

## 1.0 INTRODUCTION

The concepts of supply chain management (SCM) are not totally new to the body of management literature; credible research studies and articles on the topic can be found that are over 25 years old. However, during the past 5 to 10 years, the focus on SCM as a competitive weapon has increased due to the significant effects that supply chain activities have on all elements of a company's or organization's financial performance, including operating costs, revenue growth, and asset management. This recognition has given rise to an abundance of recent research on SCM practices flowing from business schools, industry consortia, SCM software providers, and consultancies. In fact, the volume of literature and case study data on the various aspects of supply chain management practices has become so large that it is becoming difficult to track. This publication is intended to provide a strategic overview of the current state of supply chain management, along with explanations of the major operational elements of supply chain practice. Key topics in supply chain management are discussed, and descriptions are provided as to how supply chain operations integrate with each other and with other operational areas of the business. For example, one of the key issues, which continues to be explored and developed, is how SCM integrates with other operational performance initiatives, such as lean manufacturing, total quality management, and new product development.

### 1.1 Supply Chain Management

So, what exactly is supply chain management? The following definition offered by Massachusetts Institute of Technology (MIT) researchers is useful:

"...a process-oriented, integrated approach to procuring, producing, and delivering end-products and services to customers. It includes sub-suppliers, suppliers, internal operations, trade customers, retail customers, and end-users. It covers the management of materials, information, and funds flows."<sup>1</sup>

The key words here are *integrated* and *customer* – any meaningful approach to SCM must begin with the customer's requirements and must include analysis and planning for all activities that touch the product or add value by the time it is delivered to the end-user. This means that true supply chain management and optimization must transcend the individual factory or operation and involve all of the participants in the chain. This concept is commonly called the total value chain or the "extended enterprise".

Supply chain management, then, involves the effective planning and execution of activities and processes across the entire value chain. This requires new levels of involvement by materials suppliers, service providers (e.g., freight/transportation services), and even distribution customers and resellers, in order to be successful. The opportunities for competitive advantage are significant. A current industry/academic consortium doing research on SCM best practices, the

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<sup>1</sup> Metz, Peter J., "Demystifying Supply Chain Management", *Supply Chain Management Review*, Winter, 1998.

Supply Chain Council, has estimated that most companies and organizations can realize the following performance benefits from improved SCM:<sup>2</sup>

- Increased forecast accuracy by 25 to 80%
- Reduced inventory levels by 25 to 60%
- Reduced fulfillment cycle time by 30 to 50%
- Lowered supply chain costs by 25 to 50%
- Upgraded fill rates by 25 to 30%
- Improved delivery performance by 16 to 28%

Given the potential for these kinds of performance improvements, it is clear that the competitive landscape of the future will no longer be limited to competition among individual companies but will involve supply chains competing against other supply chains.

## 1.2 Optimizing Supply Chains

Optimal management of supply chains generally involves three distinct elements of activity – supply chain analysis, supply chain planning, and supply chain execution.

*Supply chain analysis* is critical to success but tends to be a traditionally weak element in many organizations. This analysis should start with the end-customer requirements and work back through each element of the chain to assess the value-added activities and required resources at each stage of material transformation (or service activity). This analysis should be done for both the current, "as-is" condition, and for the desired state. Costs should be evaluated on a basis of "total cost of ownership" of the materials or services being provided. This typically means building a total-cost model that includes not only price paid for the materials at each stage, but also all other meaningful elements of cost involved in acquiring, transforming, and delivering the materials to the next stage in the chain. These elements can include such costs as inventory carrying costs, quality costs, freight, warehousing, insurance, late delivery costs, warranties, and other factors.

*Supply chain planning* activities look at the alternatives for re-deployment of resources to better optimize the value chain and thereby reduce overall costs. This planning will often include development of strategies and plans for in-sourcing/outsourcing, strategic procurement of materials, inventory management plans (e.g., supplier-managed inventory), supplier management and partnering, e-procurement strategies, and third-party logistics providers. A critical element of supply chain planning is the information systems required to integrate all the partners in the chain. In this regard, first-generation, dedicated Electronic Data Interchange (EDI) systems are beginning to give way to lower-cost, web-based tools and portals for forecasting, demand balancing, inventory replenishment, order entry and tracking, and account management.

*Supply chain execution* means putting the agreed upon plans into action and establishing the requisite management review and tracking systems for ensuring that cost goals and operational requirements for the chain are being met.

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<sup>2</sup> Supply Chain Council, 2000 (<http://www.supply-chain.org>).

