

- **CENTRALIZED PURCHASING:** Larger companies often establish a centralized purchasing structure with all of the purchasing staff reporting to a purchasing executive such as a chief purchasing officer or chief procurement officer (CPO). The centralized purchasing organization will typically be located at the company's corporate office and make all the purchasing decisions for the whole company including for any plants or satellite offices.

There are a number of reasons why companies would choose this type of purchasing structure.

- **Leverage from concentrated volumes:** By having a centralized purchasing organization, the company is able to leverage the total spend when negotiating with suppliers. This should allow the purchasing organization to obtain the best price and terms from suppliers by offering them a commitment to buy in larger quantities.
- **Control:** Centralized purchasing gives a company a higher degree of control over the purchasing process. Decentralized purchasing disperses activities across the organization, involving a greater number of people and less control of the purchasing process.
- **Avoiding duplication:** Centralized purchasing avoids the possible duplication of roles and efforts across multiple locations. Decentralized purchasing means that purchasing personnel at multiple locations will essentially be performing the same role and potentially be purchasing the same items.
- **Specialization:** Centralized purchasing organizations allow purchasing professionals to specialize in one area. For example, a purchasing clerk could work with vendors who provide steel products, whereas if they were in a smaller purchasing department they would have to work with vendors from many industries.
- **No competition within units:** Centralized purchasing also avoids the potential for competition between units or locations of the same company, particularly for items in short supply. A common supply base can be established and items in short supply can be allocated appropriately to benefit the organization as a whole.
- **DECENTRALIZED PURCHASING:** Companies with multiple locations may choose to adopt a decentralized purchasing structure. In this model, each unit or location will have their own purchasing function, such as at the plant level, making their own purchasing decisions. Under decentralized purchasing, no individual purchasing manager or unit has the right to purchase materials or services for all units and locations.

There are also reasons why companies would choose this type of purchasing structure as well.

- **Diverse business needs:** Decentralized purchasing may be more appropriate for companies with diverse business units having very different needs from one another, or for companies that have acquired another company and not assimilated them into their core business model.
 - **Local sourcing:** Local purchasing functions will likely have better knowledge of local requirements, will frequently have closer ties to local suppliers, and may be able to obtain better pricing, better quality, and lower transportation costs.
 - **Speed:** Where locations require the delivery of items at a moment's notice, the centralized purchasing model may not be appropriate. If a stockout is imminent, and/or manufacturing will be stopped, a local supplier may be able to deliver the same day, whereas centralized purchasing will likely deal with a national supplier who might not be able to offer the same response.
 - **Less bureaucracy:** No heavy investment is required initially. Purchase orders can be placed quickly. The replacement of defective materials takes less time.
- **HYBRID PURCHASING ORGANIZATION:** Many companies have tried to adopt a mix of centralized and decentralized purchasing, where business units or locations have the purchasing responsibility for certain items, and the central purchasing organization has responsibility for other items. The two main types of hybrid purchasing organization are:
 - **Centralized – Decentralized:** Typically for a large organization with centralized control. Large national contracts will be centralized at the corporate level and smaller specific items will be decentralized at the business unit or location level.
 - **Decentralized – Centralized:** Typical for a large multiunit organization. There will be decentralized purchasing at the corporate level and centralized purchasing at the business unit or location level. Business units will buy all of their own materials and services and the corporate level will buy only those items needed for the corporate operations.

INTERNATIONAL PURCHASING

International purchasing involves the worldwide search for suppliers who can meet the right quality at the right price, quantity, and delivery. It is identifying, developing, and accessing the optimal sources of supply for the business regardless of the location. Opening up the purchasing function to the global market affords a company more choices and more access to innovation, information, and technology.

There are many good reasons for a company to consider global sourcing, including:

- The opportunity to improve quality, cost, and delivery performance
- To exploit global efficiencies, such as access to low cost labor and materials; tax breaks and low trade tariffs
- To respond to insufficient domestic capacity
- To achieve access to better process and product technology
- Due to a change in the domestic business environment
- To take advantage of reciprocal trade and countertrade arrangements

Companies interested in pursuing international purchasing arrangements must develop or acquire specialized skills and knowledge to deal with international suppliers, logistics, communication, political environment, and other issues.

Some of these specialized aspects involve:

- **IMPORT BROKERS:** Agents licensed by the governmental regulatory authority to conduct business on behalf of importers, for a service fee. They take the burden of filling out import paperwork, and clearing products through customs barriers for importers
- **IMPORT MERCHANTS:** A person or company engaged in the purchase and sale of imported commodities for profit. They buy and take title to the goods being imported and then sell the goods domestically.
- **TRADING COMPANIES:** Buy products in one country and sell them in different countries where they have their own distribution network. Trading companies mostly work with high production volume products such as raw materials, chemicals, generic pharmaceuticals, etc. They may carry a wide variety of goods (such as from a catalog).
- **TARIFFS:** Duties, taxes, or customs imposed by the host country for imported or exported goods.
- **NONTARIFF BARRIERS:** Quotas, licensing agreements, embargoes, laws and regulations imposed on imports and exports.
- **COUNTERTRADE:** International trade by exchange of goods rather than by currency.

There are some potential challenges to international purchasing that companies should consider and plan for prior to adopting this strategy, including:

- The potential lack of knowledge and skills concerning international trade policies and procedures
- Awareness and cost of required tariffs and duties
- The difficulty in communicating with suppliers due to language barriers, varying time zones, working weeks, holidays
- Locating, evaluating, sourcing, and expediting in global markets
- Payments and currency management
- Longer time span for negotiations
- The potential for cultural, political, and labor problems
- Protection against product liability and quality management issues
- Potentially longer transportation lead times necessitating additional inventory
- Specific and varying documentation requirements
- Handling legal matters and the process for settling disputes

GOVERNMENT AND NONPROFIT PURCHASING

Government purchases are expenditures made in the private sector by all levels of government. Nonprofit purchases are expenditures made in the private sector by all types of nonprofit organizations. Public purchasing for the government and the nonprofit sector is somewhat different from private industrial purchasing and is characterized by:

COMPETITIVE BIDDING: A transparent procurement method in which bids from competing suppliers are invited by openly advertising the scope, specifications, and terms and conditions of the proposed contract as well as the criteria by which the bids will be evaluated. Competitive bidding aims at obtaining goods and services at the lowest prices by stimulating competition, and by preventing favoritism.

A **sealed bid** is a document enclosed in a sealed envelope and is submitted in response to invitation to bid.

- **OPEN COMPETITIVE BIDDING:** The sealed bids are opened in the presence of anyone who may wish to be present, and evaluated for award of a contract.
- **CLOSED COMPETITIVE BIDDING:** The sealed bids are opened in the presence of authorized personnel only.
- The contract is usually awarded to lowest priced responsive and responsible bidder.

Bidders are generally required to furnish **bonds** as incentive to ensure that the successful bidder will fulfill the contract awarded.

- **Bid bond** is a debt secured by a bidder for the purpose of providing a guarantee that the successful bidder will accept the contract once awarded. If not, the bond would be forfeited.
- **Performance bond** is a debt secured by a bidder for the purpose of providing a guarantee that the work will be on time and meet specifications.
- **Payment bonds** is a debt secured by a bidder for the purpose of providing protection against third-party liens not fulfilled by a bidder.

Some key regulations that rule government and nonprofit procurement include:

- **Federal Acquisition Streamlining Act** (1994), which removed restrictions on bids less than \$100,000. Purchases less than \$2,500 can be made without bidding.
- **Buy American Act** (1933) basically states that purchases (whether by the government or by third parties) using federal funds must be bought from a U.S. source if the cost of the goods from the U.S. source is not more than a specific differential above the foreign source for the goods.
- **Green purchases** involve a variety of federal, state, and local initiatives to include environmental and human health considerations when making purchases.

WORLD-CLASS PROCUREMENT

"World-class procurement organizations outperform their peers by striving to provide unique value beyond cost reduction, including becoming a trusted advisor to the business, driving supplier innovation, and focusing on risk management, according to new research from The Hackett Group, Inc."²

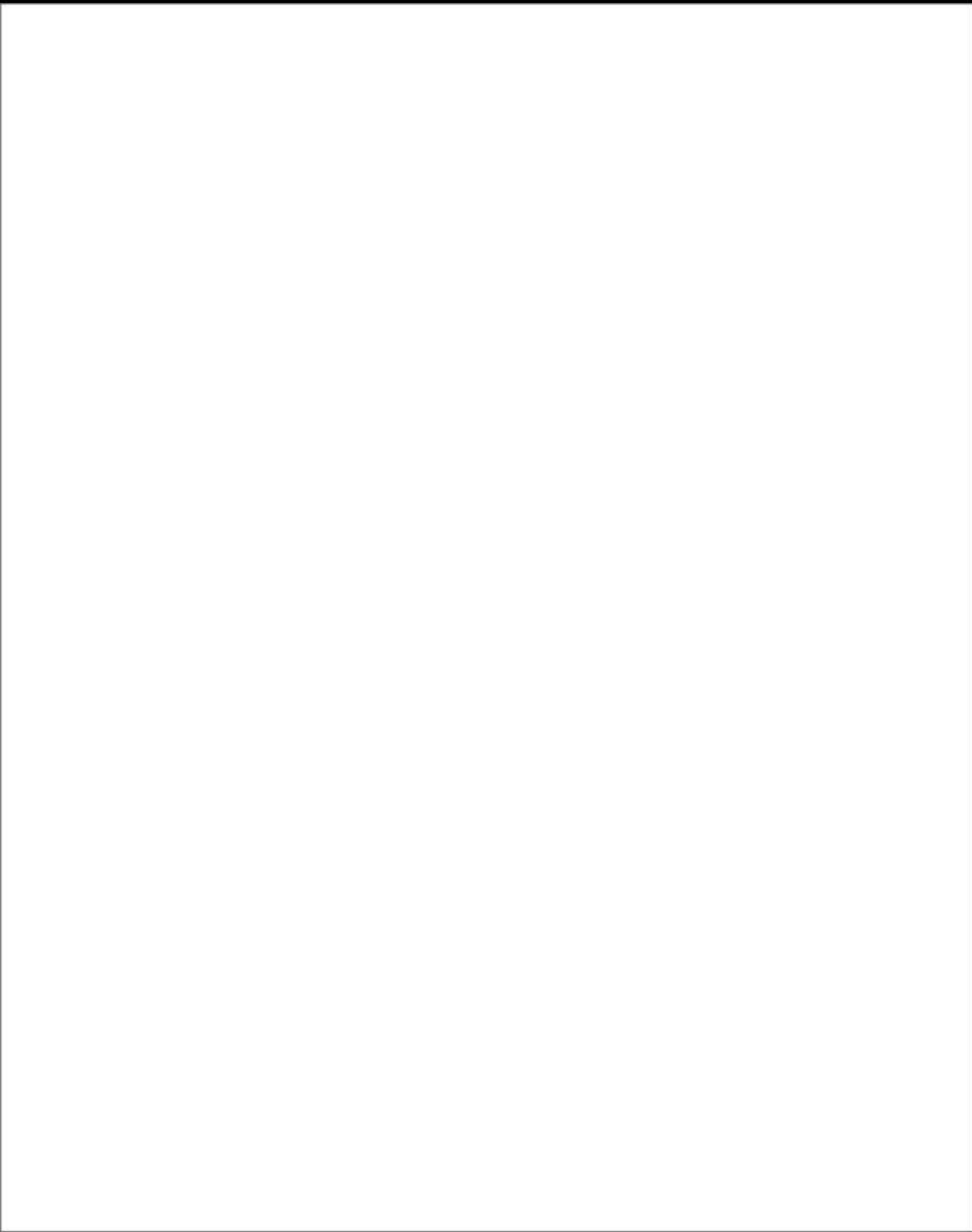
The Hackett Group's research identified five key areas where world-class organizations are adopting procurement strategies to differentiate themselves:

1. **BEING A TRUSTED ADVISOR TO THE BUSINESS:** Having a high level of involvement in the company's budgeting and planning cycle. They are considered valued business partners by the organization, not gatekeepers or administrators.²
2. **DRIVING SUPPLIERS TO INNOVATE:** Effective at harnessing the intellectual capital of their suppliers to bring new and innovative solutions to bear, helping to influence—not just support—the business strategy.²
3. **PROVIDING ANALYTICS-BACKED INSIGHTS:** Working closely with the business during operations planning and budgeting periods to provide predictive insights on supply markets, to the point that analytics, market intelligence, and benchmarking are offered on demand as a service to key stakeholders.²
4. **PROTECTING THE BUSINESS FROM RISK:** Have formal risk management programs that includes completing supplier risk assessments and working with finance and other stakeholders to determine the best mitigation strategy when risk exposure is identified.²
5. **TAKING AN AGILE APPROACH TO STAFFING:** Talent management sets procurement leaders apart from the pack, they provide more training and invest more in retention planning, and they pay higher salaries. They require substantially fewer FTEs than peer groups and are more productive overall.²

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²Hackett Group, Inc. (2014). How world-class procurement organizations outperform; Focus on becoming trusted advisors, driving supplier innovation. Retrieved from <http://www.thehackettgroup.com/about/research-alerts-press-releases/2014/08142014-how-world-class-procurement-organizations-outperform.jsp>



Chapter 6

Strategic Sourcing

CHAPTER OUTLINE

- Introduction
- Sourcing Strategies
- Supplier Selection
- Strategic Alliances
- Supplier Certification Programs
- Additional Sourcing Concepts
- Ethics and Sustainability

INTRODUCTION

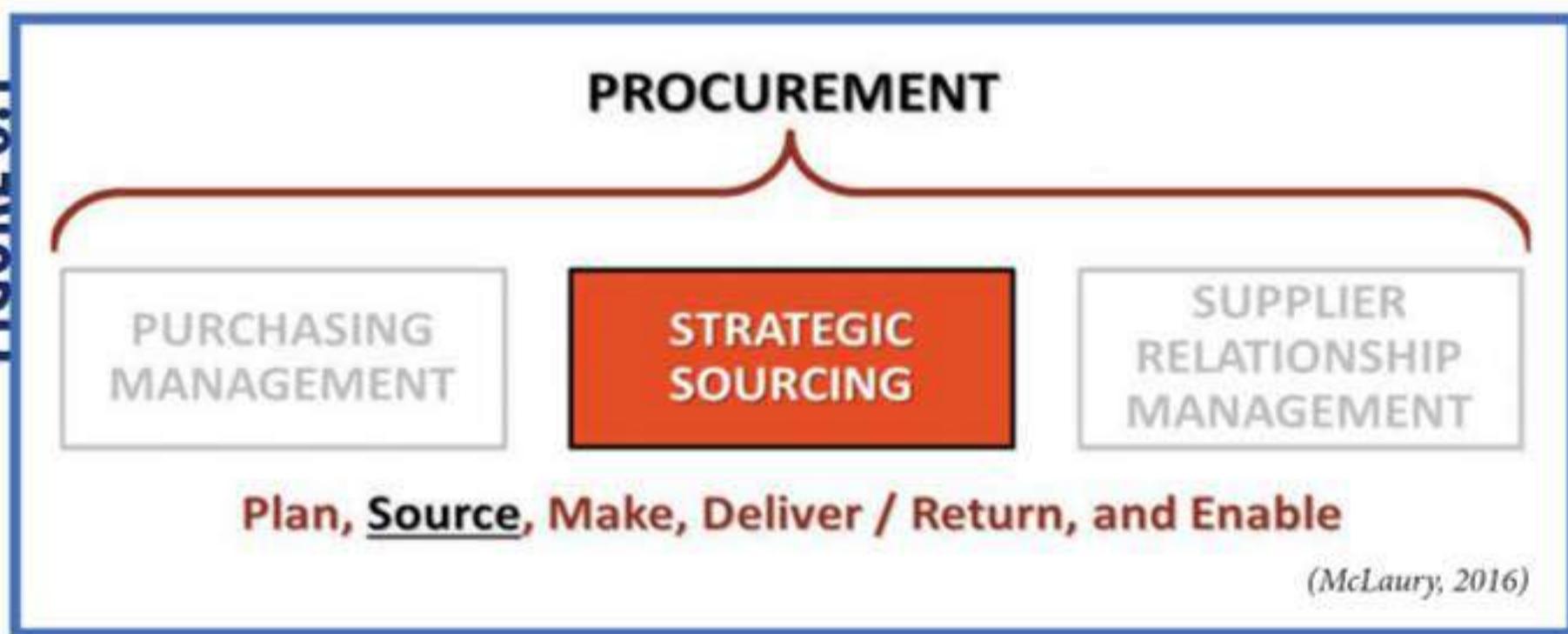
What Is Strategic Sourcing?

Sourcing is the process of identifying a company that provides a needed good or service. **Strategic sourcing** is a comprehensive approach for locating and sourcing key suppliers, which often includes the business process of analyzing the total spend by material category (see figure 6.1).

- The focus of strategic sources is on development of long-term relationships with trading partners who can help the buyer meet profitability and customer satisfaction goals.

