

# Solution-Chain<sup>SM</sup> Manufacturing

How mid-cap manufacturers can transition from making products to what really matters —  
**delivering value to customers more profitably.**

Grant Thornton 



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## Executive summary

Manufacturing is more competitive than ever, especially for mid-cap manufacturers trying to grow, thrive and even survive in today's global economy. Companies are required to excel in all facets of manufacturing, not just making products.

Vendors and customers need complete solutions that seamlessly integrate products and services. This value proposition requires a series of competencies throughout the organization, including:

- research and development (R&D)
- procurement
- processing
- assembly
- distribution, transportation and warehousing
- sales and marketing
- service and support

Is it possible for one organization to manage and excel at all these functions? Recent reports indicate that this type of across-the-board excellence is rare at even the largest and most successful manufacturers. Yet, it is possible to control and excel at all functions with a Solution-Chain<sup>SM</sup> manufacturing approach that delivers solutions to customers and significantly improves the bottom line.

Solution-Chain<sup>SM</sup> manufacturers follow a rigorous four-step approach to drive world-class capabilities across an enterprise:

1. **Assess:** Regularly assess the profit-making potential of all business functions.
2. **Prioritize:** Understand and evaluate corporate strengths and weaknesses, ranging from operational excellence to proprietary processes or products.
3. **Execute:** Invest in core competencies that aggressively improve weaknesses or outsource specific functions to vendors that immediately enhance those capabilities.
4. **Improve:** Manage and continuously improve all functions, internal or external, as a single chain of activities—seamless and highly productive—to serve all stakeholders along the supply chain with complete solutions.

This paper offers an initial perspective on how mid-cap manufacturers can improve their profitability and customer satisfaction by executing a plan and focusing on new metrics built around a Solution-Chain<sup>SM</sup> analysis.

Your customers are demanding excellence from every facet of your business. Solution-Chain<sup>SM</sup> manufacturing will help you meet that challenge profitably—for your customers, your vendors and your company.

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## Introduction

Over the last decade, U.S. mid-cap manufacturers have recognized the need for continuous improvement and have taken dramatic action. Indeed, on the shopfloors and in the supply chains of most manufacturing firms, there is intense focus on operational efficiency. Yet, despite mid-cap manufacturers' adoption of improvement strategies and corresponding increases in production metrics, *market shares and profits are still declining—with no end in sight*. Why? Three reasons:

- Processes connecting to the front and back ends of manufacturing plants are often disengaged from the improvements that take place inside the four walls of production.
- Most business functions that support shopfloor activities— i.e., R&D, front-office systems, purchasing, materials management and management of suppliers and customer channels—have failed to keep pace and complement process improvements.
- As mid-cap manufacturers grow beyond one or two plants, they often fail to leverage shared resources associated with production (i.e., asset management, procurement, warehousing, etc.), leading to duplicate support activities at each site.

Ironically, this means that even good “makers” of product can fail when opportunity is abundant, particularly small and mid-cap manufacturers. Certainly some mid-cap firms falter because they lack operational competencies (i.e., not everyone is improving on the shopfloor).

Many also fail, however, because they have not improved processes beyond the four walls of the plant. Solution-Chain<sup>SM</sup> manufacturing and overall improvement begins with these four steps:

1. **Assess:** Regularly assess the profit-making potential of all business functions.
2. **Prioritize:** Understand and evaluate corporate strengths and weaknesses, ranging from operational excellence to proprietary processes or products.
3. **Execute:** Invest in core competencies that aggressively improve weaknesses or outsource specific functions to vendors that immediately enhance those capabilities.
4. **Improve:** Manage and continuously improve all functions, internal or external, as a single chain of activities—seamless and highly productive—to serve all stakeholders along the supply chain with complete solutions.

Manufacturing has changed fundamentally, fragmenting into a series of supply chain positions and processes, each of which requires world-class competencies to remain competitive. Although some manufacturers maintain and continuously upgrade several competencies—R&D, purchasing, assembly, etc.—many others only succeed at upgrading one or two.

Solution-Chain<sup>SM</sup> manufacturers have plotted a different course, investing in their most profitable functions while outsourcing others in which they will never likely sustain competitive advantage.

## Production improves but profits lag

Despite significant productivity gains on the plant floor, trouble still lingers. Most mid-cap manufacturers have been assailed by a host of external factors and internal weaknesses beyond the shopfloor that undermine profitability.

U.S. manufacturers understand that only the most productive operations can succeed. They further realize that they will be measured both internally, as well as against the operational and financial metrics of other firms.

As a result, benchmarking of production activities has become more widespread. In all, 35% of all U.S. manufacturing plants and 46% of mid-cap manufacturers report the use of benchmarking at their facilities.<sup>1</sup>

How has this focus on improvement benefited the shopfloor at mid-cap manufacturers?

- 65% of mid-cap plants have reduced manufacturing cycle time over the past three years and another 30% have held cycle times constant
- 64% have reduced customer order lead times during the past three years and another 29% have held lead times constant
- 59% increased total inventory turn rates and 21% have kept them constant
- 40% reduced manufacturing costs in the last three years, excluding materials costs and 16% have held costs stable
- During the last three years, mid-cap plants improved:
  - finished product yield by 2%
  - on-time delivery by 3.7%
  - operating equipment efficiency by 5%
  - return on invested capital by 2%<sup>2</sup>

Manufacturers that do benchmark quickly realize that they need a plan to improve production performance, that is, a methodology for systematic improvement.

Many have already taken action. Approximately four out of five U.S. manufacturing plants have adopted an improvement approach, such as Lean Manufacturing, Six Sigma, Agile Manufacturing or Theory of Constraints.<sup>3</sup> Among mid-cap plants, adoption rates are generally higher.

These improvement approaches have assumed many shapes and sizes, with Lean Manufacturing being the most prevalent. These programs often take shape under the guise of “Lean” or are described in terms that mimic the “Toyota Production System” (i.e., the improvement approach upon which Lean was based).

Among mid-cap manufacturers using an improvement methodology, shopfloor performance generally has been better than those that do not follow a methodology.

### Plant-level improvement approaches

	All Plants	Mid-cap Plants*
Lean Manufacturing	36%	43%
Total Quality Management	16%	21%
Lean and Six Sigma	8%	11%
Theory of Constraints	4%	3%
Agile Manufacturing	4%	4%
Six Sigma	2%	4%
Toyota Production System	2%	1%
Other	7%	8%
No methodology	22%	6%

\*Plants with parent company revenues of \$100 million to \$999 million.

