



# Center for Value Chain Research Newsletter

Winter 2008

Volume 3, Number 1

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## Directors' Column: The Hard and Soft Sides of Optimization

Many of us use the term "optimization" loosely to mean "a significant improvement" from an existing way of doing things. For instance, when we talk about optimizing a business process or optimizing a supply chain, we usually mean finding strategies, often qualitative ones, that will make it function more efficiently and effectively.

To an Industrial Engineer, "optimization" has a much more precise meaning. To Industrial Engineers optimization refers to a mathematical methodology for maximizing or minimizing some quantity—like cost or profit—while simultaneously satisfying one or more constraints. For example, we might want to decide how much inventory to purchase to minimize the average excess inventory while ensuring that a desired service level is met. Or we might want to decide how to spend marketing dollars to maximize our profit subject to a constraint on our marketing budget.

This type of optimization problem is formulated mathematically—all of the variables in the problem, and the relationships among them, must be quantifiable. We refer to this as the "hard" side of optimization. Although this type of modeling can be time consuming, since every component of the problem must be described and measured quantitatively, mathematical optimization methods have been applied with great success to a wide range of logistics and supply chain management problems such as vehicle routing, facility location, inventory management, and scheduling.

On the other hand, mathematical optimization is not the most effective tool for modeling human behaviors and interactions among people, since issues like trust, fears, honesty, and personal tastes are difficult to quantify. For problems that involve issues that are best described through logic based problem solving, qualitative optimization approaches are called for. We refer to this as the "soft" side of optimization.

The Center for Value Chain Research engages in optimization activities of all types, both quantitative and qualitative. In some of our research projects, CVCR-affiliated faculty members, supported by PhD and/or MBA students, have built mathematical optimization models for complex supply chain systems, while other projects have qualitatively

optimized elaborate business processes.

The CVCR's Spring 2008 symposium in May will focus on the theme of *Supply Chain Optimization for Speed, Agility, and Efficiency*. Our presenters and participants will discuss supply chain optimization from a number of different perspectives and approaches.

We hope you'll be able to join us for this exciting event.

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## Integrated Sales and Operational Planning: The Eight Keys to Superior Business Performance

Contributed by: Stephen P. Crane, Director Supply Chain, Air Products and Chemicals, Inc., [cranesp@apci.com](mailto:cranesp@apci.com)

So you think your company has an effective S&OP (Sales and Operations Planning) process. Before you can appreciate The Eight Keys to Superior Business Performance, it's important to have a clear understanding of what S&OP is and what S&OP is not.

Some define S&OP as an ongoing business process whereby key business leaders review portfolio plans, product life cycles, demand plans, supply plans, capital plans, and financial plans in an ongoing effort to align the operations of the business with the desired business strategy.

Business leaders utilize gap analysis and measures to identify potential problems in the key areas, then evaluate each problem and prioritize it for action as part of an integrated reconciliation process. These problems, metrics, and plans are then submitted for Senior Management review in an Executive S&OP meeting, from which strategic decisions are made and definitive actions initiated as the final step in the process.

Fundamentally, Integrated S&OP is a core business process designed to influence future business direction, based on cooperative, ongoing analysis of available intelligence and key metrics, with the following end goals:

- To continuously measure business performance
- To align the operations with the business strategy and goals
- To create precise demand plans that drive the entire supply chain
- To balance supply and demand that improves overall supply chain efficiency and cost effectiveness

Seems fairly straightforward, right?

Well, there are numerous forces that exist every day across companies of all sizes and industries that can derail even the best process. So to ensure that your company's S&OP process stays on track, there are eight keys to achieving superior business performance:

1. Executing the process every month
2. Process ownership and clarity of roles and responsibilities
3. Organizational commitment to achieving high forecast accuracy
4. Focus should be on the next 3 to 12 months
5. One integrated plan that integrates the actions of the entire organization
6. Senior Management decision making
7. Measuring end-to-end supply chain performance
8. S&OP forecast vs. operating plan or budget

### **Executing the Process Every Month**

While the details of a good S&OP process, like any routine, can seem to be a bit of a grind, reducing the frequency of monthly meetings is only possible in best-case scenarios—for those businesses that experience little change in their markets, channels, supply lines, or product offerings. These businesses would have to operate with small deviations to their plan and have best-in-class key performance indicators (KPIs). Most do not, so they need to meet monthly.

### **Process Ownership and Clarity of Roles and Responsibilities**

S&OP requires a process champion, someone to drive the entire process so that functional managers can direct operations that align with your business's long term strategic plans. The ideal S&OP leader should be a process facilitator and manager who has direct involvement in determining the strategic direction for the business.

