
The Supply Chain Management Processes

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Increasingly, supply chain management is being recognized as the management of key business processes across the network of organizations that comprise the supply chain. While many have recognized the benefits of a process approach to managing the business and the supply chain, most are vague about what processes are to be considered, what sub-processes and activities are contained in each process, and how the processes interact with each other and with the traditional functional silos. In this paper, we provide strategic and operational descriptions of each of the eight supply chain processes identified by members of The Global Supply Chain Forum, as well as illustrations of the interfaces among the processes and an example of how a process approach can be implemented within an organization. Our aim is to provide managers with a framework to be used in implementing supply chain management, instructors with material useful in structuring a supply chain management course, and researchers with a set of opportunities for further development of the field.

Supply chain management is increasingly being recognized as the integration of key business processes across the supply chain. For example, Hammer argues that now that companies have implemented processes within the firm, they need to integrate them between firms:

“Streamlining cross-company processes is the next great frontier for reducing costs, enhancing quality, and speeding operations”.

Streamlining cross-company processes is the next great frontier for reducing costs, enhancing quality, and speeding operations. It is where this decade's productivity wars will be fought. The victors will be those companies that are able to take a new approach to business, working closely with partners to design and manage processes that extend across traditional corporate boundaries. They will be the ones that make the leap from efficiency to super efficiency [1].

Monczka and Morgan also focus on the importance of process integration in supply chain management [2]. The piece that seems to be missing from the literature is a

comprehensive definition of the processes that constitute supply chain management. How can companies achieve supply chain integration if there is not a common understanding of the key business processes? It seems that in order to build links between supply chain members it is necessary for companies to implement a standard set of supply chain processes. Practitioners and educators need a common definition of supply chain management, and a shared understanding of the processes.

We recommend the definition of supply chain management developed and used by The Global Supply Chain Forum:

Supply Chain Management is the integration of key business processes from end user through original suppliers that provides products, services, and information that add value for customers and other stakeholders [3].

The Forum members identified eight key processes that need to be implemented within and across firms in the supply chain. To date,

the published descriptions of these processes were limited to one-paragraph summaries that provide little guidance on how to implement a process approach [4]. Our purpose in this paper is to provide more detail on the sub-processes and activities that comprise the supply chain processes. The goal is to provide management with guidelines to help with implementation, instructors with material for structuring a supply chain management course and researchers with a detailed framework for future research on supply chain management.

The paper is organized as follows. First, there is a brief review of the supply chain framework. Next, there is a section on each of the eight processes. This is followed by a section on implementation. Finally, opportunities for future research and conclusions are presented.

Supply Chain Management

The Global Supply Chain Forum identified eight key processes that make up the core of supply chain management [5]:

- Customer Relationship Management
- Customer Service Management
- Demand Management

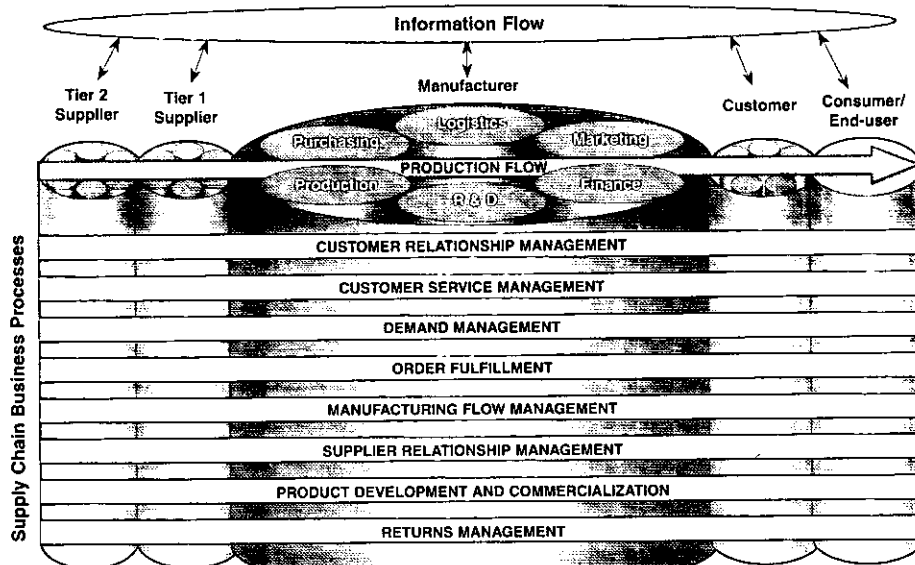
- Order Fulfillment
- Manufacturing Flow Management
- Procurement
- Product Development and Commercialization
- Returns.

The term "procurement" is a source of confusion. Novak and Simco highlight the confusion by citing studies in which procurement is defined as "...the act of buying... all those activities necessary to acquire goods and services consistent with user requirements" [6]. Other authors use similar definitions [7]. Because these definitions do not adequately represent our view of the supply chain process, we have renamed the procurement process "supplier relationship management". Also, for further clarification we have changed the name of the returns process to returns management.

The eight key business processes run the length of the supply chain and cut across firms and functional silos within each firm (see Figure 1). Functional silos include Marketing, Research and Development, Finance, Production, Purchasing and Logistics. Activities in these processes reside inside a functional silo, but an entire process will not be contained within one function.

Our purpose in this paper is to provide more detail on the sub-processes and activities that comprise the supply chain processes.

Figure 1
Supply Chain Management:
Integrating and Managing Business Processes Across the Supply Chain



Source: Adapted from Douglas M. Lambert, Martha C. Cooper, and Janus D. Pagh, "Supply Chain Management: Implementation Issues and Research Opportunities," *The International Journal of Logistics Management*, Vol. 9, No. 2 (1998), p. 2.

The customer relationship management process provides the structure for how the relationship with the customer is developed and maintained.

While management of all firms in each supply chain should consider these eight processes, the relative importance of each process and the specific activities included may vary. The sub-processes and activities we describe are designed from the perspective of a manufacturing company sitting near the middle of the supply chain (see Figure 1). Each process is described at strategic and operational levels. The strategic portion consists of the establishment and strategic management of each process, and provides a blueprint for implementation. This is a necessary first step in integrating the firm with other members of the supply chain. The operational portion is the actualization of the process once it has been established.

