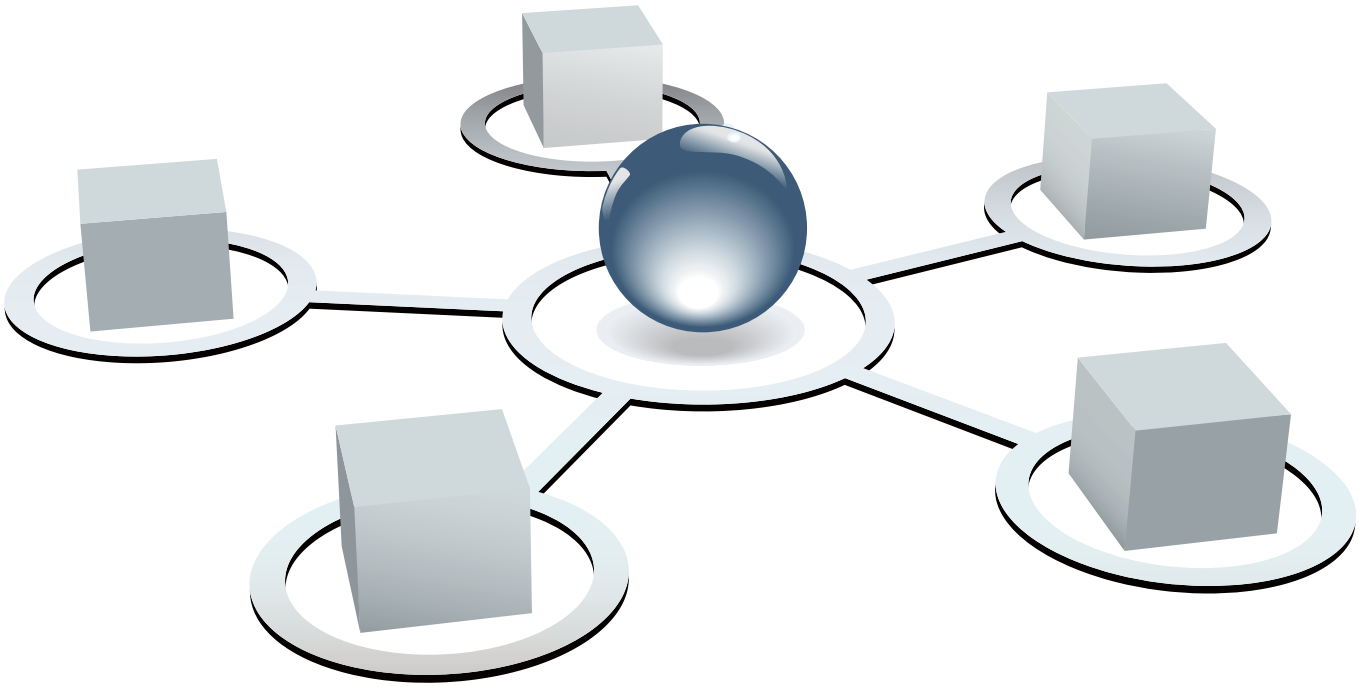
BEYOND *the* BASICS

The Integrated Supply Chain

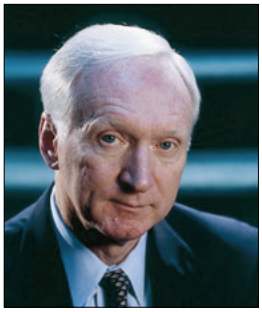


Presented by

University of Tennessee

SUPPLY CHAIN MANAGEMENT REVIEW

Introduction



Frank Quinn, Editor
fquinn@ehpub.com

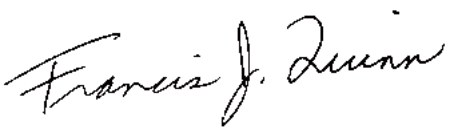
Beyond the Basics: The Integrated Supply Chain

This special report from *Supply Chain Management Review* highlights the benefits of closely integrating the key supply chain activities related to demand and supply. It's a logical follow-on to our initial series on the basics of SCM. That series of articles, like this one, was written by the experts from the University of Tennessee, one of the foremost educational institutions in the logistics and supply chain space.

Each of the articles in this series examines an advanced aspect of supply chain management. The topics covered range from collaborating more effectively with your trading partners to creating a "closed loop" supply chain to managing supply chain risk in an increasingly turbulent global environment.

A number of the articles discuss a valuable concept being researched at Tennessee called Demand and Supply Integration, or DSI. By applying the principles of the DSI business model, companies can more effectively integrate their demand and supply systems. That can result in both better financial performance and superior service to end users, as the articles explain.

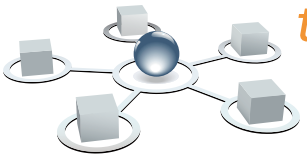
Our hope is that you can put the ideas and concepts in this "Beyond the Basics" series to work in your organization. Many companies have already done so with highly positive results.



BEYOND *the* BASICS

The Integrated Supply Chain

Contents



BEYOND the BASICS

PART I

Demand and Supply Integration: A Key to Improved Supply Chain Performance

By Dr. Theodore P. Stank, Associate Dean for Executive Education and Dove Professor of Logistics, University of Tennessee

Companies have historically separated the processes used to plan for, and manage, demand from those used to supply the resources and labor to meet it. The problem with this business model is that the companies using it are often unable to consistently ensure that supply meets demand.

Too often, the demand and supply functions are not synchronized, resulting in a shortage of the products that customers actually want and/or a surplus of products that are not wanted. Companies are trapped in a pattern of reacting to the whims of the marketplace without developing a proactively designed supply capacity

Curiously enough, such companies often are the victims of their own success—marketing programs that are not integrated with supply capacity end up creating more demand than the company can fulfill.

To create a more efficient and effective business model, companies must acknowledge that they need to integrate demand and supply systems. At the University of Tennessee, we call this business model Demand and Supply Integration, or DSI.

In 1999, the author ordered a computer three weeks before Christmas. It was a gift for his sons, and, as such, he had a very specific time frame in which to receive it. So when he received a confirmation email stating the computer would be ready on February 16, 2000, he replied that he needed the computer much earlier.

A service representative researched the delay and explained that the backlog was due to the fact that the 400 megahertz Pentium chip he had ordered was particularly popular. Rather than leaving a customer dissatisfied, the service rep suggested a way around the supply chain bottleneck. For an additional $50, Dell could upgrade the Pentium chip and ship the computer within a week. The author readily agreed, and the computer was received well before December 25. The customer's needs had been met and at a price that was reasonable to him.

What did Dell do right? First they had a system in place enabling customer service representatives to readily access sales, marketing, and supply chain information. This system allowed the service representative to do far more than just "empathize" with the problem. The service rep was able to work with the customer within the company's current supply chain limitations and ensure satisfaction.

How often have you gone to a store for a specific item only to be told that it will not be available for a week or more? Frequently that is the only assistance you receive. You either purchase the product somewhere else or become frustrated with the delay. Either way, you are less than satisfied with the store's service.