Source: IW/MPI 2006 Census of Manufacturers

<sup>1,2,3</sup> IndustryWeek/Manufacturing Performance Institute 2006 Census of Manufacturers, plants whose corporate-parent annual revenues are \$100 million to \$999 million.

Specifically, among mid-cap plants with “significant” or “complete” adoption of any improvement methodology, they have improved return on investment capital (ROIC) and manufacturing cycle times by 2%. At mid-cap plants with “no methodology,” ROIC and cycle times have remained flat.

### Broad-based improvements lacking

While the vast majority of mid-cap manufacturers are improving their shopfloor operations, their improvements do not reach beyond production lines, cells and “touch” processes.

For example, 89% of mid-cap plants have applied their improvement approach in production, but just 47% indicate that it reaches the materials management function—often the next best target for operational improvement.

Even worse are the implementation rates at plant-level activities, including such activities as customer relations, R&D and supplier relations.<sup>4</sup>

At headquarters and satellite facilities separated from the site of actual manufacturing, research indicates that adoption of improvement initiatives is even lower.

For business and office processes, employees are likely to view their work as “creative” and “impossible to measure,” and they may fail to understand that a significant portion of their activity represents waste and inefficiency. These workers are also less likely to comprehend the positioning of individual processes within a broader supply chain, a gap in understanding that isolates them from the effect of their inefficiencies on internal and external customers.

### Plant-level improvement by department

	All Plants	Mid-cap Plants*
Production	82%	89%
Materials management	43%	47%
Shipping and logistics	39%	44%
Purchasing	32%	31%
Customer relations	27%	26%
Engineering	23%	18%
Supplier relations	20%	23%
Administration	19%	18%
Finance and accounting	16%	12%
R&D	9%	10%
Other	3%	8%
None of these	11%	6%

Source: IW/MPI 2005 Census of Manufacturers

<sup>4</sup>IndustryWeek/Manufacturing Performance Institute 2006 Census of Manufacturers.

### Unrelenting customer pressures

How successful are mid-cap manufacturers in maintaining margins as they sell into today's ever-demanding supply chains? How much leverage do mid-cap manufacturers have when negotiating with Home Depot or Wal-Mart?

Mid-cap manufacturers have learned the hard way that market behavior is no longer driven by products or supplier relationships, but by the increasing demands of end-users in a staggeringly diverse array of segments.

Mid-cap manufacturers are also pressured by customers who increasingly demand—and receive—added value in the form of more product features, better support and service, and lower prices. Indeed, customer expectations in industries ranging from the automotive sector to big-box retailers have changed dramatically in recent years. The stresses and effects of these value-adds impact manufacturers all along the supply chain.

Yet, too many mid-cap manufacturers have reacted to these new customer expectations with old-fashioned responses that rely on shopfloor improvements to find margins. After years of focusing on efficiency, these manufacturers often find that there is only so much profit that can be squeezed out of the factory.

This sole focus means that each new customer demands results in lower margins, especially because mid-cap firms typically lack the leverage to push their own vendors for better pricing or value-added relationships.

### Market blind spots

Understanding what customers want and where markets are going is another problem for mid-cap executives. Manufacturers in this segment are often unable to capture information efficiently from customers in order to identify their needs and offer better, more highly valued solutions.

They also struggle, or are incapable, of communicating customer needs quickly and effectively throughout the organization. As a result, businesses are limited in their ability to respond and leverage the best methods to sell products in the most efficient sales channels.

Other mid-cap manufacturers routinely overestimate how thoroughly they understand their customers' evolving businesses. In the short-term, this assumption results in lost sales opportunities as they focus on products rather than customer needs. Most damaging in this scenario is the loss of the long-term partnerships that truly sustain sales, market share and growth.

### Faltering R&D

Today, product cycles and market shifts are occurring more rapidly than ever before. More often than many care to admit, these shifts make products obsolete before they even arrive in the hands of consumers. At many mid-cap firms, the need for fast-paced product introduction collides with poor R&D processes to create a chronic innovation/sales problem.

Why would R&D falter? Because at many mid-cap firms, R&D typically responds only to customer requests—or “gut feel” — rather than strategic objectives and formal market analysis.

In its most extreme form, this analysis-free innovation can lead to the predictable situation in which a mid-cap firm is an expert in making flawless products—efficiently and for a reasonable price—that no one wants to purchase. This type of R&D failure, gone unchecked, may jeopardize an entire company.

### Competitors here, there, everywhere

Low-cost competitors, particularly those operating overseas—Asia, Eastern Europe, Central/South America and so on—are rapidly commoditizing every market, regardless of product or product-design qualities.

Price competition from China is especially fierce, prompting many mid-cap executives to ask: Do we need an international presence to take advantage of those cost structures? What will it cost to establish operations overseas? Should we move our business to China?

It is true that outsourcing, particularly in China, represents significant opportunities for manufacturers of every size. Yet, outsourcing is not a simple yes or no decision. Its potential opportunities require careful analysis.

Although the onslaught of global competition creates a sense of urgency, manufacturers often do not have an international plan in place. What at first appears to be a cost savings in the international arena can be more than offset by hidden costs such as transactional taxes, foreign exchange controls, labor relationships, supply chain disruptions or governmental approvals and licenses.

Additionally, many mid-cap owners don't like losing control of any portion of their operations to China or elsewhere. Nor do many know how to cost effectively divest themselves of underperforming activities.

Then, too, many simply do not understand that manufacturing is more than just making products. The product-making function just happens to be the most obvious opportunity, but it may not be the business segment that drives margins and profits.

### Solution-Chain<sup>SM</sup> approach

How can mid-cap firms respond profitably to these pressures and demands? By becoming Solution-Chain<sup>SM</sup> manufacturers. This four-step process involves analyzing business operations based on selected performance indicators. This ongoing assessment leads to an objective examination that:

- aligns, supports and improves an organization's strengths
- directs resources to core competencies that drive production and profitability
- intelligently outsources weaker functions; keeping "control" but not ownership where necessary
- generates market awareness about the new strengths of the organization.

# Solution-Chain<sup>SM</sup> analysis

## Assess operations

Many mid-cap manufacturers have trouble assessing their strengths because they don't know which metrics are best suited for their individual business units or for the organization as a whole. For example, some metal companies still make pricing decisions based on "contribution margin" despite the availability of more useful measures.

Also, many functions far from the shopfloor lack any truly meaningful measures. These non-production areas too often rely on rule-of-thumb productivity measures that squeeze labor and other resources to exacerbate inefficiencies.