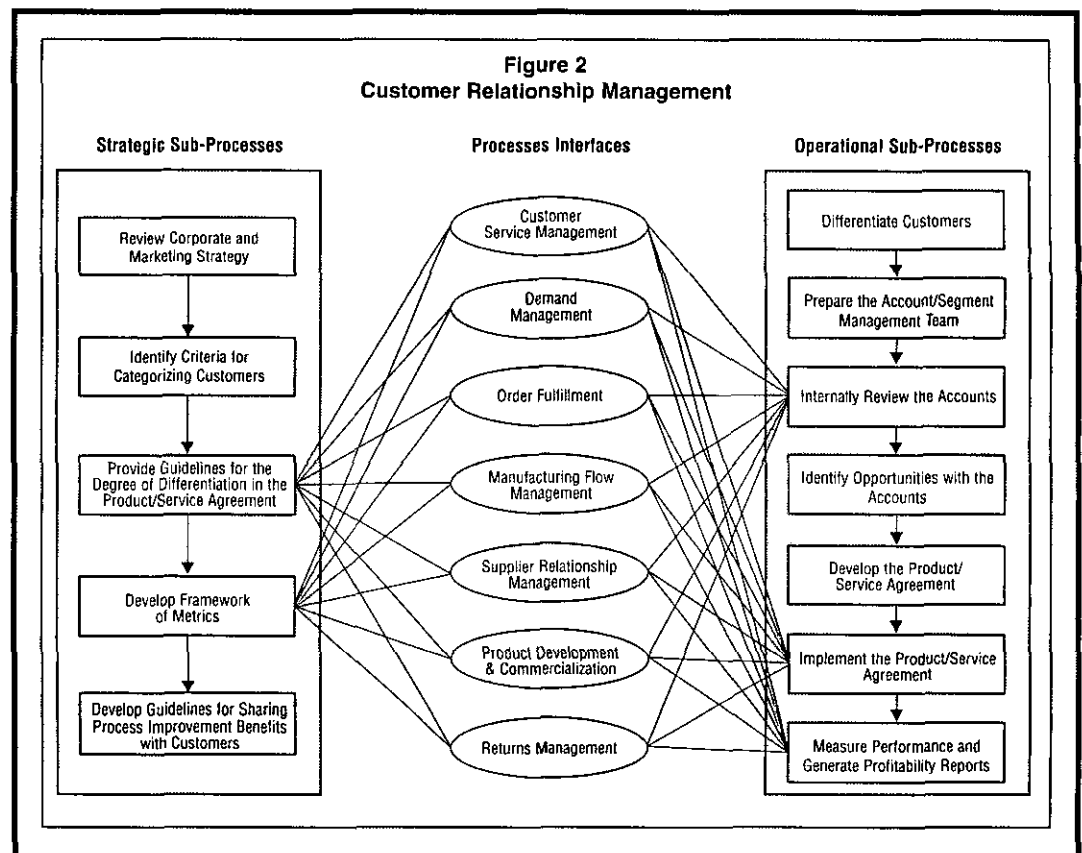
Next, we will describe the sub-processes and activities that make up each of the eight processes as well as the interactions between processes, functions, and key members of the supply chain. The description of each process is accompanied by a figure that illustrates the sub-processes and the interfaces between the processes.

Customer Relationship Management

The customer relationship management process provides the structure for how the relationship with the customer is developed and maintained. Management identifies key customers and customer groups to be targeted as part of the firm's business mission [8]. Customer teams tailor Product and Service Agreements (PSA) to meet the needs of key accounts and segments of other customers [9]. Teams work with key accounts to improve processes, and eliminate demand variability and non-value-added activities. Performance reports are designed to measure the profitability of individual customers as well as the firm's financial impact on those customers.

The Strategic Process

At the strategic level, the customer relationship management process provides the framework for managing relationships with customers, and is comprised of five sub-processes (see Figure 2). In the first, the process team reviews the corporate and marketing strategies to identify customer segments that are key to the organization's success now and in the future.



Next, the team identifies the criteria for categorizing customers and provides guidelines for determining which customers qualify for tailored PSAs and which customers will be grouped into segments and offered a standard PSA that is developed to provide value to the segment. Potential criteria include: profitability, growth potential, competitive positioning issues, access to market knowledge, market share goals, margin levels, level of technology, resources and capabilities, compatibility of strategies, and channel of distribution. As part of this sub-process, the team develops the firm's strategy for dealing with segments of customers who do not qualify for individually tailored PSAs.

In the third sub-process, the team develops guidelines for the degree of differentiation in the PSA. This involves developing the differentiation alternatives and considering the revenue and cost implications of each. The output is the degree of customization that can be offered to customers. The goal is to offer PSAs that enhance the profitability of the firm and the customers. To find and understand the differentiation opportunities, this sub-process will interface with all of the other processes.

Developing the framework of metrics involves outlining the metrics of interest and relating them to the customer's impact on the firm's profitability as well as the firm's impact on the customer's profitability. The customer relationship management process has the responsibility for assuring that the metrics used to measure all of the other processes are not conflicting. Management needs to insure that all internal and external measures are driving consistent and appropriate behavior [10].

In the final sub-process, the team develops the guidelines for sharing process improvement benefits with customers. The goal is to make these process improvements win-win solutions for both the firm and the customer.

In summary, the objective of customer relationship management at the strategic level is to identify customer segments, provide criteria for categorizing customers, provide customer teams with guidelines for customizing the product and service offering, develop a framework for metrics, and provide guidelines for the sharing of process improvement benefits with the customers.

The Operational Process

At the operational level, the customer relationship management process deals with writing and implementing the PSAs. It is comprised of seven sub-processes. First, customers are differentiated based on the criteria developed at the strategic level. Key customers are identified and other customers are grouped into customer segments.

Next, the account or segment management teams are formed, including the salesperson who will be the account or segment manager. The teams are cross functional with representation from each of the functional areas. In the case of key accounts, each team is dedicated to a specific account and meets regularly with the customer. In the case of customer segments, a team manages a group of customers and develops and manages the standard PSA for the segment.

Each account team reviews their account or segment of accounts to determine the products purchased, sales growth and their position in the industry. Once the team has an understanding of the customer(s), they work with each account or segment of accounts to develop improvement opportunities in sales, costs and service. These opportunities might arise anywhere, so the account teams need to interface with each of the other processes.

In the fifth sub-process, each team develops the PSA for their account or segment of accounts. This team first outlines and drafts the PSA, and then gains commitment from the internal functions. For key accounts, they present the PSA for acceptance, and work with the customer until agreement has been reached. It is important that the PSAs for key accounts include a communication and continuous improvement plan. For other accounts, the PSA is presented to the customer.

In the sixth sub-process, the team implements the PSA, including regular meetings with key customers. At this point, input is provided to each of the other processes that are affected by the customizations in the PSA.

In the last operational sub-process, the team captures and reports the process performance measures. Metrics from each of the other processes also are captured in order

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to generate the customer profitability reports. These profitability reports provide information for measuring and selling the value of the relationship to each customer and internally to upper management. The value provided should be measured in terms of costs, impact on sales, and associated investment, otherwise the efforts incurred will go unrewarded [11].