### **Organizational Commitment to Achieving High Forecast Accuracy**

A business needs to have a long-term commitment and view to taking whatever actions are necessary to achieve high forecast accuracy. The Demand Plan drives the entire supply chain from the supply plan, production plan, inventory plan, sourcing plan, and the financial plan. If you don't have a good handle on what you expect customers to buy, it is then difficult to make good supply chain decisions.

### **Focus should be on the Next 3 to 12 Months**

While it is important to understand where a business stands relative to the budget, the focus should not be on past results. It should be on looking forward, examining what the next 3 to 12 months are projected to look like. A proper S&OP process should really have an 18-month planning horizon. Companies that have a longer-term view have a better grasp of the demand drivers influencing their business; as a result their demand plans are much more reliable, predictable, and actionable.

### **One Integrated Plan that Integrates the Actions of the Entire Organization**

The fundamental purpose of an integrated S&OP process is to review deviations in operational forecasts, new product plans, budgets, capital plans, and plans as they relate to achieving the goals of the business or company. Every step in your S&OP process should be governed by an overarching focus on executing the strategic plans of the business.

### **Senior Management Decision Making**

In a best-in-class Sales and Operations planning process the endgame is decision-making. If senior management is not willing to take action, the result will just be a lot of hand waving and will not have any benefit to the business. This problem is typical where the Executive S&OP Meeting serves more as a "reporting" session, from which few decisions are made and even fewer action items are assigned.

### **Measuring End-to-End Supply Chain Performance**

Many leaders do not like the prospect of having their work conspicuously evaluated on a monthly basis and in public. Companies that embrace measurement as a starting point for continuous improvement are far better served by S&OP than those that resist measurement. In any S&OP process, the metrics are vital to ensuring success. They provide indicators of how well the business is performing, and they clearly illustrate progress that has been made to drive improvement.

### **S&OP Forecast vs. Operating Plan or Budget**

The majority of the time the S&OP forecast will not match a company's operating plan target or budget for a given year. It's alright that these two plans are not the same at any point in time. Companies should never artificially adjust the S&OP forecast to match the budget. Since the S&OP forecast should be driving all the other supply chain decisions, artificially adjusting a forecast will just increase costs and will not help to meet the budget. The greatest business value is realized when companies are willing to analyze the gaps between the forecast and budget and take the time to identify the actions that need to be taken to close the gaps.

In general, companies that design, implement, and manage their own S&OP processes fail to realize the full potential of the process. The reason so many S&OP meetings devolve into mere reporting sessions is because people are often afraid to face or ask the tough questions. Too many senior managers lose sight of their commitment to improving the cycle, falling prey to yesterday's news and the fire of the day. Overcoming that mindset usually requires a "cultural" change that must be driven from the top down.

Regardless of your approach, utilizing The Eight Keys to Superior Business Performance and insisting on a new standard of excellence by following these best practices and behaviors is an ideal way to demonstrate the proper path forward to a more effective S&OP process.

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## What's in a Name? Part II: Value Chain's Future

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*In our Fall 2007 Newsletter, Volume 2, Issue 4, we described the tortuous path the Council of Logistics Management took in becoming the Council of Supply Chain Management Professionals. In this issue we'd like to take a look at another name, Value Chain, which is even closer to the Center's heart.*

*For more discussion on Value Chain, check out our Fall 2006 Newsletter, Volume 1, Issue 2. This issue is on our website at [www.lehigh.edu/~inchain](http://www.lehigh.edu/~inchain) under Publications. The article entitled A Value Chain Primer can be found in the Director's Column.*

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### Introduction

Since the term Value Chain plays such a prominent role in the Center's name, we thought it would be helpful to describe briefly where Value Chain Theory originated, how we see it being applied in the future and how it relates to Supply Chain.

In 1985 Michael Porter coined the term "Value Chain" in his seminal work on business strategy entitled "Competitive Advantage". On page 33 he reveals that he invented the concept because "A systematic way of examining all the activities a firm performs and how they interact is necessary for analyzing the sources of competitive advantage." He says, "The value chain disaggregates a firm into its strategically relevant activities in order to understand the behavior of costs and the existing and potential sources of differentiation". He claims that "A firm gains competitive advantage by performing these strategically important activities more cheaply or better than its competitors." In the remaining 554 pages Porter painstakingly uses his Value Chain concept, case studies and conventional business strategy principles to craft what has become a must-read touchstone in his field.

There have been some key developments since 1985 that make Value Chain Theory more important than ever.

### Key Developments

We'd like to focus on three enablers that have dramatically altered the business landscape and increased the utility of Value Chain Theory—Reengineering, the Internet, and Global Supply Chain Management.