### 1.3 Supplier Relationship Management

Competing in supply chains requires some non-traditional thinking in terms of the relationships between an organization and its suppliers. In the extended enterprise model, suppliers and distribution customers become the arms and legs of the product or service provider. As we move outside the traditional four walls of our own operation, it becomes clear that we need the same (or better) levels of planning and communications with key suppliers as we have enjoyed inside the organization, in order to meet or exceed end-customer expectations for cost, lead-times, quality, and demand flexibility. The traditional arms-length, win-lose approach that many companies take with their suppliers will simply not deliver the required results. A more integrated, win-win relationship may be called for. The net effect is that companies will need to take a more sophisticated, and segmented approach to suppliers.

Certainly, there will remain some suppliers with whom a traditional buyer-seller relationship will suffice. However, for more critical commodities and services, higher-level relationships will be required. These could range from conventional preferred supplier agreements to sophisticated, multi-year partnering arrangements with value-added activities included, such as inventory management systems, technical support, and even technology co-development programs. These special supplier relationships must be built on the basis of shared business goals and mutual trust and respect. They are more complex to put in place and they require proactive management but they hold the potential for significant competitive advantage if they are managed properly.

### 1.4 Operational Integration

The extended enterprise model requires better operational integration of the value chain than traditional business models normally provide. Information flow is especially critical to the success of the supply chain to meet demand flexibility requirements while keeping inventory costs down. Thus, a well-planned, integrated information system strategy is a critical element. The SCM software industry aggressively has pursued after this market requirement and there are two primary types of software products attempting to achieve SCM integration.

Large enterprise resource management (ERM) providers have seen this market as an opportunity to offer supply chain solutions as part of their enterprise package. The other group of software providers offers dedicated SCM packages that perform functions such as demand forecasting and balancing, inventory management, logistics planning, supply chain optimization, and other features. It is also clear that SCM and "lean" manufacturing concepts are closely related. In fact, it could be said that SCM is akin to lean manufacturing applied beyond the four walls of our own factory.

Fully integrated suppliers can support a variety of lean manufacturing activities, such as kanban and automatic replenishment systems, vendor-managed inventory systems, and outsourced subassembly operations. A further, logical development of these concepts is the recent rise of third-party logistics (3PL) or "lead logistics providers" (LLPs) who offer a fully integrated logistics outsourcing approach that can include inventory management, warehousing, freight and transportation, cross-docking, kitting and kanban, and outbound distribution services on an optimized basis. Supply chain partners are also frequently engaged in technology co-development

and new product development activities. In this context, integration of supplier reliability, maintainability, and supportability (RMS) capabilities into the new product development process becomes a key enabler and should occur in the earliest phases of the product development program. Key suppliers should be members of the cross-functional product development team in order to best leverage their organization's capabilities to reduce costs and cycle times. In most cases these key suppliers can contribute effective ideas and capabilities for reducing material costs, design fabrication costs, logistics costs, and manufacturing cycle times.

### 1.5 Potential Impacts of E-Procurement

As they are with many other aspects of business, information technologies, and the worldwide web in particular are having an increasing impact on the way operations are conducted. E-procurement gained a significant foothold during the "dot-com" buildup of the late 1990s; and although the rate of e-procurement penetration into purchasing has not met its fantastic early predictions, it continues to grow steadily. The Center for Advanced Purchasing Studies reports that on average, across all U.S. industry categories, companies currently purchase about 13% of their total requirements through EDI arrangements with suppliers and about 7% through business-to-business (B2B) e-commerce sites on the web. Significantly, these companies also reported buying over 55% of purchased goods and services via on-line e-catalogs.<sup>3</sup> These numbers are expected to grow dramatically in the next decade. E-procurement models are still evolving and there are several categories of sites currently doing business on the web. These can generally be classified under the following categories:

- Supplier-hosted web sites (essentially web-based catalogs and ordering)
- Supply-side trade exchanges
- Buyer-side trade exchanges
- Electronic auction sites

It remains to be seen which models or combination of models will ultimately prevail in the marketplace, but it is clear is that companies are under increasing pressure to realize the potential cost savings inherent in these e-procurement tools. A study by the Boston Consulting Group estimated that on average, manufacturing companies could expect to save an additional 12 to 15% of total cost on materials that were migrated from traditional procurement methods to e-procurement.<sup>4</sup> As a result, procurement organizations will be under increasing pressure to expand e-procurement, and the use of these tools will no doubt continue to grow as a percentage of total purchase dollars.

