



The Supply Chain Connection

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Sense and Respond—the Next Generation Business Model

By Jin Whang, Co-Director

“The Minority Report,” Steven Spielberg’s sci-fi movie released in 2002, has the following scene. John Anderton (Tom Cruise), after having eyeballs replaced to escape police arrest, walks into an apparel store (the Gap). The camera in the store scans his eyes, and the flat TV panel instantaneously starts an advertisement showing a holographic image of a woman, “Hello, Mr. Yakamoto! Welcome back to the Gap. How did those assorted tank tops work out for you? Come on in and see how good you look in one of our new Winter sweaters.” This scene (prepared with the help of MIT Media Lab) demonstrates the next generation business model—Sense and Respond.

In place of broadcasting uniform messages to a wide audience in an indiscriminate fashion, sense and respond (S&R) attempts to pinpoint the right individual with the right message—or, product or service. S&R, if properly implemented in the context of supply chain management, could reduce various costs and headaches such as stockouts, excess inventory, poor customer service, low yield of customer response to ad campaigns, and inaccurate delivery time quotes. S&R may be viewed as a compound of Real-time Enterprise (RTE) and Mass Customization. Although the full version of S&R is not to be seen in a while, we see several preliminary versions like Dell Computers and Seven Eleven Japan, and many other companies aspire to go in that direction (e.g., Toyota’s 3-Day cars). Indeed, as an industry speaker from Intel mentioned at one of the recent Forum events, “These days every company wants to be like Dell, including Dell itself.”

Perhaps the closest example to S&R will be Harrah’s Casino. In Las Vegas, you will see a variety of showings—not just gaming machines, but also shows and displays—put up by hotels and casinos to attract customers with better entertainment packages. Examples are artificial volcanoes, talking Caesar’s statue, sinking ships, and replica of Paris and NYC. But Harrah’s Casino (belonging to the Harrah’s Entertainment, the third largest Casino chain), sitting across Caesar’s Palace, is as profitable as any of its fancier competitors without any exotic display. It instead chose to focus on dynamic customer relationship management (CRM), by becoming a “real-time active enterprise” or S&R player, in our term. At the core of their CRM is their Total Reward (TR) program, a sort of airline mileage program applied to the gaming business.

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Upcoming Events

Global Supply Chain Management Conferences

Date: June 1–3rd

Event: Annual Symposium Ten Year Anniversary Celebration

Topic: Global Supply Chain Management: The Next Ten Years

Location: Stanford

This year marks the Forum's ten year anniversary! To celebrate, we have planned a special Annual Symposium.

On the afternoon (4:15-7:15 P.M.) of June 1st Members are invited to attend the Design for Manufacturability and Supply Chain Student Project Presentations. Students are engaged in six-month long industry partnered projects in which they apply structured methods to optimize product design, manufacturability, and supply chain. The projects include: Toyota: Car features that help in panic/disaster; SLAC: Serviceability Design for Linear Colliders; BAE Systems: Modular Power Management System; St. Jude Medical: ICD Communication (Smart Pacemaker); Nissan: Fuel Cell Power Train System; Ebara: Semiconductor Manufacturing Machine Engineer System; Medtronic: Advanced Catheter System; SAVI: The Next Generation RFID (IC Tag) System.

On June 2nd and 3rd (half-day on the 3rd) we will be hosting the Annual Symposium's Ten Year Anniversary Celebration. Reflecting on what we have learned so far, the Symposium will review the key advances that have been made in the field of supply chain management over the past ten years. And, considering the next ten years, the Symposium will also focus on emerging supply chain trends and innovations.

European Supply Chain Forum Events

Stanford Forum members are invited to attend one of the Eindhoven Forum's events each year (up to two attendees), space permitting. If you are interested in attending or speaking at one of these events, please contact Christel Nieman (efgscm@tm.tue.nl). You may also want to visit their general web site at www.tm.tue.nl/efgscm/

Date: June 23

Topic: Workshop: Asset Management

Location: Eindhoven, The Netherlands

The 4 I's *cont. from page 3*

ion. People development, with continuous education, involvement, and performance management is how Intel invested in to arrive at an agile supply chain with predictable and reliable delivery to customers.