Even when sound metrics are in place, visibility is often lacking. For example, a department or person in the organization may have data on what it costs to process an order, yet this data is never shared throughout the organization. The financial success of any organization can be directly correlated to how quickly and effectively key metrics and other critical information is shared throughout all departments of a company.

Many times there are aspects and impacts of key functions that are completely invisible to managers and front-line employees. This is certainly the case with tax issues and the ramifications of holding onto or outsourcing functions and their assets (see *Solution-Chain<sup>SM</sup> tax implications* below).

## Solution-Chain<sup>SM</sup> tax implications

Tax issues profoundly influence activities and specific functions throughout the supply chain. Tax management can also positively affect Solution-Chain<sup>SM</sup> manufacturing processes both above the line (net income before taxes) and below the line (income-based taxes).

As such, when assessing business functions and their place in the Solution-Chain,<sup>SM</sup> an experienced professional tax analysis must be applied to avoid leaving opportunity, and cash, on the table.

Typical business activities where savings can be found:

**Procurement:** From a tax perspective, ownership of the transaction (i.e., the ability to determine the amount, subject matter and jurisdiction) is crucial to determining tax liability.

Ownership of this function will allow the taxpayer, not its vendors, to determine the subject matter of the transaction (services, intangible or tangible personal property), the value of each component (if it is a bundled transaction), and the appropriate jurisdiction in which to impose taxes.

**Sales and brand management:** Tax implications include the determination of when goods are "branded" and, therefore, where the value is added. Licensing and protecting intellectual property (IP) associated with the brand (i.e., copyrights, patents, trademarks) often determine: the income tax jurisdiction; the value of certain IP which may influence customs and duties charges; and where IP is held,

which can impact the tax costs of dispositions when a business unit and its related IP is sold.

**Finance:** The structure of internal financing can shape a firm's overall tax profile. For instance, the capital structure of a legal entity can often impact its franchise tax profile. Efficient internal leveraging in some jurisdictions can serve to reduce an operation's income taxes.

### Market analysis and customer relationship management

**(CRM):** Companies manage buyer data that is collected from many contact points (i.e., surveys, interactions with customer service representatives, orders placed online, dealings with warranty personnel).

Tax considerations include sales tax of software and IT systems used to house data; state income tax where data is stored and maintained; property tax where CRM software is capitalized; and excise taxes on telecommunications charges. All of which may lead to potential tax refunds.

**Distribution and asset management:** Tax impacts may include, but are not limited to: property taxes paid on actual assets employed and special-purpose designs of facilities; proper valuation methodology of inventory, which can reduce the holding cost; sales tax exemptions for transportation equipment used in interstate commerce; and capitalization of inventory handling operations for federal and state income tax purposes.

To identify, align and grow core competencies, it is necessary for an organization to have a deep understanding of the strengths and improvements necessary to achieve world-class status for each function and each product sold. This analysis must be based on sound metrics that assess each of the critical Solution-Chain<sup>SM</sup> manufacturing functions,<sup>5</sup> a list that includes:

- R&D
- procurement
- processing
- assembly
- distribution, transportation and warehousing
- sales and marketing
- service and support

It is important to note that Sarbanes-Oxley compliance is already pushing some organizations toward a business process framework of internal analysis and controls. These ongoing efforts can sometimes be extended into formal and required organizational assessments.

Regardless of which assessment method is used, savvy executives should make sure that results are action oriented with well-defined metrics and decision points that enable the company to move all its functions toward world-class status.

The assessment process for each function requires understandable measures of operational and financial performance. These measurements include:

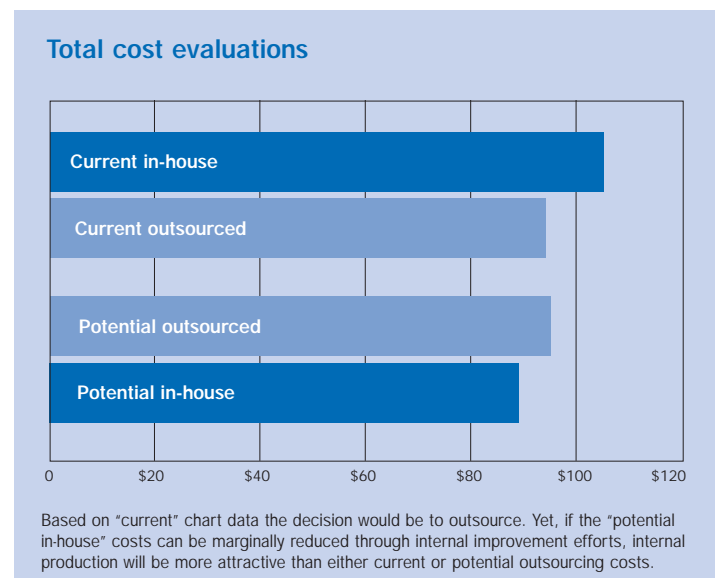
- accurate calculations of margins,
- consistent and well-reasoned management processes,
- an established definition of success for a function, and
- clear methods to determine total costs for an activity.

Solution-Chain<sup>SM</sup> manufacturing advocates putting all activities, internal and external, under review against a calculation of total costs—reflecting both current status and, as importantly, potential-improvement status (i.e., if you apply a determined improvement effort, then forecast a best case improvement scenario).

Then, too, it is important to remember that total cost for one product, or a family of products, cannot be applied to all without being placed in market and customer context.

For example, if a domestic high-end consumer products manufacturer made a line of mainstream commodity-priced goods, would it still make sense for the company to manufacture its products in the United States?

All too often manufacturers fall victim to the “comfort syndrome”—adopting a business as usual approach so long as a business merely sustains itself—and do not know if their business is truly profitable or not.



<sup>5</sup>While there are certainly more functions and supporting activities within an organization, we believe these are the natural lines of demarcation for a mid-cap manufacturer upon which to base strategic Solution-Chain<sup>SM</sup> decisions. Analysis of any function can also be further segmented into smaller groups of activities to clearly identify where value is created. For example, within the R&D function, building prototypes may be an activity that could or should be outsourced, while basic research to validate technologies could be retained.

Our experience indicates that there is a better way; one that requires significantly higher levels of customer knowledge and partnering that delivers the benefits of supply chain connectivity.

The following tables and tools provide baselines, ranging from R&D to service and support, from which mid-cap manufacturers can begin to make more informed, profit-driven assessments of their key functions.

The tools also suggest a range of metrics to review (or establish) for each function, along with total costs, to help make strategic Solution-Chain<sup>SM</sup> manufacturing decisions.