Reengineering: First is the concept and tools associated with reengineering. We mean the radical rethinking of process structure as originally envisioned by Michael Hammer and James Champy without the evil specter of "downsizing" that many associate with the term. Hammer and Champy taught us to go far beyond analyzing existing processes for opportunities to reduce cost and increase differentiation.

They put forward a manifesto that called for the rethinking of all existing business processes in order to ensure that we didn't "pave the cow paths" using information technology. Their work spawned the tool sets to develop and automate new processes faster than ever before.

Internet: Next, there is the ubiquitous growth of the Internet. The Net truly changes everything. Even this early in its history, the Net provides the capabilities needed to locate potential value chain partners, to discuss with them alternative roles and to implement and operate the resulting new Value Chains. At best, pre Net, such activities took months, today, weeks or even days are sufficient. Still jaded by the collapse of the Internet bubble? Google's billions in cash today should help you get by that burp.

Global Supply Chain Management: Finally, there is our increasing ability to design, assemble and manage global supply chains. This ability is best illustrated in the growth of the Third Party Logistics Industry. The major thrust of this industry has been and continues to be globalization. Regional firms have all but disappeared into the arms of globally networked companies that offer utility-like international movement capabilities to customers of all scales.

So what? Do these enablers really change the game?

### **The New, but Old Game**

The Net and Global Supply Chain Management provide the means to move information and goods to and from anywhere in the world. The methods and tools for reengineering provide the ability to develop streamlined business processes that tie the participants together toward a common business purpose. Together these capabilities enable the rapid configuration of value chains to meet both existing market needs and to bring to market entirely new products and service concepts.

This new game is not without its challenges. This past holiday season we saw the difficulty of ensuring quality across multiple global participants. Formerly staid make/buy decisions take on new global dimensions. The number of alternative value chains that meet a given business purpose explode. The ability to accurately cost the alternative chains and access their relative risks becomes central to the value chain selection process.

The enablers certainly speed up the game and extend the game's reach across the globe, but at its heart the same overarching question remains. *What Value Chain should we create to serve the business opportunity we wish to pursue?*

### **Value Chain Theory's Answer**

Porter provided the answer in 1985: craft a Value Chain that creates a sustainable competitive advantage. The game's speed and reach may have grown enormously, but the game's objective hasn't changed.

The ingredients of business strategy formulation—industry structure, cost competitiveness, differentiation, segmentation, substitution, complementary products—are built on the foundation of traditional microeconomics. These strategic business concepts are enduring. Porter's unique contribution was to provide a bridge from these concepts to what today is best described as business process design.

Business process design itself encompasses all business activities which include, but are not limited to, product design, the supply chain, marketing, sales, and service and infrastructure activities such as human resource management, finance and accounting. Porter's charge is to focus on those business processes that are the keys to creating a sustainable advantage in a given competitive environment.

Porter's Value Chains have more utility today than ever as our ability to create them grows exponentially.

## What's the relationship of Value Chains to Supply Chains?

When Porter first introduced Value Chain Theory in Chapter two of his "Competitive Advantage" he identified the functions of inbound logistics, operations and outbound logistics. He created the term "Value System" to depict how one firm's Value Chain related to its suppliers' and customers' Value Chains. By doing so, Porter anticipated what we describe today as the "Supply Chain", but his Chain extends even further.

Porter's Value Chain encompasses Supply Chains because it goes beyond the generally accepted Supply Chain functions to incorporate all activities that the firm undertakes since any of them could prove to be a source of competitive advantage.

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## The CVCR Fall 2007 Symposium

### Participants Discuss Transforming Lean from Theory to Practice

On November 6 and 7, 2007, Lehigh University's Center for Value Chain Research held its annual Fall Symposium. The meeting featured formal presentations addressing the application of Lean principles in a wide variety of industries including confectionery, high-tech, industrial equipment and finished aircraft. Each session included intense audience participation delving deeper into each issue.

PowerPoint presentations for most of these presentations can be found on the CVCR website ([www.lehigh.edu/~inchain/SymposiumFall07](http://www.lehigh.edu/~inchain/SymposiumFall07)). The following is a brief overview of each presentation.

**The Hershey Company:** Deborah Laudenslager, Director—Industrial Engineering, presented *Continuous Improvement at Hershey: The Challenges of Changing a Culture*. Deb explained how Hershey's continuous improvement model began taking shape in 2004 and is still evolving. She explained that although many successful operational and process improvements have been made through the implementation of Lean tools, the cultural change across the organization is only just beginning.

**Hewlett Packard:** Christopher Greene, Business Manager—Utility Services, presented *Manufacturing and Information Supply Chains: An Inter-Disciplinary Approach to Lean*. Chris explained how HP has been successful at streamlining its manufacturing supply chains as well as making significant advances in its Lean information supply chains. Chris reviewed the transformation of one of HP's manufacturing supply chains looking at the tools, processes, and metrics used to attain targeted efficiencies. In addition, he shared a number of trends in information supply chains that HP is leveraging to support its manufacturing supply chains, the significant shift within internal information systems, and how HP is helping its customers deploy Lean information supply chains.