Customer Service Management

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The Strategic Process

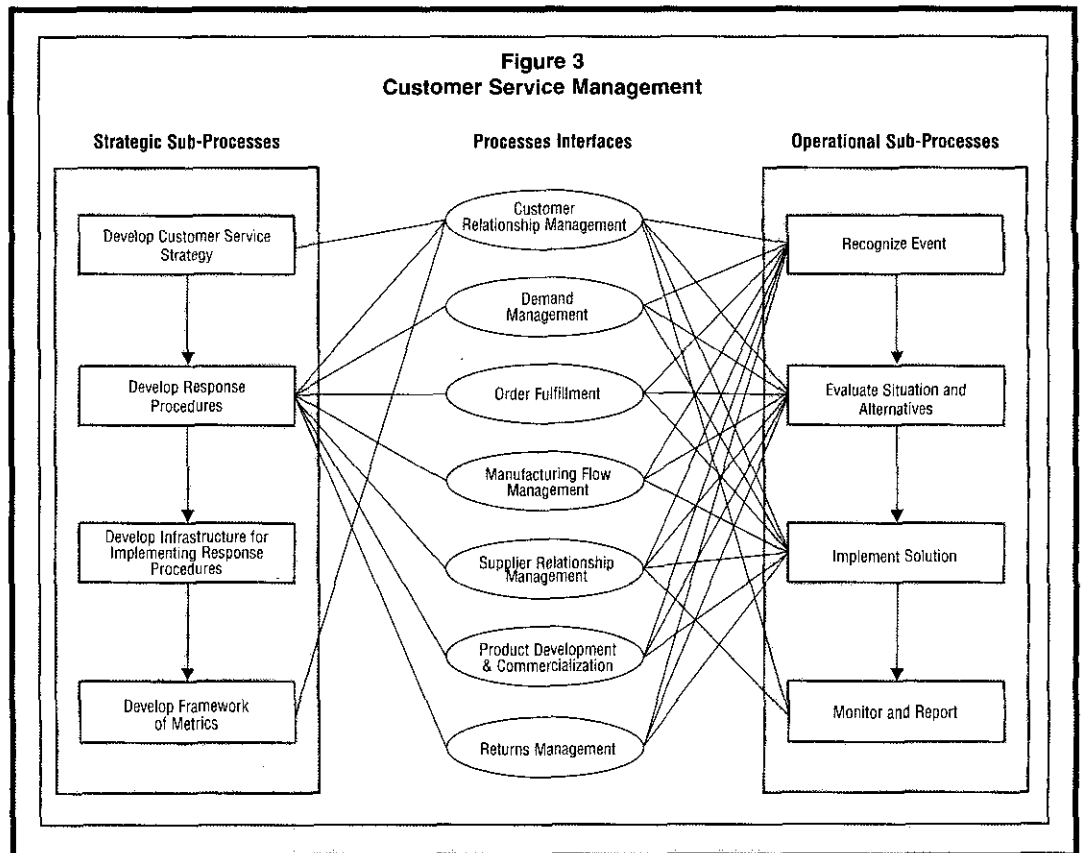
At the strategic level, the customer service management process is concerned with designing the process for managing the PSA. Customer relationship management

provides the set of products and services the firm can offer its customers. The strategic customer service management process is responsible for planning how each of the possible products and services to be included in the PSA is going to be delivered and managed.

Strategic customer service management has four sub-processes (see Figure 3). In the first, the customer service strategy is developed for the set of PSA features identified in the customer relationship management process. The team identifies the deliverables of the customer service process, operationalizes the triggers for initiating action, and defines the staffing needs. The deliverables of the process are standardized responses to standardized events that occur while administering the PSA.

The output of this first sub-process is a list of events with its corresponding triggers and deliverables. In the second sub-process, the team develops response procedures for each of these events. This includes developing the internal and external coordination required to respond.

Next, the process team identifies the



infrastructure for implementing the response procedures. This involves identifying the sources of the information needed to handle each of the events and determining the appropriate communication means for internal and external coordination. This sub-process provides the information technology and communication needs for managing the PSAs efficiently and effectively. If there are technical constraints restricting the establishment of this infrastructure, the products and services that are affected have to be re-evaluated and eventually modified to make them feasible.

As in the other processes, the last sub-process of customer service management at the strategic level is to develop the framework of metrics. The metrics should provide management with the information necessary to identify problems and improvement opportunities in the administration of the PSA. These measurements are used not only for managing the process, but also for improving its efficiency. The team interfaces with the customer relationship management team to assure that the metrics developed are consistent with the firm's objectives.

In short, the objective of customer service management at the strategic level is to develop the necessary infrastructure and coordination means for implementing the PSA and providing a key point of contact to the customer.

The Operational Process

At the operational level, the customer service management process is responsible for responding to both internal and external events. The first step is to recognize the event. This might seem trivial but the goal of being proactive makes this a challenging part of administering the PSA. The team needs to have a thorough understanding of the firm's operations, and try to foresee the effects of a given event on the customer and on the internal operations of the firm. Events that require action might originate in any one of the other processes so coordination is essential.

Once the event is recognized, the team evaluates alternatives for managing the event with the least disruption to the customer and internal operations. The team determines a set

of alternative actions working jointly with the specialists in each of the functions affected by the event or that can contribute to implementing the solution. This requires interfacing with other processes that are affected by the alternative responses. The implementation of the selected alternative is coordination intensive, as other business process owners or function managers often need to participate in the implementation. At this point, the actual response to the event is executed.

Finally, the customer service management process includes monitoring and reporting the process performance. This sub-process includes recording the event in a database that can be used for future reference, and monitoring the evolution of the event in order to know to what extent the response has been implemented. Part of the sub-process is collecting information and informing the customer about how the issue is being resolved. Performance of the process is measured and conveyed to the customer relationship management and supplier relationship management teams.

Demand Management

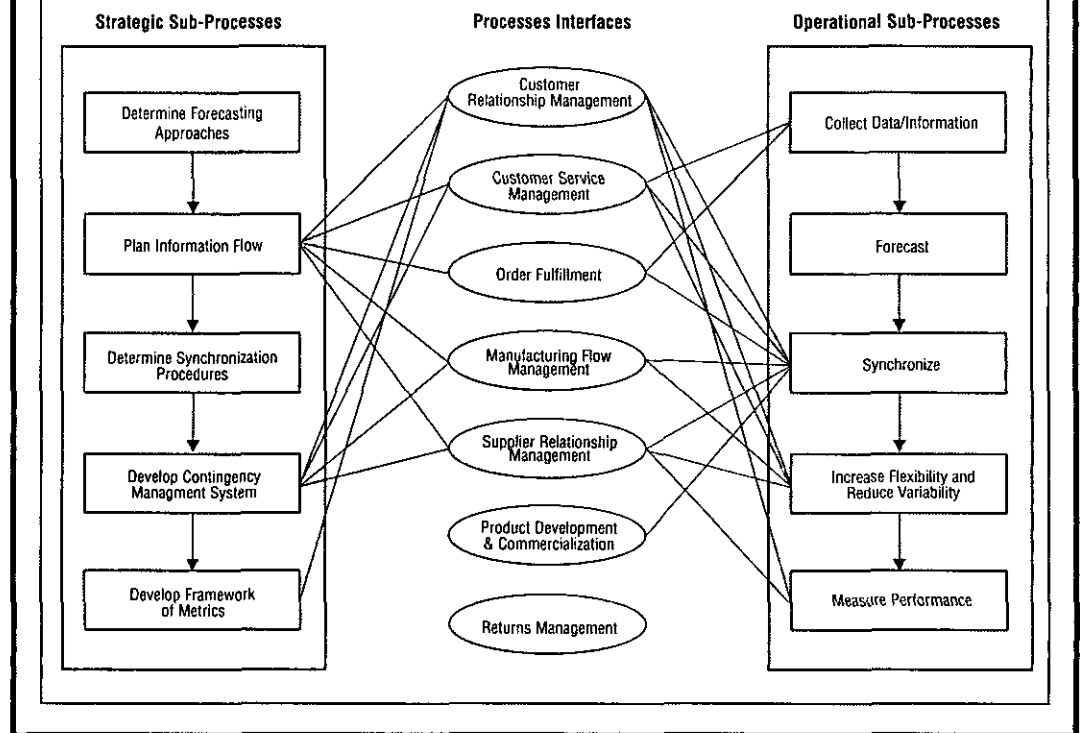
The demand management process needs to balance the customers' requirements with the firm's supply capabilities. This includes forecasting demand and synchronizing it with production, procurement, and distribution. "Demand Management coordinates all acts of the business that place demand on manufacturing capacity" [12]. The process is also concerned with developing and executing contingency plans when operations are interrupted.

