Supply Chain Management: A Tool of Business Process Integration

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Abstract

Successful SCM requires a change from managing individual functions to integrating activities into key supply chain processes. In an example scenario, a purchasing department places orders as its requirements become known. The marketing department, responding to customer demand, communicates with several distributors and retailers as it attempts to determine ways to satisfy this demand. Information shared between supply chain partners can only be fully leveraged through process integration.

Supply chain business process integration involves collaborative work between buyers and suppliers, joint product development, common systems, and shared information. According to Lambert and Cooper, operating an integrated supply chain requires a continuous information flow. However, in many companies, management has concluded that optimizing product flows cannot be accomplished without implementing a process approach.

Keywords: *Worldwide logistics, Synchronizing Supply, Supply Chain Event Management, Enterprise Resource Planning,*

1. Introduction:

Supply chain management (SCM) is the management of the flow of goods. It includes the movement and storage of raw materials, work-in-process inventory, and finished goods from point of origin to point of consumption. Interconnected or interlinked networks, channels and node businesses are involved in the provision of products and services required by end customers in a supply chain. Supply chain management has been defined as the "design, planning, execution, control, and monitoring of supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand and measuring performance globally."

There are essentially three goals of SCM: to reduce inventory, to increase the speed of transactions with real-time data exchange, and to increase revenue by satisfying customer demands more efficiently.
In computing, SCM typically is used in reference to software applications that enable more efficient management of the supply chain.

SCM draws heavily from the areas of operations management, logistics, procurement, and information technology, and strives for an integrated approach.

2. Origin of the term and definitions

The term "supply chain management" entered the public domain when Keith Oliver, a consultant at Booz Allen Hamilton (now Booz & Company), used it in an interview for the Financial Times in 1982. The term was slow to take hold. It gained currency in the mid-1990s, when a flurry of articles and books came out on the subject. In the late 1990s it rose to prominence as a management buzzword, and operations managers began to use it in their titles with increasing regularity.

Figure(a): Application supply chain management

Commonly accepted definitions of supply chain management include:

- The management of upstream and downstream value-added flows of materials, final goods, and related information among suppliers, company, resellers, and final consumers

- The systematic, strategic coordination of traditional business functions and tactics across all business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term performance of the individual companies and the supply chain as a whole

- A customer-focused definition is given by Hines (2004:p76): "Supply chain strategies require a total systems view of the links in the chain that work together efficiently to create customer satisfaction at the end point of delivery to the consumer. As a consequence, costs must be lowered throughout the chain by driving out unnecessary expenses, movements, and handling. The main focus is turned to efficiency and added value, or the end-user's perception of value. Efficiency must be increased, and bottlenecks removed. The measurement of performance focuses on total system efficiency and the equitable monetary reward distribution to those within the supply chain. The supply chain system must be responsive to customer requirements."

- The integration of key business processes across the supply chain for the purpose of creating value for customers and stakeholders (Lambert, 2008)

- According to the Council of Supply Chain Management Professionals (CSCMP), supply chain management encompasses the planning and management of all activities involved in sourcing, procurement, conversion, and logistics management. It also includes coordination and collaboration with channel partners, which may be suppliers, intermediaries, third-party service providers, or customers. Supply chain management integrates supply and demand management within and across companies. More recently, the loosely coupled, self-organizing network of businesses that cooperate to provide product and service offerings has been called the *Extended Enterprise*.

Figure: (b) Area covered by supply chain management

A supply chain, as opposed to supply chain management, is a set of organizations directly linked by one or more upstream and downstream flows of products, services, finances, or information from a source to a customer. Supply chain management is the management of such a chain.

Supply chain management software includes tools or modules used to execute supply chain transactions, manage supplier relationships, and control associated business processes.

Supply chain event management (SCEM) considers all possible events and factors that can disrupt a supply chain. With SCEM, possible scenarios can be created and solutions devised.

In many cases the supply chain includes the collection of goods after consumer use for recycling. Including third-party logistics or other gathering agencies as part of the RM re-patriation process is a way of illustrating the new endgame strategy.

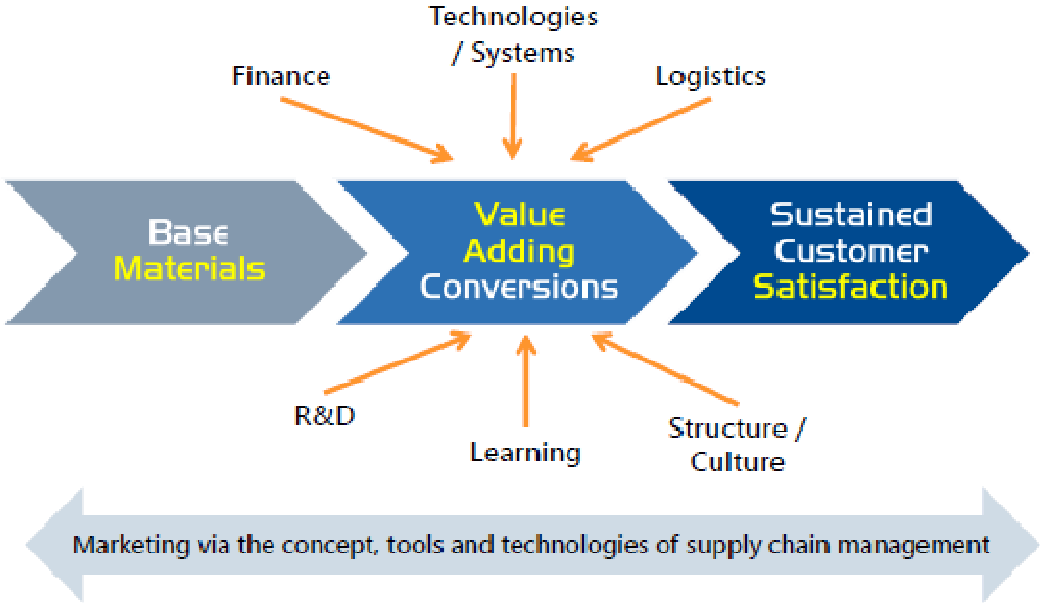


Figure: (c) Concept, tool, and technologies of Supply Chain Management

Information Builders' solutions are available in the market which provide organizations with real-time insight into their entire supply chain, so they can:

- Monitor the performance of vendors, distributors, logistics service providers, and other partners
- Improve inventory control for components and finished goods to support just-in-time and lean manufacturing strategies
- Perform sophisticated analysis to better forecast demand fluctuations and optimize resource allocation
- Track works in progress to uncover problems and optimize production and distribution efficiencies