## R&D

Creating products that customers want, developing methods that efficiently get new products to market, and managing the knowledge that creates an ongoing stream of innovation, are the key activities of a world-class R&D function.

That is, in today's rapidly changing and complex global supply

chains, R&D can often be a firm's largest contributor to margins and profitability, especially since income associated with R&D may generate material sources of low-tax income for mid-cap companies in foreign markets.

Finding the capital to spend on R&D often can mean the difference between success and failure for manufacturers. The federal R&D credit is a 20 percent incentive, and many states provide additional R&D credits. Performing an in-depth analysis of qualifying activities in light of changing regulations is essential to maximizing these tax saving opportunities.

Beyond this basic analysis, consider also whether your customers think of your R&D to be their R&D—an opportunity that represents both significant opportunities and risks as your firm takes on prototyping and new product launch concerns.

At the other end of the spectrum, has a lack of strategically driven R&D turned your company to commodity markets or “job shop” status?

### R&D assessment sheet

Strong position	Weak position	Key metrics
<ul style="list-style-type: none"> <li>• Thorough understanding of products and related markets</li> <li>• Develops products efficiently and on time</li> <li>• High flow of opportunities that come from being close to your customer and developing products they are not aware they need yet</li> <li>• Understands the market well enough to know when to exit, retool, and move in another direction</li> <li>• Applies process improvements to the design process</li> </ul>	<ul style="list-style-type: none"> <li>• Obsolete products</li> <li>• Product launch delays and overruns</li> <li>• Following market trends without proving the concepts</li> <li>• No true R&amp;D function exists, creating a risk of becoming a commodity player</li> <li>• Not enough capacity to try high-risk/high-reward ideas</li> <li>• Lack of niche skills</li> <li>• New product ideas centered on “gut feel” or “owner’s ideas”</li> </ul>	<ul style="list-style-type: none"> <li>• New product sales as a % of annual sales volume</li> <li>• New product profit as a % of annual profit volume</li> <li>• % of obsolete product as a % of finished-goods inventory</li> <li>• % of new products launched on time</li> <li>• % of new products launched on budget</li> <li>• Right first time, on time (RFTOT) at design process steps</li> <li>• Return per R&amp;D dollar</li> <li>• % of products developed as an integrated customer approach</li> <li>• Customer satisfaction/retention</li> <li>• Same-customer sales volume % change</li> <li>• Margin % change per same-customer sales</li> <li>• Amount of tax favorable foreign IP income</li> <li>• Tax consequences, including R&amp;D credit dollars available vs. R&amp;D dollars used</li> <li>• Current total cost</li> <li>• Potential total cost</li> </ul>

**Procurement**

Acquiring materials and services at the best price is often the only measure applied to purchasing departments. World-class, Solution-Chain<sup>SM</sup> manufacturers view procurement based on total costs, while simultaneously satisfying all internal purchase requirements—speed of delivery, right quantities, high quality, etc. (i.e., a low-cost freighter of components moving slowly across the Pacific may hinder your ability to satisfy customer just-in-time demands).

And while managing procurement often seems a requirement of being a manufacturer, firms can frequently gain advantage by not performing some or all of this function internally.

For those companies with international operations, the procurement function can often be a source of excessive tax loss after accounting for multiple jurisdictions. If not addressed, value-added tax (VAT), customs, fees and duties can often become additional cost items rather than pass-through items.

Accordingly, the tax consequences for purchasing—such as tax deferrals, double taxation avoidance and property tax exemptions—all require a keen, experienced financial eye.

**Purchasing assessment sheet**

Strong position	Weak position	Key metrics
<ul style="list-style-type: none"> <li>• Strong partner relationships with minimum necessary suppliers, providing timely access to required materials and components</li> <li>• Sourcing agreements based on potential lowest-cost performance basis (i.e., if supplier was performing at or above industry benchmarks and using improvement methodologies, pricing could be X% lower...)</li> <li>• Savvy use of online markets where applicable, such as for commodity materials or one-off purchases</li> <li>• Leveraging suppliers like a big-box retailer – suppliers do ‘what you ask them to’</li> <li>• Use of alternative measures (brokers) where applicable</li> </ul>	<ul style="list-style-type: none"> <li>• Inconsistent and unpredictable supplier performance</li> <li>• Company is a low priority to suppliers</li> <li>• Above-market and increasing pricing</li> <li>• Suppliers dropping your business</li> <li>• Quality of goods purchased is inconsistent or low</li> <li>• Purchasing habits that put production operations at a disadvantage (i.e., large lots, slow deliveries)</li> </ul>	<ul style="list-style-type: none"> <li>• Cash gap/cash-to-cash cycle</li> <li>• Raw material and component lead times</li> <li>• Raw material and component turns</li> <li>• RFTOT supplier performance</li> <li>• % of suppliers that own, manage and sequence material at your site(s)</li> <li>• % of suppliers certified to your standards of operation</li> <li>• % of suppliers providing 80% of components and materials</li> <li>• Tax consequences such as: property tax imposed on inventory and equipment, tax audit adjustments, VAT, customs and duties</li> <li>• Expedited shipments as a % of all shipments</li> <li>• Current total cost</li> <li>• Potential total cost</li> </ul>

## Processing

Safely and profitably producing what is needed, when it is needed and in the quantity needed, is what all manufacturers ask of their processing functions (injection molding, painting, plating, refining, stamping, powder-coating, heat-treating, etc.).

But, while these outcomes appear simple, the underlying capital investments to make them possible can make or break an organization. Maintaining legacy process equipment versus replacing it with state-of-the-art technology (or outsourcing the processing altogether) is a complex and difficult decision.

Considerations include not only technological and financial issues, but tax and depreciation ramifications as well (i.e., Section 199 of the American Jobs Creation Act, the Domestic Production Activities Deduction).

### Processing assessment sheet

#### Strong position

- Strong quality, cost and delivery performance as measured to internal customers
- Excellent safety and environmental performance
- High external and internal customer satisfaction
- Competitive technological processing advantages
- Competitive manufacturing advantages in place and expanding (i.e., Lean methodologies, Six Sigma, etc.)
- State-of-the-art equipment (Note: asset management may need to be considered as a capital service-and-support component)
- Reliable equipment performance
- Advantageous tax positions around capital assets
- Ready supply of processing materials
- Deep knowledge and bench strength in processing sciences

#### Weak position

- Poor internal quality, cost and delivery measures
- High source of internal customer dissatisfaction (i.e., "Why can't they ever get this right!")
- Antiquated equipment
- Little or no technical advantages (i.e., common products and common processing technology)
- Unreliable sourcing and costing of raw materials
- Weak knowledge and bench strength
- OSHA and EPA violations

#### Key metrics

- ROIC
- Finished-product yield %
- RFTOT to internal processes
- Cycle time improvement
- Changeover times
- Scrap/rework as a % of sales
- Productivity measured as value-add and sales per employee, per labor hours, per asset costs (choose best applicable measures)
- Machine availability (as a % of scheduled uptime).
- Operating equipment efficiency rate
- OSHA safety rates
- EPA measures applicable to industry
- Tax consequences, including understanding of Section 199
- Current total cost
- Potential total cost

**Assembly**

Evaluating the assembly function (which encompasses all non-processing activities, such as assembly, packaging and staging, testing, etc.) too often comes down to a glance at labor costs, which represent only a single facet of this function.