The Strategic Process

Demand management is about forecasting and synchronizing (see Figure 4). The process team first determines which forecasting approaches to use. This includes determining the levels and timeframes of the forecasts needed throughout the firm. Different parts of the organization might need different forecasts [13]. The team determines the sources of the data required to generate the forecasts [14]. These might include historical data, sales projections, promotion plans, corporate objectives, market share

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Figure 4
Demand Management



Another important component of the strategic demand management process is developing contingency plans in the event of either internal or external events that disrupt the balance of supply and demand.

data, trade inventory, market research, and new categories of growth. If systems such as collaborative planning, forecasting and replenishment (CPFR) or vendor managed inventory (VMI) are being implemented, the customer is a direct source of data.

Once the team decides on the method of forecasting and the sources of data, they plan the information flow. Several functional silos and customer relationship management need to provide input to the forecasting process. The forecasts are then communicated to the other process teams that are affected by them, including customer service management, order fulfillment, manufacturing flow, and product development and commercialization.

Next, the team determines the synchronization procedures required to match the demand forecast to the firm's production, sourcing and distribution capabilities. To do this, they need to understand the capacity and flexibility available at all points along the supply chain. They also need to determine the long-term planning requirements, particularly in the case of demand with high seasonality or long-term changes, such as sustained growth. At

this point in the process, the team might recognize future capacity issues and make recommendations to proactively address them before they cause problems.

Another important component of the strategic demand management process is developing contingency plans in the event of either internal or external events that disrupt the balance of supply and demand [15]. The team develops guidelines or rules to deal with unexpected demand or interruptions to supply. These guidelines should be developed in accordance with the expectations of the customers outlined in the customer relationship management process, and with input from manufacturing flow and supplier relationship management. The team determines the guidelines and communicates them to the customer service management team, since they address the concerns of customers when these events occur.

Finally, as with the other processes, the team develops the framework of metrics to be used to measure and monitor the performance of the process. Typical process measures might include forecast error and capacity utilization. Again, the team confirms these

measures with the customer relationship management team to assure consistency.

The Operational Process

At the operational level, the process team executes the forecasting and synchronization as it was designed at the strategic level. This begins with collecting the data. To do this, the team interfaces with the marketing functional silo as well as the order fulfillment and customer service management processes. These sources are close to the customer and provide critical information on sales projections and anticipated demand.

With all the required data in hand, the team develops the forecasts. They track and analyze the forecast error and incorporate this feedback to fine-tune the forecasting method. This is an important component of the learning process associated with good forecasting.

The forecast provides the input for matching demand with supply. Some firms refer to this as aggregate planning. Sources of information for the synchronization sub-process include customer relationship management, customer service management, manufacturing flow, and product development and commercialization. The output of the synchronization sub-process is an aggregate production plan and an inventory-positioning plan. The team also develops a rough-cut capacity plan for any new products soon to be launched. These plans need to be communicated throughout the firm, and therefore there are interfaces with customer relationship management, customer service management, order fulfillment, manufacturing flow, supplier relationship management, and product development and commercialization. In addition, any internal or external event that causes a disruption to supply or large forecast errors needs to be handled with the contingency management plans developed at the strategic level.

Another key component to demand management is an ongoing process aimed at increasing flexibility and reducing variability (in demand, lead-times, capacity, etc). The former helps management respond quickly to both internal and external events, and the latter aids in consistent planning and minimizing surprises. "The supply chain which best succeeds in reducing uncertainty

and variability is likely to be most successful in improving its competitive position" [16]. For example, to gain flexibility, the team might work with the manufacturing flow team to find ways to introduce postponement into the manufacturing process. To reduce demand variability, the team might work with the customer relationship management team to help customer's better plan promotions. In order to find ways to increase flexibility and reduce variability, the process team works with the sales, marketing and manufacturing organizations, customers and suppliers. This involves process interfaces with customer relationship management, customer service management, manufacturing flow and supplier relationship management.

Finally, the process team is responsible for measuring the performance of the process with the metrics developed at the strategic level. These metrics are used to improve the process and are conveyed to the customer relationship management and supplier relationship management teams.

Order Fulfillment

A key to effective supply chain management is to meet customer requirements in terms of order fulfillment [17]. Effective order fulfillment requires integration of the firm's manufacturing, logistics and marketing plans. The firm should develop partnerships with key members of the supply chain to meet customer requirements and reduce total delivered cost to customers.

The Strategic Process

The strategic order fulfillment process considers manufacturing, logistics and marketing requirements to design the distribution network (see Figure 5).

In the first sub-process, the team reviews the role of customer service in the marketing strategy, customer service goals, and the supply chain structure [18]. This requires an interface with the customer relationship management process.

Next, the requirements for order fulfillment are specified, including the order-to-cash cycle. Key inputs include manufacturing capabilities, lead-times and customer service requirements [19]. At this stage, the customer relationship management

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and manufacturing flow processes provide input. The team evaluates the core competencies within order fulfillment and determines which aspects of the process are potentially service differentiating.

Evaluating the logistics networks is an important step in order fulfillment. The design and operation of the network has a significant influence on the cost and performance of the system [20]. It has been estimated that up to 80% of the total cost of the final product is determined in the design of the network [21]. It is necessary to evaluate the network including: which plants produce which products; where warehouses, plants, and suppliers are located; and, which transportation modes should be used. Important input to this sub-process comes from the demand management and returns processes. The resulting network is provided to the manufacturing flow process.

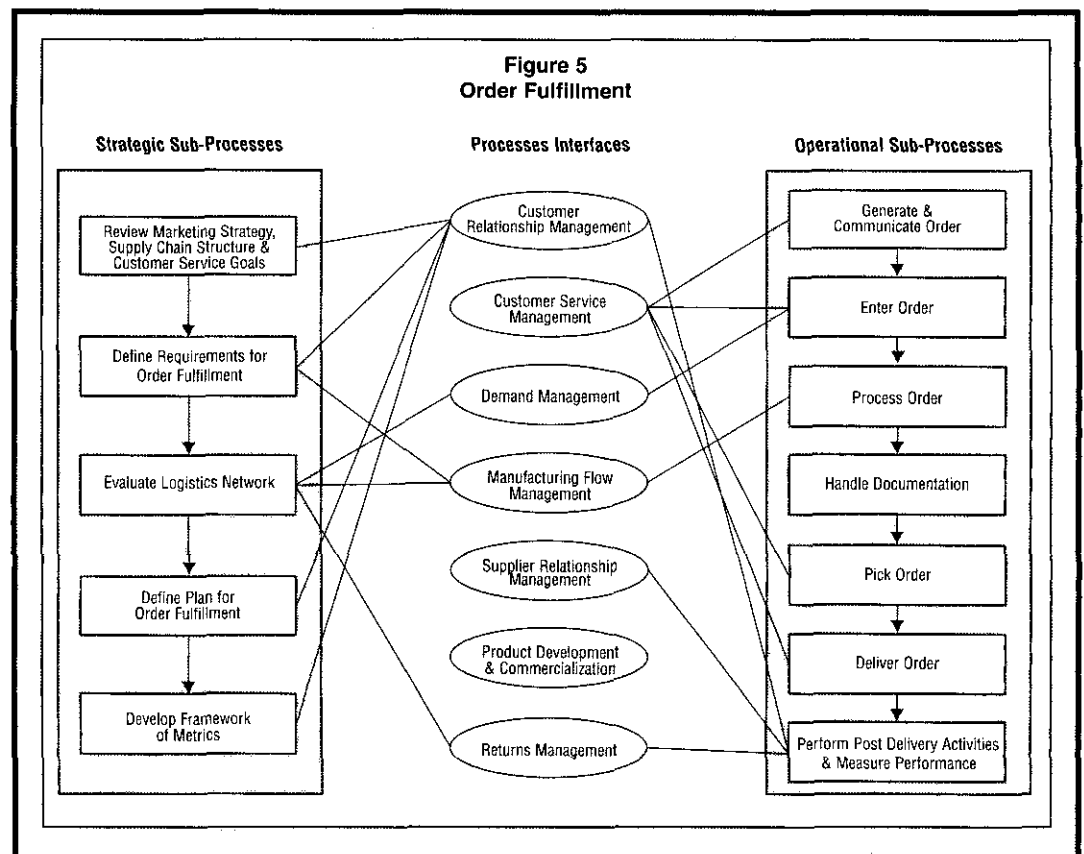
The next strategic sub-process is to define the plan for order fulfillment, determining how orders from various customers or segments of customers will be filled. The process team communicates with the customer relationship management

process team to make sure that all customer expectations are met.