Through close relationships that facilitate information sharing at the system level, DSI allows companies to serve

end-users better. It empowers each member of the supply chain to develop immediate and appropriate solutions to problems as they arise. It requires that managers not only focus on their own goals, but also learn to look to the larger organization (including external supply chain members such as retailers and end-users) as a whole. Goals must be agreed upon corporately and worked toward in unity.

One key element of DSI is development of an integrated sales and operations planning (S&OP) process to facilitate systemic information sharing. This provides a formalized procedure to begin synthesizing a company's operational plan with its demand plan. The operational plan consists of manufacturing, procurement, distribution, finance, and related human resource plans

Operational plans include such items as monthly production schedules, extended contracts for raw materials with supply chain partners, and any plans to expand manufacturing capacity internally and/or with partners. In the demand plan, sales and marketing determine what should be sold and marketed… and when (given the supply capabilities of the firm). Demand plans may involve suppressing demand for products or services that are capacity constrained, or shifting demand from low- to high-margin items.

In this way, Lowe's, Whirlpool, and their suppliers execute DSI across the entire supply chain, recognizing that DSI is not just about managing supply, but also about managing demand.

Once more, Dell serves as a model for effective creation and implementation of a sales and operations planning process to facilitate DSI. In the fall of 2003, California dock workers organized a strike that brought imports into the largest West coast ports to a standstill.

While most companies weather such supply chain disruptions by holding weeks (or even months) of domestic safety stock, Dell's business model only provides for a few day's supply of product on hand. Regardless, Dell needed to keep end-users happy. To continue providing product to its customers, Dell was left with only one option; it had to use expensive air freight to transport supplies from Asian vendors to the U.S. Company executives realized that one major constraint to this plan was the cost of transporting bulky cathode ray tube (CRT) computer monitors by air.

Dell's demand and supply managers created an alternative plan; they determined that they could "shape demand" by offering end-users the opportunity to buy flat screen monitors for the same price as the older ones. It would still be costly to transport monitors by air, but the cost of moving the flat screens was much lower than that for the bulkier and heavier CRT monitors.

Dell might not make as much money on the deal, but their end-users were significantly more satisfied with their "free" upgrades. Essentially, they changed the monitor market overnight, a development for which competitors' supply chains were not prepared. This sort of dynamic solution is only possible when organizations embrace a business model that integrates demand and supply processes.

Lest we think Dell is the only practitioner of DSI, consider the relationship between Whirlpool and Lowe's. Every week, this retailer and vendor have a DSI conference call to discuss what appliances are selling in the stores and Whirlpool's capacity to make product. Often, the discussion revolves around a particular model that is selling at a higher-than-expected rate in Lowe's.

As executives from both companies related in a speech to the University of Tennessee Supply Chain Management Forum, this often results in Whirlpool quickly flexing its supply chain to make more of the high-selling product and deliver it to Lowe's customers (perhaps, in the process, shifting capacity away from products for which Lowe's is experiencing lower-than-anticipated demand). However, sometimes the answer is that Whirlpool and/or its suppliers do not have the capacity to make more of the product in question. It then becomes a question of demand shaping for Lowe's.

What promotions, in-store displays, and sales incentives can Lowe's implement to shift demand from the capacity-constrained model to one that the supply chain has more capacity to deliver?

While the stories shared here have been successes, incorporating DSI is not simple. There are many potential obstacles. The most common pitfall is misunderstanding the role of DSI within the organization. It should not be subject to company politics or artificial financial targets or quotas. Rather DSI should be used to establish organizational financial targets without preconceived ideas of the end result

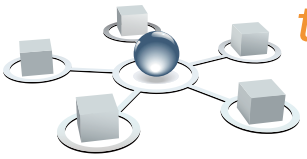
Often this requires a reframing of corporate (and even the entire supply chain) culture, a shift that only occurs with a significant investment of time and labor on the front end.

In addition, DSI necessitates another company change: strong, effective customer integration. For that to occur, information must already flow easily between departments. A company must shift its focus from prod-

uct and supply to customer, market, and supply chain. The transition is challenging, yet the ultimate value of DSI is undeniable.

Editorial Note:
To be notified of all the latest *Supply Chain Management Review* editorial information and updates, including this series "Supply Chain Management: Beyond the Basics" make sure you are on our eNewsletter subscriber list.

Dr. Theodore (Ted) Stank is the associate dean of executive education and Dove Professor of Logistics at the University of Tennessee, Knoxville. Stank has an extensive business background in sales and marketing, has served as a surface warfare officer in the United States Navy, and has performed extensive consulting and executive education services for dozens of manufacturing and logistics firms. He is a member of the Institute of Supply Management and the American Society of Transportation and Logistics and is a board member of the Council of Supply Chain Management Professionals. His research focuses on the strategic implications and performance benefits associated with logistics and supply chain management best practices. He has authored over 60 articles in academic and professional journals and has co-authored several books. He can be reached at tstank@utk.edu.



BEYOND the BASICS

PART 2

Demand and Supply Integration: "Within and Across" Integration—The Key to DSI

By Terry L. Esper, Ph.D., Associate Professor of Logistics, The University of Tennessee

At the University of Tennessee we have placed significant emphasis on a business model we call Demand and Supply Integration (DSI). In essence, DSI represents a holistic approach to managing demand creation and management activities by aligning them with all of the processes and activities necessary to fulfill demand. At the very core of DSI, therefore, is the notion of internal cross-functional integration. The promise and potential of leveraging this business model for organizational and supply chain success will only be realized if the appropriate infrastructure and culture are in place to facilitate integration.

I have talked to several companies that are engaging in perhaps the most popular application of the DSI concept—Sales and Operations Planning (S&OP). S&OP is a series of formalized meetings with a focus on aligning sales and operational plans.

By definition, therefore, the S&OP process is the embodiment of DSI, as it emphasizes the importance of synthesizing demand-side and supply-side activities. What I have begun to observe, however, is that many firms adopt S&OP processes but are not integrating them. The internal cross-functional integration that is assumed to happen by adopting a "process" is, in fact, not taking place.

For example, when observing the S&OP process of a firm that I'll call "Company A", it was quite obvious that this firm was holding S&OP meetings, yet the firm was not involving marketing or sales. However, the firm was convinced that it was "doing" S&OP because it was having S&OP meetings. When talking with a marketing executive within "Company A" about marketing's noticeable absence from the S&OP meetings, he replied, "that's an operations meeting—we go if and when we can." Hence, the company was attempting to leverage S&OP, but with minimal success and participation. Operations and sales/marketing were good at working internally to develop forecasts and plans; they just didn't come together for the synthesizing and adjustments that S&OP entails. As such, the company possessed large amounts of excess inventory and were mediocre in terms of customer service.

While spending time at a firm that I'll call "Company B," I was inspired by the initial findings regarding its S&OP process. Several employees were involved in S&OP from both the sales/marketing and operations areas of the firm. They were committed to the process and generally saw the value of DSI. Upon further observation, however, it became clear that the marketing group was significantly frustrated with "Company B's" S&OP activities. The crux of its concern was the lack of cohesion among the operations managers. Instead of arriving at the S&OP meetings with a comprehensive plan, they would bog down the meetings by attempting to develop agreed-upon operational forecasts, which often slowed down the S&OP process and led to contentious debate and "tug-of-war" about which area of operations (i.e. manufacturing, procurement, logistics) would

have to sacrifice its respective P&L in order to develop a comprehensive operations forecast. In the end, "Company B" leveraged DSI and realized the benefits, but its processes were lengthy and sub-optimal—all due to a lack of integration within operations.