Even in labor-intensive assembly environments, labor is rarely a major component of the costs of the goods sold. For example, median labor costs as a % of COGS is 18% among mid-cap discrete manufacturers and 15% among mid-cap process manufacturers.<sup>6</sup>

Safely and profitably building what is needed, when it is needed and in the quantity needed is still the best way to service customers. It also provides opportunities to add value beyond the product (i.e., building just-in-time, small lots in sequences requested by customers).

Here too, U.S. tax and labor ramifications (i.e., Section 199) must be weighed against other jurisdictions' low-cost labor and special tax programs, such as Mexico's maquiladoras and PITEX (supporting legislation) initiatives.

**Assembly assessment sheet**

Strong position	Weak position	Key metrics
<ul style="list-style-type: none"> <li>• Strong quality, cost and delivery performance as measured process step-to-process step, as well as to customers</li> <li>• High internal customer satisfaction (process step-to-process step)</li> <li>• High external customer satisfaction</li> <li>• Competitive manufacturing advantages in place and expanding (i.e., Lean methodologies, Six Sigma, etc.)</li> <li>• Empowered and flexible workforce able to take on new business lines or transition quickly to new market demands (cross-trained employees)</li> <li>• Reliable sourcing and costing of components and materials</li> <li>• Excellent safety and environmental performance</li> </ul>	<ul style="list-style-type: none"> <li>• Poor internal quality, cost and delivery measures</li> <li>• High internal/external customer dissatisfaction</li> <li>• Little or no evidence of manufacturing advantages or likelihood to adopt improvement methodologies (i.e., no Lean, no Six Sigma programs and/or conditions are present that would make such implementations unlikely to succeed – lack of leadership commitment, confrontational worker/management environment, etc.)</li> <li>• Unreliable sourcing and costing of components and materials</li> <li>• High labor turnover, absenteeism</li> <li>• OSHA and EPA violations</li> </ul>	<ul style="list-style-type: none"> <li>• First-pass yield % to customers</li> <li>• RFTOT at each step in process</li> <li>• ROIC</li> <li>• % adherence to customer demand take time</li> <li>• Scrap/rework as a % of sales</li> <li>• Productivity measured as value-add and sales per employee, per labor hours, per asset costs (choose best applicable measure)</li> <li>• Machine availability and OEE where applicable</li> <li>• Value-creating time as a % of total work content time</li> <li>• Customer satisfaction and retention</li> <li>• Labor turnover</li> <li>• Absenteeism rates</li> <li>• OSHA safety rates</li> <li>• EPA measures applicable to industry</li> <li>• Tax consequences, including U.S. Section 199 opportunities vs. other countries' special tax and labor incentives</li> <li>• Current total cost</li> <li>• Potential total cost</li> </ul>

<sup>6</sup>IndustryWeek/Manufacturing Performance Institute 2006 Census of Manufacturers.

### Distribution, transportation and warehousing

Efficient management of an enterprise's distribution, transport and storage functions can be a defining factor for a Solution-Chain<sup>SM</sup> manufacturer. World-class performance can and should rise above merely filling orders and delivering products.

For example, a stamping operation leveraged its distribution connections and expertise to become a sequencing facility for an automotive OEM. At the same time, logistics activities offer opportunities to leverage technology and customer data in ways that improve other business functions (i.e., R&D).

Companies with global operations should be especially aware of the tax consequences for their logistics activities. A savvy mix of company fleet, common carriers and dedicated carriage offers the potential for significant cost savings.

As seamless as any Solution-Chain<sup>SM</sup> can be, it is exceptionally more difficult to maintain efficiencies given the potential for interruptions due to natural and manmade disasters. From devastating forces of nature to insidious acts of terrorism, a company, its employees, partners and customers will directly or indirectly be impacted when disaster strikes. But, steps can be taken to lessen the blow (see *Business disaster recovery strategy* on next page).

### Distribution, transportation and warehousing assessment sheet

Strong position	Weak position	Key metrics
<ul style="list-style-type: none"> <li>• Strong quality, cost and delivery performance to customers</li> <li>• Sound order-management (picking, shipping, etc.)</li> <li>• State-of-the-art warehousing technologies (i.e., WMS, RFID, bar coding)</li> <li>• Excellent safety performance</li> <li>• High customer satisfaction</li> <li>• Competitive advantages in place and growing (i.e., Lean methodologies, Six Sigma, etc.)</li> <li>• Empowered and flexible workforce (cross-trained employees)</li> <li>• Warehousing strongly linked to adjacent manufacturing facility and unable to disengage</li> <li>• Proximity to customer base (although depending on other variables, this function could still be under third-party ownership)</li> <li>• Flexible blend of carrier options</li> </ul>	<ul style="list-style-type: none"> <li>• Poor quality, cost and delivery measures to customers</li> <li>• High source of customer dissatisfaction</li> <li>• Little or no evidence of advantages or likelihood to adopt improvement methodologies (i.e., no Lean, no Six Sigma and conditions that would make such implementations difficult)</li> <li>• Easy to outsource to third-party providers or to merge warehousing capabilities of multiple current sites</li> <li>• Antiquated order management</li> <li>• High labor turnover</li> <li>• Not able to move goods when necessary</li> <li>• Locked into one carrier or one mode of carrier</li> <li>• OSHA violations</li> </ul>	<ul style="list-style-type: none"> <li>• ROIC</li> <li>• Dock-to-stock time (receipt to storage time in hours)</li> <li>• Cost per order (annual labor and overhead costs ÷ total orders)</li> <li>• Order fill rate (orders filled complete ÷ total orders)</li> <li>• Order accuracy (error-free orders ÷ total orders)</li> <li>• Perfect order rate (perfect deliveries ÷ total deliveries)</li> <li>• Customer delivery lead time (receipt of order to delivery)</li> <li>• Total inventory turn rate (annual dollar-volume shipments ÷ average on-hand inventory)</li> <li>• Transportation costs as % of sales</li> <li>• Data-capture success rate</li> <li>• Repeat-customer orders vs. managing orders by volume</li> <li>• OSHA rates</li> <li>• Labor turnover</li> <li>• Tax consequences, such as private fleet vs. common carriers</li> <li>• Current total cost</li> <li>• Potential total cost</li> </ul>

## Business disaster recovery strategy

Quite often there is an assumption that corporate insurance programs cover the majority of any financial loss that might occur. While this is typically the case for small and/or simple losses, it rarely is the case when large losses disrupt normal business operations.