In the final sub-process, a framework of metrics is developed and communicated to the customer relationship management process. Typical process measures might include order-to-cash cycle time, order fill rate, and order completeness.

The Operational Process

The order fulfillment operational process defines the specific steps regarding how customer orders are: generated and communicated, entered, processed, documented, picked, delivered, and handled post delivery. There are three steps to accepting and processing an order. First, orders are generated and communicated. Generally, these orders come from customer service management. Second, a member of the order fulfillment team receives, enters, edits the orders, and transmits these data to the customer service management and demand management processes. Third, the inventory and customers' credit are checked and the order is processed. Information about these orders is provided to the manufacturing flow process.



In the next sub-process, the team handles all documentation. They acknowledge the order and prepare the bill of lading, picking instructions, packing slips and generate the invoice. At the order picking stage, the merchandise is picked, packed, and staged for loading. The load confirmation is prepared and feedback is provided to customer service management.

The order fulfillment team is responsible for preparing shipping documents, transmitting delivery confirmation, and auditing and paying the freight bill. They also provide delivery information to the customer service management team.

In the final sub-process, the team performs post-delivery activities, including receiving and posting payment, recording bad debt expense, and measuring performance. Feedback is provided to customer relationship management, supplier relationship management and returns management.

Manufacturing Flow Management

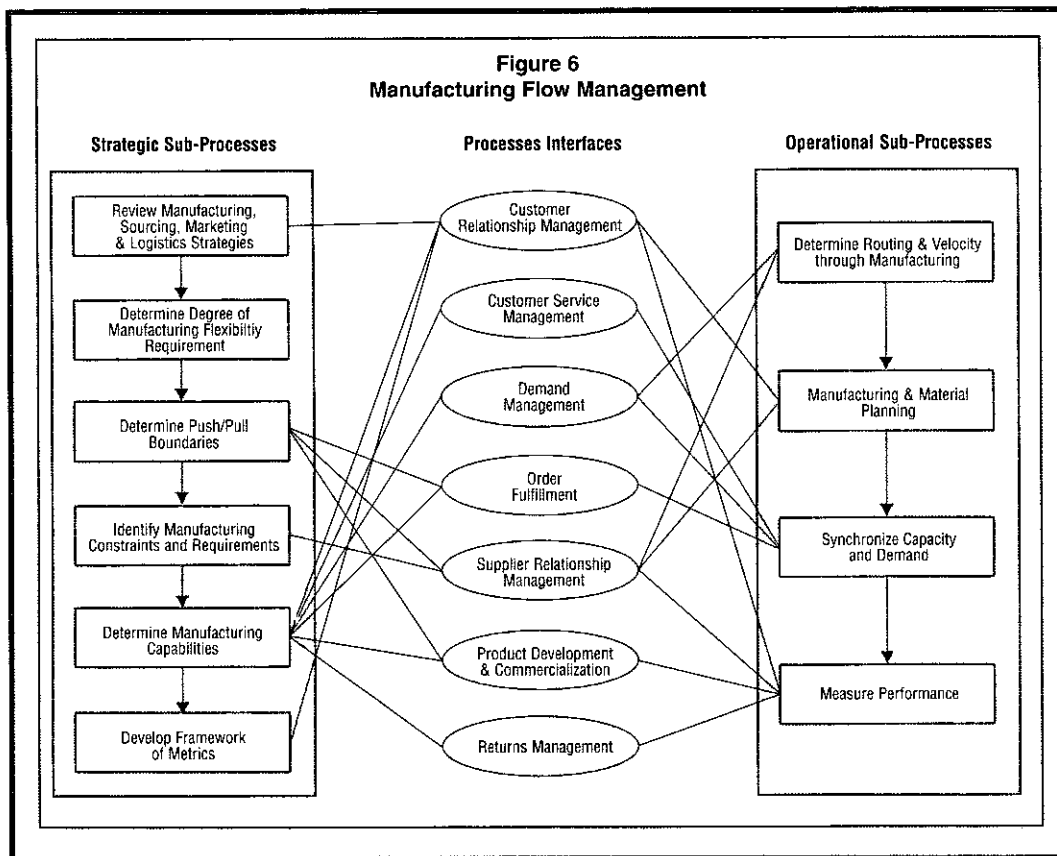
The manufacturing flow process deals with making the products and establishing the manufacturing flexibility needed to serve the

target markets. The process includes all activities necessary for managing the product flow through the manufacturing facilities and for obtaining, implementing and managing flexibility.

The Strategic Process

At the strategic level, the objective of manufacturing flow is to determine the manufacturing infrastructure needed for fulfilling the customers' needs and wants (see Figure 6). The process begins with the team reviewing the functional business strategies from marketing, logistics, manufacturing and purchasing. This sub-process requires interfaces with customer relationship management, where the corporate and marketing strategies are reviewed. These strategies help identify the expertise and the changes in the manufacturing technology that are needed to operationalize manufacturing flow. Incompatibility between the manufacturing process and market characteristics may have "unfavorable impact on business performance" [22]. In the same vein, environmental aspects of manufacturing set by the business plan, corporate strategy, and the

The manufacturing flow process deals with making the products and establishing the manufacturing flexibility needed to serve the target markets.



environmental laws have to be taken into account. Manufacturing strategy is linked to the corporate strategy since environmental management practices may strengthen the firm's competitive advantage [23].

The objective of the second sub-process is to determine the degree of manufacturing flexibility the firm and the supply chain require. This sub-process provides the manufacturing capabilities and constraints, such as the minimum batch size and cycle time, the labor expertise needed for manufacturing, and the quality policy and controls. Product development and commercialization, and order fulfillment provide input to this sub-process. The team defines the make/buy strategies, for example, what manufacturing activities are regarded as strategic and should not be outsourced at any cost? These strategies provide indications to supplier relationship management about supplier selection and eventually the guidance of partnership opportunities. In the last activity of this sub-process, the team plans capacity growth based on the marketing strategy and the business plan.