Strategic sourcing can be further defined as an institutional procurement process; “an approach to supply chain management that formalizes the way information is gathered and used so that an organization can leverage its consolidated purchasing power to find the best possible values in the market-place.” (Rouse, 2016) “Strategic sourcing requires analysis of what an organization buys, from whom, at what price and at what volume.” (Rouse, 2016) “... it differs from conventional purchasing because it places emphasis on the entire life-cycle of a product, not just its initial purchase price.”¹

FIGURE 6.1



To become a world-class procurement organization companies must consider strategic sourcing to be integral to their overall strategy. There are four competencies that enable strategic sourcing and create value throughout the supply chain:

1. To meet current demand by ensuring that the goods get where they are needed, when they need to be there
2. To anticipate and meet future demand

3. To do so in a customer-driven environment
4. To manage the flow of information throughout the extended supply chain

Drivers of Strategic Sourcing

Strategic sourcing is intended to manage an organization's external resources in support of the mission, vision, and long-term goals. There are seven main drivers of strategic sourcing to consider when developing sourcing strategies:

1. Improve long-term financial performance
2. Increase customer focus
3. Improve product quality
4. Reduce the cost of materials
5. Reduce delivery cycle times (i.e., lead times)
6. Optimize the number of global suppliers (Note: for most companies, this means a reduction in the number of suppliers.)
7. Deliver more innovative products, in less time, and less expensively than competitors

Objectives of Strategic Sourcing

Following the drivers of strategic sourcing, the specific objectives of strategic sourcing surround the reduction of cost while simultaneously maintaining or improving quality:

- Improve the value-to-price relationship (i.e., achieve cost reductions while maintaining or improving quality/service)
- Understand category buying and management process, to identify improvement opportunities
- Examine supplier relationships across the entire organization
- Develop and implement multiyear contracts with standardized terms and conditions across the organization
- Leverage the entire organization's spend
- Share best practices across the organization

SOURCING STRATEGIES

Strategic sourcing involves managing purchasing transactions in a strategic way providing the analysis and ability to make adjustments based on price, the evaluation of supplier performance, and the overall needs of the organization.

A regular review of an organization's sourcing strategy is a must in order to achieve significant agreed upon results. The high-level sourcing strategies utilized in today's business environment include:

- **INSOURCING:** Producing goods or services using a company's own internal resources.
- **OUTSOURCING:** The traditional definition involves purchasing an item or service externally, which had been produced using a company's own internal resources previously. The term has more recently become synonymous with the concept of buying an item from an external source of supply regardless of whether the item had been produced using a company's own internal resources previously.
- **SINGLE SOURCING:** A sourcing strategy where there are multiple potential suppliers available for a product or service; however, the company decides to purchase from only one supplier. This is in contrast to a situation where there is only one supplier for an item (i.e., sole sourced). Sole source is not truly a strategy as there really isn't a choice, and there is very little opportunity for a company to negotiate price or service.
- **MULTIPLE SOURCING:** Purchasing a good or service from more than one supplier. Companies may use multiple sourcing to create competition between suppliers in order to achieve higher quality and lower price.

Strategies for Functional versus Innovative Products

When developing successful sourcing strategies companies will likely adopt different strategies for functional products versus innovative products, the differences being:

- **FUNCTIONAL PRODUCTS:** MRO items and other commonly low profit margin items with relatively stable demands and high levels of competition (office supplies, food staples, etc.)
 - Potential Strategy: Multiple sourcing with several reliable, low cost suppliers
- **INNOVATIVE PRODUCTS:** Items characterized by short product lifecycles, volatile demand, high profit margins, and relatively less competition (e.g., technology products such as the iPhone)

- Potential Strategy: Single sourcing with an innovative, high-tech, cutting edge, market leading supplier; develop a long-term partnership

A framework for sourcing strategy development can utilize the following steps (additional and more in-depth steps will be discussed later in this chapter):

1. Classify the company's products and suppliers as belonging to either the functional or innovative category.
2. Develop strategic sourcing goals and strategies for each category.
3. Create the sourcing team (typically a cross-functional team led by procurement team).
4. Develop a team strategy and communication plan.
5. Identify the targeted spend area(s) and conduct a spend analysis.
6. Gather information on supplier capabilities; use RFI.
7. Develop a supplier portfolio (i.e., a profile of each supplier in each category).
8. Develop a future state (i.e., vision of what the company wants the future to look like).
9. Conduct supplier selection and negotiation.
10. Implement supplier relationship management (SRM; see Chapter 7).

Spend Analysis

A spend analysis is the process of collecting, cleansing, classifying, and analyzing expenditure data with the purpose of decreasing procurement costs, improving efficiency, and monitoring compliance.

The basic steps for conducting a spend analysis include:

- Defining the scope
- Identifying all data sources
- Gathering and consolidating all data into one database

- Cleansing the data (finding and correcting errors) and standardizing it for easy review
- Categorizing the data

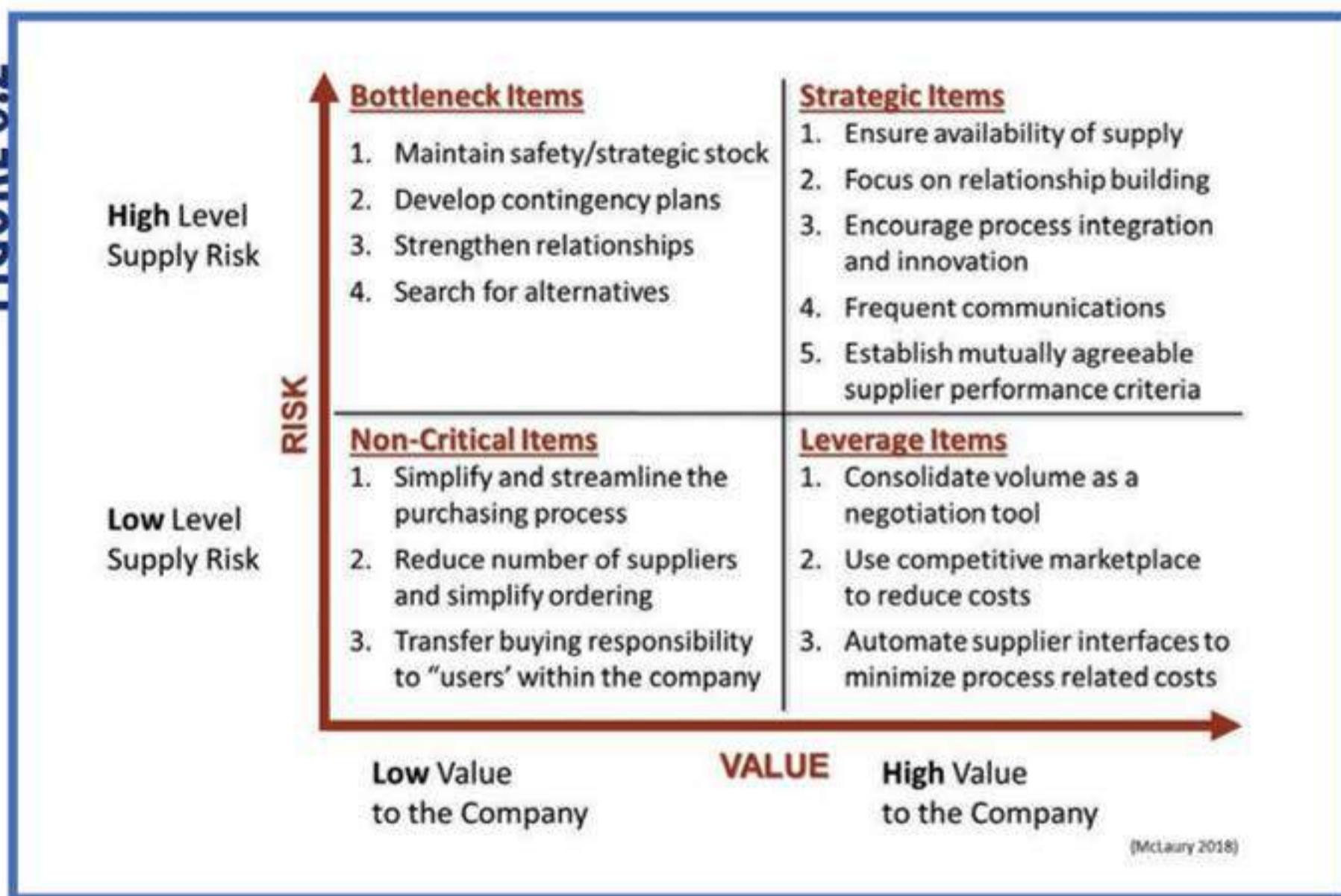
A typical spend analysis consists of:

- The total historic expenditure and volumes
- Expenditures categorized by commodity and subcommodity
- Expenditures categorized by division, department, and/or user
- Expenditures categorized by supplier
- Future demand projections or budgets
- Analyzing the data
 - For the best deals per supplier
 - To ensure that all purchases are from preferred suppliers
 - To reduce the number of suppliers per category
- Repeating the process on a regular schedule

General Portfolio Spend Categories

Companies can generally apportion their total spend into the following four main categories:

1. **NONCRITICAL:** Items that involve a low percentage of the company's total spend and involve very little supply risk
2. **BOTTLENECK:** Items that present unique procurement problems (where supply risk is high, availability is low, and there are only a small number of alternative suppliers)
3. **LEVERAGE:** Commodity items where many alternatives of supply exist and supply risk is low (Spend for these items is generally high, and there are potential procurement savings.)
4. **STRATEGIC:** Strategic items and services that involve a high level of expenditure and are vital to the company's success

FIGURE 6.2

Sourcing Strategies by Category

Figure 6.2 is an example of a Kraljic matrix, which shows the plotting of each of the sourcing strategies, where the vertical axis is Risk, and the horizontal axis is Value, Bottleneck items and Strategic items are high risk, and Strategic items and Leverage items are high value. There are different sourcing strategies that can and should be used for each category.

- **BOTTLENECK ITEMS:** Two major strategies are searching for alternative sources of supply that might be able to alleviate the unique sourcing problems, and strengthening the relationship with each supplier to maximize the opportunity for success. Efforts to integrate the supplier with the company's operations may also help to resolve the supply problems. Items in this category are candidates for maintaining safety or strategic stock and also for the development of contingency plans in the event of a supply disruption.
- **STRATEGIC ITEMS:** Strategies to ensure the availability of supply, and encourage process integration and innovation, should help to reduce the risk of a supply disruption. Companies should develop a formal supplier relationship management program with these suppliers to build the relationship. Using value management techniques such as value engineering, reducing complexity,

and early supplier involvement in product design are some of the ways that procurement can work with suppliers toward that goal. Frequent communications coupled with mutually established and agreed upon supplier performance criteria and measurement are critical.

- **LEVERAGE ITEMS:** The main strategy for items in this category is to consolidate all of the volumes and use the competitive marketplace to generate the lowest total cost of ownership. This is the category where procurement professionals can really use their analytical and negotiation skills to generate savings. Another aspect of the strategy may be to automate supplier interfaces to minimize process-related costs, and build longer term agreements utilizing automated payment methods to simplify the buying activity.
- **NONCRITICAL ITEMS:** Because items in this category are both low risk and low value, the strategy here is for procurement to reduce their level of effort and focus. The transactional costs associated with buying these items may actually exceed the purchase price of these items. These are most likely routinely purchased items which may be suitable candidates for delegating the transactional purchasing activities to users within the company based on some predetermined guidelines, rather than to use valuable procurement personnel's time to process. Simplifying, streamlining, standardizing, and reducing the number of suppliers will facilitate this strategy.

Supplier Base

A supply base is defined as “the group of suppliers from which a firm acquires goods and services.”¹

Over time as a company matures and grows, its supplier base tends to grow as well. All too frequently, companies have more suppliers than they truly need or than they can manage effectively. Managing suppliers takes time and resources, and every supplier-related activity costs money, including monitoring and reporting supplier performance, conducting supplier audits, performing site visits, maintaining up-to-date supplier information in the company database, and of course all of the transactional aspects of RFPs, RFQs, POs, invoice payments, and the like. This is one reason why a company might want to conduct a supply base rationalization program.

Supply base rationalization, or supply base optimization, involves selectively and systematically determining the right number of suppliers, with the right capabilities, to achieve the company’s overall business objectives. Rationalizing or optimizing the supply base could mean either reducing or increasing the number of suppliers a company works with, as well as potentially increasing or enhancing the opportunity presented to new or existing suppliers.

The current trend is companies emphasizing long-term strategic supplier alliances consolidating volume into one or fewer suppliers, resulting in a smaller supply base. Buyer-supplier partnerships are easier to manage with a rationalized supply base and can result in:

- Reduced purchase prices
- Fewer supplier management problems
- Closer and more frequent interactions between buyer and supplier
- Greater levels of quality and delivery reliability

SUPPLIER SELECTION

Supplier selection is the process a company uses to choose a supplier. The process involves selecting the best and/or the most appropriate supplier based on an assessment of the supplier's capabilities. Selecting suppliers is a complex process and should be based on multiple criteria using formal evaluation forms or scorecards. Typical criteria used to assess suppliers includes:

- Management, organization, and strategic fit
- Reputation and references
- Amount of past business
- Reliability
- Quality systems
- Order system and cycle time (i.e., lead time)
- Cost
- Supplier's willingness to share information
- Capacity
- Service performance
- Supplier's product and process technologies
- Communication capability, both in terms of the method in which they communicate and whether they are proactive in communicating, particularly if there are issues
- Location/proximity to the company's operations
- Warranties and claim policies

The supplier selection process is usually conducted by a cross-functional team led by the procurement organization and typically includes representatives responsible for quality, finance, engineering, etc. The process can be time consuming and costly. It can involve travel to potential supplier sites, and interviews with suppliers and with the suppliers' other customers. Accordingly, evaluation and selection can take weeks or months.

How Many Suppliers Are Needed?

Determining the optimal number of suppliers to use for each good or service being purchased is not an easy task. There is no standard rule. Generally, companies should use the fewest number of suppliers that they can without increasing risk significantly.

SINGLE-SOURCE SUPPLIER STRATEGY: The following are some reasons a company may opt for a single-source supplier strategy:

- To establish a good relationship with the supplier
- To reduce quality variability
- To achieve the lowest cost, as 100% of volume will be with the single source
- To achieve transportation economies
- If the single-source supplier has a proprietary product or process
- If the volume is too small to split between multiple suppliers

With a single-source supplier strategy, a buyer is likely to experience significant bargaining power, better transparency, easier relationship management, and better supplier responsiveness. While these are valid reasons and advantages to a single-source supplier strategy, there is potentially also an increased risk of supply problems or shortages. If the single-source supplier has a problem, it could quickly result in a supply disruption for the company. Therefore, it may be preferable to keep the number of single-sourced suppliers at a minimum if possible.

MULTIPLE SOURCING SUPPLIER STRATEGY: The following are some reasons a company may opt for a multiple sourcing supplier strategy:

- If the company needs more capacity than can be accommodated by a single source
- To spread the risk of a supply disruption among multiple trading partners
- To create competition on price, delivery, and other services

- To take advantage of more sources of information
- To meet a requirement involving some special kinds of business

If a company adopts a multiple sourcing supplier strategy, the risk of a major supply disruption may be reduced. Most businesses depend on a continuity in the flow of products or services and should not underestimate the importance of reduced dependency on a single source of supply. When a disruption occurs in the supply of products or services due to quality issues, production or processing problems, capacity constraints, financial difficulties, etc., the purchasing company can be significantly impacted and potentially irreparably damaged.

When choosing between a single and a multiple sourcing supply strategy, it is not about one strategy being better than the other strategy. It is about what strategy better meets the needs of business.

Preferred Suppliers

A preferred supplier is a supplier of choice; generally one that has achieved a specific and exceptional level of performance over time as measured by a set of criteria agreed upon by both buyer and supplier. Preferred suppliers are typically trusted partners who know the buyers organization, processes, procedures, and requirements. They usually provide a higher value than their competitors and are characterized as reliable, responsive, flexible, and cost effective.

Preferred suppliers are commonly used to provide:

- Product and process technology, and expertise
- Product development and value analysis
- Information on latest trends in materials, processes, or designs
- Capacity for meeting unexpected demand
- Cost efficiency due to economies of scale

STRATEGIC ALLIANCES

In general terms, a strategic alliance, in the context of strategic sourcing, is an agreement between a buyer and a supplier to pursue a set of agreed upon objectives, while remaining independent organizations. These companies have decided to share information and resources to achieve a mutual benefit.

Preferred suppliers are potentially ideal candidates for a strategic alliance.

The benefits of these types of arrangements can vary, but the most basic benefits are the potential to increase revenue and profits for both parties, the potential to create a competitive advantage or block a competitor from gaining market share, to mitigate risks and ensure a continuity of supply, and to position the partners for future strategic opportunities.

A strategic alliance is a natural extension of a supplier development program in which “technical and financial assistance is given to existing and potential suppliers to improve quality and/or due date/performance.”¹ Strategic alliances can be very advantageous for both the buyer and the supplier. They can result in better market penetration, access to new technologies and knowledge, and a higher return on investment. Eventually the arrangement could extend to a company’s second-tier suppliers as key first-tier suppliers begin to form their own alliances.

Tapping into Strategic Supplier’s Knowledge

As noted, strategic alliances can create access to previously untapped knowledge. Strategic sourcing partners offer buyers the opportunity to extend their own intellectual capabilities by involving their external partner base in their product development process. The two most common ways to accomplish this are through:

- **EARLY SUPPLIER INVOLVEMENT (ESI):** “The process of involving suppliers early in the product design activity and drawing on their expertise, insights, and knowledge to generate better designs in less time, and designs that are easier to manufacture with high quality.”¹ These strategic supply partners become more involved in the internal operations of the buyer’s company, particularly with respect to new product and process design, working with buyers to do concurrent engineering, and designing products specifically for manufacturability.
- **VALUE ENGINEERING:** Activities help the buyer’s company to reduce costs, improve quality, and reduce new product development time. The goal is to satisfy the product’s performance requirements at the lowest possible cost. This typically involves considering the availability of materials, production methods, transportation issues, limitations or restrictions, planning and organization. Benefits can include a reduction in lifecycle costs, improvement in quality, and a reduction in environmental impact, to name just a few.