At present, these disruptions range from relatively commonplace events such as fires and floods to natural disasters and acts of terrorism. More than ever, it is important to understand the true nature of these risks and their real costs to an organization.

While the term “cost of risk” is often used in today’s risk management world, it usually is not well understood by business disaster recovery personnel. In a broad sense, cost of risk is a way of measuring a company’s degree of risk by examining several of its worst possible loss scenarios.

Once identified, these scenarios should be communicated to senior management so they too can begin to see and support the value of risk management and disaster recovery planning. Failure to support and coordinate these efforts can drastically affect a company’s bottom line, its ability to recover or even survive.

A business impact analysis is a proven method of determining this cost of risk by identifying the interdependency of manufacturing operations as well as the relationship between manufacturing and other business functions. The analysis should also identify recovery time frames and priorities, potential sources of severe business interruption and cost-effective recovery strategies.

Once this information is gathered, analyzed and the results presented to senior management, agreement should be reached on the recovery strategy. It is here that developing a tactical response plan should begin. It will be important to integrate a planning tool within the process to facilitate not only plan development, but also to monitor flexibility, maintenance and viability of the plan.

Automation should be able to provide relevant, instantaneous computerized reporting data at the time of a disaster. This automation will also result in a significant decrease of the funds and personnel necessary to keep the plan relevant and up to date.

The National Fire Protection Fire Analysis & Research Division’s latest statistics tell us that hazard analysis, loss control and fire prevention in the industrial setting need to be carefully designed to address not only the facility, but the specific processes, equipment and hazards of each particular type of operation.

Industrial and manufacturing facilities account for 11.8% of non-residential structure fires, 29% of associated direct property damage, 18.4% of associated civilian deaths and 22.5% of associated civilian injuries. Within this category, the leading businesses to incur damage are: metal or metal products manufacturers (21% of industrial and manufacturing fires, 11% of property damage), wood, furniture, paper or printing products manufacturers (20% of industrial and manufacturing fires, 11% of property damage), and agricultural farm products facilities (13% of industrial and manufacturing fires, 6% of property damage).<sup>7</sup>

Bottom line...proper disaster recovery strategy requires a thorough understanding of risk exposure. This means conducting a business impact analysis and vulnerability assessment, establishing loss prevention and loss mitigation measures, coordinating with public authorities, maintaining proper insurance coverage, implementing recovery and business continuity strategies, formalizing emergency responses, outlining crisis management team action plans, testing and maintaining adopted programs, promoting senior management support, training of all personnel and funding for all of the above. Then you need to review, refine and test your strategy repeatedly.

Is your company ready?

<sup>7</sup>Saul J. Swartout, Director, Arkwright Disaster Recovery Services, and Manager; Arkwright Boiler Machinery Services in Malvern, Pa. Pat Moore is Vice President - Business Continuity Education for Strohl Systems, in King of Prussia, Pa.

## Sales and marketing

Finding, developing and closing leads in an efficient manner—as well as identifying new markets and channels—are the activities that determine success or failure in this function.

However, in many instances, sales and marketing success is defined solely by specific employees and their relationships with customers, rather than by well-defined sales and marketing processes.

Leaders often fail to ask even basic questions, believing that sales and marketing are more art than science, and therefore, resistant to traditional analysis.

Finding the right hard metrics to measure this soft function (not number of sales calls) can help mid-cap manufacturers to ask, and answer, those questions.

Companies with global aspirations must be especially careful with this analysis, as the international sales and marketing function is often a source of unintended G&A and tax costs due to misalignment of company resources.

### Sales and marketing assessment sheet

Strong position	Weak position	Key metrics
<ul style="list-style-type: none"> <li>• Expanding markets and channel options</li> <li>• Clear sales and marketing positions covering all products/lines, with markets receptive to sales positions</li> <li>• Longstanding market relationships among sales personnel with strong succession/mentoring paths in place</li> <li>• Favorable channel costs</li> <li>• Productive sales staff</li> <li>• High customer retention</li> <li>• Sales, forecasting and planning data visible to the organization; especially R&amp;D</li> <li>• Sales force complements the internal and external sales environment and culture</li> <li>• Value-added sales function—identifying product shifts, new markets, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Stagnant or declining markets and channel options</li> <li>• High sales staff turnover</li> <li>• Dissatisfied customers and high customer complaints</li> <li>• High customer turnover</li> <li>• Little or no customer information share</li> <li>• Unfavorable channel costs and relationships</li> <li>• Lack of sales technologies and processes</li> <li>• “Good-ol’-boy” sales network</li> </ul>	<ul style="list-style-type: none"> <li>• SKU market share growth/retention rates</li> <li>• Stockouts</li> <li>• Sales to cash cycle</li> <li>• % of inquiries that are complaints (exploring “where is product” vs. order placement)</li> <li>• Labor turnover</li> <li>• New customers secured by marketing (as % of customers)</li> <li>• % of customers that respond to marketing (% of targeted)</li> <li>• Sales dollar volume per sales personnel, sales costs, etc.</li> <li>• SKU displacement—competitor SKUs displaced by your products and vice versa</li> <li>• Forecasting accuracy by volume and SKU</li> <li>• Same customer sales volume change</li> <li>• Integrated solutions sales dollars as a % of all sales</li> <li>• Finance/leasing as % of sales</li> <li>• New markets to revenue/profits</li> <li>• Channel costs as a % of sales</li> <li>• Customer complaints</li> <li>• Tax consequences</li> <li>• Current total cost</li> <li>• Potential total cost</li> </ul>

**Service and support**

Backing up manufactured goods with reliable, value-added services and support to ensure customers get a “total packaged solution” is truly a competitive advantage. Unfortunately, the service and support function is a competitive disadvantage for most mid-cap manufacturers, providing neither timely service nor helpful support.

Processes are frequently driven by the number, rather than by the effectiveness, of customer touches. Worst of all, measuring the effectiveness of this function seems to be all but impossible

for many mid-cap firms. The easy decision is to push this function outside the company (where the success rate is not necessarily any better).