**Boeing:** David Ott, Support Systems Lean Enterprise Focal, presented *Using Lean Tools, Techniques to Boost Customer Service*. David discussed how Boeing, through a series of Lean activities, is shortening the amount of time each aircraft spends on the ground for maintenance, allowing more flexibility to the war fighter. In addition, David shared how Lean maintenance is critical because it ensures mechanics and technicians perform work that adds value as defined by the customer. He also showed how this process discipline improves quality, schedule and cost, in turn increasing customer satisfaction.

**Hytrol Conveyor Company:** Gregg Goodner, President, presented *Hytrol Power Lean—The Transformation of a Company*. Gregg shared how Hytrol, after 55 years of operating the business in the same manner, embarked on a journey to transform its company using the principles of Lean enterprise, six sigma and maintenance excellence. Gregg explained how this small company made a major commitment to change the culture and shared the successes and setbacks encountered during the journey.

**Supply Chain Visions:** Kate Vitasek, Managing Partner, presented *Understanding the Lean Supply Chain—Beginning the Journey*. Kate explained how Lean principles have enabled firms to be more flexible and profitable. She explained that to truly be Lean firms must extend these principles beyond the bounds of manufacturing to their supply chain partners. Kate shared the key attributes of a Lean supply chain; presented clear benchmarking data; and provided six major attributes of the Lean supply chain—demand management, cost and waste reduction, process standardization, industry standardization, cultural change, and cross-enterprise collaboration.

**Panel Discussion:** Kate Vitasek facilitated a panel discussion consisting of the guest speakers on *When is Lean Too Lean?* The panel discussed how Lean practices have revolutionized supply chain management and enabled enormous cost savings. The panelists also agreed that Lean practices can leave supply chains vulnerable to uncertainty, unable to react when unexpected events cause changes in the supply chain's environment. This panel discussed potential risks faced by Lean supply chains and the benefits that supply chain "fat" can provide. The panelists suggested ways that companies can evaluate the tradeoff between the risks and benefits of Lean practices, illustrating these concepts with examples from their own companies.

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## News and Upcoming Events

Our annual **CVCR Spring Symposium** on *Supply Chain Optimization for Speed, Agility and Efficiency* will be held May 13-14, 2008. The event will start with a networking dinner on May 13, followed by a full day of presentations and discussions on May 14. We have assembled an impressive list of speakers from J&J, Air Products, GE, LogicTools (division of ILOG), and Lehigh University. The event will be co-sponsored by the Council of Supply Chain Management Professionals ([www.cscmp.org](http://www.cscmp.org)). Visit [www.lehigh.edu/~inchain/SymposiumSpring08](http://www.lehigh.edu/~inchain/SymposiumSpring08) for more information.

**New CVCR member--Dresser-Rand** ([www.dresser-rand.com](http://www.dresser-rand.com)), one of the largest global suppliers of rotating equipment solutions, with field-proven centrifugal and reciprocating compressors, steam turbines, expanders, gas turbine packages, and control systems, is the newest member of the CVCR. Houston, Texas based Dresser-Rand operates 10 manufacturing plants and 27 service centers world wide providing a complete package of solutions, from initial concept to equipment retirement for the worldwide oil and gas, chemical, petrochemical, and process industries.

**New CVCR member--The Hershey Company** ([www.hersheys.com](http://www.hersheys.com)), the largest North American manufacturer of quality chocolate and sugar confectionery products has become a member of the CVCR. The Hershey Company markets such iconic brands as *Hershey's*, *Reese's*, *Hershey's Kisses*, and *Ice Breakers* and is the leader in the fast-growing dark and premium chocolate segment, with such brands as *Hershey's Special Dark*, *Hershey's Extra Dark* and *Cacao Reserve by Hershey's*.

On March 26-28, Joel Sutherland will be presenting at the LogiCon 2008 in Las Vegas, NV. For more information check out [www.logicon2008.com](http://www.logicon2008.com)

The CVCR continues to improve its website to provide more content and value. We recently added a members-only feature to provide our members access to a growing library of white papers, research papers and presentations. Check it out at [www.lehigh.edu/~inchain](http://www.lehigh.edu/~inchain), and stay tuned for additional improvements throughout the year.

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## Questions? Comments? Feedback?

If you have questions about the CVCR or would like to discuss the content of this newsletter, please contact Joel Sutherland at 610-758-6428 or at [joel.sutherland@lehigh.edu](mailto:joel.sutherland@lehigh.edu). We look forward to hearing from you!