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Value engineering involves buyers and suppliers working together:

- Identifying the materials and other key aspects of a product
- Analyzing those materials and key aspects
- Developing alternative solutions for delivering those functions with the aim of achieving reduced costs, improved quality, and reduced development time
- Assessing the alternative solutions
- Determining the costs of the alternative solutions
- Selecting the alternatives with the highest likelihood of success for further development

Negotiating Win-Win Strategic Alliance Agreements

When negotiating an agreement, there are two basic negotiating strategies from which the parties can choose:

1. **DISTRIBUTIVE NEGOTIATIONS:** A process that leads to a self-interested, one-sided outcome
2. **INTEGRATIVE OR COLLABORATIVE NEGOTIATIONS:** A process where both sides work together to maximize the outcome or create value. A win-win result. This negotiating strategy requires open discussions and a free flow of information between the parties.



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Successful integrative or collaborative negotiations start with a clearly expressed understanding of how each company wants to benefit from the collaboration. Desired benefits may or may not be readily apparent. Confirming the alignment between both parties regarding motivation, contribution, financial benefit, and the management of the alliance are essential to a successful conclusion to the agreement and to continuing success into the future. Consequently, negotiations are not about each company obtaining the most value, but more about establishing a relationship that works well for both parties.

Rewarding Supplier Performance

Another important aspect of a strong supplier alliance is implementing a supplier rewards and recognition program. Recognition of a supplier is the identification of exceptional performance, contributions, and/or capabilities.

Rewarding suppliers for outstanding performance motivates and encourages them to continue to strive for excellence in their products, services, and operations. Recognizing and rewarding suppliers strengthens and fosters strong and productive supplier relationships.

Reward incentives can include the promise of future business, some form of public recognition such as a plaque, an awards dinner, an honors ceremony, a press release, or formal communication to the supplier's senior leadership team. Recognition programs encourage performance improvements by rewarding suppliers with additional benefits, cash back for achieving performance-based objectives, and strategic or preferred supplier status.

Rewarding suppliers provides an incentive to surpass performance goals.

Pain and Gain Share Provisions

A supplier rewards and recognition program could also be reflected as part of the formal supply agreement in the form of pain and gain share provisions. Agreements could be constructed and negotiated to spell out in detail the gains (rewards) and pains (penalty) that the supplier will realize for either exceptional or poor performance. This is sometimes referred to as a "Pain and Gain Share Agreement." Both parties would mutually agree on the provisions and the positive and negative outcomes. Generally this will only be acceptable to both parties if both pain and gain provisions are included.

- **PAIN:** Using a penalty or punishment is a negative outcome for poor performance, cost overruns, quality problems:
 - Buyer could impose a financial penalty (i.e., fine) on the supplier for poor performance.
 - Buyer could reduce future business with the supplier for poor performance.



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- Buyer could implement a bill-back amount equal to, or a percent of, the incremental costs resulting from poor performance.
- **GAIN:** Using a reward as a positive outcome from exceptional performance:
 - Buyer could award a financial bonus to the supplier for exceptional performance.
 - Buyer could award more business and/or longer contracts to the supplier.
 - Buyer could share a portion of any cost reductions developed by the supplier which benefit the buyer.
 - Buyer could provide access to in-house training seminars, conferences, tools and information, or other resources to the supplier.
 - Buyer could publicly recognize the supplier and/or confer a special status on the supplier such as “Preferred Supplier,” “Partner,” or “Supplier of the Year.”

SUPPLIER CERTIFICATION PROGRAMS

One of the elements for building a strong strategic supplier partnership is having a well-defined and established supplier certification program.

Supplier certification is defined as “certification procedures verifying that a supplier operates, maintains, improves, and documents effective procedures that relate to the customer’s requirements. Such requirements can include cost, quality, delivery, flexibility, maintenance, safety, and ISO quality and environmental standards.”¹

- Supplier certification programs are used to differentiate strategic supplier alliance candidates from others.
- Companies may choose to develop internal certification programs, and may also require external certifications such as ISO 9000 / ISO 14000, as part of their overall certification process.



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The following is a list of certification components that a company might consider when evaluating its suppliers for a certification program:

- “The supplier measures its quality performance
- The supplier uses parts-per-million (ppm) as its quality unit of measure, not percent defective
- The supplier has quality performance goals
- The supplier has a documented record of continuous quality improvement over several years
- The supplier’s quality efforts are focused on preventing defective items from being produced rather than detecting defective items that have already been produced
- The supplier has formalized quality documentation, training programs, and the like to ensure that quality is sustainable through personnel changes
- The supplier knows its standard deviation
- The supplier can demonstrate how it uses tools to determine whether or not its processes are in control
- The supplier has a quality-related certification like ISO9001
- The supplier has implemented a leading quality improvement program like Lean, Six Sigma, or Lean Six Sigma
- The supplier has implemented a quality improvement program with its own suppliers
- The supplier has won a prestigious quality award such as the Malcolm Baldrige National Quality Award”¹

One of the benefits of a supplier certification program is being able to reduce the amount of time and resources necessary for the buyer to conduct incoming inspections of products and materials from certified suppliers. These suppliers can be trained on the buyer’s procedures and methods for testing the products or materials they supply to the buyer so that they can test these items before they are transferred to the buyer, and provide the buyer with a certificate of analysis with each shipment or lot. Buyers may then opt to only test items periodically on incoming inspection rather than with each delivery or lot, providing that the periodic testing confirms the supplier’s results.

External Certifications

External certification can be very beneficial for a company, because having an independent third party verify that the products or services supplied by the company meet specific and internationally recognized requirements will add credibility. It is also worth noting that certification is actually a legal or contractual requirement in some industries.

Suppliers that are externally certified, such as “ISO 9001:2008 certified,” are preferred by procurement departments because of the following:

- They have to conform to an externally defined set of standards for quality, delivery of service, etc.
- They are easier for procurement to initially qualify and periodically audit.
- Certification is done by an external register agency alleviating some of the procurement workload.
- They are open to sharing supply chain information.
- They want to build relationships with their customers.
- They have formal processes in place for continuous improvement.
- They have to be recertified every three years.

ADDITIONAL SOURCING CONCEPTS

The following are some additional sourcing concepts of note.

Reverse Auctions

Reverse auctions are a sourcing technique where prequalified suppliers access a website at prearranged time and date, and try to underbid competitors to win the buyer’s business. The buyer makes potential sellers aware of the intent to buy a specified good or service. During the course of the actual reverse auction event, the sellers bid against one another to secure the buyer’s business, driving the price to be paid for the item down.

Vendor Management Inventory

Vendor management inventory (VMI) is an inventory replenishment arrangement where the supplier directly monitors the buyer's inventory and refills the stock automatically when necessary, without the customer initiating a purchase order. VMI arrangements transfer the responsibility for managing the inventory located at a customer's facility back to the vendor (i.e., supplier, manufacturer) of that inventory based on a predetermined set of parameters. This arrangement reduces the buyer's workload and benefits both buyer and supplier.

- From the buyer's perspective:
 - The supplier tracks the inventories.
 - The supplier determines the delivery schedule and order quantities.
 - The buyer can take ownership at the stocking location.
 - The buyer may be able to avoid taking ownership until the material is actually being used, thereby reducing inventory carrying costs and improving cash flow.
- From the supplier's perspective:
 - The supplier avoids ill-advised orders from the buyer.
 - The supplier decides inventory setup and shipments.
 - The supplier has access to more information from the buy to aid in planning.
 - The supplier may have an opportunity to educate the buyer about other products or services offered by the supplier.

VMI arrangements can help to stabilize the supply chain. It reduces the risk of major disruptions that can affect all the companies that are linked directly and indirectly through the supply chain. It reduces the potential for the bullwhip effect.

Co-Managed Inventory

Co-managed inventory (CMI) is an arrangement where a specific quantity of an item is stored at the buyer's location. Once it is used, the item is replaced by the supplier, with the knowledge and approval of the buyer. In CMI, the buyer provides systems access to the supplier, and the supplier takes responsibility for managing the replenishment process in the buyer's system accordingly. The

supplier reviews all of the available information and generates orders in the buyer's system. The primary difference between CMI and VMI is that in CMI the supplier is just recommending an order, which is not confirmed until and unless the buyer approves it. In VMI, the order created by the supplier is a confirmed order and the supplier is responsible to deliver the product and bill the buyer for the materials delivered.

JIT 2

The concept of JIT 2 is very similar to VMI and CMI, except that with JIT 2 a representative of the supplier is actually embedded in the buyer's organization. The employee is on the payroll of the supplier but works for the buyer and is empowered to forecast demand, monitor inventory, and place orders. The arrangement involves the buyer granting the supplier access to potentially proprietary or sensitive data. JIT 2 benefits both buyers and suppliers, from day-to-day operational improvement, to strategic advances in the structure of the supply chain organization.

ETHICS AND SUSTAINABILITY

As the discipline of supply chain management has been increasingly recognized for the value that it brings to an organization, supply chain professionals have been tasked with a larger role, and an evolving set of responsibilities over the years. That role has expanded to include responsibility for ensuring that not only does the company act in an ethical manner, but that it holds its supply partners to a high ethical standard as well. Companies should seek to replace suppliers who do not exhibit strong corporate morals and behave ethically. Supply partners are an extension of the company and can have a significant negative impact on the company and its reputation. There are several significant cases in the recent past where this has occurred.

Business Ethics and Ethical Sourcing

Most companies today have some type of corporate social responsibility program. Frequently these programs also require suppliers to agree to abide by a supplier code of conduct in order to be considered an approved supplier. Some key terms and concepts related to ethics include:

- **CORPORATE SOCIAL RESPONSIBILITY (CSR)** is the practice of business ethics.
- **BUSINESS ETHICS** is the application of ethical principles to business. The two main ethical approaches are:
 - **UTILITARIANISM:** An ethical act that creates the greatest good for the greatest number of people, and should be the guiding principle of conduct.

- **RIGHTS AND DUTIES:** Some actions are just right in and of themselves, regardless of the consequences. Think; Do the right thing!
- **ETHICAL SOURCING** is that which attempts to take into account the public consequences of organizational buying, or to bring about positive social change through organizational buying behavior. This involves the procurement organizations ensuring that the products being sourced are acquired in a responsible and sustainable way. The people involved in producing these products should be treated fairly and work in a safe environment. The environmental and societal impacts must also be considered as part of the sourcing process.

Ethical Policies

Companies that seek to create ethical policies to ensure compliance in this areas should:

- Create a supplier code of conduct and require all suppliers to formally agree to abide by the code as a condition of being an approved supplier.
- Inform suppliers of ethical sourcing expectations and create specific provisions within supplier agreements accordingly.
- Determine where all purchased goods originate and the manner in which they are made.
- Have knowledge of their suppliers' workplace principles.
- Seek independent verification of supplier compliance with ethical standards.
- Include ethics as part of their supplier performance rating system.
- Routinely report supplier compliance to key stakeholders.

Sustainable Sourcing

Sustainability is an integral part of ethical business practices. Sustainability in the supply chain is defined as the ability to meet the current needs of the supply chain without hindering the ability to meet future needs in terms of economic, environmental, and social challenges. In simple terms, do not mortgage the future for the present.

For organizations to establish and achieve a sustainable sourcing strategy they will have to set and meet strong, realistic, measurable, and achievable targets. Companies must understand their supplier's sustainability impact and initiatives, considering things like worker safety, wages, working conditions, human rights, and so forth.

Establishing a sustainable procurement process takes work and the company involved must understand the value of incorporating sustainable standards into its sourcing goals.

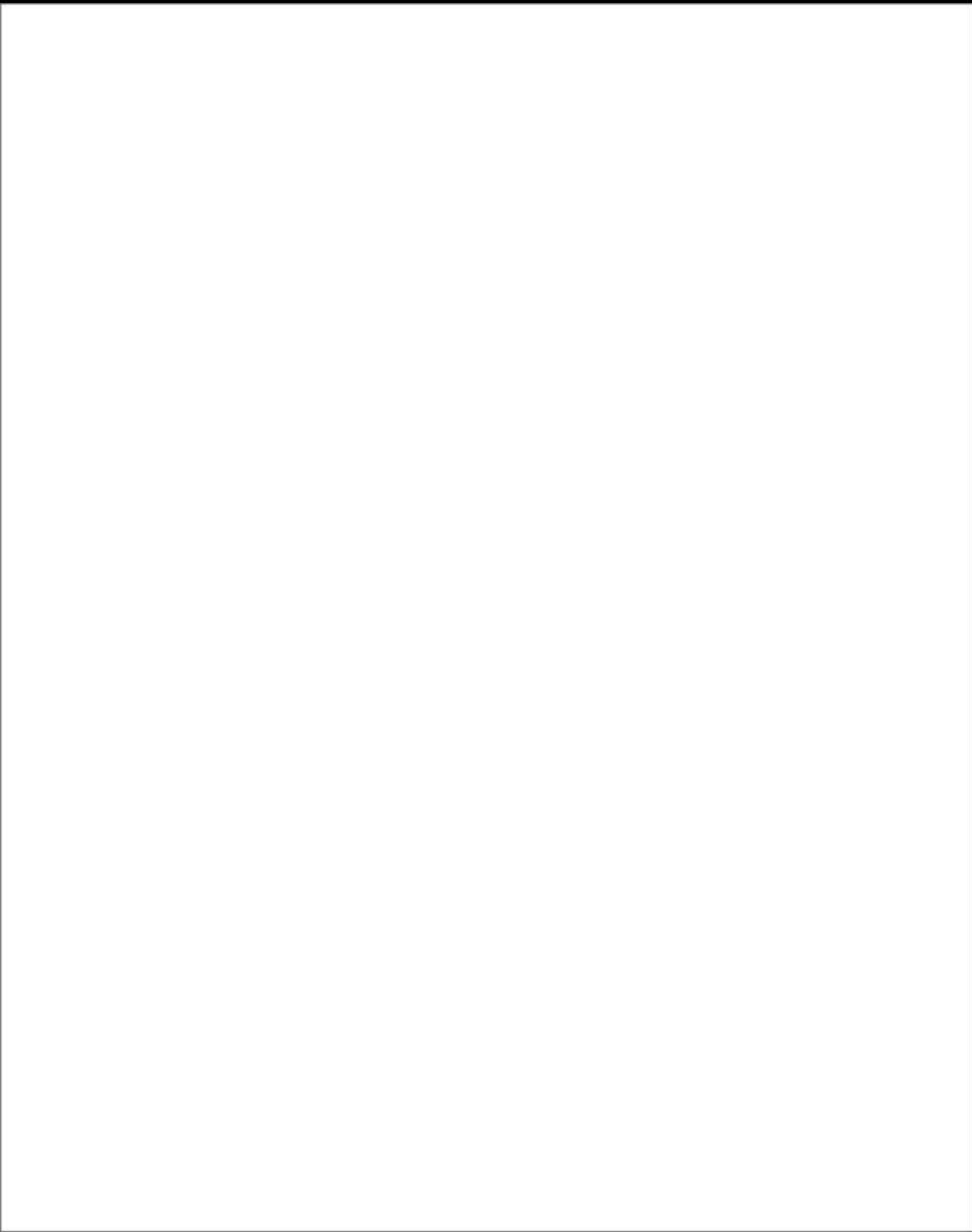
Sustainable Sourcing Strategies

Sustainable sourcing strategies should include elements such as:

- Growing the company through the launch of new sustainable products
- Increasing resource efficiencies which will also help to reduce costs
- Ensuring that the products or materials used meet environmental objectives for things like waste reduction, reuse, and recycling
- Linking company brands to the social consciousness of consumers
- Building intangible assets such as social and environmental responsibility; increasing consumer awareness of sustainable sourcing and sustainability (e.g., go green).

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¹ APICS Dictionary (14th ed.). (2013). Chicago, IL: APICS. www.apics.org; Rouse, M. (2016). *Strategic sourcing*. Whatsit.com. Retrieved from <http://searchfinancialapplications.techtarget.com/definition/strategic-sourcing>; Dominick, C. (2016). A 12-point supplier quality checklist; and Do you practice supplier quality management? Next Level Purchasing, Inc. Retrieved from <http://www.nextlevelpurchasing.com/articles/supplier-quality-management.php>





Chapter 7

Supplier Relationship Management

CHAPTER OUTLINE

- Introduction
- Successful Partnerships
- Keys to Successful Partnerships
- Supplier Performance Evaluation
- Supplier Certification
- Supplier Development
- Supplier Recognition
- Supplier Relationship Management Systems
- Trends in Supplier Relationship Management
- Summary

INTRODUCTION

Supplier relationship management (SRM) is the discipline of strategically planning for, and managing, all interactions with the third-party organizations that supply goods and/or services to an organization in order to maximize the value of those interactions. Most supply professionals view SRM as an organized approach to defining what they need and want from a supplier and establishing and managing the company-to-company link to obtain those needs. The focus of SRM is to develop two-way, mutually beneficial relationships with strategic supply partners delivering greater levels of innovation and competitive advantage than would be achieved by operating independently.

In many ways, SRM is similar to customer relationship management. Just as companies interact with customers, so do they interact with suppliers—negotiating contracts, purchasing, managing logistics and delivery, collaborating on product design, and more. SRM is a recognition that various interactions with suppliers are not unique and/or insular; in reality they are comprising a relationship, one that can and should be managed in a coordinated and systematic way across functional business units (the entire organizations supply chain), and continue throughout the SRM lifecycle.