The Power of Information Integration

Integrating a supply chain with a diverse supply base requires a lot of information flows, which could be daunting since multiple suppliers and the different parts of a company may use different information systems and means for communication. Nike has recognized this as a major impediment to two of the Four I's—instantaneous information sharing and value chain integration. As a result, the company embarked on an ambitious project to bring multiple ERPs and supply chain systems under a simple web-based platform so that visibility is ensure for all. Paul Saunders, Director of Global Logistics at Nike,

shared their experience, recognizing that this is a long and painful journey, but one that the company is fully committed to pursuing.

Information Technologies for the Four I's

Indeed, when proper information tools and technologies are deployed, the benefits to the Four I's could be rewarding. This is exactly what happened at Solectron. David Cooper, VP of Supply Chain Solutions, described the company's investment to achieve the Four I's. It created a tool called VisiChain that acted like a control tower to give real time information to all supply chain members, from design, supply, manufacturing logistics to service. Besides providing instantaneous information flow, VisiChain also helped to bring the country and company borders to be invisible, and enabled intelligent, real time decision making. To integrate the extensive supply chain, Solectron made use of tools to support design for supply chain management

(DesignChain), information visibility (VisiChain), and order fulfillment reengineering (DeliveryChain). The rewards have been sweet, as some of their customers were able to experience huge lead time and inventory savings.

Tax-Effective Supply Chain Management

As companies operate in multiple global countries, it is not sufficient to design your supply chain network to give you time and operating cost efficiencies. Pete Kloet, Partner at Ernst and Young, described some startling results that companies could pay a huge tax penalty by not setting up the right supply chain structure. Redefining the functional missions of different sites could give rise to different risk profiles, but also to potentially huge tax differences. So the final lesson is: don't forget the financial flow part of your supply chain.

The Four I's of High-Performance Global Trade

As supply chains become increasingly global, companies are also increasingly operating with supply chain partners and customers that are geographically dispersed. Products and services could pass through countries and continents as imports and exports multiple times before they reached the final customers. The barriers to efficient supply chain management include time-zone differences, country borders, organizational silos, cultural diversities and distinct corporate objectives. Stanford University's Global Supply Chain Management Forum and Accenture jointly sponsored a symposium on February 9, 2005 to address how companies can overcome these barriers in a global supply chain. We collectively identified four key competencies that would allow companies to gain a competitive edge in the new world of global trade. These are the Four I's of High Performance Global Trade:

- Instantaneous information flow
- Invisible borders across countries and companies
- Integrated value chains
- Intelligent, real-time decision making

Professor Hau Lee of Stanford and David Rich of Accenture opened the symposium by emphasizing the drivers for the need to master the Four I's—increasing globalization, increasing clockspeed of product and technology life cycles, increasing complexity of legal and regulatory requirements, and the increasing anxiety faced by companies in a global economy. Peter Hale, Executive Director of Market Access and Compliance of the US Department of Commerce, echoed the importance of global trade, but cautioned the need to ensure compliance especially given the potential threat of severe counterfeit products in countries such as China.

Predictions

Al Delattre of Accenture presented his trade-marked predictions of business trends in the global market. (1) Today's "export" economies will prosper and

become consumption economies, implying that we all should not ignore the importance of these economies as markets. (2) Companies that can overcome organizational and cultural barriers first will dominate their markets. This is because, based on extensive surveys, companies still identify time zone, language and cultural differences as overwhelmingly the top three risk factors in global operations. (3) Speed and Proximity will be reborn as competitive differentiators, since time windows of opportunities are short as we face increasing global competition. (4) Virtual products will enjoy significantly faster growth, if they are supported globally. Products that can be digitalized have the highest growth potential, since they can be introduced in remote global markets almost overnight. (5) Value chains will continue to evolve consistent with Darwin's theory. There will always be potentially new winners who are faster, better, and cheaper. Today's winner must not be complacent.

The Three E's as Strategic Vision

The Four I's are crucial for supply chain efficiency, but John Campi, Senior VP of Global Sourcing and Supply Chain at The Home Depot, emphasized the need to have the right strategic vision for the supply chain first. He described the experience at Home Depot, where the company went through three stages of strategic visioning: *Enhance* the core, *Extend* the business, and *Expand* the market. The core business enhancement is a foundation, while extend the business to different business platforms could be a growth engine, and finally, expand to high growth markets such as Canada, Mexico and China is the ultimate goal. All the strategic initiatives are grounded on a customer-centric philosophy, which forms the basic value at Home Depot. On the supply chain side, Campi felt that the best way to achieve the Four I's was to move from a transactional relationship with your supply chain partners to a collaborative one. It is important to have end-to-end (or in Campi's terminology,

wing-to-wing) views in coordinating the supply chain.