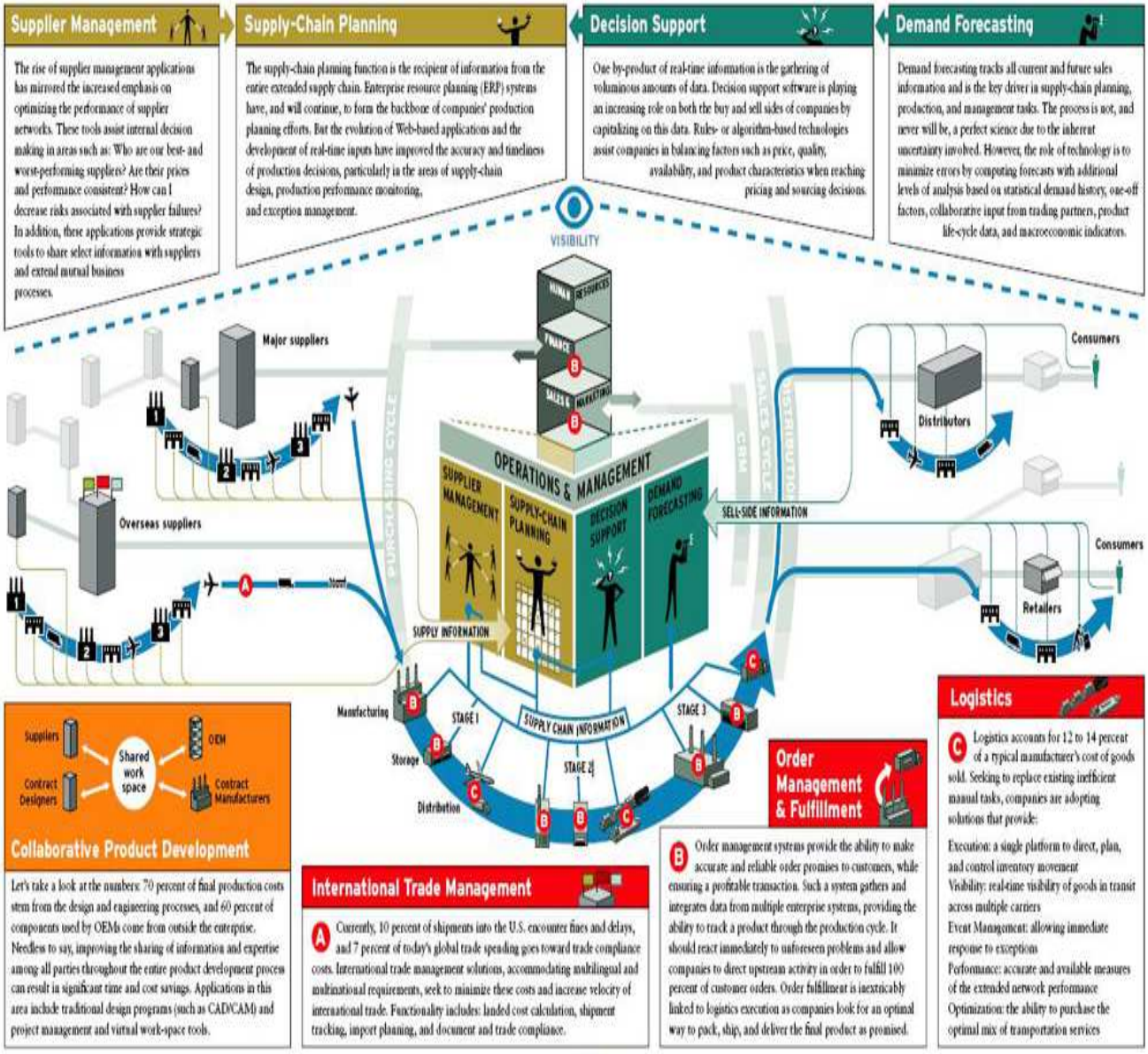


Figure (d): Supply Chain Information

- Manage overall supply-chain performance by assessing critical metrics such as on-time delivery, reductions in working capital, qualitative and quantitative ROI, and cost of goods produced and/or sold
- Automate order processing, production, fulfilment, and other critical processes
- Dynamically collaborate with third-party supply-chain partners through robust B2B integration

3. Problems addressed

Supply chain management addresses the following problems:

3.1.Distribution network configuration: the number, location, and network missions of suppliers, production facilities, distribution centers, warehouses, cross-docks, and customers.

3.2.Distribution strategy: questions of operating control (e.g., centralized, decentralized, or shared); delivery scheme (e.g., direct shipment, pool point shipping, cross docking, direct store delivery, or closed loop shipping); mode of transportation (e.g., motor carrier, including truckload, less than truckload (LTL), parcel, railroad, intermodal transport, including trailer on flatcar (TOFC) and container on flatcar (COFC), ocean freight, airfreight); replenishment strategy (e.g., pull, push, or hybrid); and transportation control (e.g., owner operated, private carrier, common carrier, contract carrier, or third-party logistics (3PL)).

3.3.Trade-offs in logistical activities: The above activities must be coordinated in order to achieve the lowest total logistics cost. Trade-offs may increase the total cost if only one of the activities is optimized. For example, full truckload (FTL) rates are more economical on a cost-per-pallet basis than are LTL shipments. If, however, a full truckload of a product is ordered to reduce transportation costs, there will be an increase in inventory holding costs, which may increase total logistics costs. The planning of logistical activities therefore takes a systems approach. These trade-offs are key to developing the most efficient and effective logistics and SCM strategy.

3.4. Information: The integration of processes through the supply chain in order to share valuable information, including demand signals, forecasts, inventory, transportation, and potential collaboration.

3.5. Inventory management: Management of the quantity and location of inventory, including raw materials, work in process (WIP), and finished goods.

3.6.Cash flow: Arranging the payment terms and methodologies for exchanging funds across entities within the supply chain.

Supply chain execution means managing and coordinating the movement of materials, information and funds across the supply chain. The flow is bi-directional. SCM applications provide real-time analytical systems that manage the flow of products and information throughout the supply chain network.

4. Functions

Supply chain management is a cross-functional approach that includes managing the movement of raw materials into an organization, certain aspects of the internal processing of materials into finished goods, and the movement of finished goods out of the organization and toward the end consumer. As organizations strive to focus on core competencies and becoming more flexible, they reduce their ownership of raw materials sources and distribution channels. These functions are increasingly being outsourced to other firms that can perform the activities better or more cost effectively. The effect is to increase the number of organizations involved in satisfying customer demand, while reducing managerial control of daily logistics operations. Less control and more supply chain partners led to the creation of the concept of supply chain management. The purpose of supply chain management is to improve trust and collaboration among supply chain partners, thus improving inventory visibility and the velocity of inventory movement.

5. Importance

Organizations increasingly find that they must rely on effective supply chains, or networks, to compete in the global market and networked economy. In Peter Drucker's (1998) new management paradigms, this concept of business relationships extends beyond traditional

enterprise boundaries and seeks to organize entire business processes throughout a value chain of multiple companies.