These two examples highlight the importance of internal cross-functional integration, particularly when trying to focus on DSI. DSI requires integration both within and across functional areas. "Company A" possessed good "within" integration, but lacked "across" integration, and the opposite was the case for "Company B." The reality is that effective organizations focus on BOTH, as both "within and across" integration are necessary to effectively streamline internal supply chain flows that, in turn, allow for more effective upstream and downstream exchange flows with suppliers and customers.

So, how do firms achieve effective "within and across" integration? Well, it's definitely not easy.

The difficulty stems from the fact that integration must be undergirded by the organization's culture. Without a corporate culture that emphasizes and facilitates integration, it's very likely that elements of the disintegration we saw in Companies "A&B" will impede firm and supply chain process flows. Hence, integration requires more than meetings and process adoption; it must be part of the actual culture of the firm.

In order to foster an integrative culture, I have observed that many firms focus on performance measures, internal structure, and the support of corporate leadership. Each of these elements play a significant role in culture-shifting, as they all signal the values and managerial approaches that are considered important when engaging in day-to-day management activity. Although Companies "A&B" were clearly lacking on some aspects of these elements, resulting in either the absence of "within" or "across" integration, there are some insights that we can extract from their respective scenarios.

Performance Measures—It was no surprise, upon further investigation, that "Company B" lacked within-function integration, as its measures didn't foster or facilitate it. Instead of comprehensive operational measures (i.e. total landed or supply chain costs, perfect customer order), it used fragmented measures that were very siloed in nature. Hence, procurement, manufacturing and logistics had no incentive to work together, as there were no holistic, comprehensive, total-cost-focused measures or rewards in place to foster such integration. The "tug-of-war" that ensued in the S&OP meetings was a function of the company's measurement system; the company was, in essence, stimulating disintegration by using measures that fostered an "us against them" mentality.

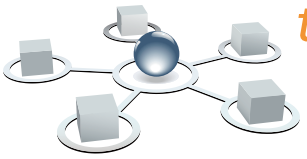
Internal Structure—One of the key issues plaguing the DSI activity of "Company A" was lack of ownership. Marketing managers didn't attend S&OP meetings because they, quite frankly, didn't have to. There existed no shared lines of reporting or upper management control that would foster the type of "across" integration that they needed for success. The organizational structure of "Company A" was disintegrated, yielding a lack of integration across the firm. Outside of the CEO function, there were no structural points where joint responsibility of the demand-side and supply-side areas of the business overlapped. As such, it was difficult for the company to enforce DSI approaches like S&OP because it was viewed as an operations issue, not an operations AND marketing issue. Structurally, there were no touchpoints that would help facilitate integration from a top-down perspective. Which brings us to our last point.

Corporate Leadership—In both companies, there were a general lack of corporate leadership attention to the issues of "within and across" integration. Although upper management saw DSI activity as important enough to attempt to engage in S&OP, they didn't emphasize it enough to focus on investing in the culture and infrastructure necessary to make it work effectively. In the end, if corporate leadership is not focused on integration, then integration will likely be a grass-roots effort, at best.

Both of our example companies were only able to scratch the surface of the benefits of DSI activity, primarily due to the lack of awareness of the deep-rooted issues that were plaguing their processes and impeding their success. Corporate leadership's endorsement and facilitation of internal "within and across" integration is paramount. Otherwise, the other issues that foster disintegration, such as measures and structure, will likely be exacerbated and amplified—further impeding the realization of the supply chain benefits of DSI.

Editorial Note:
To be notified of all the latest *Supply Chain Management Review* editorial information and updates, including this series "Supply Chain Management: Beyond the Basics" make sure you are on our eNewsletter subscriber list.

Terry Esper is an Assistant Professor of Logistics in the Department of Marketing and Logistics at The University of Tennessee. Dr. Esper's research interests include supply chain collaboration, boundary spanner role perceptions and behavior, supply chain orientation, and supply chain relationship management. He has work experience with Hallmark Cards, Inc. and Hallmark.com.



BEYOND the BASICS

PART 3

Collaboration in the Supply Chain: Getting Things Done Beyond the Four Walls

By Dr. Chad W. Autry, Associate Professor of Logistics
The University of Tennessee

Collaboration among supply chain partners is certainly a hot topic, but many supply chain managers remain unsure of what the concept of collaboration really entails. To some companies, collaboration simply means an exchange of ideas and information among partners – usually directed toward a specific opportunity or problem – where members of the collaborating companies get together to share best practices, address concerns, and generate solutions.

For example, one pet products manufacturer stages monthly meetings with its key transportation providers in order to discuss rates and fuel market concerns, talk about capacity issues, and share demand data and projections for a few critical SKUs for broad-level planning purposes. We can refer to this type of loose collaborative relationship as a "conventional" or weak collaboration, and it carries with it only moderate levels of potential risk and reward for the partners involved.

However, for other companies, collaboration may mean something greater and/or different. Companies that have migrated further down the evolutionary chain of collaboration tend to view it more in terms of a long-term strategic venture, intended to allow partners to synthesize planning; decision-making; and execution on an open-ended, open-subject basis— keeping each other's desired outcomes in mind throughout. In this latter type of arrangement, which we can refer to as a "vested" or strong collaboration, the key is that both sides have generally put some "skin in the game"—the risks and rewards of the collaborative venture are both real and shared.

Examples of strong collaborations would include synchronizing a manufacturer's product development and marketing functions with its partner's packaging and distribution capabilities; joint forecasting and inventory planning among multiple members of partner organizations to optimize total supply chain inventory; and co-creating long-term supply chain network models with upstream suppliers and downstream customers so as to minimize annual transportation costs for the entire system. Additionally, the Vested Outsourcing research conducted by the University of Tennessee provides another excellent illustration of the power of strong collaboration. In a Vested Outsourcing relationship, companies and their third-party providers work together very closely, keeping each other's key process requirements and best outcome interests in constant focus.

Depending on how your company sees a particular opportunity or threat, collaboration can therefore be approached as either a tactical or strategic-level initiative and would commensurately yield short or long-term, and small- or large-scale, benefits.

Strong Collaboration

In talking with companies who are sponsors of UT's Demand and Supply Integration Forums and during company-specific projects, I have heard managers say they are interested in strengthening their collaboration arrangements with certain

key partners in order to more fully leverage their best relationships. Strong collaboration may be productive in the right settings in some collaborative partnerships, but it is perhaps less advantageous to pursue in other partner/product scenarios. In order to better understand which collaboration arrangement is right for a given setting, it is important to understand the potential benefits of strong collaborations, and weigh those benefits against the potential risks of entering into such an alliance with a partner whose interests may/may not be perfectly aligned with your own. Additionally, you should be aware of the key factors that enable or inhibit productive, collaborative arrangements so that steps can be taken to leverage or mitigate their effects.