Performance Drives Incentives and Everything

The barriers in global supply chains can only be broken through the right incentive system in place. Without it, we cannot get over the country and organizational barriers, and it would be hard to have information sharing seamlessly across the partners. This is why Luke Gill, VP of JSF Global Sustainment at Lockheed Martin Aeronautics, focused on designing an innovative performance system that would induce the supply chain partners to have the right incentives for overall supply chain efficiency. Lockheed has experimented with a new performance-based agreement where partners were rewarded by performance outcome, rather than fixed fees or material-based contracts. Such an agreement also allows suppliers to pursue continuous improvements.

Lean Supply Chains

Charles Scheiderer, Senior VP of Logistics at Best Buy, described how Best Buy used the lean concepts in supply chain management. The Four I's are results of multiple supply chain initiatives that aim at creating a lean supply chain—gaining end-to-end visibility and information integration, fulfillment improvement through VMI, direct imports, cross-docking and flow-through capabilities, use of RFID technologies, and strengthening the supplier relationship. All of these seem basic, but they are the fundamentals of lean supply chains, which would give rise to the Four I capabilities.

Predictability is What Matters

In complex manufacturing environments with rapidly changing technologies, uncertainties seem to be inherent in every supply chain. Besides focusing on speed and efficiency, Intel has focused on predictability and reliability of the supply chain. Robert Baker, Senior VP and General Manager of the Technology and Manufacturing Group at Intel, shared with the participants how Intel made use of tight teamwork to ensure "edge-to-edge" planning (the Intel version of end-to-end supply chain planning), bringing technology, strategy, manufacturing, and demand fulfillment together in a coordinated fash-

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A World of Opportunity: Examining the Attractiveness of Offshore Locations

By Janet Pau and Uday Singh

While the intense political spotlight on offshoring might well be expected to fade as industrialized country macroeconomic performance and job markets recover, corporate executives' growing interest is ensuring that offshoring makes a smooth transition from a perceived fad to a cornerstone strategy. The benefits of cost savings, access to talent, and new market penetration opportunities are too important to ignore. Growing technological connectivity, ongoing liberalization in services trade, and standardization of business processes continue to facilitate the globalization of services supply chains. And just as developed countries face the problem of aging workers, developing and newly industrialized economies offer an abundant and growing supply of young, college-educated workers.

But how do companies decide where to locate? A.T. Kearney developed the Offshore Location Attractiveness Index as a tool to help companies understand and identify potential locations for business services around the world. The annual index measures location-specific attributes in terms of costs, people skills and availability, and business environment. While low labor and overhead costs are still the primary driving factors behind location decisions, companies are also stressing the importance of superior workforce skills and supply, as well as a stable and low risk business operating environment.

Attractive Offshore Destinations

India and China, two of the most popular investment locations for multinational firms, sweep the top two spots on the 2004 index (see figure). Three smaller countries, Malaysia, the Czech Republic and Singapore, round out the list. What factors make these locations so attractive? And what are their potential downsides? What trends should executives look for in these countries in the coming months and years? The following overview begins to address these questions.

All eyes on India. India tops the index by a comfortable margin. In addition to its much-discussed cost leadership, India also takes a commanding lead in the people category, thanks to the depth of experience in IT services and business process outsourcing (BPO), and a large labor force second only to that of China.

Each year, the education system graduates two million proficient English speakers with strong technical and quantitative skills. India also benefits from its lengthy experience as a large-scale offshore destination. Indian service providers have evolved from software coding to business process management and high-level analytics and consulting. The labor force is familiar not only with the job content, but also with the work ethic and quality and productivity expectations of major global clients.

Where is India vulnerable? Although its human assets have made India the offshore leader, the country ranks below the top 10 in terms of business environment, due in part to infrastructure weaknesses and concerns over economic stability. In addition, while India has become increasingly integrated into the global economy in recent years, the general population is not widely exposed to