In recent decades, globalization, outsourcing, and information technology have enabled many organizations, such as Dell and Hewlett Packard, to successfully operate collaborative supply networks in which each specialized business partner focuses on only a few key strategic activities (Scott, 1993). This inter-organisational supply network can be acknowledged as a new form of organisation. However, with the complicated interactions among the players, the network structure fits neither "market" nor "hierarchy" categories (Powell, 1990). It is not clear what kind of performance impacts different supply network structures could have on firms, and little is known about the coordination conditions and trade-offs that may exist among the players. From a systems perspective, a complex network structure can be decomposed into individual component firms (Zhang and Dilts, 2004). Traditionally, companies in a supply network concentrate on the inputs and outputs of the processes, with little concern for the internal management working of other individual players. Therefore, the choice of an internal management control structure is known to impact local firm performance (Mintzberg, 1979).

Figure (e): Supply Chain Management Process

In the 21st century, changes in the business environment have contributed to the development of supply chain networks. First, as an outcome of globalization and the proliferation of multinational companies, joint ventures, strategic alliances, and business partnerships, significant success factors were identified, complementing the earlier "just-in-time", lean manufacturing, and agile manufacturing practices. Second, technological changes, particularly the dramatic fall in communication costs (a significant component of transaction costs), have led to changes in coordination among the members of the supply chain network (Coase, 1998).

Many researchers have recognized supply network structures as a new organisational form, using terms such as "Keiretsu", "Extended Enterprise", "Virtual Corporation", "Global Production Network", and "Next Generation Manufacturing System".[13] In general, such a structure can be defined as "a group of semi-independent organisations, each with their capabilities, which collaborate in ever-changing constellations to serve one or more markets in order to achieve some business goal specific to that collaboration" (Akkermans, 2001).

The security management system for supply chains is described in ISO/IEC 28000 and ISO/IEC 28001 and related standards published jointly by the ISO and the IEC. Supply Chain Management draws heavily from the areas of operations management, logistics, procurement, and information technology, and strives for an integrated approach.

6. Historical developments

Six major movements can be observed in the evolution of supply chain management studies: creation, integration, and globalization (Movahedi et al., 2009), specialization phases one and two, and SCM 2.0.

6.1. Creation era

The term "supply chain management" was first coined by Keith Oliver in 1982. However, the concept of a supply chain in management was of great importance long before, in the early 20th century, especially with the creation of the assembly line. The characteristics of this era of supply chain management include the need for large-scale changes, re-engineering, downsizing driven by cost reduction programs, and widespread attention to Japanese management practices.

6.2. Integration era

This era of supply chain management studies was highlighted with the development of electronic data interchange (EDI) systems in the 1960s, and developed through the 1990s by the introduction of enterprise resource planning (ERP) systems. This era has continued to develop into the 21st century with the expansion of Internet-based collaborative systems. This era of supply chain evolution is characterized by both increasing value added and cost reductions through integration.

A supply chain can be classified as a stage 1, 2 or 3 network. In a stage 1–type supply chain, systems such as production, storage, distribution, and material control are not linked and are independent of each other. In a stage 2 supply chain, these are integrated under one plan and is ERP enabled. A stage 3 supply chain is one that achieves vertical integration with upstream suppliers and downstream customers. An example of this kind of supply chain is Tesco.

6.3. Globalization era

The third movement of supply chain management development, the globalization era, can be characterized by the attention given to global systems of supplier relationships and the expansion of supply chains over national boundaries and into other continents. Although the use of global sources in organizations' supply chains can be traced back several decades (e.g., in the oil industry), it was not until the late 1980s that a considerable number of organizations started to integrate global sources into their core business. This era is characterized by the globalization of supply chain management in organizations with the goal of increasing their competitive advantage, adding value, and reducing costs through global sourcing.

6.4. Specialization era (phase I): outsourced manufacturing and distribution

In the 1990s, companies began to focus on "core competencies" and specialization. They abandoned vertical integration, sold off non-core operations, and outsourced those functions to other companies. This changed management requirements, by extending the supply chain beyond the company walls and distributing management across specialized supply chain partnerships.

This transition also refocused the fundamental perspectives of each organization. Original equipment manufacturers (OEMs) became brand owners that required visibility deep into their supply base. They had to control the entire supply chain from above, instead of from within. Contract manufacturers had to manage bills of material with different part-numbering schemes

from multiple OEMs and support customer requests for work-in-process visibility and vendor-managed inventory (VMI).

The specialization model creates manufacturing and distribution networks composed of several individual supply chains specific to producers, suppliers, and customers that work together to design, manufacture, distribute, market, sell, and service a product. This set of partners may change according to a given market, region, or channel, resulting in a proliferation of trading partner environments, each with its own unique characteristics and demands.

6.5. Specialization era (phase II): supply chain management as a service

Specialization within the supply chain began in the 1980s with the inception of transportation brokerages, warehouse management, and non-asset-based carriers, and has matured beyond transportation and logistics into aspects of supply planning, collaboration, execution, and performance management.

Market forces sometimes demand rapid changes from suppliers, logistics providers, locations, or customers in their role as components of supply chain networks. This variability has significant effects on supply chain infrastructure, from the foundation layers of establishing and managing electronic communication between trading partners, to more complex requirements such as the configuration of processes and work flows that are essential to the management of the network itself.

Supply chain specialization enables companies to improve their overall competencies in the same way that outsourced manufacturing and distribution has done; it allows them to focus on their core competencies and assemble networks of specific, best-in-class partners to contribute to the overall value chain itself, thereby increasing overall performance and efficiency. The ability to quickly obtain and deploy this domain-specific supply chain expertise without developing and maintaining an entirely unique and complex competency in house is a leading reason why supply chain specialization is gaining popularity.

Outsourced technology hosting for supply chain solutions debuted in the late 1990s and has taken root primarily in transportation and collaboration categories. This has progressed from the application service provider (ASP) model from roughly 1998 through 2003, to the on-demand model from approximately 2003 through 2006, to the software as a service (SaaS) model currently in focus today.

6.6.Supply chain management 2.0 (SCM 2.0)

Building on globalization and specialization, the term "SCM 2.0" has been coined to describe both changes within supply chains themselves as well as the evolution of processes, methods, and tools to manage them in this new "era". The growing popularity of collaborative platforms is highlighted by the rise of Trade Card's supply chain collaboration platform, which connects multiple buyers and suppliers with financial institutions, enabling them to conduct automated supply-chain finance transactions.