The degree of flexibility established in the previous sub-process leads to the determination of the push-pull boundaries. The customer tolerance time (the time the customer is willing to wait for an order) and the customer service goals constrain the extent to which manufacturing can be postponed in the supply chain. Postponement promises to be beneficial to the supply chain, but might lead to longer delivery times [24]. The degree to which the firm postpones manufacturing and logistics activities depend to a great extent on the design of the products; therefore, the product development and commercialization process provides input for setting the push-pull boundaries. In order to determine the push-pull boundaries for the supply chain, the team identifies the decoupling point separating the part of the supply chain operating in a make-to-order environment from the part of the supply chain based on planning [25], which is the typical make-to-stock operating environment. The push-pull boundaries help to determine the stocking points in the supply chain for servicing manufacturing facilities, distribution centers and customers. These stocking points, referred to as decoupling

points, permit the downstream section of the supply chain to operate independently from the upstream section [26]. The decisions made in this sub-process are communicated to the supplier relationship management team since the push-pull boundaries affect the interactions with the suppliers. Similarly, coordination with order fulfillment is necessary for establishing lead-times and stocking requirements.

The objective of the next sub-process is to identify manufacturing constraints and requirements to help determine the capabilities of the supply chain. The role of suppliers and the supplier development strategy is an important component of this sub-process for defining the extent to which activities in the supply chain are synchronized. The process team designs communication mechanisms for synchronizing the activities with minimal management effort. They also develop acceptance criteria for establishing the quality standards expected at each step of the manufacturing process. Performing these activities may lead to identifying needs for the suppliers that can be included in a supplier development program; if so, this is an input for the supplier relationship management process.

In the next sub-process, the team determines the manufacturing capabilities and translates them into deliverables to the customer. For example, the minimum cycle time and the minimum economically viable lot size is a result of the design of the manufacturing capabilities. For a strategy to be effective, it must be communicated and understood throughout the organization [27]. At this point, the manufacturing flow and customer relationship management teams discuss the possible features of the PSA, and adjust infeasible features. The capabilities are communicated to the demand management, order fulfillment, and returns process teams. Further, the customer service management team receives the order acceptance guidelines. The team uses these guidelines every time a customer has a request. They help to identify which customers' requests can be fulfilled. Some requests require additional management time to evaluate their economic and technical viability.

The push-pull boundaries help to determine the stocking points in the supply chain for servicing manufacturing facilities, distribution centers and customers.

In the final sub-process, the team develops the metrics framework and communicates it to the customer relationship management team. These metrics measure the effectiveness of the manufacturing flow process and might include cycle time, inventory levels, and product quality.

The Operational Process

Manufacturing flow at the operational level looks like operations management internal to the firm. However, certain characteristics of the process are designed to integrate internal operations management with activities in the supply chain. In the first sub-process, the team determines the routing and velocity through manufacturing. This step includes developing a master production schedule by translating the output of demand management into resource and production planning. The team integrates the capacity of the manufacturing facilities into these decisions to assure no disruptions in the product flow. This sub-process interacts with demand management to establish manufacturing priorities, and with supplier relationship management to set priorities for suppliers and to gain their commitment of resources.

In the next step, manufacturing and material planning, the process team produces a detailed capacity plan and a time-phased requirement plan. Interfaces with the customer relationship management and supplier relationship management processes extend the focus of this sub-process to other supply chain members. Manufacturing planning and control encompasses creating the overall manufacturing plan, performing the detailed planning of materials and capacity needs, and executing these plans [28].

Next, capacity and demand are synchronized. This step identifies what inventory levels are needed for synchronizing the activities of the many supply chain members. Inventory includes raw materials, work-in-process, sub-components, and packaging at the different tiers. This step requires input from demand management and order fulfillment, and provides output to customer service management.

The final step in the manufacturing flow process, measuring performance, includes more than just tracking process measures, and reporting them to the customer relationship

management and supplier relationship management teams. It includes analyzing product quality and examining the root causes of quality problems. The manufacturing flow process team is responsible for finding solutions to quality issues. This might involve working with supplier relationship management, product development and commercialization, or returns management.

Supplier Relationship Management

Supplier relationship management is the process that defines how a company interacts with its suppliers. As the name suggests, this is a mirror image of customer relationship management. Just as a company needs to develop relationships with its customers, it needs to foster relationships with its suppliers. As in the case of customer relationship management, a company should forge close relationships with a small subset of its suppliers, and maintain more traditional relationships with the others [29]. Each supplier agrees to a PSA that defines the terms of the relationship. Supplier relationship management is about defining and managing these PSAs.

The Strategic Process

At the strategic level, the output of the process is an understanding of the levels of relationships the firm will maintain, and the process for segmenting the suppliers and working with them to develop appropriate PSAs. To do this, the process team first reviews the corporate, manufacturing and sourcing strategies, and identifies product and service components that are key to the organization's success now and in the future (see Figure 7).

With these key components driving the decisions, the team identifies criteria for categorizing suppliers. Criteria to examine might include, but are not limited to: the supplier's profitability, growth and stability; the criticality or required service level of the components purchased; the sophistication and compatibility of the supplier's process implementation; the supplier's technological capabilities and compatibility; the volume purchased from the supplier; the capacity available from the supplier; the culture of innovation at the supplier; and, the supplier's

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anticipated quality levels.

The team determines which of these criteria should be used and how a supplier will be measured on each one. They develop a categorization scheme that will guide the operational team on determining the firm's key suppliers, and grouping other suppliers into segments.

Key suppliers work with customized PSAs; other suppliers work with standard PSAs with little to no customization. Therefore, a standard PSA is written for each supplier segment. For key suppliers, the team provides guidelines for the degree of customization that is acceptable. To do this, they consider the quality and cost implications of various differentiation alternatives, and select the boundaries for the degree of customization that might be required or desired. At this step, the team interfaces with each of the other processes because they need to understand the degree of differentiation that is desirable as well as be ready to design systems for supporting these alternatives. For example, examining the demand management process might lead the team to consider implementing CPFR with

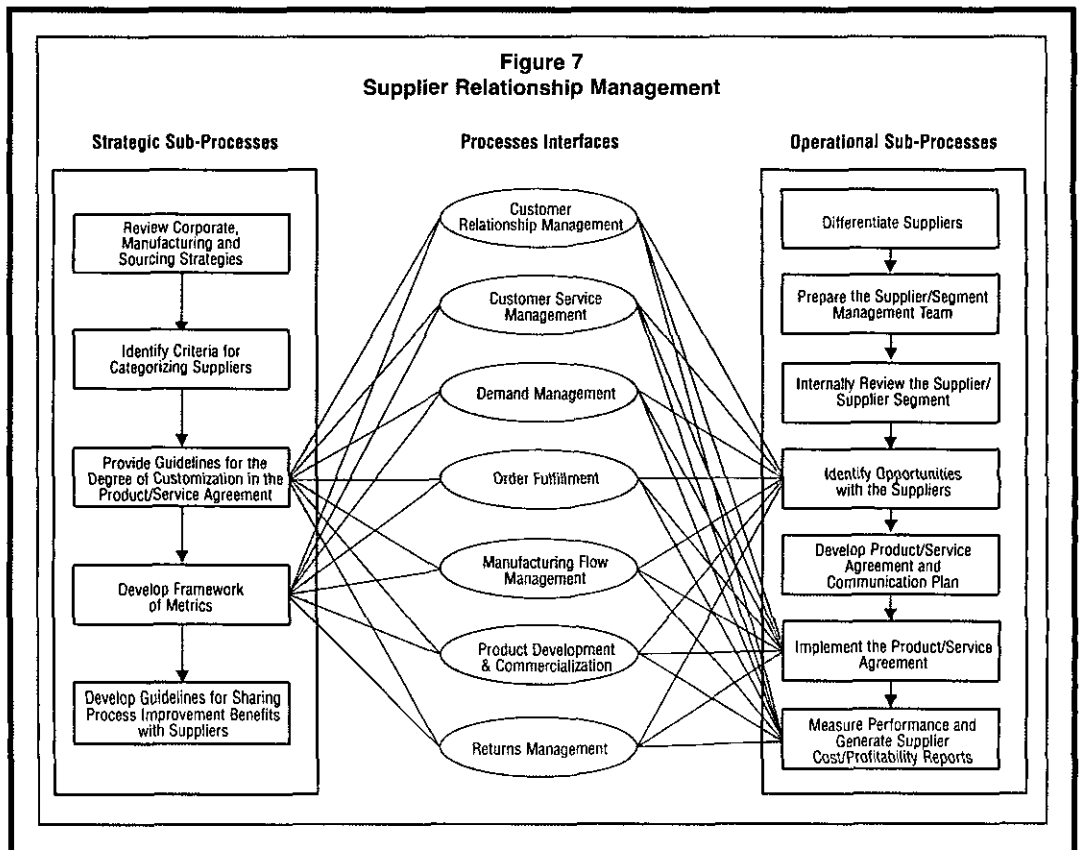
some of the suppliers, but doing so might require implementing new technology and making changes to the existing demand management process.