To weigh the collaboration decision effectively, we must first gain some sense of what a strong collaboration arrangement entails. Much research has begun to explore this issue, and luckily there is some consensus. Most investigators agree that the close, highly productive collaborative arrangements we denote as strong or "vested" have at least three characteristics in common: 1) deep, intensive communication among the partners, 2) open and free information sharing, and 3) some form of joint planning, including mutually shared goals and dually aligned incentives with which to reach them.

The collaborative venture must involve persons with leadership skills and must be characterized by trust among the members of the participating companies.

Open communication, information sharing, and joint planning represent the lifeblood of any strong collaboration arrangement, and a venture would almost certainly fail without them. These measures are supported by alignment of incentives across the partnering organizations, which ensures that the developed plans are adhered to and that the resulting work actually gets done. Additionally, variations of strong interfirm collaboration may include several other aspects that are believed to generate additional positive outcomes for the partners. Depending on the specific setting, these may include processes that enable joint problem solving; knowledge-creation routines or "think tanks"; decision-making heuristics designed to align the partners' approaches to opportunity development or risk management; and resource-sharing mechanisms that allow each company to take best advantage of the other's talent, assets, and ideas.

Each of these may look different from context to context, and may be more or less relevant depending on the situation, but variations of these themes frequently occur in many strong collaboration arrangements. On the flip side, as collaborations among companies increase in strength, their benefits are to some degree balanced out by certain risks—sharing of proprietary customer or supplier information with partners or divulging trade secrets each present unique dangers, for example—and so companies are wise to consider such tradeoffs before entering into any form of collaborative agreement. In addition, some firms may be wary of involving outsiders in key decisions where both the motivations and underlying agendas for undertaking certain strategic supply chain actions are less than fully transparent.

Enablers and Inhibitors of Effective Supply Chain Collaboration

Despite the best efforts of supply chain managers, only some collaborative ventures among companies end up working out for the participants' mutual benefit. During a recent interview with a well-known paper products manufacturer, one manager asked us what the differences are between collaboration opportunities that work and others that seem destined to fail from the outset. Knowing little or nothing about a particular situation, it would be hard to say with precision what the critical success factors would be in any given setting, but we can make some generalizations as to typical enablers and barriers to collaboration success. I will conclude by addressing three primary factors in each category that are supported by the current research.

In terms of factors that have been demonstrated as enabling strong interfirm collaboration efforts, it is imperative that we understand that above all (and despite what some believe), collaborative ventures are primarily dependent on personalities, knowledge, and skills of the people from the involved companies. Accordingly, the collaborative venture must involve persons with leadership skills and must be characterized by trust among the members of the participating companies.

Because collaboration outside the four walls will necessarily involve extra effort and resources, both sides will need an internal champion to maximize their returns on the relationship. Additionally, it is crucial that the members of the collaborating firms trust each other—perhaps not fully, but enough that the information critical to the venture can be exchanged with full openness. Until full and free information exchange can occur, the product of the collaboration will only be a shell of its full potential.

Furthermore, because much of modern collaboration among geographically separated firms takes place in virtual space, a third key enabler is usually the implementation of an adequate technological collaboration tool. It may not be necessary to adopt the most sophisticated technology available for this purpose, and the exact functionality will of course be context-dependent, but most every successful strong collaboration will include an electronic workspace for the transmission and sharing of the key data, work, and ideas. A number of other enablers have been cited as well and are variably appropriate for consideration depending on the product/partner context.

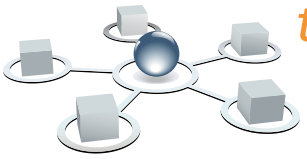
Of course, in addition to the enablers, a number of factors have been shown to inhibit or reduce the overall effectiveness of a strong interfirm collaboration arrangement. Again, these are generally related to the human element of the collaborative venture. First, it should be widely apparent that insufficient communication among the members of the collaborating companies would spell trouble for the entire venture. Sometimes, the collaborative effort starts off with the best of intentions, but, given that partners may be non-local, members of the initiative might communicate less and less throughout the venture's life as more immediate and local issues become more pressing. In other cases, there are outright betrayals of trust that occur either intentionally or inadvertently.

Obviously, such actions would spell doom for the relationship. One way to manage these sorts of human issues would be to formalize the terms of the relationship upfront, and then relax them as the relationship matures to a point where it can be governed by trust. A third reason frequently cited as a cause for collaboration failure is simply resistance to change in the individual organizations.

In spite of these issues, some companies are finding that a very productive way to address complex supply chain issues is through the development of strong collaborative arrangements with key partners. Though collaboration has been a supply chain mantra for over a decade, many companies have yet to figure out how to do it well. Exploring the possibilities presented here with your most important partners may lead to a differential advantage for your supply chain in the foreseeable future.

Editorial Note:
To be notified of all the latest *Supply Chain Management Review* editorial information and updates, including this series "Supply Chain Management: Beyond the Basics" make sure you are on our eNewsletter subscriber list.

Chad W. Autry, Ph.D. is an associate professor of logistics in the College of Business Administration at the University of Tennessee, Knoxville. He holds a Ph.D. in Business Administration, supply chain management focus, from the University of Oklahoma. Autry has worked with many organizations related to supply chain process improvement, including Boise Corp, IBM, Goodwill Industries, the American Red Cross, the U.S. Air Force, and the U.S. Marine Corps. He is a member of the Education Strategies Committee of the Council of Supply Chain Management Professionals; has assumed active leadership roles with WERC, Production and Operations Management Society, ISM, National Association of Purchasing Managers; and is a co-founder of the Supply Chain Management and Industrial Distribution Symposium. His has authored over 40 articles in academic and professional publications about logistics and supply chain relationship-based collaboration and network design.



BEYOND the BASICS

PART 4

Demand and Supply Integration in the Closed Loop Supply Chain

By Diane A. Mollenkopf, Ph.D., McCormick Associate Professor of Logistics, University of Tennessee College of Business inistration

The last several articles in this series on **Demand and Supply Integration (DSI)** have set the stage for understanding the importance of both intra-firm and inter-firm collaboration in order to bring about truly integrated supply chain performance. As Terry Esper acknowledged in the second article of the series, DSI is "a holistic approach to managing demand creation and management activities by aligning them with all the processes and activities necessary to fulfill demand."

To the uninitiated, this definition seems to reinforce the notion of a supply chain as a uni-directional flow of product (that, is products move "down" the supply chain, from suppliers to the ultimate customer). Nothing could be further from the truth, however. In the "Back to Basics" series, I addressed some of the issues of the reverse flow by discussing reverse logistics and returns management. The savvy supply chain manager, therefore, must consider how to develop a DSI orientation that integrates both the forward and reverse flows across the supply chain.

In a world of increasing resource scarcity (think water, rare-earth metals) and volatility (think fuel prices, carbon 'taxes'), firms are increasingly addressing their roles as corporate citizens on a planet with finite carrying capacity. Such consideration was not part of business leaders' "top issues" list during most of the 20th century. But as this century continues to advance, resource scarcity issues will come to dominate our business landscape. Developing effective DSI processes now will enable firms to develop competitive advantages and capabilities that will carry them in to the future.

While forward supply chains focus on moving product toward the customer, reverse supply chains focus on moving product from the customers back toward the point of origin.