Web 2.0 is a trend in the use of the World Wide Web that is meant to increase creativity, information sharing, and collaboration among users. At its core, the common attribute of Web 2.0 is to help navigate the vast information available on the Web in order to find what is being bought. It is the notion of a usable pathway. SCM 2.0 replicates this notion in supply chain operations. It is the pathway to SCM results, a combination of processes, methodologies, tools, and delivery options to guide companies to their results quickly as the complexity and speed of

the supply chain increase due to global competition; rapid price fluctuations; surging oil prices; short product life cycles; expanded specialization; near-, far-, and off-shoring; and talent scarcity.

SCM 2.0 leverages solutions designed to rapidly deliver results with the agility to quickly manage future change for continuous flexibility, value, and success. This is delivered through competency networks composed of best-of-breed supply chain expertise to understand which elements, both operationally and organizationally, deliver results, as well as through intimate understanding of how to manage these elements to achieve the desired results. The solutions are delivered in a variety of options, such as no-touch via business process outsourcing, mid-touch via managed services and software as a service (SaaS), or high-touch in the traditional software deployment model.

7. Business process integration

Successful SCM requires a change from managing individual functions to integrating activities into key supply chain processes. In an example scenario, a purchasing department places orders as its requirements become known. The marketing department, responding to customer demand, communicates with several distributors and retailers as it attempts to determine ways to satisfy this demand. Information shared between supply chain partners can only be fully leveraged through process integration.

Supply chain business process integration involves collaborative work between buyers and suppliers, joint product development, common systems, and shared information. According to Lambert and Cooper, operating an integrated supply chain requires a continuous information flow. However, in many companies, management has concluded that optimizing product flows cannot be accomplished without implementing a process approach.

The key supply chain processes stated by Lambert are:

- Customer relationship management
- Customer service management
- Demand management style
- Order fulfilment
- Manufacturing flow management
- Supplier relationship management
- Product development and commercialization
- Returns management

Much has been written about demand management. Best-in-class companies have similar characteristics, which include the following:

- Internal and external collaboration
- Initiatives to reduce lead time
- Tighter feedback from customer and market demand
- Customer-level forecasting

One could suggest **other critical supply business processes** that combine these processes stated by Lambert, such as:

a. Customer service management
b. Procurement

c. Product development and commercialization
d. Manufacturing flow management/support
e. Physical distribution
f. Outsourcing/partnerships
g. Performance measurement
h. Warehousing management

a) Customer service management process

Customer relationship management concerns the relationship between an organization and its customers. Customer service is the source of customer information. It also provides the customer with real-time information on scheduling and product availability through interfaces with the company's production and distribution operations. Successful organizations use the following steps to build customer relationships:

- determine mutually satisfying goals for organization and customers
- establish and maintain customer rapport
- induce positive feelings in the organization and the customers

b) Procurement process

Strategic plans are drawn up with suppliers to support the manufacturing flow management process and the development of new products. In firms whose operations extend globally, sourcing may be managed on a global basis. The desired outcome is a relationship where both parties benefit and a reduction in the time required for the product's design and development. The purchasing function may also develop rapid communication systems, such as electronic data interchange (EDI) and Internet linkage, to convey possible requirements more rapidly. Activities related to obtaining products and materials from outside suppliers involve resource planning, supply sourcing, negotiation, order placement, inbound transportation, storage, handling, and quality assurance, many of which include the responsibility to coordinate with suppliers on matters of scheduling, supply continuity, hedging, and research into new sources or programs.

c) Product development and commercialization

Here, customers and suppliers must be integrated into the product development process in order to reduce the time to market. As product life cycles shorten, the appropriate products must be developed and successfully launched with ever-shorter time schedules in order for firms to remain competitive. According to Lambert and Cooper (2000), managers of the product development and commercialization process must:

1. coordinate with customer relationship management to identify customer-articulated needs;
2. select materials and suppliers in conjunction with procurement; and
3. develop production technology in manufacturing flow to manufacture and integrate into the best supply chain flow for the given combination of product and markets.

d) Manufacturing flow management process

The manufacturing process produces and supplies products to the distribution channels based on past forecasts. Manufacturing processes must be flexible in order to respond to market changes and must accommodate mass customization. Orders are processes operating on a just-in-time (JIT) basis in minimum lot sizes. Changes in the manufacturing flow process lead to shorter cycle times, meaning improved responsiveness and efficiency in meeting customer demand. This

process manages activities related to planning, scheduling, and supporting manufacturing operations, such as work-in-process storage, handling, transportation, and time phasing of components, inventory at manufacturing sites, and maximum flexibility in the coordination of geographical and final assemblies postponement of physical distribution operations.

e) Physical distribution

This concerns the movement of a finished product or service to customers. In physical distribution, the customer is the final destination of a marketing channel, and the availability of the product or service is a vital part of each channel participant's marketing effort. It is also through the physical distribution process that the time and space of customer service become an integral part of marketing. Thus it links a marketing channel with its customers (i.e., it links manufacturers, wholesalers, and retailers).

f) Outsourcing/partnerships

This includes not just the outsourcing of the procurement of materials and components, but also the outsourcing of services that traditionally have been provided in house. The logic of this trend is that the company will increasingly focus on those activities in the value chain in which it has a distinctive advantage and outsource everything else. This movement has been particularly evident in logistics, where the provision of transport, warehousing, and inventory control is increasingly subcontracted to specialists or logistics partners. Also, managing and controlling this network of partners and suppliers requires a blend of central and local involvement: strategic decisions are taken centrally, while the monitoring and control of supplier performance and day-to-day liaison with logistics partners are best managed locally.

g) Performance measurement

Experts found a strong relationship from the largest arcs of supplier and customer integration to market share and profitability. Taking advantage of supplier capabilities and emphasizing a long-term supply chain perspective in customer relationships can both be correlated with a firm's performance. As logistics competency becomes a critical factor in creating and maintaining competitive advantage, measuring logistics performance becomes increasingly important, because the difference between profitable and unprofitable operations becomes narrower. A.T. Kearney Consultants (1985) noted that firms engaging in comprehensive performance measurement realized improvements in overall productivity. According to experts, internal measures are generally collected and analyzed by the firm, including cost, customer service, productivity, asset measurement, and quality. External performance is measured through customer perception measures and "best practice" benchmarking.

h) Warehousing management

To reduce a company's cost and expenses, warehousing management is carrying the valuable role against operations. In the case of perfect storage and office with all convenient facilities in company level, reducing manpower cost, dispatching authority with on time delivery, loading & unloading facilities with proper area, area for service station, stock management system etc.

8. Theories

Currently there's a gap in the literature on supply chain management studies present: there is no theoretical support for explaining the existence or the boundaries of supply chain management. A few authors, such as Halldorsson et al. (2003), Ketchen and Hult (2006), and Lavassani et al.