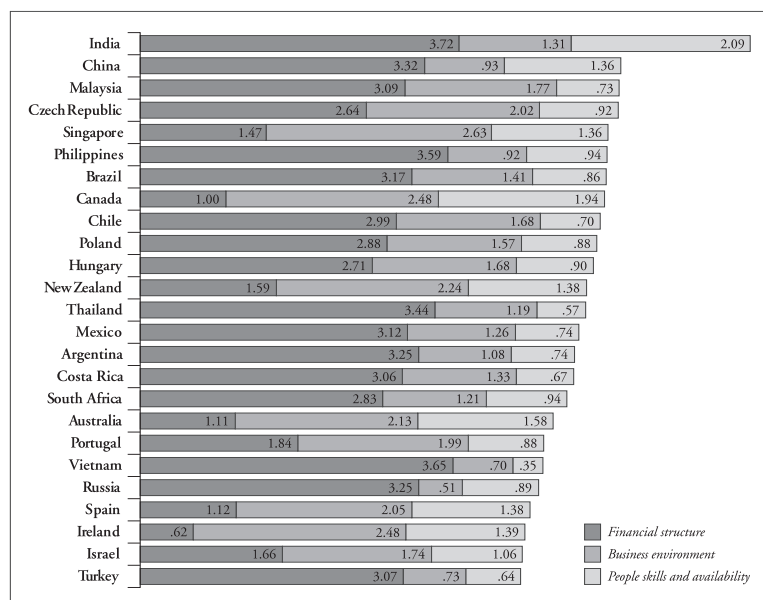
other cultures, sometimes making cultural adaptation a challenge. Yet India's environment score still outranks that of most other low-cost Asian locations. Government efforts to improve infrastructure and maintain economic and political stability seem likely to reinforce India's status as a global player.

As the number of service providers proliferates, leading Indian suppliers have begun to pursue their own globalization strategies to tap into new customer and talent markets. The U.S. and Canadian operations of both Tata Consultancy Services and Wipro Technologies contribute a large and growing proportion of each company's global revenues. Setting up shop in these countries not only allows the companies to provide services for locally based clients through proximity and cultural similarities, but also enhances the companies' ability to compete with U.S.-based global players.

China on the rise. China ranks second in the index, enjoying cost advantages and a large educated labor pool. However, its direct BPO experience is still behind that of India. China is perceived to rank behind India in terms of IT and management training and international certification of IT and contact center operations. China scores particularly low in the areas of intellectual property (IP) piracy and bureaucratic red tape. Even as national legislation improves, enforcement at the provincial and municipal

management training and international certification of IT and contact center operations. China scores particularly low in the areas of intellectual property (IP) piracy and bureaucratic red tape. Even as national legislation improves, enforcement at the provincial and municipal

Figure: A.T. Kearney Offshore Location Attractiveness Index 2004



Note: The numbers in the bars are index numbers. The weight distribution for the three categories is 40:30:30, meaning that the financial structure is rated on a scale of 0 to 4, and that business environment, and people skills and availability are on a scale of 0 to 3. Source: A.T. Kearney

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levels remains a challenge. More important, China needs to improve English language skills of its workforce if it wants to challenge India.

Nevertheless, leading global companies are already tapping Chinese talent, particularly for software development, as well as business operations targeting the Japanese and Korean markets. In the northeastern city of Dalian, for example, Hewlett-Packard established a call center that provides customer support in English, Japanese, Chinese and Korean.

China's entry into the World Trade Organization is spurring further investment, and companies are increasingly interested in China's innovation and design capabilities. Western companies have established more than 130 R&D facilities in China, and the government has established more than 50 state-level economic and technological development zones to facilitate higher value-added investment. Shanghai, home of Pudong Software Park, is already becoming a services hub and challenging Hong Kong's long track record in attracting service sector investment. Services industries accounted for more than half of the roughly 1,000 foreign start-ups in Shanghai in 2002 and have seen even stronger growth ever since.

The Chinese government is serious about creating a first-class high-tech labor force. Besides helping local firms cover the costs of acquiring international qualifications such as the Carnegie Mellon Capability Maturity Model (CMM) certification and partnering with multinational and Indian firms to provide training, the government is also investing heavily in improving English language training. For example, a growing number of elementary and secondary schools in Shanghai are teaching math and science classes in English. The 2008 Olympics and 2010 World Expo are also expected to provide additional opportunities for English usage. As the supply of bilingual, IT-skilled workforce grows, China's low wages will make it an increasingly formidable competitor to India.

Malaysia, the up and comer. Malaysia is an often overlooked but natural choice for business services. The country offers low costs, particularly for infrastructure, and boasts a strong score in business environment for an emerging market. Government

support for the information and communication technologies sector and strong global exposure of the workforce also helped Malaysia reach the number three spot in the index. With these advantages, Malaysia is among the countries that will challenge India's dominant position in BPO in the next five years. However, as a small country with only 22 million people, Malaysia will not be able to match India's scale advantages, and piracy continues to raise concerns.