As with each of the other supply chain processes, an important step at the strategic level is developing the metrics framework. This is particularly critical in the supplier relationship management process because these metrics measure the success of the firm's relationship with its suppliers. With these metrics management sees the impact of the integration in the supply chain. It is important that the team relates these metrics to the supplier's impact on the firm's profitability as well as the profitability of the supplier. It is key that the team performs profitability analyses because management can use these to sell the value of supply chain activities [30]. Improvements from suppliers may have impact throughout the organization and these should be reflected in supplier cost or profitability reports.

It is important for the supplier relationships to be win-win. If both parties do not gain from the relationship, the incentive to be in the relationship is diminished and it will

Key suppliers work with customized PSAs; other suppliers work with standard PSAs with little to no customization.

It is important for the supplier relationships to be win-win. If both parties do not gain from the relationship, the incentive to be in the relationship is diminished and it will likely dissolve.



likely dissolve. The supplier relationship management process team must develop guidelines for sharing process improvement benefits with the suppliers. For example, Wal-Mart decided to split cost savings with Procter & Gamble three ways: 1/3 to Wal-Mart, 1/3 to the supplier and 1/3 to the customer [31]. A key to this step of the process is finding ways to easily quantify benefits in financial terms.

The Operational Process

Once the process team determines the criteria for categorization of suppliers and the levels of customization at the strategic level, the operational supplier relationship management process develops and manages the PSAs. First, the team implements the categorization scheme in order to identify key suppliers and supplier segments. This involves analyzing how suppliers impact the firm's profitability and measuring each supplier on the appropriate criteria.

Each key supplier is assigned to a supplier management team. Other suppliers are grouped into segments and a management team is assigned to each segment. Each supplier/segment team is comprised of a team manager and a cross-functional set of team members.

Each supplier/segment team internally reviews the suppliers to assure that they understand the role of that supplier in the supply chain. A supplier team works with each key supplier to identify improvement opportunities within the account. The team examines each of the other supply chain processes, both at the firm and at the supplier, looking for opportunities to increase sales, reduce costs, and improve service.

Next, each team works with a key supplier to negotiate the PSA. Recall that segments of other suppliers receive a standard PSA. For key suppliers, the team customizes the agreement according to the improvement opportunities identified. An important step in developing the PSA for key suppliers is gaining commitment of the company's internal functions, particularly those affected by the customized PSAs. The PSA includes a communication plan between the firm and the supplier and a continuous improvement plan.

Once the suppliers have agreed to the PSA, the supplier teams are responsible for

implementing and managing it. This involves working with the other processes to assure that the PSA is being adhered to, and meeting with the suppliers regularly to monitor progress and performance.

Measuring performance is a critical part of the supplier relationship management process because management needs to assess the success of the firm's relationships. The other process teams communicate supplier-related performance to the account teams who tie these metrics back to the profit of both the firm and the supplier, and report the results both internally and to the supplier.

Product Development and Commercialization

Product development is critical to the continuing success of the firm [32]. Developing new products quickly and getting them to the marketplace in an efficient manner is a major component of corporate success. Time to market is a critical objective of this process [33]. Supply chain management includes integrating customers [34] and suppliers [35] into the product development process in order to reduce time to market. As product life cycles shorten, the right products must be developed and successfully launched in ever-shorter timeframes in order to remain competitive [36].

The Strategic Process

The first step in the strategic portion of the product development and commercialization process is to review the sourcing, manufacturing and marketing strategies to determine how those plans will likely impact product development (see Figure 8). The marketing strategy contains the needs assessment of customers.

Next, the process team develops the idea generation and screening processes. This stage can include determining sources for ideas, considering incentives for developing new products for the focal firm and their suppliers and customers, beginning to develop formalized customer feedback programs, and establishing guidelines for strategic fit. At this point, the product development and commercialization process interfaces with the customer relationship management process to provide the

Supply chain management includes integrating customers and suppliers into the product development process in order to reduce time to market.

It is critical to have the right people from the internal functional silos along with key customers and suppliers involved in the product development and commercialization process.

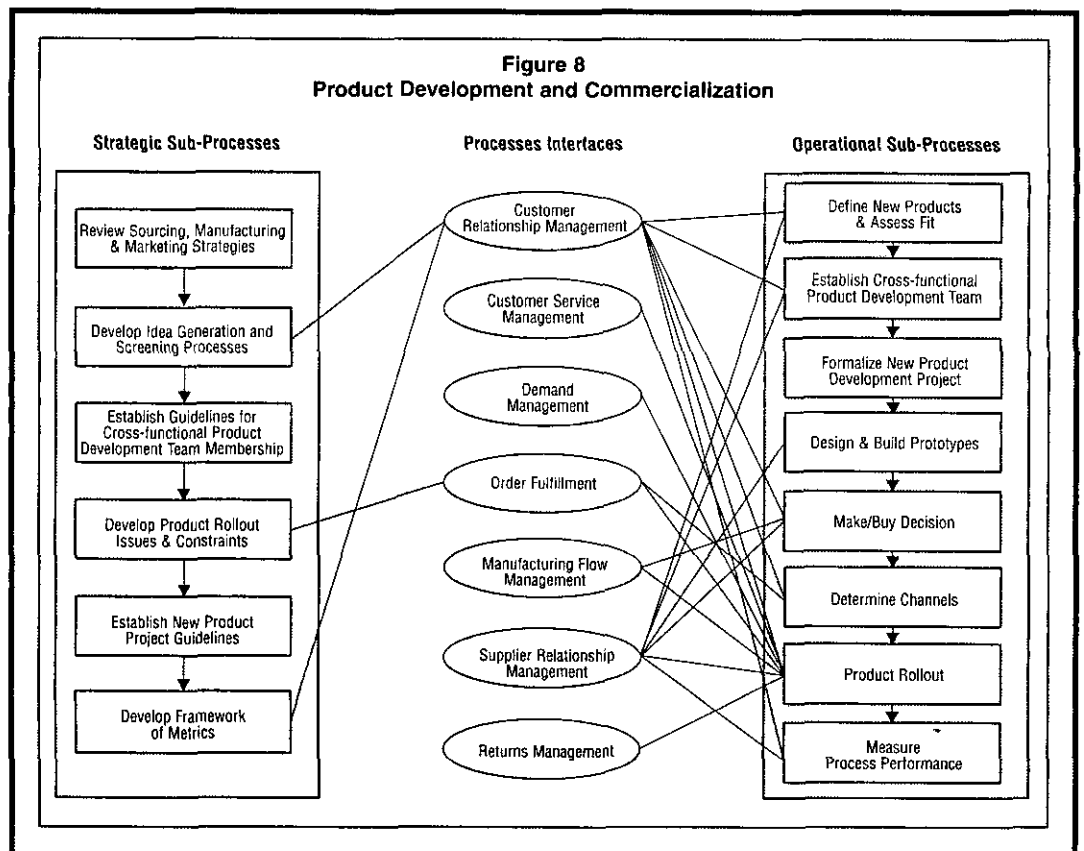
framework that will be used to determine how new products will impact customers and the level of acceptance of those products.