(2009), have tried to provide theoretical foundations for different areas related to supply chain by employing organizational theories. These theories include:

- Resource-based view (RBV)
- Transaction cost analysis (TCA)
- Knowledge-based view (KBV)
- Strategic choice theory (SCT)
- Agency theory (AT)
- Channel coordination
- Institutional theory (InT)
- Systems theory (ST)
- Network perspective (NP)
- Materials logistics management (MLM)
- Just-in-time (JIT)
- Material requirements planning (MRP)
- Theory of constraints (TOC)
- Total quality management (TQM)
- Agile manufacturing
- Time-based competition (TBC)
- Quick response manufacturing (QRM)
- Customer relationship management (CRM)
- Requirements chain management (RCM)
- Available-to-promise (ATP)

However, the unit of analysis of most of these theories is not the supply chain but rather another system, such as the firm or the supplier-buyer relationship. Among the few exceptions is therelational view, which outlines a theory for considering dyads and networks of firms as a key unit of analysis for explaining superior individual firm performance (Dyer and Singh, 1998).

9. Supply chain centroids

In the study of supply chain management, the concept of centroids has become an important economic consideration. A centroid is a location that has a high proportion of a country's population and a high proportion of its manufacturing, generally within 500 mi (805 km). In the US, two major supply chain centroids have been defined, one near Dayton, Ohio, and a second near Riverside, California.

The centroid near Dayton is particularly important because it is closest to the population center of the US and Canada. Dayton is within 500 miles of 60% of the US population and manufacturing capacity, as well as 60% of Canada's population.The region includes the interchange between I-70 and I-75, one of the busiest in the nation, with 154,000 vehicles passing through per day, 30–35% of which are trucks hauling goods. In addition, the I-75 corridor is home to the busiest north-south rail route east of the Mississippi River.

10. Tax efficient supply chain management

Tax efficient supply chain management is a business model that considers the effect of tax in the design and implementation of supply chain management. As the consequence of globalization, cross-national businesses pay different tax rates in different countries. Due to these differences, they may legally optimize their supply chain and increase profits based on tax efficiency.

11. Sustainability and social responsibility in supply chains

Supply chain sustainability is a business issue affecting an organization's supply chain or logistics network, and is frequently quantified by comparison with SECH ratings, which uses a triple bottom line incorporating economic, social, and environmental aspects. SECH ratings are defined as social, ethical, cultural, and health' footprints. Consumers have become more aware of the environmental impact of their purchases and companies' SECH ratings and, along with non-governmental organizations (NGOs), are setting the agenda for transitions to organically grown foods,anti-sweatshop labor codes, and locally produced goods that support independent and small businesses. Because supply chains may account for over 75% of a company's carbon footprint, many organizations are exploring ways to reduce this and thus improve their SECH rating.

For example, in July 2009, Wal-Mart announced its intentions to create a global sustainability index that would rate products according to the environmental and social impacts of their manufacturing and distribution. The index is intended to create environmental accountability in Wal-Mart's supply chain and to provide motivation and infrastructure for other retail companies to do the same.

More recently, the US Dodd–Frank Wall Street Reform and Consumer Protection Act, signed into law by President Obama in July 2010, contained a supply chain sustainability provision in the form of the Conflict Minerals law. This law requires SEC-regulated companies to conduct third party audits of their supply chains in order to determine whether any tin, tantalum, tungsten, or gold (together referred to as *conflict minerals*) is mined or sourced from the Democratic Republic of the Congo, and create a report (available to the general public and SEC) detailing the due diligence efforts taken and the results of the audit. The chain of suppliers and vendors to these reporting companies will be expected to provide appropriate supporting information.

Incidents like the 2013 Savar building collapse with more than 1,100 victims have led to widespread discussions about corporate social responsibility across global supply chains. Wieland and Handfield (2013) suggest that companies need to audit products and suppliers and that supplier auditing needs to go beyond direct relationships with first-tier suppliers. They also demonstrate that visibility needs to be improved if supply cannot be directly controlled and that smart and electronic technologies play a key role to improve visibility. Finally, they highlight that collaboration with local partners, across the industry and with universities is crucial to successfully managing social responsibility in supply chains.

12. Components

12.1.Management components

SCM components are the third element of the four-square circulation framework. The level of integration and management of a business process link is a function of the number and level of components added to the link (Ellram and Cooper, 1990; Houlihan, 1985). Consequently, adding more management components or increasing the level of each component can increase the level of integration of the business process link.

Literature on business process re-engineering buyer-supplier relationships,[and SCM[24] suggests various possible components that should receive managerial attention when managing supply relationships. Lambert and Cooper (2000) identified the following components:

- Planning and control
- Work structure

- Organization structure
- Product flow facility structure
- Information flow facility structure
- Management methods
- Power and leadership structure
- Risk and reward structure
- Culture and attitude

However, a more careful examination of the existing literature leads to a more comprehensive understanding of what should be the key critical supply chain components, or "branches" of the previously identified supply chain business processes—that is, what kind of relationship the components may have that are related to suppliers and customers. Bowersox and Closs (1996) state that the emphasis on cooperation represents the synergism leading to the highest level of joint achievement. A primary-level channel participant is a business that is willing to participate in responsibility for inventory ownership or assume other financial risks, thus including primary level components (Bowersox and Closs, 1996). A secondary-level participant (specialized) is a business that participates in channel relationships by performing essential services for primary participants, including secondary level components, which support primary participants. Third-level channel participants and components that support primary-level channel participants and are the fundamental branches of secondary-level components may also be included.

Consequently, Lambert and Cooper's framework of supply chain components does not lead to any conclusion about what are the primary- or secondary-level (specialized) supply chain components (see Bowersox and Closs, 1996, p. 93) —that is, which supply chain components should be viewed as primary or secondary, how these components should be structured in order to achieve a more comprehensive supply chain structure, and how to examine the supply chain as an integrative one.

12.2.Reverse supply chain

Reverse logistics is the process of managing the return of goods. It is also referred to as "aftermarket customer services". Any time money is taken from a company's warranty reserve or service logistics budget, one can speak of a reverse logistics operation.

13. Systems and value

Supply chain systems configure value for those that organize the networks. Value is the additional revenue over and above the costs of building the network. Co-creating value and sharing the benefits appropriately to encourage effective participation is a key challenge for any supply system. Tony Hines defines value as follows: "Ultimately it is the customer who pays the price for service delivered that confirms value and not the producer who simply adds cost until that point".

14. Global applications

Global supply chains pose challenges regarding both quantity and value. Supply and value chain trends include:

- Globalization
- Increased cross-border sourcing
- Collaboration for parts of value chain with low-cost providers
- Shared service centers for logistical and administrative functions

- Increasingly global operations, which require increasingly global coordination and planning to achieve global optimums
- Complex problems involve also midsized companies to an increasing degree

These trends have many benefits for manufacturers because they make possible larger lot sizes, lower taxes, and better environments (e.g., culture, infrastructure, special tax zones, or sophisticated OEM) for their products. There are many additional challenges when the scope of supply chains is global. This is because with a supply chain of a larger scope, the lead time is much longer, and because there are more issues involved, such as multiple currencies, policies, and laws. The consequent problems include different currencies and valuations in different countries, different tax laws, different trading protocols, and lack of transparency of cost and profit.