The Czech Republic, a rising star in Europe. The Czech Republic boasts competitive infrastructure costs, a stable business environment, and a strong education system. In fact, about 70 percent of the population speaks a foreign language. These advantages have attracted multinational firms such as Accenture, IBM, Sun Microsystems and Symbol Technologies to establish IT and BPO operations in the country. The rise in services investment in the Czech Republic should continue in the next few years. But as pressure mounts for the country to become more economically integrated with the European Union, the country risks losing its cost advantage and will need to focus on promoting its competitive advantages relative to low-cost non-EU contenders further east.

Singapore, a high-end niche player. Singapore rounds out the top five. With one of the world's highest per capita income levels, Singapore hardly leaps to mind as a low-cost services location. However, excellent education levels and infrastructure, high ratings for economic and political stability, IP security, and aggressive government promotion of the information and communication technologies sector continue to reinforce Singapore's position.

IP security and business continuity management capabilities have become Singapore's key weapons in its competition with lower-cost locations. Singapore has an active Intellectual Property Office charged with formulating and enforcing laws and stimulating the creation of intellectual property. In addition, the Infocomm Development Authority of Singapore announced in 2004 the establishment of the world's first industry standard for business continuity management and disaster recovery.

Singapore can maintain its position by providing a high-quality front end to a lower-cost Indian or Chinese back end.

Given its small size, Singapore will likely remain a high-end niche player and an important candidate for companies considering service hubs for mission-critical functions.

Close contenders keep up the heat. The top 10 locations continue with the Philippines, a popular destination for customer contact centers due to high university enrollment and English fluency coupled with a favorable cost structure. Brazil ranks highest among Latin American countries, offering a large labor force, low costs, and growing sophistication of the local software and IT services sector. Canada ranks eighth in the index, providing a low risk operating environment and similar education and infrastructure levels at a lower cost compared to the United States.

Chile has Latin America's best business environment score, with a robust digital network and high quality satellite services. The Chilean government is also focusing on promoting English language skills of its workforce by certifying English speakers for the labor market.

Capping off the top 10 list is Poland—with Hungary in close contention at number 11. Central and Eastern Europe destinations are particularly attractive for Western European operations of multinationals, which take advantage of the highly educated, relatively low-cost, and culturally adaptable workforce.

Striking the Best Balance

Countries from every region of the world are competing to become attractive destinations for business services, both through policies targeted at improving workforce quality and the business operating environment, as well as proactive investment promotion efforts to attract multinational companies. As such, the variety of possible locations will continue to increase. The challenge for companies is to adopt a multi-location strategy that strikes the best balance of costs, workforce capabilities and business environment while diversifying risks associated with operating in a single location.

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Chemical Management Services: Re-Designing the Chemical Supply Chain

By Jill Kauffman Johnson and Jeff Cole

Introduction

Over the past decade, supply chain strategies are progressively expanding to include consideration of the entire lifecycle of a product. This move towards incorporating the “total cost of ownership” suggests that supply managers are considering more than just the unit price of a product when optimizing purchasing decisions. This approach is especially relevant in the acquisition of chemicals, which is a highly managed and risk-laden product. An innovative supply chain strategy called, “Chemical Management Services” (CMS), bundles management services with the chemical product to optimize the purchase, use, and management of chemicals. The rapid growth of this CMS model holds lessons for broader supply chain strategies. This article provides an overview of the CMS model, and is based on research conducted by the non-profit, Chemical Strategies Partnership (CSP).

What is Chemical Management Services (CMS)?

CMS is a fundamental re-thinking of the chemical supply chain. Suppliers are transformed from salespeople into service providers integrated throughout customers’ operations, focused on continuous improvement of business and production processes to reduce chemical use, cost, risks, and environmental impact. The service providers engage in a strategic, long-term contract to supply not only chemicals but also associated management services. In addition, while the customer will continue receiving products and services from multiple suppliers, a single “Tier 1” CMS provider manages numerous “Tier II” suppliers.

Chemical management covers the entire chemical lifecycle within a company, from procurement all the way through use and disposal of chemicals. At each stage of the lifecycle, a company incurs quantifiable costs of labor, materials, equipment, liability, safety training, and compliance efforts (see Figure 1). Several studies have

revealed that these lifecycle costs can range from one to seven times the purchase cost of chemicals. Optimizing these chemical management activities and reducing these lifecycle costs are the basis of the value proposition by CMS providers.