Products move upstream for a variety of reasons (addressed in the "Back to Basics" article on returns management), but what's important here is how and why companies manage the acquisition of such products, and then the processing and disposition of those "reverse" products. Actively designing supply chain structures and processes that integrate both forward and reverse product flows moves a firm into the realm of closed-loop supply chain management.

The closed-loop paradigm consists of three major themes:

1) Returns management, product acquisition, and asset recovery

2) remanufacturing and secondary markets, and

3) life-cycle management

Returns management, as discussed in the "Back-to-Basics" series requires supply chain capabilities for effectively and efficiently managing the reverse flow of product. However, it's one thing to manage the returns that "happen"; it's another to purposefully seek products to enter the reverse stream. Yet, product acquisition and asset recovery involve very proactive initiatives on the part of firms and their supply chain partners to recapture products from the marketplace. In a world of resource scarcity and rising raw material costs, such an approach increasingly makes sense. For example, the millions of de-commissioned cell phones sitting in consumers' kitchen junk drawers may not be worth much individually, but the precious metals in them add up to significant dollar value when viewed collectively. Reverse supply chains to recapture used cell phones are now becoming commonplace for the purpose of recapturing the valu-

able components within the phones. As commodity prices rise, recapturing metals such as gold from individual phones becomes economically viable as a means to controlling costs for cell phone manufacturers (or any firm wishing to deal in precious metals).

Product recapture will require the joint efforts of end customers, retailers, 3rd-party logistics providers, and a host of processors that will become part of the reverse supply chain. The plethora of involved parties will demand a high level of inter-firm collaboration and efforts to create DSI-oriented supply chain relationships that are focused not only on getting products to the customer, but also on getting products from the customer.

Recapturing product or assets is only part of the story. Remanufacturing and refurbishment of returned products offers firms a significant opportunity to recapture value from the returned products. Whether the remanufacturing facilities are co-located with the original manufacturing sites or not, a high level of DSI is required to effectively manage the conversion of "used" inventory into sellable inventory. Whether parts can be recaptured for use in new products, or as repair/service parts in field support operations, this needs to be coordinated with existing production and procurement plans. Recovery rates on remanufactured/refurbished goods must be managed and integrated with production of new product and also aligned with market demand for products. Thus, a high level of intra-firm integration is required to coordinate the flow of inventory back to the firm, through the re-conversion process, and then, as the remanufactured product is re-inserted, to the forward supply chain again.

Part of the DSI processes needed to position a firm for the future will be the development of closed-loop supply chain capabilities.

Such efforts also require a high level of DSI with suppliers and customers. In fact, integration efforts can be taken back to the product design stage. Many firms are increasingly working with their suppliers to design products for disassembly or remanufacturing. Such collaborative efforts in the early stages of a product's life cycle ensure that the remanufacturing process will be more efficient, with higher recovery rates.

Firms are also finding it important to integrate their efforts with 3rd-party processing and logistics firms to better coordinate the flow of returned products back to the (re)manufacturing site, and aligning network flows with the more conventional forward distribution flow of products.

Firms that have traditionally managed their supply chains only to the point of initial sale to the customer have much to learn from the expertise of firms such as Deere or Caterpillar.

At the same time, marketing plans and activities need to focus on developing secondary markets in which the remanufactured products (or component parts) can be successfully sold. Obviously these markets should not compete with the firm's primary markets, requiring a high level of understanding and joint decision-making across the operations, logistic, and marketing/sales functions of the firm to manage the multiple kinds of markets for the firm's product offerings.

Discussion of secondary markets suggests that products often have multiple lives. Traditional supply chain management has focused on the 'first' product life of a product. But as recovery efforts increase, for both environmental impact reasons as well as for economic reasons related to value recapture, firms are recognizing that products have multiple lives. A closed-loop supply chain approach encourages a firm and its supply chain to actively manage products over multiple lives.

Some firms, like John Deere or Caterpillar, have long-recognized the long and multiple life cycles of their products. Tractors and earth-moving equipment tend to last for decades; these firms have developed expertise in servicing their products for their customers over very long life cycles. Recovery of parts and refurbishment and/or remanufacturing of parts (such as engines or turbines) are routine business practices for these firms.

Firms that have traditionally managed their supply chains only to the point of initial sale to the customer have much to learn from the expertise of firms such as Deere or Caterpillar. Not all products have the lengthy life cycle of tractors or heavy equipment, but many products can have multiple lives. Firms need to distinguish between end-of-use and end-of-life.

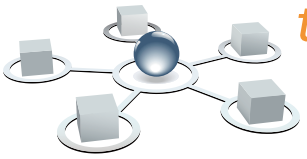
In our disposable culture, customers often "finish" with a product long before its useful life is over.

Recapturing such products for refurbishment or remanufacture enables them to be sold in secondary markets over multiple lives. But unless firms have a closed-loop supply chain orientation and have purposefully set about to manage products over those multiple lives, they are losing out on potential profits, to say nothing of improved resource management.

Closed-loop supply chains don't just happen. It takes leadership to transform a firm's thinking from forward-flow-only to one of integrated forward and reverse flows. Corporate leaders needs to develop their corporate cultures to embrace upstream and downstream integration to better manage demand and supply across the multiple lives and markets of their products.

Editorial Note:
To be notified of all the latest *Supply Chain Management Review* editorial information and updates, including this series "Supply Chain Management: Beyond the Basics" make sure you are on our eNewsletter subscriber list.

Diane A. Mollenkopf, Ph.D.is the McCormick Associate Professor of Logistics in the Department of Marketing and Logistics at the University of Tennessee, Knoxville. She has international experience, having lived and worked in France and New Zealand. Her research can be categorized into two main research streams, one relating to logistics/supply chain integration and the other relating to environmentally responsible logistics/supply chain practices. Much of her research has been conducted in an international context.



BEYOND the BASICS

PART 5

The Essentials of Supply Chain Management Strategic Sourcing: Cost Management

By Wendy L. Tate, Assistant Professor of Logistics, Department of Marketing and Logistics, University of Tennessee

Managing the cost of purchased goods and services continues to be a key concern of executives. According to the U.S. Census Bureau, the cost of purchased materials is approximately 54 percent of the value of shipments for manufacturers. The importance of services to the global economy as well as to individual organizations continues to grow, meaning that the purchasing spend for services is continuing to increase. More emphasis is being placed on strategic cost management and on the sourcing professionals who are responsible for locating and managing the suppliers that provide the materials and services. Strategic cost management takes a broad view of the organization's costs, both internal and external, in such a way as to enhance competitive advantage. Typically, the management of costs is perceived as an accounting or finance responsibility because these functions have a fiduciary responsibility for cost control. However, the purchasing organization generally controls much of the organization's expenditures. Purchasing has to be able to think creatively about ways to strategically manage the supply base to better manage costs.

Purchasers should first assess and segment purchased materials, services, and components in terms of importance to the organization and the difficulty or complexity in accessing the materials. As discussed in the previous "Back to Basics" article on strategic sourcing, segmenting the spend allows purchasers to apply the appropriate cost management tools and establish the foundation for successful negotiations and relationships. Using terminology from a segmentation process developed by Kraljic (1983) there are four major categories of segmentation: non-critical purchases, leverage purchases, strategic purchases, and bottleneck purchases. For each category, there are more effective relationship and cost management strategies. The cost analysis techniques that are applied should support the relative importance of the item being purchased and also the type of relationship that the organization desires.

