

THE SUPPLY CHAIN EVOLUTION

ROLES, RESPONSIBILITIES AND IMPLICATIONS FOR MANAGEMENT

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As change comes fast and furious, supply chain professionals can take advantage in ways undreamed of just a few years ago.

A steady increase in the complexity of supply chains and a corresponding rise in the virtualization of the manufacturing process have spawned several noticeable trends in organizational dynamics. Over the decades, management of the supply chain has moved through three distinct phases, from decentralized (functional/departmental), to centralized (corporate planning and purchasing), and finally to a combination of both.

The pendulum is currently swinging toward centralized planning combined with decentralized execution. Technology now allows for the rapid propagation of business information from all functional and geographical areas of the extended enterprise, which enables decision-makers to plan and execute with the intent of maximizing enterprise-wide profitability.

Technology-enabled transformation

Organizational structures and functional areas within organizations have transformed significantly over the past four to five decades. Figure (1) describes the transformation as occurring in multiple phases. Phase 1 represents the transformation from the post World War II era through the late 1980s. Each functional area or department planned and operated in an isolated environment. Attempts at enterprise-wide supply chain planning were often ineffective. Supply chain execution decisions were again taken from a largely functional perspective.

Phase 2 represents the incremental changes that occurred from the late 1980s through the late 1990s. The adoption and diffusion of advanced planning and scheduling (APS)

systems and enterprise resources planning (ERP) systems, in concert with business process re-engineering (BPR) were key factors behind the transformation. Supply chain planning and execution became more integrated and driven by cross-functional teams. Today with the advent of the Internet and Web-enabled technologies, the supply chain is morphing again. Phase 3 describes the current transformation from a linear supply chain to a network, where suppliers and customers collaborate to extract and share knowledge and value. In addition, increased visibility and access to real-time information will make a greater proportion of supply chain execution decisions pre-emptive rather than reactive.

Phase 1—Departmentalized or functional supply chain management

ORGANIZATIONAL STRUCTURES FROM THE fifties to the late eighties can be characterized as a series of func-

At-a-Glance

- Supply chain management is becoming a mix between centralized planning and decentralized execution.
- The evolution of supply chain management can be traced through three phases, with the emerging phase being one of connected and collaborating value networks.
- Skills needed to manage the supply chain have evolved, too, as managers have moved from functional-based decisions to enterprise-based decisions and ultimately to supply chain-based decisions.

Figure 1: **Phased Evolution of Supply Chain Management**

	Phase 1: Functional or Departmental	Phase 2: Integrated	Phase 3: Value Networked
Supply Chain Planning	<ul style="list-style-type: none"> ⌚ Done in functional silos ⌚ Ineffective due to limited information visibility and standardization across the enterprise 	<ul style="list-style-type: none"> ⌚ Shift to a business process focus ⌚ Increase in effectiveness due to standardization of information across the enterprise ⌚ Integrated supply chain planning: demand forecasting, planning & scheduling 	<ul style="list-style-type: none"> ⌚ Collaborative planning ⌚ Extension of the planning process beyond the enterprise to include contract manufacturers, key customers and suppliers
Supply Chain Execution	<ul style="list-style-type: none"> ⌚ Silo-based execution—often in a reactive mode ⌚ Decisions often made by functional managers and key associates 	<ul style="list-style-type: none"> ⌚ Integrated cross-functional decisions, still primarily in a reactive mode ⌚ Limited collaboration 	<ul style="list-style-type: none"> ⌚ Decisions taken at the most appropriate level in the organization ⌚ Greater proportion of collaborative, pre-emptive decisions

tional and geographical silos. Executive management's attempts at centralized supply chain planning in such an environment were ineffective due to the lack of standardization of business information, poor data integrity and analysis support, disparate technology systems, and incentives that did not promote sharing of information.

Supply chain execution decisions were made by a core set of managers within each silo with minimal thought about repercussions in other areas. Decisions were reactive and based solely on criteria that were applicable to the particular functional area.

Phase 2—Transformation to integrated supply chain management

IN THE LATE EIGHTIES and early nineties, with the advent of BPR, corporate leaders started seeing the benefits of aligning their organizations, along with the associated business objectives and performance incentives for executives, to underlying business processes. Advances in technology and lower cost of computing increased the penetration of enterprise-wide transaction systems such as ERP systems. Standardized business information and a coherent set of metrics from different businesses, functional and geographical areas were now readily available to senior managers. With the introduction of APS systems, supply chain optimization became a feasible option. This led to an increase in the effectiveness of increasingly centralized supply chain planning processes. The planning process was more integrated and driven by cross-functional teams with an objective to look at the enterprise as a whole.