Supplier relationship management starts with identification of suppliers and is followed by measuring their qualifications, understanding their performance ability, and determining their stability in the marketplace.

Supplier relationship management helps an organization work with suppliers for better performance and returns on their investment. It helps an organization to reduce their procurement expenses. It also coordinates between business processes and suppliers relationship, as seen in figure 7.1.

FIGURE 7.1



SRM seeks to improve profits and to reduce costs using tools such as:

- **SOURCING ANALYTICS:** Drives deep category and supplier insights by using market leading tools to process vast amounts of data
- **SOURCING EXECUTION:** The tactical operation of strategic sourcing performed by a procurement organization
- **PROCUREMENT EXECUTION:** The tactical operation of purchasing/procurement performed by a procurement organization
- **PAYMENT AND SETTLEMENT**
- **SUPPLIER SCORECARDING:** A way to track performance metrics; can be associated with various categories, depending on the supplier's role within your enterprise
- **PERFORMANCE MONITORING:** Tool that enables end users, administrators, and organizations to gauge and evaluate the performance of a given system

SRM is often a part of the rollout of strategic sourcing and is typically applied with suppliers:

- Providing high volumes of a product/service
- Providing lesser quantities of a crucial product/service
- Serving many business units of a company or organization
- Where intensive engineering, manufacturing, and/or logistics interaction is essential

SUCCESSFUL PARTNERSHIPS

Strong and successful supplier partnerships involve a mutual commitment between the buyer and the supplier over an extended time, to work together to the mutual benefit of both parties, sharing relevant information and the risks and rewards of the relationship. Successful partnerships rely on achieving a win-win for the buyer and supplier. This requires adopting a strategic perspective as opposed to a tactical position. A strategic perspective involves long-term thinking—that is, looking at relationships not for what's happening today, but for what you want to get out of the relationship over the long run. That makes a big difference in the approach to creating a partnership. One of the most important aspects is creating a win-win situation. If you focus on the tactical or hold a very

short-term view, you will look at what's best for you regardless of whether it is best for the supplier or not. If you think strategically, you will look at not only what you need to win but also what your supplier needs to win as well. It does a company no good in the long run to just beat up on their suppliers. The company may feel that they have won in the short term, but in the long term they may lose their suppliers and do themselves more harm than good. If you want to be successful in the long run, you will need your suppliers to be successful as well. There has to be mutual benefits; both sides have to feel that there's a benefit in the relationship. If you have different strategies, different perspectives, and different goals and objectives, it's not going to work. You have to share the risks and rewards.

KEYS TO SUCCESSFUL PARTNERSHIPS

If you value your suppliers, developing partnerships with some or most of those suppliers may be very important for the future of your business. There are some keys to developing successful partnerships with your suppliers.

Building Trust



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With trust, partners are more willing to work together, find compromise solutions to problems, work toward achieving long-term benefits for both parties, and go the extra mile. SRM requires a consistent approach and defined set of behaviors to foster trust over time. It also requires new ways of collaborating with key suppliers, and actively changing existing policies and practices that can hurt collaboration and limit the potential value to be derived from supplier relationships.

No partnership is going to work if you don't trust one another. Building trust can be as easy as just laying your cards out on the table: "Here's what I need to get out of this relationship; I'm neither trying to game the system nor deceive you in any way, what I need is . . ." or "I'm willing to pay you a fair amount of money for your services, I value you as a partner, I will treat you as an extension of my organization." If you can start to work together from there, you will start to build trust. The big problem with trust is that it is lost a lot faster than it is built. You can make one misstep and then your partners won't trust you and it is extremely difficult to regain trust once it is broken. You may know that from personal experience. If you had a trusting relationship with someone and they did something that caused you to feel like they are not on your side anymore, it is very difficult to trust that person again. It is the same with organizations.

Building trust may mean that you have to make some compromises. Compromising shows partners that you are willing to work with them and that you recognize that they have needs from the partnership as well. Usually, a good relationship involves compromise on both sides. Both parties give a little bit to get a lot more out of the longer-term relationship.

Shared Vision and Shared Objectives

Strong, successful partnerships involve all parties having a shared vision and shared objectives. If a company wants to establish a strategic partnership with a supplier, then they both need to be on the same page. If the company, for example, wants to grow and expand its business, but the supplier does not share that goal or objective because the supplier wants to maintain its size and market position, the partnership is not likely to succeed.

Example:

Company N has a long-term relationship with Trucking Company K, which handles all of Company N's internal shipments between its local manufacturing facilities and internal warehouses. Trucking Company K also handles shipments going to and from the local airport and ocean port. Company N approaches Company K saying, "You are a great partner, and we would like to have you start to do some of our long-haul trucking, taking our product out to the ultimate customers in addition to handling our local short haul transportation. It is a very expensive product, but we trust you." Trucking Company K responds, "Well, thank you very much for your confidence and trust in our company, but we don't have the capability to handle your long-haul trucking requirements, and that is not the business we want to be in. We don't want to develop into a long-haul trucker, we want to remain in the short-haul business." Clearly, the two companies did not share the same vision or the same objectives. Trucking Company K may be a great partner, but didn't want to expand and evolve its business. If you don't have the same vision, and you don't have the same objectives, then you're not going to be able to build or expand on an existing partnership.

Personal Relationships

Most good long-term business relationships start out with personal relationships between individuals. Companies come together through people and it is these people that need to build the relationship between the companies. Developing a relationship on a personal level between company counterparts will potentially facilitate the process of developing a long-term successful partnership between the companies. If you are going to share information and negotiate, it helps if you get to know your counterpart and begin to build some trust with them. It is the people who communicate and make things happen in any strategic partnership.



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Mutual Benefits and Needs

Clearly, if both parties in a potential relationship don't see a way to have their needs met or if they don't both see the benefits of the relationship, one or both will not value the relationship and it is not likely to succeed, or maybe even to begin. Partnership should result in a win-win situation, which can only be achieved if both companies have compatible needs. An alliance is much like a marriage, and if only one party is happy, then the marriage (i.e., alliance) is not likely to last.

Commitment and Top Management Support

Partnerships are more likely to be successful when top management of both companies is actively supporting the partnership. That support must flow down through the ranks of managers and staff to ensure everyone understands the potential benefits to be derived. Having the support of senior management will facilitate the process of securing resources, funding, and decision making related to the partnership, making it easier to operate and move the partnership forward. In addition, as issues arise which need the attention of senior management on either side of the partnership, having their buy-in and support



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from the start will also help to facilitate and ease the process of obtaining their decisions or approval to resolve issues.

Change Management

Organizations are facing faster, more complex, more interdependent, and more cross-functional change than ever before. Changes in business and business relationships occur frequently and sometimes in unanticipated ways. Any relationship or partnership will inevitably face the need to make changes. If the change is not managed well, it has the potential to derail the partnership. Therefore, having a formal and robust change management process, which both parties have agreed upon in advance, is critical to the long-term health of the relationship. Applying change management enables organizations in a partnership to deliver results on each change more effectively and build competencies that grow the partnership's capacity to handle more changes.

Information Sharing and Lines of Communication

Communication is a big part of a supplier relationship—any relationship for that matter. A strong communications plan that considers how best to share and distribute information among, within, and between partners is a necessary part of good partnership management. The frequent sharing of information and having open lines of communication fosters an ongoing dialogue, which is so important because it helps to reduce the risk of assumptions and encourages partners to stay focused on their shared vision.



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Within a supplier partnership, two main communications strategies should be considered. The first is a plan to share information about the partnership internally, within your own organization and with your supply partners. With a good internal communications strategy in place, you can then reach out externally to begin to build and share your message in hopes of successfully implementing your partnership's goals and objectives. Partners should collaborate in planning their communications strategies at the beginning of the partnership, considering each other's policies, procedures, needs, and objectives.

Most companies will set up both formal and informal communication. Formal communication, for example, would be to have a regular interval review meeting with the supplier. The partners meet and discuss items on a set agenda, talking about what's happening in their businesses, what new products are planned for launch, new services and new markets, reviewing performance, and discussing issues and potential resolutions. Informal communication, for example, would be if some-

thing happens in the day-to-day operation and someone at the organization where the activity is happening needs to notify someone at the other organization quickly. What develops is an informal communication chain primarily between individuals at the operations level of both organizations who then determine if something needs to be more formally communicated. Informal communications may go a long way toward building the relationship. If both parties know that the other is going to notify them promptly and honestly if something happens, then trust will be maintained, and these types of ad hoc communications generally take place informally.

Capabilities

For a supplier relationship to be effective and successful, suppliers must have the right technology and capabilities to meet the buyers cost, quality, and delivery requirements in a timely manner.

In the example introduced earlier under “Shared Vision and Shared Objectives,” Trucking Company K, who was handling all the internal transportation for Company N, didn’t have the capability to become a long-haul trucker for Company N, and didn’t want to develop that capability. Without this capability, the relationship will not evolve beyond the present. Company N will want to develop a supplier relationship with a supplier who has the desired capability and this may even alter the current relationship with Company K.

If a company chooses to partner with a supplier based on its needs and the supplier’s current capabilities, and does not consider whether the supplier’s capabilities are in line with the company’s long-term strategy, it may find that the supplier is not capable of supporting its needs in the long term. If a company, for example, is planning to expand its business into a new market that is projected to increase volume requirements from a supplier, and the supplier does not have the capability to meet the new volume requirements, the company is not likely to achieve its expansion goal through this partnership.

A supplier’s capability is an essential aspect of the health and success of any buyer-supplier relationship.

Continuous Improvement

“The act of making incremental, regular improvements and upgrades to a process or product in the search for excellence.”¹

Continuous improvement is an ongoing effort to improve products, services, or processes. These efforts can seek incremental improvement over time or breakthrough improvement all at once. Making a series of small improvements over time results in the elimination of waste in a system, making the system more efficient and cost effective.



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Continuous improvement should be an integral part of the SRM process and evolution. Buyers and suppliers must be willing to continuously improve their processes and capabilities in meeting customer requirements.

The process commonly utilized in continuous improvement is: plan, do, check, act.

- **PLAN:** Identify an opportunity and plan for change.
- **DO:** Implement the change on a small scale.
- **CHECK:** Use data to analyze the results of the change and determine whether it made a difference.
- **ACT:** If the change was successful, implement it on a wider scale and continuously assess your results. If the change did not work, begin the cycle again.



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Other methods of continuous improvement often considered are Six Sigma, LEAN, and total quality management, which emphasize employee involvement and teamwork, measuring and systematizing processes, and reducing defects and cycle times.

Performance Metrics

Performance metrics are quantifiable indicators used to assess how well an organization or business is achieving its desired objectives. These measures are typically tied to an organization's strategy. Measures related to quality, cost, delivery, and flexibility are generally used to evaluate suppliers. Metrics should be (1) understandable, (2) easy to measure, and (3) focused on real value-added results. The best performance measures are S.M.A.R.T (specific, measurable, achievable, relevant, and time oriented).

When evaluating suppliers, a multicriteria approach is best, as it gives the company a better overall picture of the supplier's performance. For simplicity purposes, it is also preferable to build these measurement targets around the end goals that are being sought (price, cost, quality, specific logistics details, order cycle times, lead time, etc.) rather than on the means or subcomponent activities that add up to accomplishing the end goal. For example, an order cycle time target has within it an order receipt time, an order processing time, and order filling time, and a transportation transit time, which are all means or subcomponent measures. Avoid over-requiring means or subcomponent measurements of suppliers, and focus instead on measuring the supplier against the end goal, which is what's really important.

An important performance metric related to SRM is the total cost of ownership (TCO). In supply chain management, the total cost of ownership of the supply delivery system is the sum of all the costs associated with every activity of the supply stream. The main insight that TCO offers to the supply chain manager is the understanding that the acquisition cost is often a very small portion of the total cost of ownership. TCO is made up of all costs associated with the acquisition, use, and maintenance of a good or service, which not only must be considered today, but over the life of the product. For this reason, TCO is sometimes called “lifecycle cost analysis.”

It is important to actively monitor a supplier’s performance and provide visibility and feedback on supplier performance at each stage of the evaluation process.

Relevant metrics include:

- Supplier price and cost performance
- Product receipt quality
- Delivery performance
- Contractual and standard compliance
- Financial stability
- Participation in product development
- Cooperativeness in third-party production management
- Support of both ethics and sustainable practices

SUPPLIER PERFORMANCE EVALUATION

Successful companies embrace their suppliers, viewing them as partners in helping to grow the business. Making sure that this is a mutually beneficial partnership will impact the price you are negotiating today and the quality of service you get in the future. Supplier performance evaluation against a set of mutually agreeable criteria can help to ensure that both parties in the relationship know exactly what is expected, and if expectations are being met. If done well, this will eliminate ambiguity and confusion.

At the start of the supplier relationship, determine what characteristics a supplier needs to have, demonstrate, or maintain to continue doing business with your company. Create specific perfor-

mance criteria for tracking and evaluating your suppliers on a regular basis (monthly, quarterly, and/or annually).

Along with developing SRM performance metrics, it is best to ensure value measurement is established and put in place as well. A suggested tool for monitoring performance and identifying areas for improvement is the joint, two-way performance scorecard. A scorecard should include a combination of quantitative and qualitative measures, including how key participants perceive the quality of the relationship. These key performance indicators (KPIs) are shared between customer and supplier and reviewed jointly, reflecting the fact that the relationship is two way and collaborative, and that strong performance on both sides is required for it to be successful.

One method of evaluating the performance of key suppliers is the weighted-criteria evaluation system, which should consist of the following components:

1. Select the key dimensions of performance mutually acceptable to both customer and supplier and follow the agreed method of evaluation.
2. Assign a weight to each dimension.
3. Monitor and collect supplier performance data.
4. Evaluate the actual performance of the supplier for each dimension on a scale from 0 to 100.
5. Multiply the dimension rating by the weight for that rating, for each dimension, and then sum the overall score.
6. Classify suppliers based on their overall score:
 - Certified, Preferred, Acceptable, Conditional, Developmental, Unacceptable—according to a criteria scale that the company finds appropriate
7. Audit and perform ongoing certification review.

Figure 7.2 is an example of a high-level outline of the criteria categories in a weighted-criteria evaluation system.

Follow-up actions to take with suppliers based on their performance category:

1. **PREFERRED:** Work with these suppliers in maintaining a competitive position and on new product development.

2. **ACCEPTABLE:** Require a plan from these suppliers outlining how they will achieve Preferred status.
3. **DEVELOPMENTAL:** Require corrective actions from these suppliers on how they will achieve Acceptable status. Look for alternative suppliers if these do not achieve acceptability within a fixed period of time (e.g., three months).

FIGURE 7.2

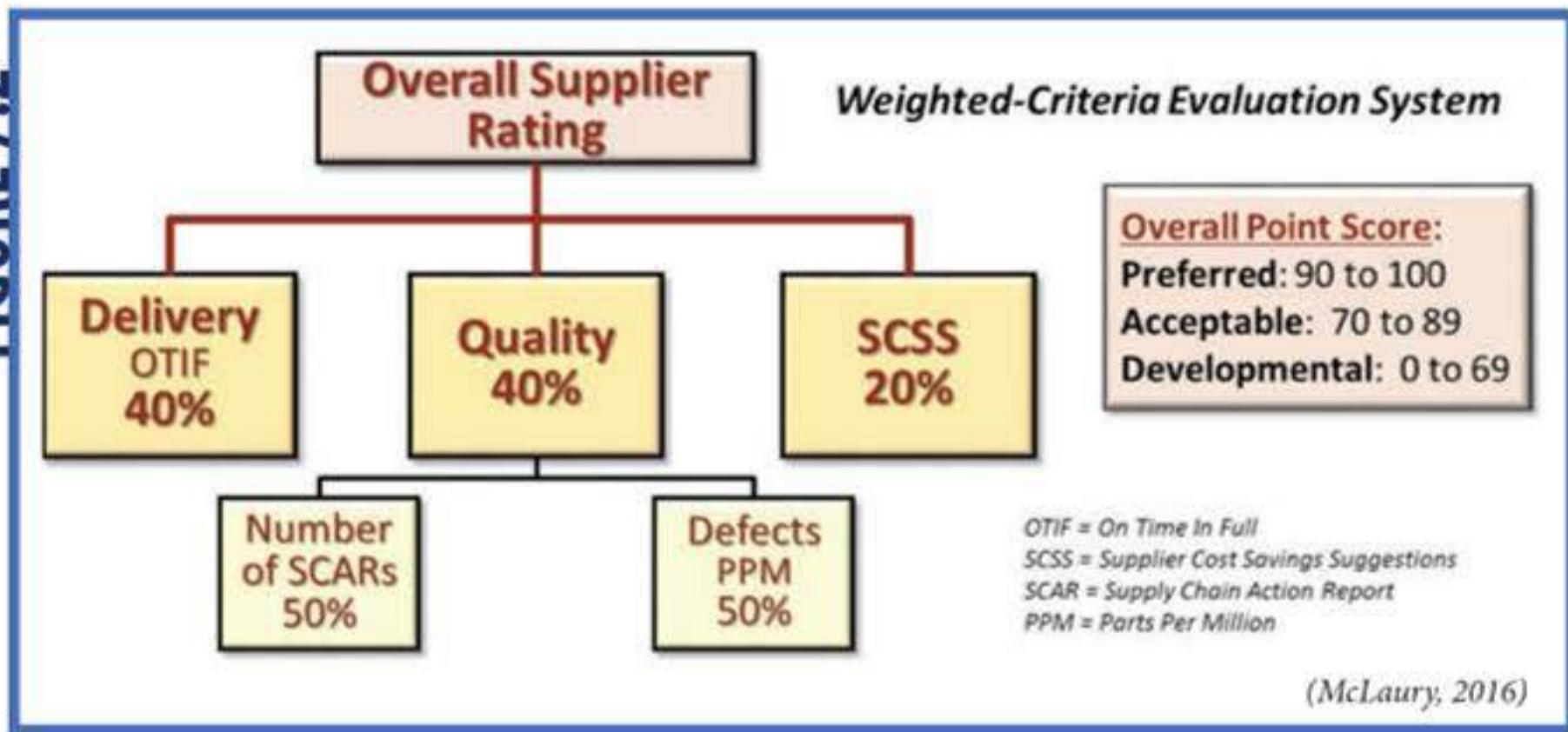


FIGURE 7.3

Performance Measure	Rating	x	Weight	=	Final Value
Quality Defects (PPM)	90	x	0.25		22.50
Delivery OTIF	85	x	0.20		17.00
Cost	80	x	0.15		12.00
Responsiveness	95	x	0.10		9.50
Innovation	85	x	0.10		8.50
Corporate Social Responsibility	90	x	0.10		9.00
Customer Complaints	90	x	0.10		9.00
Total Score			1.00		87.50

(McLaury, 2016)

Based on the criteria established earlier in this example, the supplier in figure 7.3 would be in the Acceptable category, and the company should work with this supplier on areas in need of improvement to become a Preferred supplier.