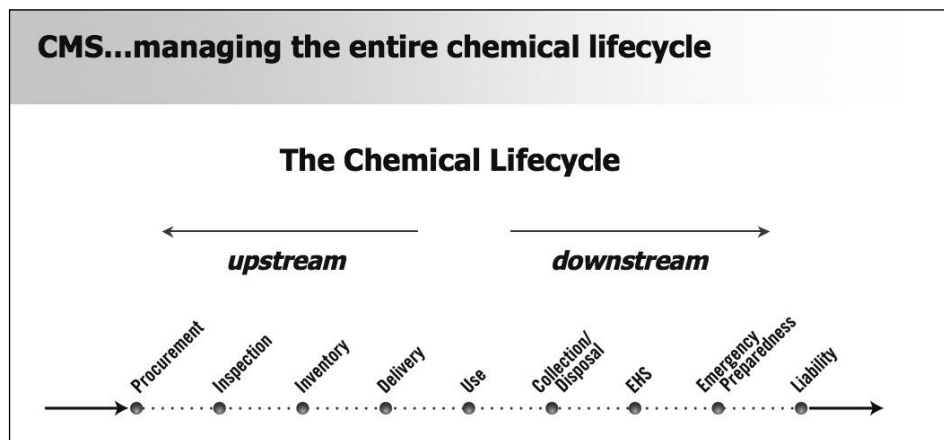


Figure 1. Chemical Lifecycle

CMS reflects a national trend in business strategy to identify service and function—and not product itself—as the basis of profit and value creation.¹ Customers often want service more than they want products. For example, they want affordable, reliable transport (not necessarily vehicles), comfort and power (not gas and electricity), information access (not computers), and clean machine parts (not solvents). CMS is also consistent with a trend where profitability growth for product-based companies is in revenues from service, not from the product. In addition, CMS is aligned with a number of other trends in supply chain management, including business process outsourcing, strategic sourcing and supply chain rationalization.

CMS Drivers and Benefits

Manufacturing companies adopt the CMS approach for the same reason they pursue many other supply chain strategies: to reduce enterprise costs. Other secondary drivers include focusing resources on core competencies and reducing risk.

According to one of the first adopters of CMS, Raj Mishra of General Motors, “Every place we have put in a chemicals management program, the total chemical use and cost reduction averages around 30%.”² These kinds of savings have been repeated at scores of other companies who have adopted CMS.³ In a 2004 CMS industry survey, providers estimated that customers can realize between 5-20% in savings from the first year of implementing a CMS contract. Over the first three years of the contract, a majority of

providers estimate customers realize 6-10% in savings per year or more. As the CMS contract matures (after five years), savings level off at 0-5% per year.

In the first year of a contract, savings comes primarily from reducing the amount of chemical used, reducing the chemical purchase price, and improving manufacturing processes. Chemical use reduction in the first year of the contract often is achieved through improving inventory management. Reducing the price of chemicals can come from two areas. First, if the CMS provider is also a chemical manufacturer with a significant portion of the chemical spend of a customer, price breaks can bring quick savings in year one. Another approach is strong negotiating with Tier II suppliers and distributors. Many of these Tier 1 CMS providers are capable of leveraging their purchasing power from a broad customer base to negotiate better unit pricing on chemicals. Savings from improved manufacturing processes generally come from identifying and implementing “low-hanging fruit” improvements. In subsequent years, cost savings are achieved primarily through

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chemical volume reduction and manufacturing process improvements.

Aligning incentives with performance-based contracts

Traditionally, supplier profits are tied to chemical volume—more chemicals sold equals more profit. In contrast, the CMS provider’s compensation is not dependent on volume of product sold, but rather on service quality and innovation delivered. In the most sophisticated contractual arrangements, the chemical service provider is compensated per each unit of product successfully produced (e.g., a fixed fee per 100 toaster ovens produced, or 1000 circuit boards cleaned). Thus, chemicals become an operational cost to the supplier instead of the manufacturer. As with labor, utilities, and other material inputs, the supplier now has an incentive to use fewer chemicals to yield higher margins. The manufacturer gains a partner in its efforts to manage chemicals more efficiently; the supplier becomes an integral part of the business by providing a differentiated, value-added service.