### 1.6 Financial Implications of Supply Chain Management

Current data and case study reports from industry make it clear that the development of SCM competence delivers financial results. In addition to the operational improvements cited previously, best-practice companies are discovering that effective, integrated SCM can impact all areas of financial performance. The traditional thinking is to relate supply chain activities

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<sup>3</sup> Center for Advanced Purchasing Studies (CAPS Database), 2003.

<sup>4</sup> Boston Consulting Group B2B Study, 2000.

primarily to cost reduction and cost management initiatives. However, it has been demonstrated by leading companies that SCM can also have significant impacts on asset management and even revenue growth. Figure 1.6-1 illustrates this concept by looking at the potential impacts of an effective SCM program on stock price and the price/earnings ratio.

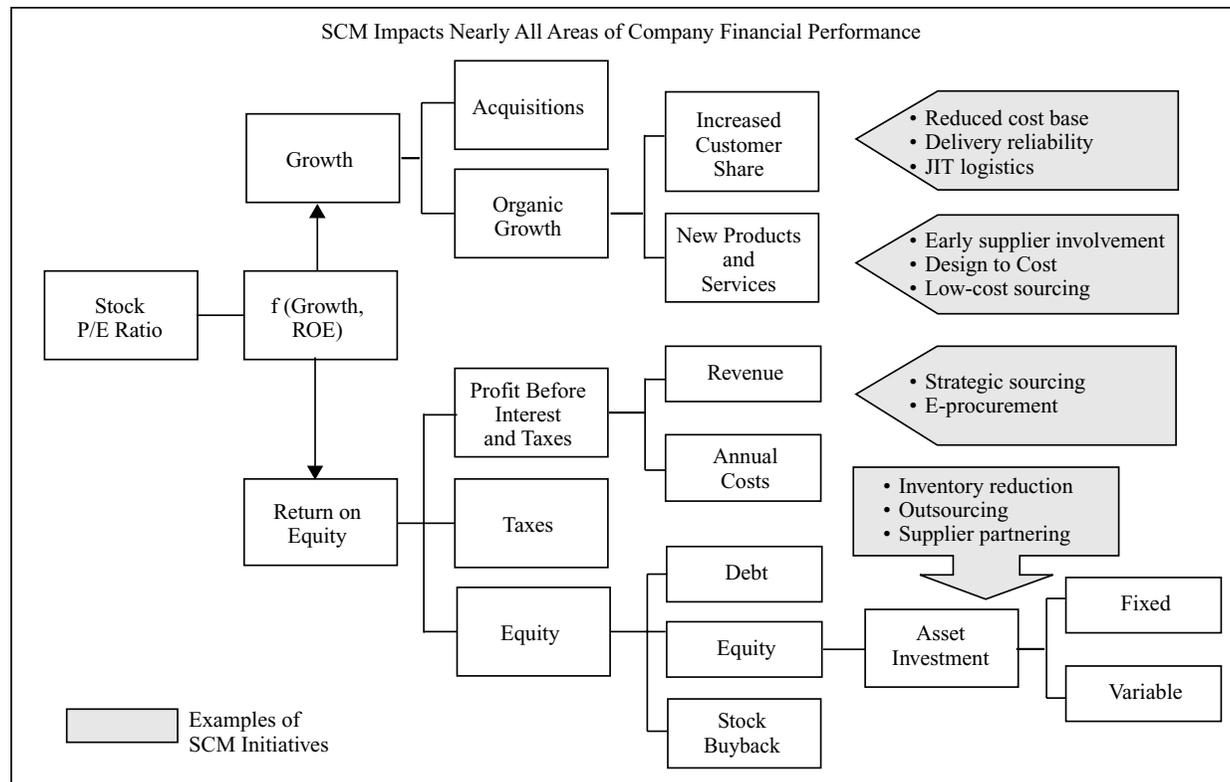


Figure 1.6-1. Supply Chain Impacts on Financial Performance

Industry leaders such as Dell Computers, IBM, United Technologies, General Electric, Ford Motor Company, and others have made SCM a core competency for competitive advantage and a centerpiece of business strategy. Table 1.6-1 shows recently published information from the Institute for Supply Management (ISM) on current SCM technology and process initiatives and the typical returns on investment (ROI) being reported for each area.<sup>5</sup>

<sup>5</sup> *Inside Supply Management*, September 2003, ISM, p. 36.