SUPPLIER CERTIFICATION

SUPPLIER CERTIFICATION: “Certification procedures verifying that a supplier operates, maintains, improves, and documents effective procedures that relate to the customer’s requirements. Such requirements can include cost, quality, delivery, flexibility, maintenance, safety, and ISO quality and environmental standards.”¹

One of the key reasons that a company might certify a supplier is to eliminate or minimize incoming inspections, saving the company time and money. By certifying a supplier to provide the quality testing on the product(s) it supplies, the company is transferring that responsibility to the supplier, which requires trust and a strong partnership.

Training and developing supply partners to consistently meet supplier certification criteria is important to achieve and maintain a supplier certification.

Benefits of Supplier Certification

The typical benefits of a supplier certification program include:

- Building long-term relationships
- Reducing time spent on incoming inspections
- Decreasing the supplier base, because if a company develops a strong relationship with a supplier(s) and certifies the supplier, the risk to the continuity of supply becomes lower, and the company will not likely need as many suppliers as a result
- Recognizing excellence

Criteria Used in Internal Certification Programs

The typical criteria in a supplier certification program includes (but is not limited to):

- No incoming product lot rejections (e.g., less than 0.5% defective) for a specified time period

- No incoming nonproduct rejections (e.g., late delivery) for a specified time period
- No significant supplier production-related negative incidents for a specified time period
- ISO 9000 / Q 9000 certified or successfully passing a recent, onsite quality system evaluation
- Mutually agreed-upon set of clearly specified quality performance measures
- Fully documented process and quality system with cost controls and continuous improvement capabilities
- Supplier's processes stable and in control

External Certification: International Organization for Standards

The International Organization for Standardization (ISO) is the world's largest developer of voluntary international standards. It was founded in 1947, and has since then published more than 21,000 international standards covering almost all aspects of technology and business. Today, the ISO has members from 163 countries and about 150 people working full time for the Central Secretariat in Geneva, Switzerland.

Organizations that become ISO certified and request and receive written permission from the ISO can display the ISO logo. ISO certification is highly sought after in the business world as it represents achieving and maintaining a stand of excellence verified by an independent third-party organization.

Two ISO standards commonly used in supplier certification programs are:

ISO 9000

- A series of management and quality standards in design, development, production, installation, and service.
- Companies wanting to sell in the global market will want to seek ISO 9000 certification.

The following are eight quality management principles on which the ISO 9000 series quality management system standards are based:

1. Customer focus—understand current and future customer needs
2. Leadership—establish unity of purpose and direction of the organization

3. Involvement of people—people are the essence of an organization
4. Process approach—a desired result is achieved through a managed process
5. Systems approach to management—managing interrelated processes
6. Continual improvement—performance improvement is a permanent objective
7. Factual approach to decision making—decisions are based on facts and data
8. Mutually beneficial supplier relationship—interdependent benefits create value for both an organization and its suppliers.

ISO 14000

- A family of standards for environmental management
- The benefits include reduced energy consumption, environmental liability, waste and pollution, and improved community goodwill.

SUPPLIER DEVELOPMENT

Supplier development is the technical and financial assistance given to existing and potential suppliers to improve quality and/or due date performance. In simpler terms, it can be described as a buyer's activities to improve a supplier's capabilities. A supplier's knowledge of, and technology used to produce, the commodity they supply can be leveraged through supplier development initiated by the manufacturer to reduce costs and lower project risks.

Supplier development programs should be designed to achieve:

- Lower supply chain total cost
- Increased profitability for all supply chain participants
- Increased product quality
- Near-perfect on-time delivery at each point in the supply chain

A supplier development program must be aimed at improving suppliers performance, not bullying them into charging less or simply auditing and rewarding them. Supplier development is all about providing suppliers with what they need to be successful in the supply chain.

Two of the most important functions of a supplier development program are:

- Providing information about products, expected sales growth, etc. Poor communication and a lack of information translates into additional costs (usually in the form of just-in-case inventory). Suppliers need to become extensions of their customers.
- Training suppliers in the application of LEAN and Six Sigma / quality tools. Asking suppliers to lower their price without giving them the knowledge on how to lower their costs (through LEAN implementation, for example) is not sustainable in the long term. This tactic will drive suppliers out of business, which goes against the purpose of supplier development.

The typical approach to supplier development is based on the following process steps:

1. Identify critical products and services.
2. Identify critical suppliers.
3. Form a cross-functional team internally to work with the supplier(s).
4. Meet with the top management at the supplier(s) to obtain their support and involvement.
5. Identify key development needs and projects.
6. Define details of the agreement and the action plan.
7. Monitor the status of the projects / action plan and modify strategies as necessary.

With a robust supplier development program, companies can establish trust through a heightened commitment to their supply partners.

SUPPLIER RECOGNITION

A supplier recognition program is just what it sounds like—a program to recognize suppliers who achieve the high performance standards necessary to meet customer expectations.

The success of the business can depend on the quality and performance of the company's suppliers. Therefore, it is always a good practice for a company to have innovative supplier recognition programs in order to recognize their achievements and reward them for their exceptional performance and services. There are several key benefits of such programs that make them valuable for a business organization.

- **MOTIVATE SUPPLIERS TO PERFORM BETTER:** Effective programs that recognize and reward suppliers for their performance can motivate them to continue to excel in terms of their quality, pricing, and delivery commitments. In a highly competitive business environment, strong and motivated suppliers can be a crucial competitive advantage for a business. Therefore, the company must take care to develop and nurture its supplier network with innovative recognition and reward schemes.
- **HELP TO IMPROVE SUPPLIER LOYALTY AND COMMITMENT:** In today's competitive environment, supplier loyalty cannot be taken for granted. Reputed suppliers are always in demand from a number of competitors, and their supply capacity is limited. Therefore, the business organization needs to ensure that it continues to receive privileged support from its key suppliers. Supplier support is important to ensure that customer delivery commitments are maintained. When there is a peak demand for the company's product, it may fail to exploit the market opportunity fully if it does not have adequate supplier support to meet that demand in the peak season.
- **ENCOURAGE SUPPLIERS TO ADAPT TO THE COMPANY'S CULTURE:** If the company treats its suppliers as a part of the family and engages in supplier recognition programs periodically, it can help to bring the suppliers closer to the corporate values, ethics, and principles of the company. They tend to identify themselves with the values and policies of the organization, and adapt to its culture more easily. This helps to consolidate the relationships with suppliers for the long run. It also fosters a better understanding of each other's needs and creates a win-win situation for both parties.
- **HELPS TO CREATE ENTRY BARRIERS FOR COMPETITORS:** Strong and mutually rewarding relationships with suppliers can lead to the creation of stiffer entry barriers for new competitors. If the suppliers trust the company, they may like to sign deals of exclusivity with the company for certain crucial components. The company can give them a buyback assurance for their entire production capacity. In such a situation, it becomes difficult for too many competitors to enter the business if they do not have access to critical supply sources.
- **ENCOURAGES SUPPLIER PARTICIPATION IN PRODUCT INNOVATION:** Recognition to suppliers also brings about their enthusiasm to work closely with the company on new product

development. A number of products require a close interaction and cooperation between the company and the suppliers during the development stages. Involvement of suppliers from an early stage helps to achieve the lowest costing and minimizes quality issues in the long run. Therefore, recognition of the value that a supplier can bring to an organization is important to achieve the overall organizational objectives.

Companies should recognize and celebrate the achievements of their best suppliers.

- A simple thank you goes a long way to show appreciation. Providing a recognition letter of appreciation (often supported by a wall plaque) is a good way to start a recognition program.
- Companies can establish supplier awards. Award winners exemplify true partnerships, continuous improvement, organizational commitment, and excellence.
- Award-winning suppliers serve as role models for other suppliers and motivate them to strive to achieve the award.

A properly developed and active supplier recognition program can and will make major contributions to the organization, its suppliers, and its customers and stakeholders. If a company is going to keep and utilize suppliers, there should be a motivation plan that reaches them. Future success depends on the supply chain; therefore, the supplier recognition program should support building a better and more competitive supply chain.

SUPPLIER RELATIONSHIP MANAGEMENT SYSTEMS

When considering development of a supplier relationship program there are several technologies available to support development. The key is to ensure that the system(s) being considered can in fact gather and track a supplier's performance data across all business units and/or locations.

The reason for, and a benefit of, a system is to provide a more comprehensive and objective view of supplier performance, which in turn can be used when making sourcing decisions. Such a system will also help in identifying and addressing supplier performance issues. It is important to recognize that an SRM system can only be implemented in line with other necessary business process changes. The SRM system is part of the process, not the whole process by itself.

The following are five key points to consider in the development and implementation of an SRM system:

1. Automation is meant to handle routine transactions.

2. Integration spans multiple departments, processes, and software applications.
3. Visibility of information and clear and concise process flows are vital.
4. Collaboration occurs through information sharing.
5. Optimization of processes and decision making are necessary.

Based on the technology and methods now available to assist in the evaluation and certification process, an organization will find it easier to make better, faster, and more informed decisions about potential suppliers. Systems can enhance the process; however, training and understanding of the system are critically important. Implementing simple systems is still a better value and provides a greater success rate than implementing complicated (often expensive) systems. The key to any system is to ensure that the staff has agreed to the system and its abilities, and that the information that it will yield will in fact be useful to all parties involved both at the supplier and organizational levels.

TRENDS IN SUPPLIER RELATIONSHIP MANAGEMENT

1. CLOSE ALIGNMENT OF SOURCING AND NEGOTIATION WITH SUPPLIER RELATIONSHIP MANAGEMENT

Many companies are determining their supplier negotiation strategies by tying them to their category management strategy, and to what type of relationship and goals they have with the supplier.

2. FOCUS ON CROSS-FUNCTIONAL ENGAGEMENT

SRM success depends on internal relationship management as much as external relationship management.

Strategic SRM requires coordination and alignment with suppliers, and with internal functions. Mixed messages cause supplier confusion, compromised trust, missed opportunities, inefficiencies, increased risk, and lost leverage.

A best practice cross-functional governance structure for strategic supplier relationships involves SRM teams at both the company and supplier levels, each led by a relationship manager, who along with executive sponsors from both organizations, form a steering committee to lead the process.

3. FOCUS ON INNOVATION

Customers and suppliers work with each other regularly or often on innovation projects. Companies that engage in more innovation with suppliers report higher ROI from their efforts. Companies estimating ROI from innovation from/with their suppliers report much higher results than from internal innovation efforts.

4. INVESTMENT IN PEOPLE AND “SOFT SKILLS”

Treat suppliers with the courtesy and respect due all people in all interactions. Be candid, and able to disagree (even forcefully), without being disagreeable. Hold both sides to the same standards. Actively search out opportunities for mutual benefit. Actively seek to cultivate mutual trust.

5. MORE ROBUST MEASUREMENT

Benefits of strategic partnerships with suppliers are numerous.

For customers:

- Preferred access to the supplier’s best people
- Increased operating efficiencies
- Lower costs
- Improved quality
- Enhanced service
- Influence over supplier investments and technology roadmaps
- Preferred access to supplier ideas
- Increased innovation from and with suppliers, leading to lower costs and incremental revenue
- Sustainable competitive advantage

For suppliers:

- Greater visibility into customer purchasing plans
- Increased operating efficiencies
- Longer term customer commitments; greater predictability of future business
- Increased scope of business and revenue
- Lower costs of sales; increased margins
- Opportunities to develop, pilot, and showcase innovative solutions
- Deeper insights into customer strategy and plans
- Ability to align investments leading to increased ROIC
- Sustainable competitive advantage

SUMMARY

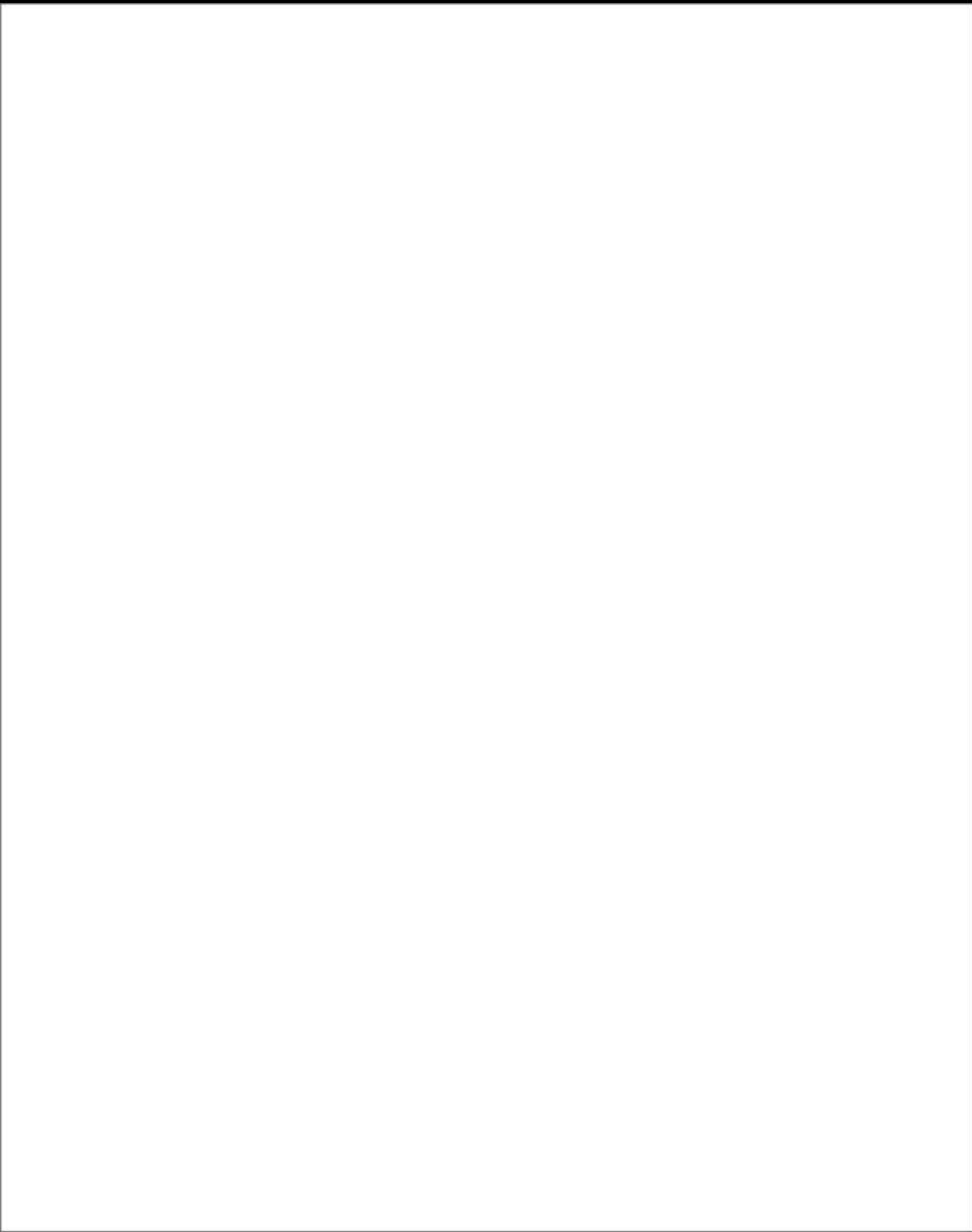
- Supplier relationship management (SRM) is the discipline of strategically planning for, and managing, all interactions with the third-party organizations that supply goods and/or services to an organization in order to maximize the value of those interactions. Supplier relationship management helps an organization work with suppliers for better performance and returns on their investment.
- Strong and successful supplier partnerships involve a mutual commitment between the buyer and the supplier over an extended time, to work together to the mutual benefit of both parties, sharing relevant information and the risks and rewards of the relationship. This requires adopting a strategic perspective as opposed to a tactical position.
- The keys to developing successful partnerships with your suppliers are:
 - Building trust
 - Having a shared vision and shared objectives
 - Building personal relationships

- Identifying mutual benefits and needs
 - Securing commitment and top management support
 - Managing change
 - Sharing information and maintaining open lines of communication
 - Understanding suppliers capabilities
 - Implementing a continuous improvement program
 - Establishing performance metrics
- Successful companies embrace their suppliers, viewing them as partners in helping to grow the business. Making sure that this is a mutually beneficial partnership will impact the price you are negotiating today and the quality of service you get in the future. Supplier performance evaluation against a set of mutually agreeable criteria can help to ensure that both parties in the relationship know exactly what is expected, and if expectations are being met.
 - One method of evaluating the performance of key suppliers is the weighted-criteria evaluation system.
- The main reason for supplier certification is for the company to eliminate or minimize incoming inspections, saving the company time and money. Companies can implement internal or external certifications or a combination of both. One external certification partner commonly used in industry is the International Organization for Standards (ISO).
 - ISO 9000 is a series of management and quality standards in design, development, production, installation, and service.
 - ISO 14000 is a family of standards for environmental management.
- Supplier development is the technical and financial assistance given to existing and potential suppliers to improve quality and/or due date performance. In simpler terms, it can be described as a buyer's activities to improve a supplier's capabilities.
- A supplier recognition program is established to recognize suppliers who achieve the high performance standards necessary to meet customer expectations. It is always a good practice for a company to have innovative supplier recognition programs in order to recognize their achievements and reward them for their exceptional performance and services.