Before doing so, consider how and why this function, which often defines the organization in the customers’ eyes, might be better served by remaining inside or partially inside, as a target for improvement. A solution may be a hybrid approach where the bulk of this function is outsourced with a portion remaining in-house to maintain direct customer contact.

**Service and support assessment sheet**

Strong position	Weak position	Key metrics
<ul style="list-style-type: none"> <li>• Low number of repeat calls/inquiries</li> <li>• Skilled problem-solving capabilities among empowered S&amp;S staff</li> <li>• High sense of responsibility and accountability among staff</li> <li>• Low turnover and high employee satisfaction</li> <li>• State-of-the-art tools and technology to support staff (i.e., technologies that instantly provide staff with thorough customer profile and histories)</li> <li>• Well-linked to R&amp;D, assembly, distribution, etc., in real-time to fix products, pull products, etc.</li> <li>• Strong measurement tools in place</li> </ul>	<ul style="list-style-type: none"> <li>• High number of customer complaints specific to S&amp;S</li> <li>• High S&amp;S turnover and “command and control” atmosphere</li> <li>• High number of repeat calls</li> <li>• Customer complaints go without analysis to improve products, operations or services</li> <li>• Few and outdated technological support and tools</li> </ul>	<ul style="list-style-type: none"> <li>• Receivables (i.e., poor service means you need to wait longer for payment)</li> <li>• Warranty costs</li> <li>• Problems completely resolved as a % of problem calls received</li> <li>• Cost of S&amp;S as a % of total annual sales volume</li> <li>• Labor turnover</li> <li>• Customer-satisfaction scores specific to S&amp;S capabilities</li> <li>• Tax consequences, including tax compliance costs—if you outsource service to a third party, do you keep your tax compliance and minimize liability?</li> <li>• Current total cost</li> <li>• Potential total cost</li> </ul>

## Outsourcing along the Solution-Chain<sup>SM</sup>

As you review your operations through a Solution-Chain<sup>SM</sup> lens, your organization will begin to establish new internal measures of excellence. You will identify those functions that provide the highest value to your customers and the highest margins to your bottom line.

This work needs to be followed by a clear assessment of the potential to upgrade your underperforming functions versus moving them elsewhere.

This assessment will rely on some or all of the measures and metrics outlined in this document and may also incorporate strategic considerations or scenarios, such as:

- Core products have become commoditized, and a firm wants to move into newer, more lucrative markets.
- An entrepreneurial leader has moved on, changing the vision and needs of the company.
- Knowledge or experience may have exited a company, taking with it the ability to compete in a given market (i.e., key R&D personnel have departed).
- Highly competitive global markets simply make it impractical to support a money-losing function.
- Technology or process advantages enable a firm to retain a piece of manufacturing against unusual odds (i.e., unlike its weaker competitors, a leading domestic technology firm continues to build data storage products in United States due to its strong technology position).

Of course, some companies may wish to hold onto all functions regardless of strategy or performance, often because they see outsourcing as difficult or risky. Other manufacturers take the opposite approach, believing that the grass is always greener on the other (outsourcing) side.

One manufacturer steadfastly insisted on taking portions of its business to China based on ‘back of the napkin’ calculations of cost savings. The cost-savings never materialized when tariffs came into play. And, to make matters worse, foreign business partners stole proprietary technology.

Making decisions to keep or outsource business functions should be thoughtfully and methodically calculated – not sketched out on the back of a napkin. Company leadership should thoroughly understand its operational and financial functions, the activities within those functions (particularly the potential to be world class), their products, their customer relationships and their prospective external partners.

A *sample outsourcing score sheet* (see next page) filled in with data for a hypothetical company offers an example of how Solution-Chain<sup>SM</sup> planning can help manufacturers build a strategic framework for these decisions. Several *blank score sheets are available* (see page 21) to pass to others in your organization to generate discussion or even try your hand at a Solution-Chain<sup>SM</sup> approach.

## Outsourcing score sheet (for a hypothetical manufacturing company) ■ decisions made by leadership

ACTIVITY	RETAIN	
	Pros (include improvement potential)	Cons
<b>R&amp;D</b>	<ul style="list-style-type: none"> <li>• Proprietary technology from design through processing</li> <li>• Best-in-the-business designers in terms of science and creativity</li> <li>• State-of-the-art design tools in place</li> </ul>	<ul style="list-style-type: none"> <li>• High-wage personnel</li> <li>• Design/innovation process in need of streamlining/improvement (i.e., too much redo and loop backs)</li> <li>• Time-to-launch and delivery-to-budget performance are below industry benchmarks</li> </ul>
<b>Procurement</b> (focused on Class A materials)	<ul style="list-style-type: none"> <li>• Longstanding supplier relationships; easy to do business with them</li> </ul>	<ul style="list-style-type: none"> <li>• Despite relationships, continuous price increases</li> <li>• Increasing material shortages</li> <li>• Poor-performance measures</li> <li>• Little ability to improve total cost, particularly tax ramifications</li> </ul>
<b>Processing</b>	<ul style="list-style-type: none"> <li>• Proprietary processing technologies</li> <li>• Recognized leader in market</li> <li>• Old, highly customized equipment that still functions well (but with little chance for resale)</li> </ul>	<ul style="list-style-type: none"> <li>• Rising skills shortages</li> </ul>
<b>Assembly</b>	<ul style="list-style-type: none"> <li>• Low hourly rate for operators</li> <li>• Low capital investments for processes</li> <li>• Could possibly improve with right leadership and approach</li> </ul>	<ul style="list-style-type: none"> <li>• Shrinking portion of business as customers seek only "processing" capabilities</li> <li>• No improvement approach</li> <li>• Night-and-day differences in approaches between assembly and processing; no cooperation between the two</li> <li>• High turnover</li> </ul>
<b>Distribution, transportation and warehousing</b>	<ul style="list-style-type: none"> <li>• Fewer DC's or one DC alone efficiently services all operations and product lines (both internal and outsourced)</li> <li>• Good proximity to 80% of customer base</li> <li>• Deep DC and carrier management expertise</li> <li>• Leading best practices at DC</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>
<b>Sales and marketing</b>	<ul style="list-style-type: none"> <li>• Veteran sales staff with deep (but declining) industry contacts</li> <li>• Despite age of sales staff, wages and benefits reasonable (though T&amp;E extremely high)</li> </ul>	<ul style="list-style-type: none"> <li>• Inflexible sales staff unwilling to adopt new technologies or best practices</li> <li>• Sales staff highly "turf-oriented" and will not function as a team</li> <li>• No mentoring programs in place</li> </ul>
<b>Service and support</b>	<ul style="list-style-type: none"> <li>• Do not recognize any advantages, but never really attempted to manage the function</li> </ul>	<ul style="list-style-type: none"> <li>• Poor management</li> <li>• High staff turnover</li> <li>• Poor staff product knowledge</li> <li>• High source of customer complaints</li> </ul>