Leading corporations across all industries started realizing that to reap the full benefits, demand forecasting, supply chain planning, and production scheduling ought to be treated as an integrated business process. Sales and operations planning programs, where cross-functional teams periodically meet to determine the best course of action, became popular.

Supply chain execution decisions also became more cross-

functional and integrated. Purchasing and manufacturing could now jointly decide on a raw material procurement decision that minimized the total cost-to-make of a product, not just the lowest purchase price. Similarly customer service and distribution and logistics could jointly decide on a fulfillment decision that minimized the total cost to serve a particular customer.

Phase 3—Transformation to value networks

TODAY, THE INTERNET IS unleashing a powerful phenomenon—collaboration—that is affecting the supply chain. Integrated and centralized supply chain planning will become even more effective as the majority of inputs to the planning process will flow bottom-up through the enterprise, and an increasing portion of it will originate from the end customer. Pertinent information will be adjusted and reviewed by relevant players based on new developments. Demand forecasts will be routinely updated by sales representatives based on the latest customer information and eventually by the end customers themselves. Sharing of information around product seasonality, promotional events and new product launches between buyers and sellers will further enhance the trend, and increase the associated benefits of higher customer service levels and lower supply chain costs.

The other significant development will be that supply chain execution decisions will become increasingly decentralized. As supply chains migrate from a push model (build-to-stock) to a pull model (build-to-demand), they require four key elements for operational success: real-time visibility (across the entire supply chain), flexibility (of supply and sourcing options), responsiveness (to changes in customer demand and product lead-times) and rapid new product introductions (based on market trends and new designs).

The next generation of supply chain systems will include supply chain process management or event management capa-

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Figure 2: **Impact on Functional Areas and Work Roles**

Functional area	Phase 1	Phase 2	Phase 3
Procurement	<ul style="list-style-type: none"> ⌚ Leverage purchasing knowledge to procure at the lowest price ⌚ Minimal interaction with other functional areas 	<ul style="list-style-type: none"> ⌚ Make integrated cross-functional decisions to minimize enterprise costs (e.g. focus on impact of raw material on total "cost-to-make") ⌚ Use MRP and long range planning to better negotiate with suppliers 	<ul style="list-style-type: none"> ⌚ Strategic sourcing ⌚ Supplier segmentation—long-term relationships/contracts for key raw materials, reverse auctions for MRO
Planning	<ul style="list-style-type: none"> ⌚ Develop supply plan based on historical production data ⌚ Minimal linkages between business planning and production planning 	<ul style="list-style-type: none"> ⌚ Integrated demand forecasting, planning and scheduling ⌚ Sales and operations planning 	<ul style="list-style-type: none"> ⌚ Collaborative planning forecasting and replenishment (CPFR) ⌚ More frequent and granular sales and operations planning
Scheduling	<ul style="list-style-type: none"> ⌚ Maximize asset utilization and minimize manufacturing costs ⌚ Minimal linkage with supply chain planning 	<ul style="list-style-type: none"> ⌚ Minimize cost-to-serve customer base—greater cooperation with customer service ⌚ Strong linkages to supply chain planning 	<ul style="list-style-type: none"> ⌚ Dynamic constraint-anchored scheduling in a capable-to-promise environment ⌚ Collaborative scheduling
Inventory Management	<ul style="list-style-type: none"> ⌚ Minimize inventory within one's four walls ⌚ Inventory treated as an "independent business variable" 	<ul style="list-style-type: none"> ⌚ Customer segmentation—align inventory policies with customer service levels ⌚ Inventory viewed as an artifact of incomplete supply chain information 	<ul style="list-style-type: none"> ⌚ Dynamic network optimization ⌚ Collaborative replenishment and vendor-managed inventory
Logistics Planning and Execution, Warehouse Management	<ul style="list-style-type: none"> ⌚ Manual—labor intensive ⌚ Limited visibility 	<ul style="list-style-type: none"> ⌚ Increased warehouse management & automation—pick, pack & ship ⌚ Logistics network optimization 	<ul style="list-style-type: none"> ⌚ Transactional logistics—real-time track and trace, multi-modal shipment delivery and visibility ⌚ Multi-modal logistics scheduling optimization
Sales/Customer Service	<ul style="list-style-type: none"> ⌚ Reactive customer service ⌚ Minimal interaction with manufacturing 	<ul style="list-style-type: none"> ⌚ Customer segmentation—align customer service levels with segment characteristics ⌚ Available-to-promise 	<ul style="list-style-type: none"> ⌚ Proactive customer relationship management ⌚ Capable-to-promise
Skills and Focus	<ul style="list-style-type: none"> ⌚ Narrow and functionally focused in a reactive mode ⌚ Soft skills not viewed as critical 	<ul style="list-style-type: none"> ⌚ Increased breadth of inter-functional knowledge spanning multiple business processes ⌚ Soft skills—the ability to lead and work in cross-functional teams, effective communication is increasingly important 	<ul style="list-style-type: none"> ⌚ Broad-based collaboration around business processes that extend beyond the enterprise to key customers and suppliers