- The reason for, and a benefit of, an SRM system is to provide a more comprehensive and objective view of supplier performance, which in turn can be used when making a sourcing decisions. Such a system will also help in identifying and addressing supplier performance issues.
- The current trends in supplier relationship management are:
 - Close alignment of sourcing and negotiation with supplier relationship management
 - Focus on cross-functional engagement
 - Focus on innovation
 - Investment in people and “soft skills”
 - More robust measurement

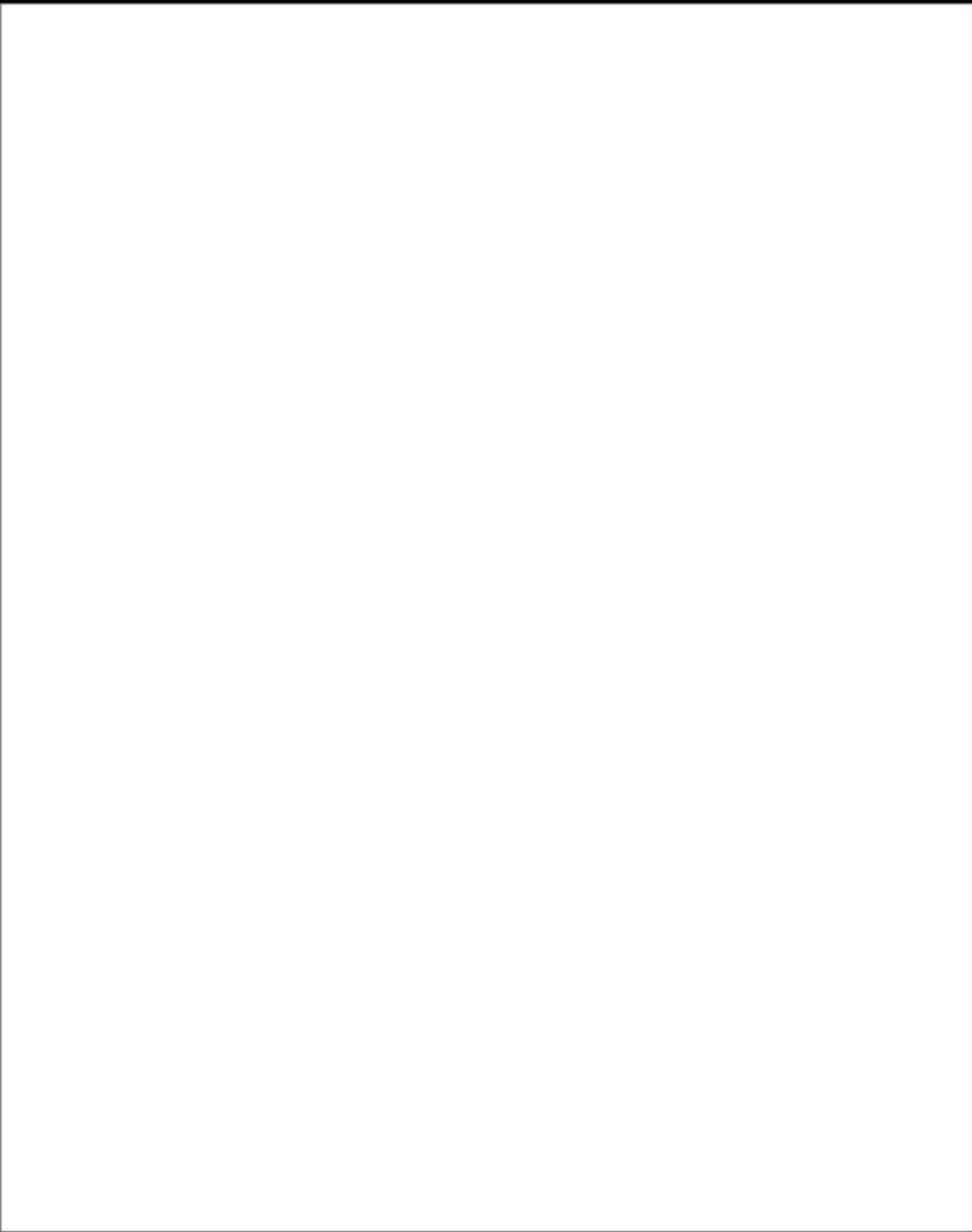
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MAKE





Chapter 8

Operations Management with LEAN and Six Sigma

CHAPTER OUTLINE

- Introduction
- Manufacturing Strategies
- Total Cost of Manufacturing
- LEAN and Six Sigma
- Introduction to LEAN
- Key Elements of LEAN Manufacturing
- Introduction to Six Sigma
- Six Sigma Methodology
- Six Sigma Training and Certification Levels
- Total Quality Management
- Quality Gurus
- Voice of the Customer
- Cost of Quality
- Quality Tools
- Statistical Process Control
- Acceptance Sampling
- Implementing LEAN and Six Sigma

INTRODUCTION

Operations Management

Operations management refers to the design, execution, and control of the operations that convert resources into desired goods and services, aligned with the company's business strategy. In simple terms, it is the business function responsible for managing the process to create goods and services. Major activities in operations management beyond product creation often include, product development, managing purchases, inventory control, production operations, quality control, storage, and logistics. The focus is on the efficiency and effectiveness of processes including the measurement and analysis of those processes. The goal of operations management is not only to convert materials and labor into goods and services as efficiently as possible, but also control costs to maximize the profit of the company. The nature of how operations management is carried out varies by company and depends on the nature of the products or services in the portfolio.

In this text we will specifically focus on the operations management areas of manufacturing strategies, LEAN manufacturing, and Six Sigma.

MANUFACTURING STRATEGIES

Companies must develop a manufacturing strategy that suits the type(s) of products that they produce, their customers' expectations, and their strengths. Manufacturing strategies can vary significantly depending on the product and/or the customer requirements. Developing a manufacturing strategy that suits a company's strengths is essential for establishing and maintaining an effective supply chain.

In this section we will review four key manufacturing strategies; make-to-stock (MTS), make-to-order (MTO), assemble-to-order (ATO), and engineer-to-order (ETO). We will also review the implications to customer delivery lead time with each of these manufacturing strategies.

- **MAKE-TO-STOCK (MTS):** "A production environment where products can be, and usually are, finished before receipt of a customer order. Customer orders are typically filled from existing stocks, and production orders are used to replenish those stocks."¹
 - Make-to-stock means to manufacture products for stock based on demand forecasts. The more accurate the forecast is, the less likely excess inventory will be created, and the less likely a stockout will occur. Therefore, the critical issue is how to forecast demands accurately.

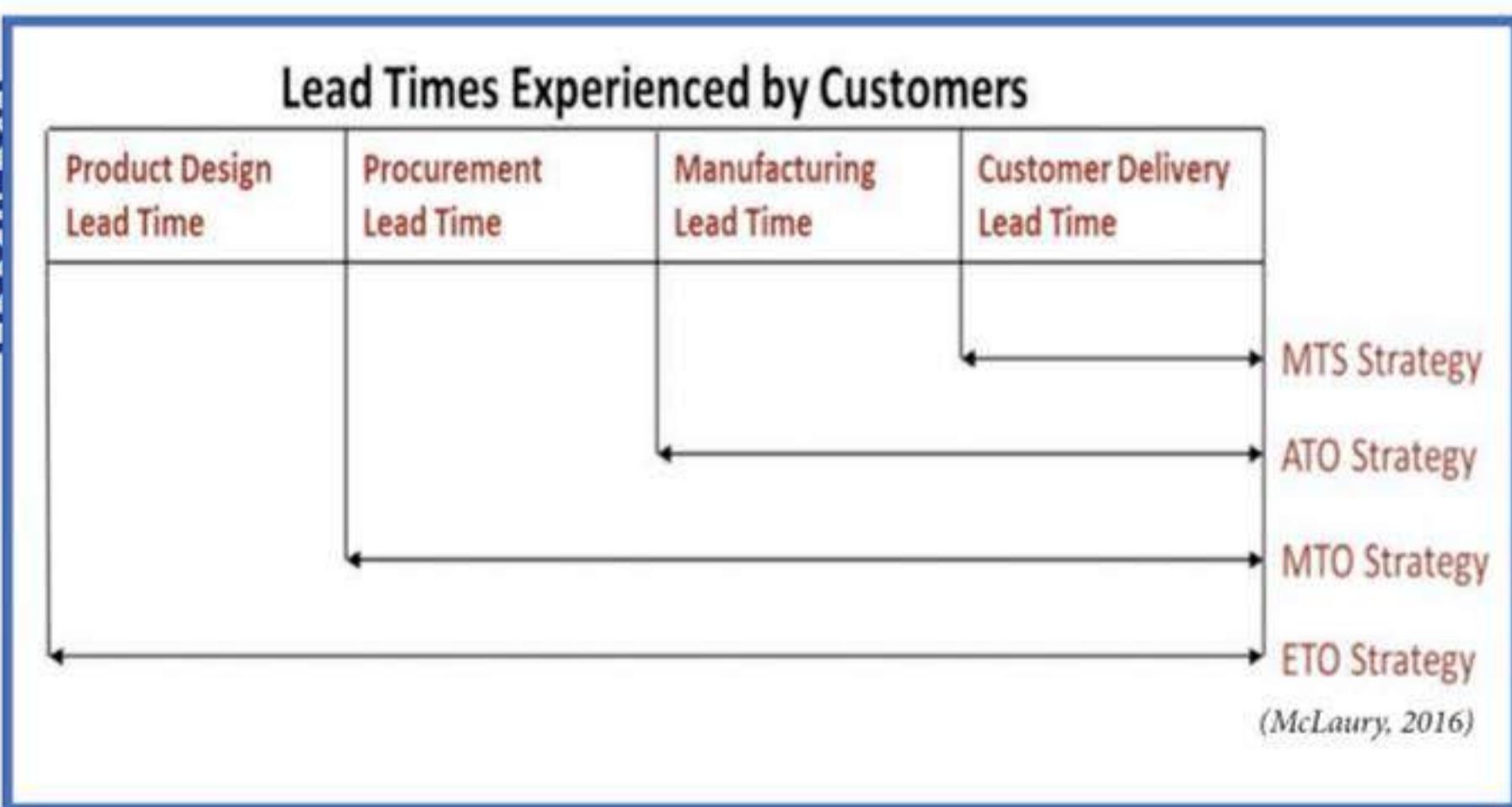
- Most daily necessities such as foods, sundries, and textiles are MTS-type products.
- One issue of MTS is the potential to have excess inventory. Companies that operate a MTS model struggle to make the correct product at the correct time in the correct quantities.
- MTS features economies of scale, large volumes, long production runs, low variety, and multiple distribution channels.
- **MAKE-TO-ORDER (MTO):** “A production environment where a good or service can be made after receipt of a customer’s order. The final product is usually a combination of standard items and items custom-designed to meet the special needs of the customer.”¹
 - The MTO strategy only manufactures the end product once the customer places the order, creating additional wait time for the consumer to receive the product but allowing for more flexible customization.
 - The MTO strategy relieves the problems of excessive inventory that is common with the traditional MTS strategy.
 - MTO is not appropriate for all types of products. It is appropriate for highly configured products such as computer servers, aircraft, ocean vessels, bridges, automobiles, or products that are very expensive to keep in inventory.
 - MTO relies on relatively small quantities, but more complexity.
- **ASSEMBLE-TO-ORDER (ATO):** “A production environment where a good or service can be assembled after receipt of a customer’s order. The key components (bulk, semi-finished, intermediate, subassembly, fabricated, purchased, packing, and so on) used in the assembly or finishing process are planned and usually stocked in anticipation of a customer order. Receipt of an order initiates assembly of the customized product. This strategy is useful where a large number of end products (based on the selection of options and accessories) can be assembled from common components.”¹
 - ATO is a hybrid strategy between a MTS strategy where products are fully produced in advance, and the MTO strategy where products are manufactured once the order has been received. The ATO strategy attempts to combine the benefits of both strategies—that is, getting products into customers’ hands quickly while allowing for the product to be customizable.
 - The ATO strategy requires that the basic parts for the product are already manufactured but not yet assembled. Once an order is received, the parts are assembled quickly and sent to the customer.

- ATO is when base components are made, stocked to a forecast, but products are not assembled until the customer order is received
- **ENGINEER-TO-ORDER (ETO):** “Products whose customer specifications require unique engineering design, significant customization, or new purchased materials. Each customer order results in a unique set of part numbers, bills of material, and routings.”¹
 - The essence of ETO is building a unique product every time. There may be components that are common from one product to another, but not in the same quantity as in repetitive manufacturing.
 - It is a more dramatic evolution of a MTO supply chain.
 - The cost of poor quality can be very high with an ETO strategy. The warranty costs and the cost of rework to replace an item in a complex assembly can have a serious negative effect on profit margins. Quality must be part of the entire process, and not just part of purchasing and manufacturing—the typical focus of a repetitive manufacturer.
 - ETO is used when products are unique and extensively customized for the specific needs of individual customers

The choice of strategy is the major determining factor in the **total cycle time** or **lead time** the customer experiences.

As shown in figure 8.1, each manufacturing strategy involves completion of different aspects of the supply chain prior to receiving a customer order, and accordingly, the customer will experience different lead times depending on which manufacturing strategy has been established.

- **MTS:** The product is already produced and available in the warehouse when the customer order is received, so the customer will only experience the customer delivery lead time.
- **ATO:** The product design is complete and the components/materials have already been procured when the customer order is received, so the customer will experience the manufacturing (e.g., assembly) and customer delivery lead times.
- **MTO:** The product design is the only element complete when the customer order is received, so the customer will experience the procurement, manufacturing, and customer delivery lead times.
- **ETO:** Since no supply chain elements have been completed when the customer order is received, the customer will experience the full cumulative supply chain lead time.

FIGURE 8.1

Manufacturing Strategies for Manufacturing Processes

There are four basic manufacturing processes from which companies can choose to produce their product(s) depending on various factors, including the level of customization required by the customer, the type of product being produced, complexity, volume, and cost. Each of these manufacturing processes aligns more closely with one or two specific manufacturing strategies. Figure 8.2 summarizes these four manufacturing processes.

- **JOB SHOP:** “A type of manufacturing process used to produce items to each customer’s specifications. Production operations are designed to handle a wide range of product designs and are performed at fixed plant locations using general-purpose equipment.”¹ Job shops produce small lots of a variety of products, which require a unique setup and sequence of process steps to create a custom product for each customer.
 - **Characteristics:** A job shop manufacturing process is characterized as being highly flexible, with a large variety of products, very long lead times, low volumes, low labor requirements, low fixed costs, but high variable costs.
 - **Examples:** Metal fabrication shops, print shops, custom cabinet making
 - **Manufacturing Strategies:** ETO or MTO are the manufacturing strategies that are most closely aligned with the job shop process.