OUTSOURCE		ACTIVITY
Pros	Cons	
<ul style="list-style-type: none"> <li>Cheaper designers available and abundant</li> </ul>	<ul style="list-style-type: none"> <li>Fear of losing company's key strategic advantage – proprietary designs</li> <li>IT system integration</li> </ul>	<b>R&amp;D</b>
<ul style="list-style-type: none"> <li>Access to more global suppliers</li> <li>Volume discounts possible by buying with groups via purchasing companies</li> <li>Tax benefits</li> </ul>	<ul style="list-style-type: none"> <li>Would negatively impact loyal department employees and morale, necessitate mass layoffs</li> <li>Material transfer costs could increase dramatically</li> </ul>	<b>Procurement</b> (focused on Class A materials)
<ul style="list-style-type: none"> <li>Cheap and abundant labor</li> </ul>	<ul style="list-style-type: none"> <li>High risk of losing proprietary technology and IP</li> <li>Material transfer costs could increase dramatically</li> </ul>	<b>Processing</b>
<ul style="list-style-type: none"> <li>Testing one product externally with good results and positive customer response</li> <li>Lowers total costs that decline even further as testing ramps up major improvement initiative</li> </ul>	<ul style="list-style-type: none"> <li>Some increased lead times as WIP moves from processing to contractor, back to distribution</li> <li>Impact on distribution costs</li> </ul>	<b>Assembly</b>
<ul style="list-style-type: none"> <li>None</li> </ul>	<ul style="list-style-type: none"> <li>No apparent outsourcing candidates (physical locations)</li> <li>Outsourcing operations of existing facility not possible and unsure of ultimate performance</li> </ul>	<b>Distribution, transportation and warehousing</b>
<ul style="list-style-type: none"> <li>Good young sales persons that have left the company available as independent contractors</li> <li>Tech-savvy approaches</li> <li>Customer buyers align more with new sales attitudes than veterans</li> <li>Strategic plan to grow markets and channels</li> </ul>	<ul style="list-style-type: none"> <li>Potential to leak corporate/inside information</li> <li>No guarantee of cost-savings</li> </ul>	<b>Sales and marketing</b>
<ul style="list-style-type: none"> <li>Some firms available near HQ that could be trained from the ground up on our products/services</li> <li>Significant cost-savings with high potential to vastly improve performance</li> <li>Hybrid approach: outsource most but retain some function in-house</li> </ul>	<ul style="list-style-type: none"> <li>Unsure of capabilities</li> </ul>	<b>Service and support</b>

## Executing the strategy

Building a Solution-Chain<sup>SM</sup> manufacturing firm is neither easy nor quick. Every organization has unique strengths, weaknesses, needs and cultural issues. Perhaps the most difficult aspect for mid-cap manufacturers in pursuing a Solution-Chain<sup>SM</sup> approach is how to outsource any activity while still retaining control of the function and minimizing negative impacts.

Even when all the issues point to outsourcing, many mid-cap companies still hesitate, refusing to act even when they can dramatically improve their bottom lines.

Solution-Chain<sup>SM</sup> manufacturing is a roadmap for transitioning an organization from product manufacturing to a state of holistic business integration. The Solution-Chain<sup>SM</sup> approach enables a mid-cap manufacturer to intelligently manage both internal improvements and strategic outsourcing in ways that will ultimately benefit all stakeholders: employees, vendors and customers.

Depending on your organization and its situation, there will be many things to consider following the completion of a Solution-Chain<sup>SM</sup> analysis. Here are a few:

- If you are going to retain business functions, you have made a decision to improve and invest in these operations. For example, if your highest margins and best capabilities are in your assembly and distribution functions, you would improve those facets through investment in people, technologies, equipment and ideas.  
Prioritize investments opportunities in these areas (even strong competencies will present a myriad of investment opportunities) and develop them toward world-class status.
- Redistribute underperforming business functions to your greatest financial benefit. Then, build upon the strengths in your retained business functions.

Since the Solution-Chain<sup>SM</sup> assessment process will have already identified possible external partners and vendors, the most important part of the divesture process will focus on how to transfer ownership (but not control) of the business functions by use of:

- outsourcing
  - joint ventures
  - sales of assets
  - other options as appropriate
- Even though certain business functions are no longer technically yours, you still must manage their activities as if they are—exercising as much oversight as necessary, especially during handoffs between functions.

In some ways this may be easier than managing activities in-house. To an outsourcing partner, your company is the customer and will likely regard your wishes with the same great care with which you treat your customers.

Where control becomes more difficult, however, is in managing the handoffs between functions. For example, even the combination of a great external R&D function and great internal processing function will fail if the two do not interact well to create a seamless, real-time stream of value.

- Clearly communicate your new Solution-Chain<sup>SM</sup> approach to everyone that your business touches.  
Tell all stakeholders how they will benefit from improved products, streamlined processes, heightened solutions and ultimately greater profits, as you grow your internal competencies in concert with well-managed external assets.  
Let it be known that you and your organization are committed to being a world-class Solution-Chain<sup>SM</sup> manufacturer.

Finally, know that you are leading your organization to increased profitability while delivering more value to your customers.

What more could any employee, vendor or customer ask for?

# Outsourcing score sheet (template)

ACTIVITY	RETAIN		OUTSOURCE	
	Pros <small>(include improvement potential)</small>	Cons	Pros	Cons
R&D				
Procurement <small>(focused on Class A materials)</small>				
Processing				
Assembly				
Distribution, transportation and warehousing				
Sales and marketing				
Service and support				

## Outsourcing score sheet (template)

ACTIVITY	RETAIN		OUTSOURCE	
	Pros <small>(include improvement potential)</small>	Cons	Pros	Cons
R&D				
Procurement <small>(focused on Class A materials)</small>				
Processing				
Assembly				
Distribution, transportation and warehousing				
Sales and marketing				
Service and support				

# Outsourcing score sheet (template)

ACTIVITY	RETAIN		OUTSOURCE	
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Procurement <small>(focused on Class A materials)</small>				
Processing				
Assembly				
Distribution, transportation and warehousing				
Sales and marketing				
Service and support				

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