bilities. These capabilities will enable close to real time, event-based escalation of relevant pieces of information through the organization to appropriate individuals, who will then execute decisions to minimize organizational impact and/or leverage opportunities created by this event. As an example, a production scheduler based on real-time in-transit inventory information will proactively mitigate (by adjusting production schedules, etc.) the unintended consequences of a raw material shipment not arriving on time. However, that same piece of information

Increased **VISIBILITY** and access to real-time information will make a greater proportion of **SUPPLY** chain **EXECUTION** decisions pre-emptive rather than reactive.

combined with the detection of a supply demand imbalance, spotted by detecting a spike in the price of a related commodity in the spot markets, can lead senior managers to conclude that the supplier may have suffered a major outage in one of its units. Resulting strategies, potentially system-recommended, could involve the following options: confirmation of the event with the supplier, an examination of the possibility of replacing the material, or an assessment of the impact on downstream value chain coupled with an evaluation of alternate suppliers.

Real-time visibility of the supply chain, combined with a monitoring and an event-management system, will increase the proportion of decisions that are taken preemptively to minimize unintended consequences or exploit unforeseen situations. Increasingly, key decisions will be made by cross-functional teams, chosen explicitly with the right skill set mix, and sometimes assembled just for the purpose of solving the problem at hand.

The demands for supply chain efficiency will emphasize a combination of both centralized and decentralized structures and approaches—collaborative and centralized planning with decentralized execution—requiring real time visibility for monitoring and rapid response mechanisms for event-driven management involving close to real-time problem escalation and remediation. Effective management of supply chains will occur through the deployment of integrated organizational team structures at multiple levels—executive through senior and middle management—executed through physical and/or virtual facilities such as “war rooms.”

Impact on functional areas and work roles

THIS EVOLUTION OF THE supply chain has had and will increasingly have a significant impact on work roles and the skill sets required for success. Figure (2) explains how the type of skills and the job focus has evolved. During Phase 1, when planning and execution was done in isolated functional silos, deep functional expertise was the key to success on the job.

With the advent of an integrated approach to supply chain planning, deep functional skills were no longer the sole set of

skills required for success—knowledge of related functional areas and more importantly, the ability to analyze and understand the ramifications of one's decisions in other functional areas became critical. What are now often known as soft skills—the ability to lead and work in teams and to communicate effectively with colleagues from other areas—became increasingly important. In a sales and operations planning session for example, the ability to listen to the other points of view, to compromise, and to reach consensus-oriented decisions were critical success factors.

In today's environment, where effective supply chain collaboration is increasingly seen as a competitive advantage, viewing the business process as something that extends beyond the enterprise, and understanding the impact of decisions on key customers and suppliers will become a critical success factor. The ability to effectively collaborate with several other stakeholders outside your organization will become increasingly important. Successful players will operate comfortably in virtual and perhaps even transient cross-functional teams, providing domain expertise to some and leadership skills to others. The ability to rapidly process information, filtering out the noise while gleaning the relevant pieces is the key to understanding that disconnected pieces of information are indeed part of a larger event. This knowledge can then be used to proactively plan several potential decision scenarios and to execute one or more of them in a pre-emptive mode.

Clearly, not all organizations in different industries are at Phase 3. Certain industries, such as the high tech sector are leading the pack. However, this juggernaut is coming and this transformation will occur across industries over the next several years. People who manage the supply chain for a company will need to have a few key characteristics. First, they must build a personal knowledge base that is integrated, diverse, and goes beyond one's immediate functional area and across the enterprise. They must focus on obtaining both the depth and the breadth of knowledge.

Another key factor is learning to work within integrated team settings, both physical and virtual. These settings will be fast-paced and oftentimes seem chaotic, however keeping a holistic and synergistic viewpoint will keep participants on such teams focused. Inherent in this approach is thinking of customers, suppliers and other organizations as partners and collaborators. You will all succeed together or you will not succeed at all.

Finally, workers with supply chain management responsibilities must strive to stay on top of new technology and develop an intimate knowledge of not only how it can affect their unit and their companies, but also how it can affect their partners. Technology is fueling Phase 3, and leading companies are beginning to adopt systems and policies that are increasing the efficiency in their supply chains.

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