FIGURE 8.2

Manufacturing Process	Flexibility	Product Variety	Volume	Fixed Costs	Variable Costs	Lead Time	Manufacturing Strategy
Job Shop	Highly Flexible	Very High	Very Low	Low	High	Very long	ETO / MTO
Batch	Somewhat Flexible	High	Low	Moderate	Moderate	Long	MTO / ATO
Line Flow	Somewhat Inflexible	Limited	High	Moderate	Moderate	Short	ATO / MTS
Continuous Flow	Highly Inflexible	Very Limited	Very High	High	Low	Very short	MTS

(McLaury, 2016)

- **BATCH:** “A type of manufacturing process used to produce items with similar designs and that may cover a wide range of order volumes. Typically, items ordered are of a repeat nature, and production may be for a specific customer order or for stock replenishment.”¹
 - **Characteristics:** A batch manufacturing process, in comparison to a job shop process, is characterized as being less flexible, with a more narrow variety of products, long lead times, slightly higher volumes, moderate labor requirements, and moderate fixed and variable costs. In batch processing, some of the components for the final product may be produced in advance.
 - **Examples:** Manufacturing component parts for a production line, manufacturing clothing, or furniture
 - **Manufacturing Strategies:** MTO or ATO are the manufacturing strategies that are most closely aligned with the batch process.
- **LINE FLOW:** “A form of manufacturing organization in which machines and operators handle a standard, usually uninterrupted, material flow. The operators generally perform the same operations for each production run. A flow shop is often referred to as a mass production shop or is said to have a continuous manufacturing layout. The plant layout (arrangement of machines, benches, assembly lines, etc.) is designed to facilitate a product ‘flow.’ Some process industries (chemicals, oil, paint, etc.) are extreme examples of flow shops. Each product, though variable in material specifications, uses the same flow pattern through the shop. Production is set at a given rate, and the products are generally manufactured in bulk.”¹

- **Characteristics:** A line flow manufacturing process is characterized as being somewhat inflexible, with a limited variety of products, short lead times, and high volumes. Products are standardized allowing a better organization of resources than with job shop or batch processing. The sequence of operations in line flow is generally fixed, and production orders are not linked to customer orders as is typical in job shop and batch processing.
 - **Examples:** Automobiles, computers, appliances, household goods
 - **Manufacturing Strategies:** ATO or MTO are the manufacturing strategies that are most closely aligned with the line flow process.
- **CONTINUOUS FLOW:** “A production system in which the productive equipment is organized and sequenced according to the steps involved to produce the product. This term denotes that material flow is continuous during the production process. The routing of the jobs is fixed and setups are seldom changed.”¹
 - **Characteristics:** A continuous flow manufacturing process is characterized as being inflexible, with a very limited variety of products, very short lead times, very high volumes, high fixed costs, and low variable costs. This type of manufacturing process involves standardized production with rigid line flows and tightly linked process segments. The process is often operated 24/7 to maximize utilization and to avoid expensive stops and starts.
 - **Examples:** Gasoline, laundry detergent, chemicals
 - **Manufacturing Strategies:** MTS is the manufacturing strategy that is most closely aligned with the continuous flow process.

TOTAL COST OF MANUFACTURING

Total cost of manufacturing (TCM) consists of all the costs associated with production, procurement, inventory, warehousing, and transportation. All of these costs are impacted by the manufacturing strategy. Since TCM results from the functional integration of manufacturing, procurement, and logistics, it is important for companies to design a supply chain strategy (and adopt a manufacturing strategy) that achieves the lowest TCM across the entire process.

Key points:

- TCM is the complete cost of producing and delivering products to your customers.

- TCM incorporates both fixed and variable costs.
- TCM is generally expressed as a cost per unit for each product.

Relationship of TCM Elements to Volume and Manufacturing Strategy

- Per unit procurement and production costs go down as volume goes up. Generally, a step function applies as more capital (i.e., fixed cost) will be required to produce more as volume grows beyond the existing output capabilities.
- Per unit inventory and warehousing costs go up as volume goes up. The company will produce and manage more inventory and therefore will likely need more warehouse storage space, insurance, and potentially pay more inventory taxes, among other things.
- Per unit transportation costs go down as volume goes up, but level off at high volumes (economies of scale in transportation until the container/conveyance is filled up).

LEAN AND SIX SIGMA

LEAN: “A philosophy of production that emphasizes the minimization of the amount of all the resources (including time) used in the various activities of the enterprise. It involves identifying and eliminating non-value-adding activities in design, production, supply chain management, and dealing with customers. Lean producers employ teams of multiskilled workers at all levels of the organization and use highly flexible, increasingly automated machines to produce volumes of products in potentially enormous variety. It contains a set of principles and practices to reduce cost through the relentless removal of waste and through the simplification of all manufacturing and support processes.”¹ LEAN is an operating philosophy of waste reduction and value enhancement. Elements of what is today known as LEAN were originally created as part of the Toyota Production System (TPS) by key Toyota executives.

SIX SIGMA: “The six sigma approach is a set of concepts and practices that key on reducing variability in processes and reducing deficiencies in the product. Important elements are (1) Producing only 3.4 defects for every one million opportunities or operations; (2) Process improvement initiatives striving for six sigma-level performance. Six sigma is a business process that permits organizations to improve bottom-line performance, creating and monitoring business activities to reduce waste and resource requirements while increasing customer satisfaction.”¹ It is an enterprise and supply chain-wide philosophy that emphasizes a commitment toward excellence, encompassing suppliers, employees, and customers.

LEAN and **Six Sigma** complement one another:

- LEAN focuses on eliminating wastes and improving efficiency.
- Six Sigma focuses on reducing defects and variations.

The combination of LEAN and Six Sigma creates a faster and better supply chain.

INTRODUCTION TO LEAN

- Starting in the 1910s, Henry Ford's mass production line created a first breakthrough by using continuous assembly and line flow systems.
- In the 1940s, Toyota executives, Taichii Ohno and Shigeo Shingo, created the Toyota Production System (TPS), which incorporated Ford's production system and other techniques to form the basis of what is now known as LEAN.
- The term LEAN was first coined by John Krafcik in 1988, and the definition was expanded in the book, *The Machine that Changed the World* (Womack, Jones, & Roos, 1990).
- In the 1990s, supply chain management combined and incorporated the concepts of:
 - **Quick Response**, which is the rapid replenishment of a customer's stock by a supplier with direct access to data from the customer's point of sale; emphasizes speed and flexibility.
 - **Efficient Consumer Response (ECR)**, which is a strategy to increase the level of services to consumers through close cooperation among retailers, wholesalers, and manufacturers
 - **Just in Time (JIT)**, which is an inventory strategy to decrease waste by receiving materials only when and as needed in the production process, thereby reducing inventory costs; requires an accurate demand forecast to be effective
 - **Keiretsu Relationships**, which involve companies both upstream and downstream of a manufacturing process, remaining independent, but working closely together for mutual benefit
- The combination of these approaches and concepts have emerged as the philosophies and practices known as LEAN manufacturing.

Lean is a culture, it is not a toolbox of methods or ideas. LEAN provides value for customers through the most efficient use of resources possible. It has become standard in many industries.

Implementing LEAN often results in:

- Large cost reductions
- Improved quality
- Increased customer service

To know how LEAN provides value for customers, we need to understand what is meant by the term “value.”

- Value is the **inherent worth** of a product as judged by the customer, and reflected in its selling price and market demand.
- Value is further defined as anything for which the customer is willing to pay

In most processes, there are value added process steps and nonvalue added process steps.

- **Value Added** process steps actually transform or shape a product or service that is eventually sold to a customer. Example: a process step that actually assembles component items into a finished product, adds value to the product.
- **Nonvalue Added** process steps take time, resources, and/or space, but do not actually add value to the product or service. Example: the process step of moving the component parts to the assembly equipment does not actually add value to the product. The overall process would be better and more efficient if this step could be minimized or eliminated.

LEAN is composed of three elements working in unison:

- LEAN manufacturing
- Total quality management
- Respect for people

LEAN manufacturing is a natural fit within the discipline of supply chain management as all of the LEAN goals and objectives help to facilitate an efficient and effective supply chain. Supply chain management strives to incorporate LEAN elements by:

- Satisfying internal as well as external customer demand
- Communicating demand forecasts and production schedules up and down the supply chain, to reduce/eliminate the bullwhip effect
- Quickly moving products into and through the production process
- Optimizing inventory levels across the supply chain (internally and externally)
- Increasing the value, capabilities, and flexibility of the workforce through cross-training
- Extending collaboration and alliances beyond just first-tier suppliers and customers to include second- and third-tier suppliers and customers as well

KEY ELEMENTS OF LEAN MANUFACTURING.....

There are many different aspects of LEAN manufacturing and each company may value various aspects differently. The following are some of the more common elements of LEAN manufacturing:

1. Waste reduction
2. Lean layouts
3. Inventory, setup time, and changeover time reduction
4. Small batch scheduling and uniform plant loading
5. Lean supply chain relationships
6. Workforce empowerment and respect for people
7. Continuous improvement



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Waste Reduction

Waste reduction is the number one objective of LEAN. Waste in the context of LEAN and supply chain management is the expenditure of one or more resources for no purpose or value. Companies can reduce costs and add value by eliminating waste from the production system. Waste can occur in many forms. Refer to figure 8.3 for the eight categories of waste, and use the mnemonic “DOWN TIME” to remember them.

FIGURE 8.3

Waste	Description
Defects	Anything that does not meet the acceptance criteria
Overproduction	Production before it is needed, or in excess of customer requirements. Providing a service that is not needed.
Waiting	Elapsed time between processes when no work is being done
Non-Utilized Talent	Underutilizing people's talents, skills or knowledge. De-motivating the workforce by not asking for input or recognizing success
Transportation	Unnecessary movement of materials or products
Inventory	Excess products or materials not being processed
Motion	Unnecessary movement of people. Multiple hand-offs
Extra-Processing	Unnecessary steps in a process. Redundancies between processes. More work or higher quality than required by the customer

(McLaury, 2016) Adapted from GoLeanSixSigma.com

Any or all of these wastes may exist in a company or with a particular process.

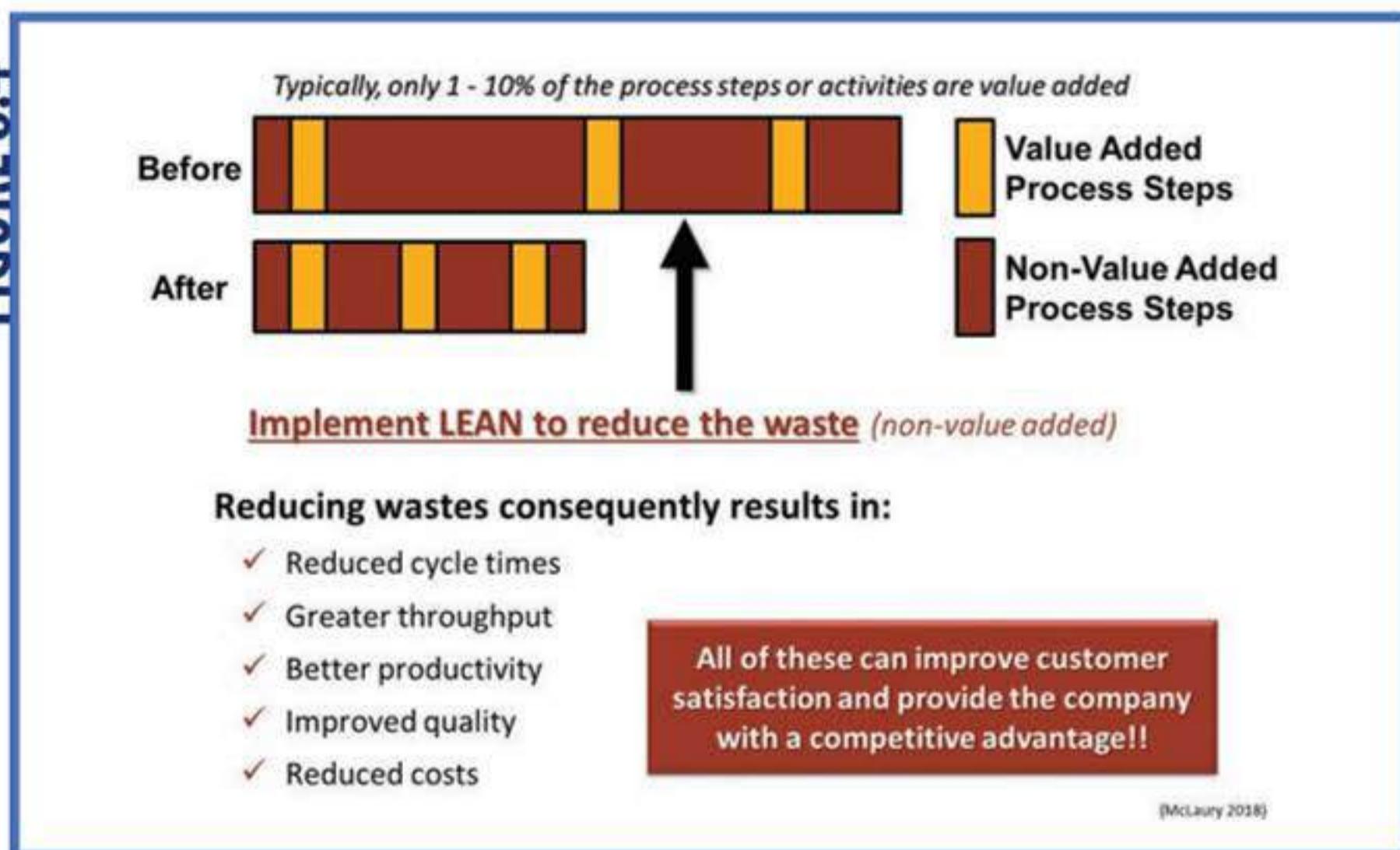
Before waste is removed, processes are less efficient, generally take longer to complete, and are often scattered, which can negatively affect customers.

After waste is removed, processes are more efficient, streamlined, and take less time to complete, resulting in more satisfied customers (see figure 8.4).

The elimination of waste can deliver many benefits. Reducing waste results in:

- Reduced cycle times
- Greater throughput

FIGURE 8.4



- Better productivity
- Improved quality
- Reduced costs

Lean Layouts

The second element is lean layouts, which involve moving people and materials when and where needed, and as soon as possible.

- Lean layouts are very visual, meaning that the lines of visibility are unobstructed, with operators at one processing station or workcenter able to monitor the progress of work at another workcenter.
 - Communication between workstations can be facilitated through the use of a kanban, which is “[a] method of just-in-time production that uses standard containers or lot sizes with a single card attached to each. It is a pull system in which work centers signal with a card that they wish to withdraw parts from feeding operations or suppliers. The Japanese word kanban, loosely translated, means card, billboard, or sign but other signaling devices such as colored golf balls have also been used. The term is often used synonymously for the specific scheduling system developed and used by the Toyota Corporation in Japan.”¹ A kanban contains information that is passed between stations, and authorizes production or the movement of materials to the next workstation.

- Lean layouts can also incorporate a manufacturing cell model where sets of machines are grouped together or in close proximity to one another based on the products or component parts they produce, saving duplication of equipment and labor.
- Lean layouts are often U shaped to facilitate easier operator and material movements.

THE CONCEPT OF 5-S

A lean layout incorporates the concept of 5-S, which is a systematic process of workplace organization. It is a discipline designed to help build a quality work environment, both physically and mentally. 5-S is also considered part of the broader idea known as visual control, visual workplace, or visual factory.

The 5-S process steps are:

1. **SORT:** Keep only necessary items in the workplace, eliminate the rest.
2. **STRAIGHTEN:** Organize and arrange items to promote an efficient workflow.
3. **SHINE:** Clean the work area so it is neat and tidy.
4. **STANDARDIZE:** Schedule regular cleaning and maintenance.
5. **SUSTAIN:** Stick to the rules. Maintain and review the standards.

There is a place for everything, and everything should be in its place.

Inventory, Setup Time, and Changeover Time Reduction

The third element of LEAN involves inventory, setup time, and changeover time reduction.

- Excess inventory is a waste.
 - Some inventory may be necessary, but excess inventory takes up space; costs money to hold and maintain; costs money to protect, secure, and insure; and it ties up financial capital which could be used for other aspects of the business (e.g., R&D, marketing and sales, improvements, dividends, pay increases).
 - Reducing inventory levels can free up capital and reduce holding costs. In addition, there is less likelihood of waste being created by obsolescence, expiry, spoilage, or damage with lower inventory levels.

What do you see? . . . a river flowing smoothly



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Now that the water level is lower what do you see?



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- Traditionally, supply chains work as a push system, where inventory is carried to cover up problems. Reducing inventory levels can also uncover production problems. Refer to the following analogy.
 - The water represents inventory. When the water level is high, you don't see the rocks beneath the water, and don't know they are there.
 - The rocks represent hidden obstacles, problems, and issues. These dangers are hiding just beneath the surface.
 - Inventory can hide the underlying problems, but they are still there and can potentially create major issues in the supply chain.
- Lowering inventory will help to expose the hidden problems. Once the problems are detected, they can be solved. The end result will be a smoother running supply chain with less inventory investment.
- Setup Time and Changeover Time are both considered waste as they are intervals when the equipment is not performing its intended function—that is, producing product.
 - Setup time is the time taken to prepare and format the manufacturing equipment and systems for production.
 - Changeover time is the time taken to adapt and modify the manufacturing equipment and systems to produce a different product or a new batch of the same product.
 - While setting up the equipment is a necessary function, if the setup time can be minimized, the difference will be more time available to produce. Both setup and changeover are non-value added operations and should be minimized as much as possible.

Small Batch Scheduling and Uniform Plant Loading

The fourth element of LEAN is small batch scheduling and uniform plant loading.

In a LEAN manufacturing environment, the ideal schedule is to produce every product as quickly as possible and at the same rate as customer demand. In the real world, material availability, labor availability, and setup or changeover time influences the scheduling of large batches.

SMALL BATCH SCHEDULING

Large batches can exacerbate the bullwhip effect as production in large batches creates an uneven workload as production is not synchronized with customer demand, and an uneven demand for

upstream processes, making a pull system impossible. Throughput times in manufacturing go up and work-in-process inventory goes up, creating more waste in the system.

Think of a snake trying to swallow a large meal.