Non-critical Purchases

These are generic purchases, of low importance to the organization, with the focus on obtaining the lowest possible purchase price from a field of many suppliers. With these types of purchases, there are typically low switching costs involved in changing suppliers. Supplier relationships are transactional and arms-length.

The focus in this category is on price analysis. The goal for these types of purchases is to get the best possible price while still maintaining customer value. Purchasers can use competitive bidding or publically posted price lists to compare the price being paid with the market value. Another key way to assess the price being paid is by using established market indices to determine the state of the market and comparing market fluctuation to historical data. One way to access market data is through the Producers Price Index (PPI), published by the Bureau of Labor Statistics. Comparison of market (PPI) versus actual (historical) trends

	PPI (Market)	Actual (Historical)	Percent Market Change	Actual (Historical)		Percent Actual Change
	January 2010	January 2011		January 2010	January 2011	
Packaging	246.5	225.8	-8.40%	132.75	124.0	-6.60%

Comparing Purchasing Price with Market Trends

is one way to measure purchasing's effectiveness. The example above is a comparison of historical prices paid for packaging with the market trend for packaging.

In this scenario, the market index decreased 8.4 percent whereas the prices that the company paid only decreased 6.6 percent. The commodity manager potentially missed out on some price decreases (depending on contracts and supplier availability). For these non-critical purchases, watching market trends is an important metric in ensuring that the organization is receiving the lowest possible price.

Leverage Purchases

This category of items is purchased in large quantities; they are often made-to-stock, have many available sources, and often are listed on the commodity exchanges. There is relatively low complexity involved in these purchases, but these products and services have an on-going impact and high importance to the organization in terms of volume purchased, percentage of total purchase cost, or impact on product quality of business growth.

The goal of purchasing is to ensure that the organization is paying a fair price based on the assumed or calculated cost of the items being purchased. The benchmarking concepts used for non-critical purchases are also appropriate methods for items in this category. Many organizations use a technique called "white-sheeting," which is a combination of price benchmarking and cost analysis. The intent is to start with a blank page and build a breakdown of all of the cost elements of an item by using industry knowledge and averages, price indices, and other benchmarking techniques to develop a "should cost" of the product. By understanding what the item should cost, you can better understand the price you should be paying once a fair and reasonable profit is applied. Organizations that use this technique have realized extensive cost savings.

Cost Element	Initial Cost Estimate	Cost Estimate with 25 percent Labor Increase
Material	$1.25	$1.25
Direct Labor	$2.00	$2.50
Mfg OH (150% Direct Labor)	$3.00	$3.75
Tooling	$1.75	$1.75
Factory Cost	$8.00	$9.25
SGA (20% of Factory Cost)	$1.60	$1.85
Total Cost	$9.60	$11.10
Profit (10%)	$0.96	$1.11
Selling Price	$10.56	$12.21

Ganging Cost Elements

Suppliers call looking for price increases because "labor rates are increasing," "the cost of materials is increasing," or for many other reasons. The ability to assess the price increase in comparison to the change in the market helps purchasers protect the company from paying too much. For example, a representative from a supplier calls and explains that they have to increase its selling price by 25 percent because its LABOR rates have increased 25 percent. The purchaser had compiled cost information when the company first started doing business with this supplier. The buyer used the initial cost breakdown to determine the potential impact of the labor increase. (*see table, left*)

The supplier is expecting you to pay a 25 percent increase on top of the initial price of $10.56 or $13.20. However, the increase is actually occurring only in the category of direct labor. By increasing the labor cost element by 25 percent (and adjusting the associated overhead allocations), the projected increase in selling price should be approximately $12.21, or $1.00 less than was being requested! These savings are significant in the leverage category where the goal is to consolidate volume to achieve economies of scale and then reduce price. There are many benchmarking databases available to help compare and estimate the different cost elements.

Strategic Purchases

This category consists of the items that are important to an organization's competency. There is much more

complexity and risk involved in these purchases because of limited availability of supply or fewer capable suppliers. Contracts and relationships with suppliers are more long-term and strategic.

The cost techniques used in this area are generally the most thorough and time consuming.

These techniques move away from price benchmarking and focus more on continuous improvement. The primary tool used here is a total cost of ownership analysis. Total cost seeks to identify the costs associated with the entire acquisition process including service costs, failure costs, administrative costs, special handling costs, transportation costs, and other elements. The idea is to identify the cost elements that the buyer incurs in doing business with a particular supplier. Once these cost elements are identified, the buyer and supplier can work together to continuously improve the process and reduce the cost.

The price paid to the supplier is only the tip of the iceberg in a total cost of ownership analysis! There are many costs beyond the initial purchase price that impact the true cost to the organization. A total cost of ownership analysis can also help to compare the purchase from differing locations – for example offshore suppliers versus homeshore suppliers. Once the cost elements are defined, a total cost model can also help show different "what if" scenarios, and negotiation strategies. Below is an example of a simplistic total cost model for the purchase of dressers.

The price paid to the supplier is only the tip of the iceberg in a total cost of ownership analysis!

Cost Element	Quoted Price	Cost per Container
Price paid to Supplier	$225 (96 per container)	$21,600
Shipping Costs	$4750 per container	$4,750
Customs Fees	2.5% Value of Container	$540
Duties	7.5% Value of Container $1,620	$1,620
Security Fees	$1250 per container	$1,250
Insurance	$350 per container	$350
Transportation port to Warehouse	$1000 per container	$1,000
Transportation from Warehouse to Customer	$900 per container	$900
Warehouse Charges	$175 per pallet (12 per container)	$2,100
Quality Control	$25 each dresser	$2,400
Travel	$20,000 per 100,000 dressers	$19.20
	Total Cost Per Container	$36,529
	Total Cost Per Dresser	$380.51

Cost Model for Purchase of Dressers

Note that the cost elements over and above the price paid to the supplier add approximately $155 to the cost of doing business with this supplier. There are also many other cost elements not included in this model, for example what happens if the quality from the supplier is less than expected? Purchasers should consider which cost elements are relevant to the analysis. One word of caution with total cost models is that they only represent the costs at a specific point in time. Purchasers must proceed with caution when the market is in a state of flux.

Bottleneck Purchases

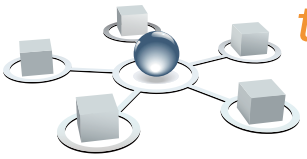
The final category contains items that may require long-term capital investment and are often project-oriented. The relationship with the supplier may or may not be strategic, but the supply market is highly complex. Bottleneck purchases usually represent one-time (or infrequent) expenditures, generally of large sums of money. Capital equipment, information systems, or other long-term assets tend to fall in this category. Total cost models are appropriate here, as well. However, these total cost models tend to focus more on the cost elements across the total life cycle of the item; for example, extended service, warranty costs, replacement parts, and disposal costs. The total cost models include additional cost elements that represent an integrated life-cycle management approach.