15. Certification

There are several certification programs for SCM staff development, including the Association for Operations Management (APICS), the International Supply Chain Education Alliance (ISCEA), and the Institute of Supply Chain Management (IOSCM). The APICS certification is called the Certified Supply Chain Professional (CSCP); the ISCEA certification is called the Certified Supply Chain Manager (CSCM). Additionally, the Institute for Supply Management is developing a certification called the Certified Professional in Supply Management (CPSM), focused on procurement and sourcing, also called supply management. The Purchasing Management Association of Canada is the main Canadian certifying body; its designations have global recipricocity. The main designation is the Supply Chain Management Professional (SCMP), with several others progressing toward it.

16. Supply chain performance from a cost and service perspective

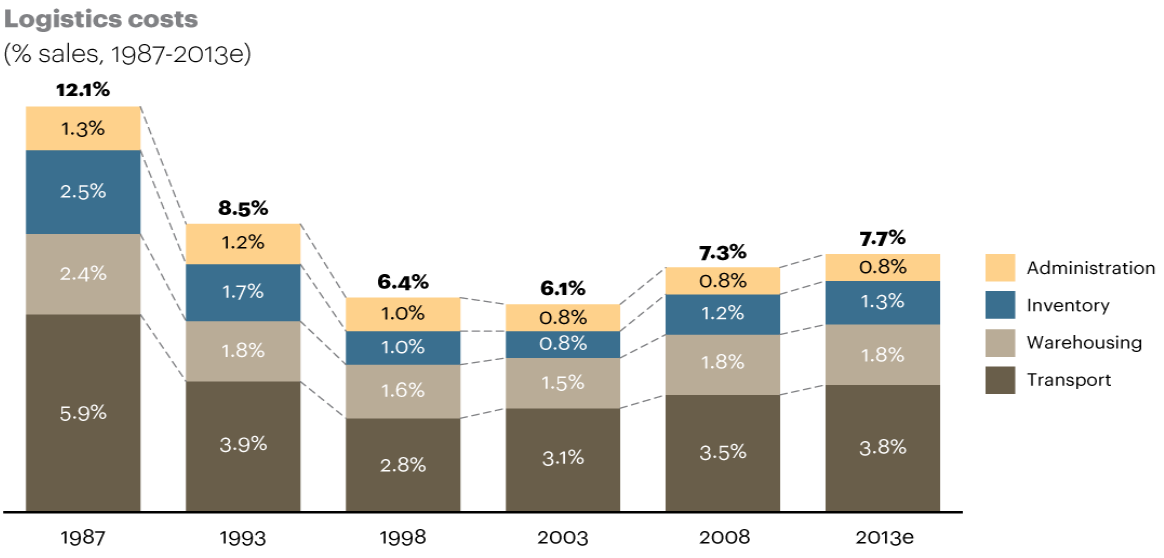
Not so long ago, the life of a supply chain executive seemed easy: The main objectives were to be cost effective and provide high-quality service. The tools and concepts to support these goals were relatively uncomplicated—from just-in-time delivery and vendor-managed inventory to collaborative planning, forecasting, and replenishment. Back then, supply chain performance was continually improving, with most performance indicators registering satisfactory or better levels of cost, service, and inventory.

Then all sorts of innovative technologies, ideas, and concepts were introduced to help improve performance. Companies centralized their supply chain organizations, brought in expensive enterprise resource planning (ERP) software, and outsourced manufacturing and distribution to bigger and more capable third parties. Yet despite these and other measures, supply chain performance from a cost and service perspective declined, stalled, or saw minimal improvements (see figure 1).

Suggestions on how to improve supply chain performance abound in industry magazines and journals, with most proposing solutions such as becoming more customer-centric, responsive, and agile. Nice words, but few people seem to know exactly what they mean or how to turn them into actions. Even as supply chain processes changed, the world around us changed even more rapidly.

Figure 1

Supply chain performance has stalled over the past 20 years



Source: A.T. Kearney analysis

Today, CEOs and supply chain executives continue to ask important questions:

- How do we control mounting complexity?
- How can we balance size and efficiency with flexibility and responsiveness?
- Is it possible to plan for demand volatility?
- Which of the many companies in our supply chains should be our closest and most trusted partners?

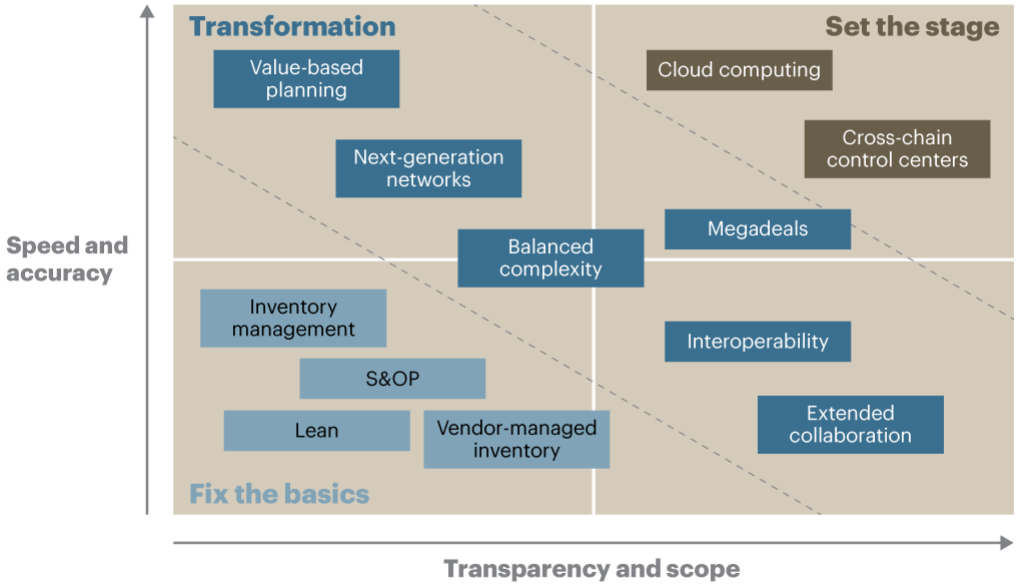
Answering these questions requires taking a closer look at the pressures on today's supply chains, the different improvement measures available, and the reasons why companies often fail to take the appropriate measures.