Many CMS programs do not lend themselves to this unit-pricing sort of contract. Figure 2 outlines various compensation mechanisms employed in CMS contracts that still incorporate incentives for continuous improvements.

CMS market is growing

From FY1999 to 2003, the CMS market has grown roughly 50% to approximately

Description of Compensation Mechanisms	
• Implementation Fee:	This is a one-time fee charged to cover start-up costs of the program. It may be an up-front fee or can be amortized over the life of the contract.
• Management Fee:	This fee is typically meant to pay for the cost (or value) of the services provided. There are several types of management fees: <ul style="list-style-type: none"> • Fixed fee (e.g., \$5,000 per month); • Variable fee (e.g., \$50 per labor hour expended); • Volume-driven (e.g., 18% of chemical purchase costs); or • A combination (e.g., \$3,000 per month plus \$20 per labor hour expended).
• Shared Cost Savings/Gain sharing:	The cost savings a customer can anticipate are broadly classified as non-material savings and management savings. These can be shared with the provider as part or all of the compensation. This feature is usually used in combination with another compensation mechanism.
• Chemical Purchase Cost Pass-Through:	The provider passes through the actual cost of the chemicals to the customer. This mechanism is coupled with another mechanism to compensate the provider for accompanying services.
• Mandated Cost Reduction:	The provider agrees to reduce the total cost of the contract by a certain percentage each year.
• Incentives for Reduction on Commodity Unit Price:	A portion of the savings or other financial reward is given to the provider for reducing the unit cost of chemicals purchased or the “last price paid” for chemicals by the customer.
• Environmental Performance Incentives:	A financial or other reward for achieving specific goals for environmental performance set by the customer (e.g. reducing emissions, reducing chemical use, reducing hazardous waste).
• Unit Price:	A set price per finished product is paid for all chemicals and services. (e.g., \$20 for each printed circuit board).

Source: *Tools for Optimizing Chemical Management-CSP Manual*, Chemical Strategies Partnership, 1999.

Figure 2. Compensation Mechanisms

\$1.22 billion, and all indicators point to continued steady growth. CSP estimates the potential U.S. CMS market to be \$17-19.5 billion. CMS is now utilized in eleven sectors, with over 30% penetration in several of these sectors (see Figure 3).

Conclusions

Fueled by proven cost savings and environmental benefits, the CMS market has experienced rapid growth over the last four

years. Due to this growth, CMS provides an interesting case study of the expansion of new supply chain management concepts, such as total cost of ownership and lifecycle management.

¹ This service-based business strategy appears in both incipient and mature forms across a broad array of traditionally product-based firms: XEROX from a photocopier machine maker to the “Document Company”; IBM from a mainframe and PC maker to a solutions and information services company; Herman Miller from an office furniture maker to an office furnishings service provider (etc.)

² “Chemical Services Contracts Save, Yet Still They Languish,” *Business and the Environment*, Vol. XI, No. 12, December 2000, pg. 5.

³ CSP/CMS Forum workshops 2000, 2001, 2002, 2003, 2004.

Jill Kauffman Johnson is Executive Director, and Jeff Cole is Program Director, both at Chemical Strategies Partnership (CSP). CSP’s mission is to reduce chemical use, waste, risks, and cost through the transformation of the chemical supply chain. CSP serves as an information clearinghouse on the theory and implementation of CMS and works with manufacturing companies to test the feasibility of CMS in new industry sectors. For more information on CSP services and resources, please visit www.chemicalstrategies.org.

Sector	Estimated CMS Penetration	
	2000	2004
Automotive	50-80%	75-80%
Automotive Suppliers	Included in Automotive	30-40%
Heavy Equipment	15-25%	15-25%
Aerospace Manufacturing	5-15%	25-30%
Air Transport Maintenance	10-20%	40-50%
Electronics	30-40%	30-40%
Steel Manufacturers	---	20-30%
Energy/Utilities	---	Under 10%
Misc. Manufacturing	---	Under 10%
Food/Beverage	---	Under 10%
Research/Laboratory	---	Under 10%

Figure 3. Industrial sectors using CMS. Source: *CMS Industry Report 2004*, Chemical Strategies Partnership

You (optionally) stick the card into a slot machine before playing it. The more you play, the more points you collect. You can redeem the reward points in the form of free meals, hotel rooms and air flights. TR to be recognized in near-real-time at every one of Harrah's 26 properties. Below (with a slight exaggeration, for exposition) we have a glimpse of S&R in action.