The intent of this document was to introduce some essentials of supply chain management, specifically in the area of strategic sourcing and cost management. The appropriate application of cost/price analysis techniques is key to successful spend management in all organizations. Each of the techniques introduced in the above paragraphs has benefits and pitfalls. With the continuing emphasis of cost savings and reductions in many organizations, the above techniques are a potential starting point. Proactively involving purchasing in the proper

application of cost/price analysis techniques could potentially have the greatest strategic impact to the organization.

Editorial Note:
To be notified of all the latest *Supply Chain Management Review* editorial information and updates, including this series "Supply Chain Management: Beyond the Basics" make sure you are on our eNewsletter subscriber list.

Wendy L. Tate, Ph.D. joined The University of Tennessee's Department of Marketing and Logistics in 2006 after completing her Ph.D. in supply chain management at Arizona State University. Her research focuses on strategic sourcing/purchasing in the context of the services supply chain and environmental sustainability. She teaches strategic sourcing to undergraduate students, MBAs, and executives. She can be reached at wendy.tate@utk.edu.



BEYOND the BASICS
PART 6

Linking Supply Chain Performance to a Firm's Financial Performance

By Priscilla Wisner, Distinguished Lecturer,
The University of Tennessee

Most businesses measure success through a high-level set of financial metrics that are reported on a quarterly or annual basis, such as operating or net income, return on investment, and earnings per share. Financial performance metrics are valuable because they capture the economic consequences of business decisions. They are the "language of business," used by internal and external stakeholders to evaluate the results of business operations.

Supply chain managers make decisions and use organizational resources that eventually impact the financial outcomes of the firm. To do so effectively, they need to link the results of supply chain decisions to the financial goals and related metrics of the company.

By creating a set of linkages between the work that is being performed and the financial outcomes of the firm, the organization's supply chain function can gain organizational visibility and demonstrate the impact of supply chain decisions and resource utilization on the firm's financial performance.

Financial Statements

The financial statements of an organization consist of the following primary statements:

- Income Statement—a report of the firm's earnings over a specific period of time, calculated as sales activities (revenues) minus product costs (cost of goods sold) and selling, general, and administrative costs
- Balance Sheet—a report of what the firm owns (assets) and owes to either debtors (liabilities) or owners (shareholders' equity)
- Statement of Cash Flows—a report detailing the sources and uses of cash from three perspectives: operational, investment, and financial
- Statement of Stockholders' Equity—a report that traces the generation and distribution of stockholders' equity through capital stock transactions, retained earnings, and other related transactions

Each of these statements report financial information that is important to management, analysts, and investors. How do decisions made by supply chain managers impact the results shown on each of these statements?

Income Statement

Most managers readily understand the basic income statement components of revenues, product costs, and administrative overhead costs. The net income figure is arguably the most focused-upon performance metric in the business community. Firms may also focus on components of net income, such as gross margin (revenues minus product costs), earnings before interest and taxes (gross margin minus administrative overhead costs), or EBITDA (earnings before interest and taxes minus depreciations and amortization expense). Supply chain decisions and performance have direct impacts on income through each of the three primary components of the income statement. (*see table on the next page*)

Balance Sheet

Within the balance sheet, a key component of organizational success (or failure) is the control of working capital. Working capital is defined as current assets less current liabilities; think of working capital as the "lifeblood" of an organization, as it is essential to keeping the organization healthy

and viable.

The primary components of current assets are cash (and cash-like investments), accounts receivables, and inventories; the primary component of current liabilities for most firms is accounts payables.

Not only do supply chain decisions have a direct impact on working capital, but working capital flows and balances have a direct impact on the financial viability and performance of a firm. A firm that lacks adequate working capital will have not have the funds available to pay its employees, suppliers, or government taxes—any of which have the potential to quickly shut the firm down. The firm will then have to borrow funds to meet working capital needs. A firm with excess working capital will have the ability to fund expansion without increasing borrowings.

One useful supply chain performance measure to evaluate working capital performance is the cash conversion cycle, calculated as Inventory Days plus Accounts Receivable Days minus Accounts Payable Days.

- Inventory Days = 365 / (cost of goods sold / average inventory balance)
- Accounts Receivable Days = 365 / (sales / average accounts receivables balance)
- Accounts Payable Days = 365 / (cost of goods sold / average accounts payables balance)

One goal of cash conversion is to balance the investments a company makes in inventory and extending credit to customers with payments that a company makes for purchases.

The supply chain function influences working capital, as shown below. (*see table below*)

In addition to working capital, the balance sheet helps firms measure utilization of the firm's physical assets. Plant, Property and Equipment (PP&E) productivity is measured by dividing sales revenues by the amount recorded for net PP&E. This measure gives an indicator of how productive the physical assets of the organization are.

Income Statement Component	Supply Chain Issues that Affect Financial Performance
Revenues	• Lead time • Time to market for new products • Response time to customer requests • On-time delivery • Product quality • Product returns
Products Costs	• Transportation costs • Network distance • Procurement costs • Inventory costs—raw materials, work in progress, finished goods • Storage costs • Packaging costs • Waste • Stock outs • Forecast accuracy • Number of suppliers • Product remediation costs
Sales, General, and Administrative Costs	• Warranty costs • Selling costs • Transaction accuracy (invoices, shipping documents, export documentation) • Exchange rate control

Supply Chain Imports on Income

Statement of Cash Flows and Statement of Shareholders' Equity

The Statement of Cash Flows contains information generated through the Income Statement and Balance Sheet, but formatted so that managers and investors can

Working Capital Component	Supply Chain Issues that Affect Financial Performance
Inventory Days	• Holding costs—financing, warehousing, tracking, moving, insurance • Obsolescence • Theft • Forecasting accuracy • Sourcing time • Delivery time
Accounts Receivable Days	• Bad debt • Follow-up calls to receive payments • Unable to ship due to non-payment • Exchange rate changes • Correct invoicing terms • Proof of receipt
Accounts Payable Days	• Discounts not taken • Late payments; subsequent orders delayed • Correct invoicing terms • Payment penalties

Supply Chain Influence on Working Capital

see the sources and uses of cash in three primary areas of the firm: operations, investing, and financing. The information on this statement is key to analyzing the health of an organization, because a company requires positive operational cash flows to endure over time. The supply chain organization impacts this statement through actions that influence the income statement or balance sheet of the firm.

The Statement of Shareholders' Equity summarizes the ownership portion of the firm—capital stock sales and purchases, income generation and payment of dividends, and other related items. The supply chain management function most directly impacts the net income generated for the firm.

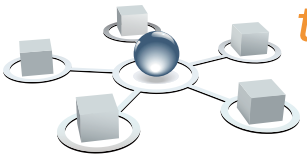
Conclusion

To build an effective model between supply chain decisions and organizational performance, the supply chain organization in a firm must understand how its actions and decisions link to the financial components of the firm. Then, it should analyze the influence that its various actions and components have on outcomes that influence financial performance. This linkage model will help to ensure that the supply chain organization is making and implementing decisions that are valued by the top management of the firm.

Editorial Note:

To be notified of all the latest *Supply Chain Management Review* editorial information and updates, including this series "Supply Chain Management: Beyond the Basics" make sure you are on our eNewsletter subscriber list.