17. Responding to Supply Chain Pressures

The world is changing. Ongoing consolidation has made competition and customers bigger and more powerful, emerging countries have developed into attractive growth areas, technology has turned ordinary customers into informed and cost-conscious consumers, and scarce commodities and natural resources are not only driving prices up but also raising environmental concerns. Add to these the cadre of new channels, new products and services, shorter product life cycles, and time-to-market, and pretty soon the impact on companies and industries worldwide becomes significant. Almost all sectors are more volatile and complex, and their supply chains have to change accordingly.

Figure 2

Three strategies for responding to industry volatility and complexity



Note: S&OP is sales and operations planning.
Source: A.T. Kearney analysis

An appropriate response to these trends usually means taking actions at three levels: fix the basics, transform the supply chain, and set the stage (see figure 2).

17.1.Fixing the basics is for those who prefer continual improvements—making incremental changes and building capabilities at a relatively measured pace. Typical initiatives focus on areas such as inventory management, lean manufacturing, and sales and operations planning. Depending on the circumstances, the cost savings are generally in the range of 5 to 10 percent.

17.2.Transforming the supply chain becomes necessary when market volatility and complexity begin playing havoc with business plans and market position. Here, next-generation tools often come into play, focused on segmentation and network optimization, complexity management, and collaboration among suppliers and customers. Improvements in these areas often lead to transformative change that goes deep into the corporate makeup and include developing forward-thinking strategies, designing new organization and governance structures, and pushing for cultural change. The benefits are usually worth the additional effort, as transformations can result in anywhere from a 10 to 25 percent improvement to either the top line or bottom line, or both.

17.3.Setting the stage is for industry frontrunners. These players are driven either by the intrinsic volatility and complexity of a sector (fashion, for example) or by their own cultures, ambitions, or aspirations (Google). Frontrunners are all about preparing for the future—maintaining a strong vision and strategic mindset, developing deep organizational capabilities, and understanding the risks and rewards associated with new techniques, processes, or structures. Some frontrunners work within the current market structure, while others attempt to reshape the market structure to their advantage. Our recent article, Playing on the New Strategy Chessboard, explains this latter point in more detail.

Companies are generally most comfortable with a fix-the-basics approach to supply chain performance. But as volatility and complexity increase, so will the need to move beyond the basics.

17.4.Trouble in Transformation

Executives know they need to improve their supply chain performance and that simply cutting costs and improving service is no longer a viable option. Yet those who move beyond the basics to take the larger leap of seeking transformative change often fall short. There are several reasons why:

17.5.After picking the low-hanging fruit, what's next? Say you are the CEO of a company that is no longer growing, or at least growth has slowed significantly, commodity prices are rising, and your customers are laying low. What do you do? Cut costs, and get lean. It is hard to find a company that hasn't applied S&OP, strategic sourcing, inventory management, lean principles, and Six Sigma programs, or rolled out improvement initiatives in manufacturing and logistics. The trouble is these only address the low-hanging fruit. Next steps and new opportunities are neither identified nor pursued.

17.6.Benchmarking is analogous to goal setting. It is fine to benchmark your supply chain setup and performance against peers, but it is not fine to consider this the end game when ambitious goals are needed. Performing slightly better than peers may look good on paper, but it doesn't address the real issues or provide the right solutions—especially when everyone in the market is registering roughly the same performance levels.

17.7.Trouble getting past unfulfilled promises. Anyone with a supply chain is likely heavily invested in ERP systems, long hailed as the panacea for most supply chain issues. But the promised harmonized processes, robust data, and end-to-end transparency never materialized. It becomes difficult first to admit that such a huge investment has fallen short and then to work up the energy (and appetite) to pursue the next big breakthrough.

17.8.Measuring beyond cost and service. Finally, transformative change requires measuring value. Companies know how to measure cost, service, and perhaps working capital but have not found a way to truly measure aspects of differentiation and competitive advantage derived from supply chains. Supply chain value must be measured and linked to the overall business strategy.

For every supply chain that fails to reach its full potential, others succeed. What do those with winning supply chains know that the others do not? Winning supply chains integrate today's supply chain capabilities with tomorrow's goals.

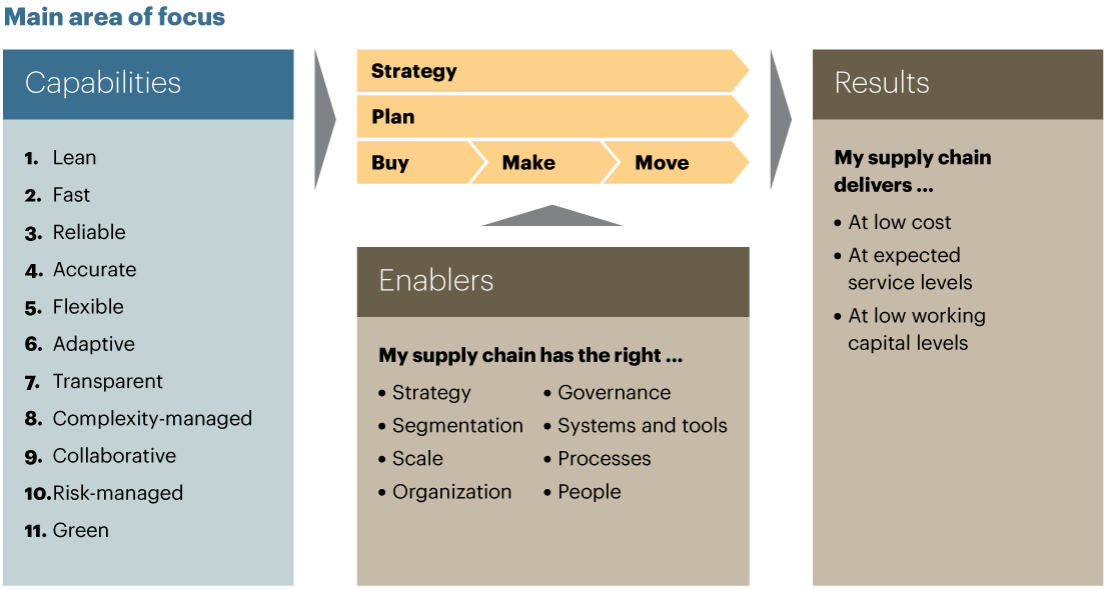
18. Setting the Stage

Supply chain objectives must be closely aligned to overall business objectives, especially if the goal is to gain competitive advantage. At this level, it is important that your supply chain capabilities can carry you into the future.

An Assessment of Excellence in Supply Chains (AESC) analysis is designed for this purpose. Instead of benchmarking cost, service, and working capital performance or looking at the classic building blocks of processes, systems, and organizational structure, an AESC analysis focuses on supply chain capabilities. It identifies 11 fundamental supply chain capabilities and provides a framework for assessing the strategic importance and the stage of excellence of the individual capabilities (see figure 3). The analysis points to the key capabilities that must be explicitly defined and actively managed. In addition, it provides a "language" to communicate the business value of the supply chain beyond cost and service and helps to identify supply chain priorities in light of future goals.