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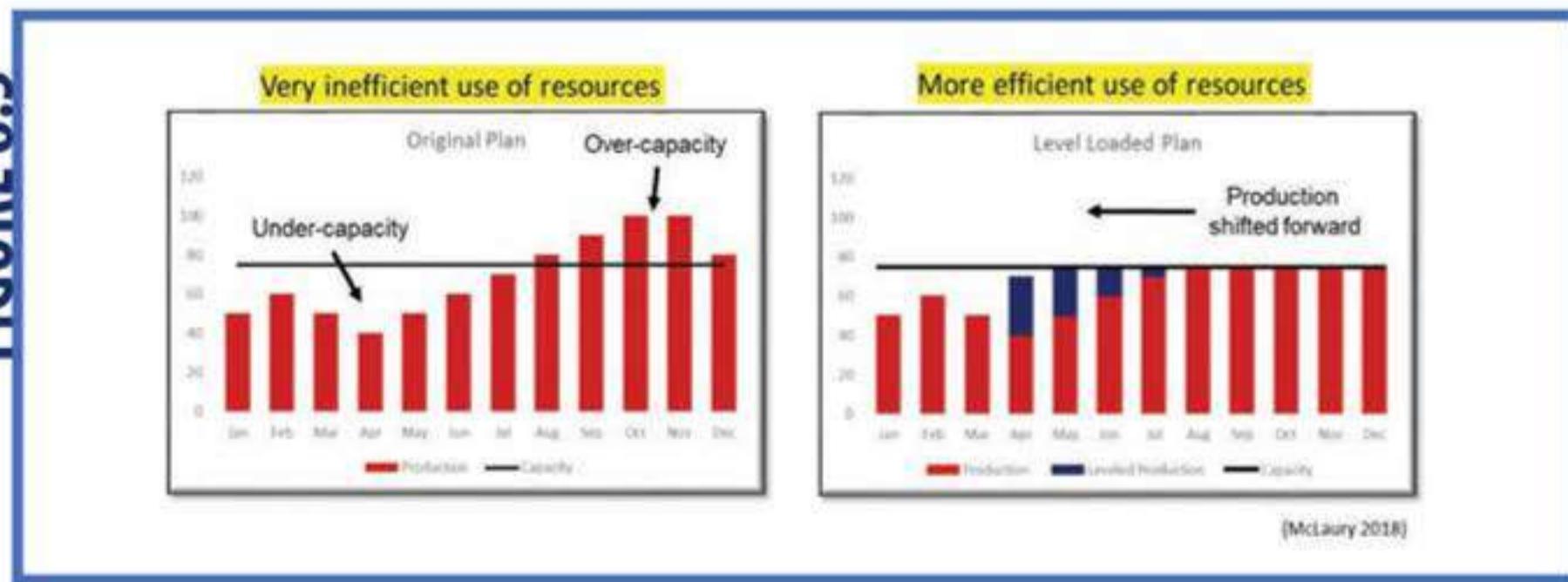
LEAN manufacturing attempts to reverse this though small batch scheduling or small lot production. If demand can be leveled and setup/changeover times can be reduced, smaller batches will facilitate producing at the same rate as customer demand. Production in small batches creates a smooth workload as production can be synchronized with customer demand, and a smooth demand for upstream processes, facilitating a pull system. It increases flexibility allowing the company to respond to changes in customer demands more quickly. Throughput times in manufacturing go down, and work-in-process inventory goes down, thus eliminating or minimizing waste in the system. The company can also get the product to the customer more quickly. Small batch scheduling can reduce costs by reducing inventory, while also increasing flexibility to meet customer demand.

UNIFORM PLANT LOADING

In a manufacturing environment, unless demand is perfectly flat, or capacity is highly variable, it is likely that demand will exceed capacity, not reach capacity, or both, at various points in the planning horizon. Matching the production plan to follow demand exactly can contribute to inefficiency and waste.

The technique of uniform plant loading involves shifting planned production forward and planning production up to the available capacity in earlier time periods, in order to meet demand in later time periods, where the production necessary to meet demand would have otherwise exceeded the available capacity. In figure 8.5, the Original Plan shows that production would be under capacity in the first seven months of the year and overcapacity in the final five months of the year. Both in-

FIGURE 8.5



stances would result in an inefficient use of resources and a potential customer service failure in the second half of the year. The Level Loaded Plan shows the shifting of some of the production from the final five months of the year, forward into the first half of the year where capacity is available. And while this “front-loading” or “leveling” of the plan creates some temporary excess inventory, it is a better utilization of the company’s resources and avoids a customer service failure in the second half of the year. This more “uniform” plan helps suppliers better plan production as well.

Lean Supply Chain Relationships

The fifth element is lean supply chain relationships.

LEAN represents a new way of thinking about supply chain partners; its principles require cooperative supplier and customer relationships that balance cooperation with competition. Cooperation involves a variety of collaborative relationships including supplier and customer partnerships, and strategic alliances, which are a key feature of LEAN supply chain management. Companies develop lean supply chain relationships with key supplier and with key customers. Supply chain partners must work together to remove waste, reduce cost, and improve quality and customer service. Mutual dependency and benefits occur among these partners.

Lean supply chain relationship principles are:

- Focus on the value stream
- Eliminate waste
- Synchronize the flow of products and information
- Minimize transactional costs and production costs
- Balance cooperation and competition
- Ensure visibility and transparency



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- Develop quick response capabilities
- Manage uncertainty and risk
- Align core competencies and complementary capabilities
- Foster innovation and knowledge-sharing

Workforce Commitment and Respect for People

The sixth element is workforce commitment and respect for people.

WORKFORCE COMMITMENT

For LEAN manufacturing to work, managers must support its principles by providing subordinates with the skills, tools, time, and other resources necessary to identify problems and implement solutions.

Management has the responsibility for motivating and engaging large numbers of people to work together toward a common goal such as LEAN manufacturing. Defining and explaining what that goal is, sharing a path to achieving it, motivating people to take the journey, and assisting them by removing obstacles are management's reason for being.

One of the fundamental elements of LEAN manufacturing is that management must be totally committed to the "customer-first" philosophy. Typically, organizations think of the customer only in terms of the person or organization that purchases the final product. LEAN manufacturing promotes the view that each succeeding process, workstation, or department is the customer. It is management's responsibility to ensure that all team members and all departments realize their dual role: they are both the customers of the previous operation and the suppliers to the next operation downstream.



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RESPECT FOR PEOPLE

People are the most valuable resource in any company. Without good people the business will not succeed. When people do not feel respected themselves, they tend to lose respect for the company.

This can become a major problem at any time but particularly when you are trying to implement LEAN. Most people want to perform well in their jobs. They want to feel like they have contributed to the company goals. A company that respects people will appreciate their workers' efforts and keep them in high regard. Some of the more basic ways a company can ensure that their people know they are respected include frequent communication, actively listening to their ideas, praising good performance, and providing help and support when necessary.

In a LEAN manufacturing environment:

- A flatter hierarchy than traditional organizations is embraced.
- Ordinary workers are given greater responsibility.
- Supply chain members work together in cross-functional teams.
- The goal regarding the workforce is NOT to reduce the number of people in an organization, but to use the people resources more wisely and more efficiently.

The role of workers, management, and suppliers in a LEAN manufacturing environment:

- **ROLE OF WORKERS:** Workers are given greater responsibility and their expanded duties include improving the production process, monitoring quality, and correcting quality problems. Workers often work in teams and form quality circles to facilitate these expanded responsibilities.
- **ROLE OF MANAGEMENT:** Management must create the cultural change needed for LEAN to succeed. They provide an atmosphere of cooperation, empower workers to take action based on their ideas, and develop incentive systems to encourage and reward lean behaviors.
- **ROLE OF SUPPLIERS:** A key element of LEAN is to build lean supply chain relationships with suppliers over the long term. Suppliers are expected to help improve process quality and share information. The goal is to have fewer but more strategic supply partners.

Continuous Improvement

The seventh element is continuous improvement.

In the context of LEAN manufacturing, continuous improvement is a method for identifying opportunities for streamlining work and reducing waste. Continuous improvement can be viewed as a formal practice or an informal set of guidelines. Continuous improvement helps to streamline workflows; and efficient workflows save time and money, allowing the company to reduce wasted time and effort.



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- The continuous improvement approach helps to reduce process, delivery, and quality problems such as machine breakdown problems, setup problems, and internal quality problems

INTRODUCTION TO SIX SIGMA

What Is Six Sigma?

Six Sigma is a quality management process that seeks to improve the quality of process outputs by identifying and removing the causes of defects (errors) and minimizing the variability in manufacturing and business processes. The goal of Six Sigma is to attain less than 3.4 defects per million opportunities (DPMO). Six Sigma is a structured and data-driven approach to drive a near-perfect quality goal (i.e., “Zero Defects”).



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Six Sigma History

- The modern-day concept of Six Sigma was originated by Motorola in 1980. Bill Smith, a Motorola engineer, is credited with coining the term “Six Sigma.”

- In the early to mid-1980s, Motorola developed the new standard, created the methodology, and copyrighted it as well.
 - Motorola has documented more than \$16 billion in savings as a result of Six Sigma.
- Thousands of companies around the world have adopted Six Sigma as a way of doing business. This is a direct result of many of America's leaders openly praising the benefits of Six Sigma (e.g., Jack Welch of General Electric Company). Six Sigma became famous when Welch made it central to his successful business strategy at General Electric in 1995.
 - GE reported \$200 million in savings in the first year of implementation (1996).

SIX SIGMA METHODOLOGY

There are three main foundational aspects of Six Sigma:

1. **QUALITY IS DEFINED BY THE CUSTOMER:** Customers expect performance, reliability, competitive prices, on-time delivery, good service, clear and correct transaction processing, and more. It is vital to provide what the customers need to achieve customer satisfaction.
2. **USE OF TECHNICAL TOOLS:** Six Sigma provides a statistical approach for solving any problem and thereby improves the quality level of the product as well as the company. All employees should be trained to use technical tools (e.g., statistical quality control and the seven tools of quality). Six Sigma is concerned with the permanent fix to quality problems and seeks to identify and correct the root cause of the problem.
3. **PEOPLE INVOLVEMENT:** Six Sigma follows a structured methodology, and has defined roles for the participants. A company must involve all its employees in the Six Sigma program, and provide opportunities and incentives for them to focus their talents and ability to satisfy customers. All employees are responsible to identify quality problems. It is important that all Six Sigma team members have a well-defined role with measurable objectives. Under Six Sigma, the members of an organization are assigned specific "roles" as follows:
 - Senior Leader: Defines the goals and objectives in the Six Sigma initiative.
 - Implementation Leader: Supervises the Six Sigma initiative.
 - Coach: Six Sigma expert or consultant who sets a schedule, defines result of a project, and who mediates conflict, or deals with resistance to the program.

- **Sponsor:** High-level individual within the company that acts as a problem solver for the Six Sigma initiative.
- **Team Leader:** Oversees the work of the Six Sigma team and acts as a liaison between the sponsor and the team members.
- **Team Member:** Executes specific Six Sigma assignments.
- **Process Owner:** Takes responsibility for a process after the Six Sigma team has completed its work.

Six Sigma has two key methodologies:

- **DMADV methodology:**

Define --> Measure --> Analyze --> Design --> Verify: a data-driven quality strategy for designing products and processes. This methodology is used when the company wants to create a new product design or process that is more predictable and defect free.

- **DMAIC methodology:**

Define --> Measure --> Analyze --> Improve --> Control: a data-driven quality strategy for improving processes. This methodology is used when the company wants to improve an existing business process. DMAIC is the most widely adopted and recognized Six Sigma methodology in use. It defines the steps a Six Sigma practitioner typically follows during a project.

This text will focus on the DMAIC methodology, which consists of the following five steps.

- **Define the problem:** The focus should be on the customers' expectation of the process.
- **Measure the problem and process:** Map out the current process. Determine the frequency of defects.
- **Analyze the data and the process:** Identify the root cause(s) of the problems and defects. Determine why, when, and where defects occur.



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- Improve the process: Find solutions to fix or reduce the root cause(s) of the problems, and prevent problems from occurring. Implement and verify the solution(s).
- Control and sustain the improvement solutions: This ensures that the process stays fixed. “Bake” the solutions into the process permanently.

SIX SIGMA TRAINING AND CERTIFICATION LEVELS

There are multiple Six Sigma certification levels based on training, knowledge, and experience. These people conduct Six Sigma projects and implement improvements.

- **YELLOW BELT**: Has a basic understanding of Six Sigma methodology and the tools in the DMAIC problem-solving process. A team member that reviews processes and process improvements in support of a Six Sigma process improvement project. A person who has passed the Green Belt certification exam but has not yet completed a Six Sigma project.
- **GREEN BELT**: A Six Sigma trained individual that can work as a team member on complex project and lead small, carefully defined Six Sigma projects. On complex Six Sigma projects, Green Belts work closely with the Black Belt team leader to assist with data collection and analysis, and to keep the team functioning through all phases of the project.
- **BROWN BELT**: A Six Sigma Green Belt who has passed the Black Belt certification examination but has not yet completed a second Six Sigma project.
- **BLACK BELT**: A full-time quality professional who has a thorough knowledge of Six Sigma philosophies and principles, and possesses technical and managerial process improvement/innovation skills. Leads the Six Sigma project team and problem-solving efforts. Identifies projects and selects project team members. Trains and coaches project teams. A Black Belt is typically mentored by a Master Black Belt.
- **MASTER BLACK BELT**: Is a career path. A Master Black Belt has successfully led 10 or more teams through complex Six Sigma projects. A proven change agent, leader, facilitator, and technical expert in Six Sigma. A seasoned individual with a proven mastery of process variability reduction, and waste reduction. Acts as an advisor to executives, and a coach and mentor on projects that are led by Black and Green belts. Functions as the keeper of the Six Sigma process, and can effectively provide Six Sigma training at all levels.

In addition, every project needs organizational support. Six Sigma champions and executives set the direction, ensure that projects succeed and add value, and that selected projects fit within the organizational plan.

TOTAL QUALITY MANAGEMENT

Total quality management (TQM) is a management philosophy based on the principle that every employee must be committed to maintaining high standards of work in every aspect of a company's operations, focused on meeting customer needs and organizational objectives. TQM is a combination of quality and management tools designed to increase business and reduce losses resulting from wasteful practices.

When implemented, Six Sigma is an integral part of TQM. Its key principles are as follows:

- Management Commitment
- Employee Empowerment
- Fact-Based Decision Making
- Continuous Improvement
- Customer Focus

There is no single academic formalization of total quality, but noted quality gurus W. Edwards Deming, Philip Crosby, Joseph Juran, and Kaoru Ishikawa, among others, contributed to the basic framework:

- This discipline and philosophy of management institutionalizes planned and continuous improvement.
- Quality is the outcome of all activities that take place within an organization.
- All functions and all employees must participate in the improvement process.
- Organizations need both quality systems and a quality culture.

QUALITY GURUS

Each of these quality gurus (i.e., experts) significantly contributed to our current understanding and practice of quality management today.



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- **W. Edwards Deming** is widely considered the father of TQM. He is the creator of the Plan-Do-Check-Act model. He stressed management's responsibility for quality, and he developed 14 points to guide companies in quality improvement. He has been credited with the quote, "In God we trust, all others bring data."

Deming's 14 points:

1. Create constancy of purpose to improve product and service
 2. Adopt the new philosophy
 3. Cease dependence on inspection to improve quality
 4. End the practice of awarding business on the basis of price
 5. Constantly improve the production and service system
 6. Institute training on the job
 7. Institute leadership
 8. Drive out fear
 9. Break down barriers between departments
 10. Eliminate slogans and exhortations
 11. Eliminate quotas
 12. Remove barriers to pride of workmanship
 13. Institute program of self-improvement
 14. Put everyone to work to accomplish the transformation
- **Philip Crosby** coined the phrase "quality is free" (which is also the title of his book) as defects are costly. He introduced the concepts of zero defects, and focus on prevention and not inspection. Philip Crosby demonstrated what a powerful tool the cost of quality could be to raise awareness of the importance of quality. He referred to the measure as the "price of nonconformance" and argued that organizations choose to pay for poor quality. He has been credited with the quote, "Quality is the result of a carefully constructed cultural environment. It has to be the fabric of the organization, not part of the fabric."

He introduced the four absolutes of quality:

1. The definition of quality is conformance to requirements.
 2. The system of quality is prevention.
 3. Performance standard is zero defects.
 4. The measure of quality is the price of nonconformance.
- **Joseph Juran** defined quality as "fitness for use." He developed the concept of the cost of quality. He has been credited with the quote, "Without a standard, there is no logical basis for making a decision or taking action." He was a proponent of concepts of quality planning, quality control, and quality improvement.

- **Quality Planning:** Identify internal/external customers and needs:
 - Develop products satisfying those needs.
 - Managers must set goals, priorities, and compare results.
- **Quality Control:** Determine what to control:
 - Establish standards of performance.
 - Measure performance, interpret the differences, and take action.
- **Quality Improvement:** Show the need for improvement:
 - Identify projects for improvement.
 - Implement remedies.
 - Provide control to maintain improvement.
- **Kaoru Ishikawa** developed one of the first tools in the quality management process, the cause-and-effect diagram, or the Ishikawa (fishbone) diagram. With this tool, the user can see all possible causes of a problem to help find the root cause. He emphasized use of all seven of the basic quality tools. He is also known as the father of quality circles and helped bring this concept into the mainstream. Further, Ishikawa was a proponent of continuous customer service, meaning that a customer should continue receiving service even after receiving the product.

VOICE OF THE CUSTOMER

Voice of the customer (VOC) is a term used in business to describe the in-depth process of capturing internal and external customers' stated and unstated expectations, preferences, likes, and dislikes. Total quality management is all about meeting or exceeding customer expectations, so capturing the VOC is essential for TQM to be successful.



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The VOC can be captured in a variety of ways: direct discussion or customer interviews, market surveys, focus groups, customer specifications, observation, warranty data, field reports, complaint logs, among others. The data are used to identify the quality attributes needed for a process or product.