Priscilla Wisner has a joint appointment with the University of Tennessee (UT), Knoxville, Department of Accounting and Information Management and the Center for Executive Education., Wisner has taught at the Thunderbird School of Global Management, at Montana State University, and in the Executive MBA program at the National Economics University in Hanoi. She has over 12 years of experience in management and consulting and has published two dozen articles in academic and professional journals. Wisner earned a B.A. from The George Washington University, an MBA from Cornell University, and a Ph.D. from the University of Tennessee.



BEYOND the BASICS
PART 7

Managing Risks in the Global Supply Chain

Dr. J. Paul Dittmann, Director of Corporate Partnerships, University of Tennessee

One of the greatest impediments to sustaining a successful supply chain is the lack of any process to identify, prioritize, manage, and mitigate risks. At the University of Tennessee, in our contacts with literally hundreds of companies, we rarely find such a process in place. Frankly, most firms ignore risks, sometimes with dire consequences. Many supply chain executives we talk with concede that they don't have time to consider everything in the crush of deadlines, but then spend their days in a vicious cycle trying to fix problems that could have been avoided.

Supply Chain Risk Can Manifest in Devastating Ways

Global supply chains are a source of competitive advantage. They provide access to inexpensive labor and raw materials, better financing opportunities, larger product markets, arbitrage opportunities, and additional inducements offered by host governments to attract foreign capital. However, coupled with these benefits that entice firms to go global are the uncertainties and consequent risks that global supply chain managers must face.

Since the life blood of the corporation flows through its supply chain, any changes to it can carry huge risk. Supply chain disruptions can result in a devastating impact on shareholder value; with one study showing an average 40 percent decline in share price due to the supply chain disruptions in the study. The lack of a risk-management process is especially evident with global outsourcing initiatives.

For example, a dishwasher manufacturer told us that they decided to outsource the production of water seals to China. The net savings considering all known costs was nearly $0.75 per unit and totaled a $2 million annual savings. But soon after the arrangement was made, the Chinese supplier changed to a different rubber supplier, resulting in a catastrophic problem. The seals made from this new rubber were found to leak in dry climates, causing nearly a 10 percent failure rate. Before the problem was discovered, over two million dishwashers had been produced with the defective seal. When the seal failed, and the unit leaked water onto the kitchen floor, it took an average cost of $125 to fix, which included some compensation for water damage to kitchen floors to maintain goodwill and to try to salvage some of the manufacturer's reputation. The total cost to the company, once the dust settled, was north of $7 million. This one event wiped out savings from the outsourcing initiative for over three years! The company thought they had taken all factors into consideration. But they failed spectacularly in considering the potential risks.

Only 10 Percent Consider Risk When Outsourcing

Clearly, it is extremely important that a supply chain outsourcing strategy identify risks, and that the change-management plan appropriately mitigates those risks. However, when companies analyze global outsourcing decisions, we find that they fall into three categories:

- Category One (35 percent): Look at unit cost plus transportation cost only
- Category Two (55 percent): Include inventory cost as part of the assessment
- Category Three (10 percent): Add a risk assessment

In other words, 90 percent of the firms do not formally consider risk when outsourcing production. Yet, sourcing offshore carries a myriad of additional risks such as political instability, port disruptions, currency swings, demand swings, et cetera. And unforeseen events occur more frequently in very long global supply chains.

Supply Chain Risk is Also a Local Phenomenon

It's not just the global environment that creates supply risk. There's plenty of it in almost every major initiative. For example, a supply chain professional from a retailer specializing in children's toys told of trying to implement a new fulfillment system that was completed months late and far over and budget. The Christmas spike exploded before the fulfillment system was complete, resulting in an inability to process orders. People throughout the company worked 50 days straight, including Sundays, to try to stay ahead, yet the firm was forced to send thousands of letters saying, "Sorry your toy order will not arrive before Christmas."

In another alarming example, a candy maker spent over $100 million installing a new supply chain decision support system. The "go-live" for this project slipped from April to September. As the Halloween spike approached, the firm pushed the system into operation before it was ready and subsequently missed $150 million of sales due to an order processing process containing many bugs. The stock dropped 45 percent. In yet another situation, a shoe manufacturer installed a complex new system to run its supply chain. Again, there were major delays. The company's CEO announced that there would be a $100 million sales shortfall due to this new software, causing the stock to fall 20 percent.

	Risk 1: Safety of Food Product	Risk 2: Freshness of Product
Severity (1-10)	9	6
Probability of Occurrence (1-10) High probability = 10 Low probability = 1	2	4
Probability of Early Detection (1-10) High probability = 1 Low probability = 10	6	2
Probability Index (Multiply Three Items Above)	9 x 2 x 6 = 108	6 x 4 x 2 = 48
Recommended Action	Enhance testing process	Audit inventory, and ensure stock rotation
Responsibility	Safety engineering	Third party with company oversight

Table 1: Food Manufacturer Risk Analysis

It is essential that firms have a disciplined process in place to identify, prioritize, and manage the wide range of risks that can impact their supply chain.

Identifying, and Prioritizing Risk

Supply chain risk, of course, cannot be managed unless it is first identified and prioritized. Companies need a standard process for doing that, and the examples below illustrate two such approaches.

Engineers long ago developed a well-known approach to identify and prioritize risks using the FMEA (failure mode and effects analysis) approach. The military has used the FMEA approach as far back as the 1940s. Those familiar with it know that it prioritizes risks based on three factors:

1. Seriousness of consequences
2. Likelihood of the problem ever occurring, or frequency of occurrence.
3. Likelihood of early detection of the problem

We know of several firms that have successfully applied this approach to supply chain issues as a way of identifying high-priority risks that would then require a mitigation plan. They tell us that the framework serves as a vehicle to guide the discussion of risks in a group setting; and that's the real power of it. Given that risk analysis has a large subjective component, reaching group consensus is critical.

Addressing Supply Chain Risk at a Food Manufacturer

A food products manufacturer planned to outsource its warehouse operations to a third party. It used a table similar to the one below to guide the risk discussion. Its supply chain group, in brainstorming sessions, identified 13 risks. Using the approach below, the company prioritized these risks and eventually decided to launch a mitigation project for the top five prioritized risks. An example using just two of the identified risks is shown in Table 1 (*left*).

There are other examples, especially with defense

contractors, who have quite sophisticated approaches to managing risk, even using stochastic simulations. Sadly, even simplistic risk management approaches are exceptions. The vast majority of firms have no formal process at all for dealing with supply chain risk. Yet, the supply chain essentially determines the overall financial health of the firm. Because of that, any risk magnifies in importance. It is essential that firms have a disciplined process in place to identify, prioritize, and manage the wide range of risks that can impact their supply chain.

Editorial Note:
To be notified of all the latest *Supply Chain Management Review* editorial information and updates, including this series "Supply Chain Management: Beyond the Basics" make sure you are on our eNewsletter subscriber list.

Dr. J. Paul Dittmann is the director of the College of Business Administration Office of Corporate Partnership at the University of Tennessee, Knoxville. He joined the university after a 30-year career in industry. He has published and spoken at numerous public seminars and conferences in the areas of lean manufacturing, global business, and supply chain excellence and is the co-author of The New Supply Chain Agenda. At the University of Tennessee, he is managing director of the Demand-Supply Integration Forums and teaches supply chain and logistics courses at the undergraduate and executive education levels. He can be reached at jdittman@utk.edu.