Figure 3

Top supply chains are designed around capabilities, not historic results

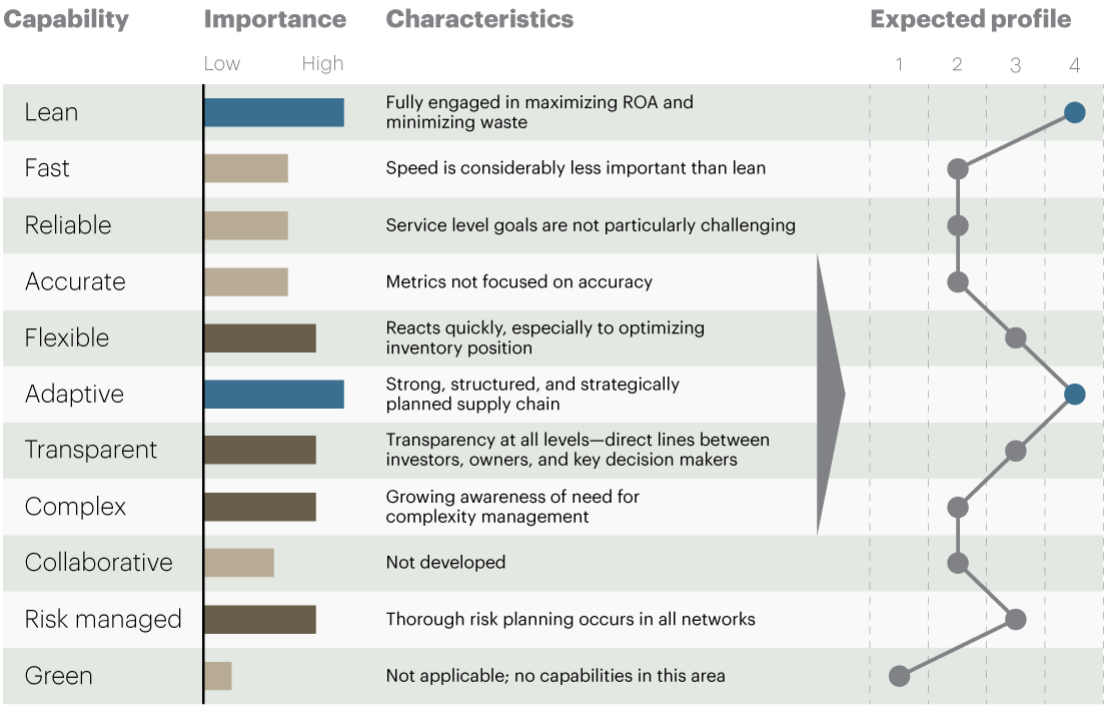


Source: A.T. Kearney analysis

Figure 4 illustrates a typical output of our AESC analysis, in this case a consumer packaged goods company. The company's strongest performance is in its lean capabilities and in the ability to adapt to changing market conditions. The company is less effective in the areas of speed, reliability, accuracy, complexity, and collaboration and has ignored suggestions for building a green supply chain.

Figure 4

Analysis of a slow-moving consumer packaged goods company — Client example



Note: ROA is return on assets.
Source: A.T. Kearney analysis

19. Immediate Impact, Growing Advantage

Once you are looking beyond cost and service and including "new" capabilities among your strategic targets, the result is increased and growing competitive advantage. Consider the following case examples from our client work:

19.1.Green

A leading Brazilian cosmetics company took its environmental and social responsibilities so seriously that company executives included these as criteria in supplier selection, incorporating them into their financial metric system and supplier selection process. We helped the company implement a "triple bottom line" framework in which economic criteria (costs and flexibility, for example) are considered along with environmental effects (water usage, carbon footprint, waste) and social impact (percent of disabled employees). The new framework resulted in selecting numerous new suppliers and excluding the larger incumbent suppliers. The result: a 17 percent economic benefit, a 2 percent environmental benefit, and a 9 percent social impact. And the company's supplier base has become proactively green.

19.2.Collaboration

When two large companies—a food manufacturer and a retailer—decided to build a more collaborative supply chain, their primary goal was to work together to create lasting value. They wanted to go beyond talking about collaboration to become truly collaborative, exploiting each other's capabilities to differentiate their products and increase value for the consumer. Collaboration would take place in all functions, from buying, manufacturing, and logistics to finance, promotions, and the store shelf. They challenged each other with a few simple questions: How would we behave if we were on the precipice of a merger? How closely would we work?

What information would we share? What goals would we meet? The results of their true collaboration: 40 percent-plus profit improvement that has proven sustainable over time.

19.3.Complexity

Achieving the right level of complexity requires going beyond simply "cutting the tail" to asking the right questions: How does reducing packaging types affect our sourcing and manufacturing costs? What is the impact of excluding a customer? To this end, we introduced a state-of-the-art multi-cube, an end-to-end decision support system that links revenues to costs throughout the value chain using a smart combination of database information. When deployed with linear programming, it can calculate the impact of any complexity scenario. Results range from 2 to 6 percent increased earnings.

19.4.Transparency

In volatile industries where demand is high, upstream manufacturing capacity is scarce, and production cycles are long, the importance of supply chain visibility to forecast future demand cannot be overstated. Technology is helping to obtain this much-needed view. For example, a leading glass bottle manufacturer sets up its production planning processes based on the forecasts of its key customers. Information is delivered directly to the production line and to raw material suppliers. Its supply chain is considered one of the most flexible and reliable in the industry.

19.5.Speed

Supply chains designed around speed are commonly found in fast-paced industries like fashion where the ability to respond quickly to new trends can make or break a business. We have helped several companies find creative and cost-effective ways to organize supply flow. For example, a fashion retailer is now able to source the same item from different regions, with different costs and different supply lead times. Part of its forecasted volume is ordered from low-cost countries, such as Madagascar, and the remainder from Morocco, Turkey, or even Portugal. With "smart orders," the retailer orders different sized bundles of the same items, sometimes even at the store level. Products are cross-docked immediately after arriving at the ports of entry.

20. Conclusion

Supply chains have changed dramatically in a matter of a few years. They have gone from uncomplicated to complex, and the tools to improve their performance have changed almost as radically. Yet the returns on supply chain performance have rarely lived up to the promise. That's because supply chains continue to be measured by costs and services rather than by the capabilities that lead to success. By aligning supply chain objectives with overall business objectives, companies not only improve performance and competitive advantage, but also have a supply chain that can carry them into the future. Winning supply chains integrate today's supply chain capabilities with tomorrow's goals.

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