises, SMBs, service providers, and consulting and systems integration houses—should discuss a regionally focused, collaborative supply chain hub based on the special business nature and requirements of each region. Large enterprises could use this hub to execute procurement orders and keep track of the order-fulfillment process across multiple component suppliers. Global logistics visibility and, if possible, data on supplier quality, engineering design, and testing could also be executed and tracked via the hub.

For a successful special-purpose hub, proper security and risk-management capabilities must be implemented according to consistent industry standards. This is the best way to transform China's electronics manufacturing industry so that it can adopt IT and network-ready capabilities to move up the value chain. A collaborative supply chain hub is illustrated in Figure 7; a number of capabilities are currently being discussed with the Guangdong government for the creation of a collaborative transformation center (CTC).

Figure 7. Collaborative Supply Chain Hub



Source: Cisco Manufacturing Operations, 2008

To effectively execute the value chain collaboration strategy proposed in this white paper, all stakeholders should take a holistic approach to strategizing and planning for successful transformation by:

- Assessing and prioritizing business needs and identifying specific pain points
- Clearly articulating the transformational theme and analyzing the current state
- Analyzing organizational and cultural readiness to apply new technology
- Defining required business and technology capabilities
- Developing a transformation and collaboration roadmap
- Building collaboration solutions
- Developing an effective ICT architecture
- Creating a program management office structure to define and prioritize execution standards, and designing measurements for success

Advanced ICT offers companies great potential for addressing emerging business challenges along the value chain. Today's next-generation data centers and converged IP networks enable secure, high-quality voice communications on demand; real-time video; timely and accurate data availability; and workforce mobility capabilities that can be configured to meet a company's unique business requirements.

With an effective governance structure that oversees planning and execution, enterprises and SMBs along the collaborative supply chain hub will quickly improve their operational productivity and reduce operations costs. Over time, innovation- and customer-centric capabilities can be implemented to increase business value, sales margins, and revenue.

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Endnotes

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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.

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