It's 9PM Saturday night. Harrah's Casino in Lake Tahoe is overflowing with dazzling lights and eager gamblers. It is unexpectedly more crowded than usual, so most of the machines are taken. New customers coming to the room will be frustrated not to find a machine of their liking and may leave for another Casino. At this time the system identifies Ms. Sarah Jones playing on machine 35. She usually plays for 3 hours in a row, but today so far she played for 2.5 hours. Also the system sees from past records that she loves Chinese foods. The chain has three Asian restaurants nearby, but the Pacifica restaurant on the second floor of Harvey's (another of its 26 properties) has some open seats available now. Then, the slot machine 35 begins to print the following message for Ms.

Jones: "Ms. Jones: Thank you for using our Harrah's Casino. In token of our gratitude, we here offer you a free dinner buffet at Pacifica—on the second floor of Harvey's located just across the street from us. For your convenience, we made a reservation for you for the next half an hour. Please present this printout as a coupon. I hope you will enjoy the dinner with us tonight."

Using such dynamic CRM and other innovations, Harrah's has become one of the most profitable casino chains, and recently agreed to acquire one of its bigger competitor chains, Caesar's Palace.

Given the emerging technologies like the Internet, mobile phones, RFID, and telematics, we seem quite close to S&R. But it brings several challenges, including privacy intrusion.

In addition to various crimes, commercial greed (more in line with the movie *The Truman Show*, featuring Jim Carrey, than George Orwell's book 1984) will drive the annoyances such as unstoppable streams of spam and the leakage of private information. Inevitably, we will see a collision between the corporate efficiency and individual privacy. Whether we like it or not, however, it will come.

News from the Team

Professor **Hau Lee** attended the Special Symposium to honor the inauguration of Professor **Jan Fransoo's** professorship at Eindhoven University on December 10, 2004. Professor Fransoo and the Stanford Global SCM Forum have over ten years of close relationship, and so Hau Lee was very gratified to be able to attend this special event. At the Symposium, Lee spoke about research developments in RFID and supply chain management.

Professors Hau Lee and **Jin Whang** gave a joint talk on the Teaching and Research Evolution of Supply Chain Management at Tsinghua University in Hsinchu, Taiwan, on December 16, which drew researchers and students from the universities in Taiwan. On December 17, Lee and Whang spoke to executives at TSMC on Supply Chain Innovations.

On December 20, the Supply Chain and Logistics Forum at the Hong Kong University of Science and Technology organized a Symposium on Advances in Supply Chain Management, and Lee opened the event with a talk on Hyper-Performing Supply Chains.

Professor **Tunay Tunca** presented his paper titled "Liquidity in Industrial Exchanges" (joint with Professor **Haim Mendelson**) at the Annual Meetings of the American Economic Association, which took place in Philadelphia on January 7, 2005. On January 8, Professor Tunca presented his paper "Private Information and Performance in Oligopolistic Markets for Procurement" at the Econometric Society Meeting, which also took place in Philadelphia. Both these presentations were under the umbrella of

the annual meeting of ASSA (Allied Social Sciences Association).

Over the last few months, Professor **Kos Ishii** gave a talk on "Global Engineering and Manufacturing; 3 keys to success" at Toyota (November 2004), Toshiba, Nissan, and Ebara (December 2004), GM Michigan (January 2005), and GM Mexico (February 2005).

On February 11, Hau Lee spoke at the Sintec Executive Forum on AAA Supply Chain Management in Mexico City, and was delighted to meet some of his former students there. On the same date, Jin Whang gave a talk entitled "The Secondary Market for Supply Chain Management" at Ohio State University.

As part of Professor Kos Ishii's Design for Manufacturability course (ME317), students are engaged in six-month long industry partnered projects, in which they apply structured methods to optimize the design of an improved product and plan for its manufacture, testing, and service. Of the eight projects that are taking place this year, the one with the strongest supply chain management relevance is "Next Generation RFID (IC Tag) System" (Savi), which focuses on (1) analyze Savi's next generation RFID Tag, (2) identify key opportunities to improve manufacturability of the product, and (3) identify other opportunities for cost reduction, while maintaining the military's stringent product quality requirements.

Professor **Warren Hausman's** Spring graduate course Supply Chain Management (MS&E 262) is now accepting proposals for student projects. Please contact Prof. Hausman immediately if your company wishes to propose a project (hausman@stanford.edu).

The Supply Chain Connection

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