Table 1.6-1. Typical ROIs for Leading SCM Processes

Technology	Leading Processes	Typical ROI
<b>Spend Analytics (Purchasing Intelligence)</b>	Spend analysis by supplier and commodity in data warehouse. Customizable dashboards with alerts for out-of-tolerance conditions.	Strategic sourcing using data to identify greatest ROI potential and e-sourcing tools yield savings of 5 to 10% in a 12 to 18 month period.
<b>E-sourcing and Reverse Auction Tools</b>	Automated tools with attribute scoring, weighting, and collaboration. Awards converted into Purchase Orders (POs). Commodity specific templates based on best practices.	
<b>Core Purchasing</b>	Multi-organizational blanket and contract POs, planning system generated, PO-based sourcing rules and bills of distribution.	Self-service, automated, and standardized procurement, Internet procurement, and contracts can yield overhead reductions of 10 to 15% within 12 to 18 months or corresponding productivity improvements.
<b>Internet Procurement</b>	Self-service requisitions, catalogs with parametric and fuzzy logic search engines, punch-outs to popular Maintenance Repair and Operations (MRO) suppliers, workflow approvals and alerts.	
<b>Contract Management</b>	Data warehouse with business rules, approval workflows, collaboration and milestones. Apply standard templates to terms and conditions. Create a complete audit trail.	Collaborative order, inventory, and planning management through supplier collaboration tools can yield an additional 15 to 25% overhead reduction plus reductions in obsolete and excess inventories of 25 to 50% while improving supplier performance and time-to-market.
<b>Supplier Collaboration</b>	Self-service view and update of POs, acknowledgments, advanced shipments, payment, inventory, capacity, lead-time, payables, and quality data. Multi-tiered collaboration tools permit alerts and exception messages to be communicated up and down the entire supply chain in days versus weeks.	
<b>Automated Payables</b>	EDI, Electronic Funds Transfer, pay-on-receipt/auto-pay, procurement card, and ghost card with summary payments.	Automated payables can yield headcount reductions of over 50%.
<b>Procurement Cards and Supplier Cards</b>	Procurement-cards issued to individuals and supply or ghost cards with summary payments can go through internet procurement to provide controls.	Procurement- and Supplier-cards with monthly summarized billings eliminate/reduce purchasing and accounts payable workloads.
<b>Design for Supply Chain</b>	Design, source, and buy using component management tools. Provides supply chain visibility, clean bills of materials, lead-time and end-of-life visibility. Identifies lower cost equivalents, alternatives, and redundancies.	Components are identified from preferred suppliers, with shorter lead-times and commonality among products. Component cost reductions of 5 to 30% are possible while improving design cycle times and productivity.
<b>Project Management</b>	Tasks and task dependencies. Responsibilities and due dates with alerts when deliverables are not met. Multiple sourcing events tied together under one project with discrete budget. Internal collaboration with prioritized communications.	Communication, collaboration, and coordination greatly improved within and between related sourcing events and teams. Efficiencies and cycle times improved by standardized processes and tools. Develops sourcing knowledge within organization.

## 1.7 Organization of this Publication

This publication is organized by major topics under the umbrella of integrated supply chain management practice. Section 2 describes the concept of the total value chain, provides a review of various value chain models, and discusses the critical concept of Total Cost of Ownership (TCO). Section 3 describes the supply chain planning and analysis process for customer-focused supply chains and reviews processes and tools for supply chain optimization. Section 4 provides a description of strategic sourcing processes and methods for reducing overall procurement costs. Section 5 reviews the concepts of strategic supplier management and provides a description of current supplier relationship models and tools. Section 6 provides an overview of critical elements of logistics planning and execution, as they relate to supply chain strategies. Section 7 gives an overview of the rapidly evolving state of e-procurement and the impacts of information systems technology on supply chain operations. Section 8 discusses key topics related to the operational integration of suppliers into the overall supply chain, including the involvement of suppliers in new product/technology development and in lean manufacturing initiatives. Appendix A provides a comprehensive listing of reference materials for further study, including texts, journals, web site sources, SCM software and system suppliers, consultancies, and leading SCM university programs.

## 1.8 Conclusions

The concept of the high-performing supply chain as a competitive weapon is coming into its own and, in fact, has already arrived in some industries, such as the automotive industry and the personal computer industry. There is no doubt that successful organizations of the future will be operating in an environment of well-integrated supply networks communicating over web-based information systems on a real time basis. Such organizations will enjoy significant operating cost advantages, reduced cycle times, and improved production flexibility. Many of these supply chain networks can be expected to be global in nature. The biggest obstacles to achieving optimized supply chain management solutions will likely be overcoming traditional mindsets concerning buyer/supplier relationships and cost-effectively establishing the required information systems networks between different organizations in the chain. Those companies and organizations that succeed in achieving this level of supply chain integration will be richly rewarded. Those that do not will get the crumbs.

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