The process team then establishes guidelines for the membership of the cross-functional product development team. It is critical to have the right people from the internal functional silos along with key customers and suppliers involved in the product development and commercialization process. This step includes determining the extent of involvement from both key customers and suppliers. Empirical studies found that firms may form alliances to complement their existing internal knowledge and help them learn about new markets and technologies as well as to reduce overall risk in the product development process [37]. In this stage of the process, the team assesses relative strengths, weaknesses, and roles of personnel to determine who should be involved in the product development and commercialization process. The team examines constraints to determine which resources the firm can utilize on specific new product projects.

The fourth step is to develop product rollout issues and constraints. The team identifies pinch points that could hamper the product development and commercialization process. Activities within this sub-process include market and promotion planning, sales force training, inventory deployment planning, and transportation planning. In this stage of the process, each of the internal functional silos have to be involved to avoid poor product rollouts. In addition, the team obtains input from the order fulfillment team to assess how new products will impact the network flow.

Next, the team establishes new product project guidelines. This includes determining time-to-market and profitability expectations, and estimating the drain on human resources resulting from new product projects. The team establishes guidelines for examining the strategic fit of potential new products and for making the make/buy decision.

The final step to the strategic product development and commercialization process is to develop the framework of metrics. Typical process metrics might include time to market, time to profitability and first year



sales. The metrics are communicated to the customer relationship management team to assure they do not conflict with other metrics or the firm's objectives.

The Operational Process

The first step in the operational product development and commercialization process is to define new products and assess fit. Using the means defined at the strategic level, new product ideas are generated and screened. In this initial screening, the team completes a market assessment, consults with key customers and suppliers, and determines the fit with existing channels, manufacturing, and logistics environments. This involves interfaces with customer relationship management and supplier relationship management, as well as with the functional silos in the firm.

Using the guidelines developed at the strategic level, a cross-functional product development team is established for each product idea that passes the screening process. Key suppliers and customers are included on the team as early as possible in order to compress time to market. Therefore, this sub-process includes an interface with supplier relationship management and customer relationship management. The focal company might also participate in the product development process of a key customer. For example, a supplier of salad dressings may participate in the product development process of a restaurant chain. In such cases, the customer relationship management process team is actively involved.

The team is responsible for formalizing the product development project. This step includes determining time-to-market expectations, identifying likely product profitability scenarios, and further examining the strategic fit of the product within the firm and its key markets.

The product development team manages the process of designing and building prototypes of the product ideas. For example, the auto companies develop concept cars to test new product ideas. In this phase, each team works with suppliers and performs a value analysis to determine what portions of the product design and rollout process add value. They then source materials and manufacture prototypes.

Once the team evaluates the prototypes, they determine how much of the new product should be manufactured in-house. Many firms adopt a short-term perspective for making make/buy decisions. However, these decisions may have strategic implications for the firm. For example, during the development of the personal computer, IBM outsourced the operating system to a small company named Microsoft. This decision may have enabled IBM to bring the PC to market quicker, but with hindsight, it was clearly a strategic error. The make/buy decision "...should be formulated from a strategic perspective with senior management involvement" [38]. Once it is determined what will be sourced, the team assesses supply capabilities and manages requests for quotations. Sourcing decisions require interfaces with the customer relationship management, manufacturing flow and supplier relationship management processes.

In the sixth sub-process, the team determines the marketing and distribution channels for the new product. These channels are defined with input from customer relationship management and order fulfillment. Then, the team develops the market plan for the product and does initial inventory planning.

The next step is the actual product rollout. Many products are unsuccessful due to poor management of product rollout. In this step, the team sources materials, positions inventory, and manufactures the product. They also implement the market plan, train the sales force on the new product offering, and execute the promotion plan. Inventory is deployed using methodologies developed in demand management. It is important that the other process teams are involved in planning and executing the product rollout.

In the final step, the team measures process performance through the metrics developed at the strategic level, and communicates results to the customer relationship management and supplier relationship management teams.

Returns Management

Effective returns management is a critical part of supply chain management. While many firms neglect the returns process because management does not believe it

The focal company might also participate in the product development process of a key customer.

While many firms neglect the returns process because management does not believe it is important, this process can assist the firm in achieving a sustainable competitive advantage.

As part of this sub-process, the team develops procedures for analyzing return rates and tracing the returns back to the root causes.

is important, this process can assist the firm in achieving a sustainable competitive advantage. Effective management of the returns process enables the firm to identify productivity improvement opportunities and breakthrough projects [39].

The Strategic Process

In the first step of the strategic returns process, the team reviews environmental and legal compliance guidelines (see Figure 9). Team members need to understand laws that apply to used products and products planned for disposal. They also need to recognize rules associated with recall campaigns and packaging issues.

Next, the team develops return avoidance, gatekeeping and disposition guidelines. Return avoidance means manufacturing and selling the product in a manner such that returns are minimized. This avoidance can be derived from improved quality or better instructions to the consumer as to how to properly operate the product. Gatekeeping is the screening of defective and unwarranted returned merchandise at the entry point into the reverse logistics process [40]. Improved gatekeeping is a critical factor in making the entire reverse flow manageable and efficient. It assures that only product that should be returned to a specific point in the returns network is indeed returned to that point. Disposition guidelines define as clearly as possible the returned item's ultimate destiny. Typical disposition options include return to supplier, refurbish or remanufacture, recycle, and landfill. The team can examine potential secondary markets including Internet-based auctions or retailers that specialize in returned goods or "seconds".

A firm should be able to make disposition decisions quickly. The team develops the rules in conjunction with other members of the supply chain, as well as with input from other processes, such as customer relationship management, product development and commercialization, and supplier relationship management. Disposition and return reason codes compliant with company policy are developed during this stage of the process.

Next, the team develops the returns network and flow options. During this stage, the team develops plans for transporting and holding returned products until they reach

their final disposition. For some firms, products may be routed to central returns centers where returned items are consolidated and examined. The team also determines what transportation programs the firm will employ. For example, supply chain managers might decide that utilizing backhauls may be the most efficient way of transporting returns. Developing the returns network requires input from customer service management, order fulfillment, and supplier relationship management.

In the fourth step, the process team develops credit rules governing the returns process. At this stage, the finance organizations of the focal firm, and key suppliers and customers negotiate how returned merchandise will be credited. The team establishes credit authorization guidelines and credit policies. Since this involves both suppliers and customers, supplier relationship management and customer relationship management are involved in determining the rules.

The last step of the strategic returns process is developing the framework of metrics and communicating it to the customer relationship management team. Possible metrics are return rates and financial impact of returns. As part of this sub-process, the team develops procedures for analyzing return rates and tracing the returns back to the root causes.

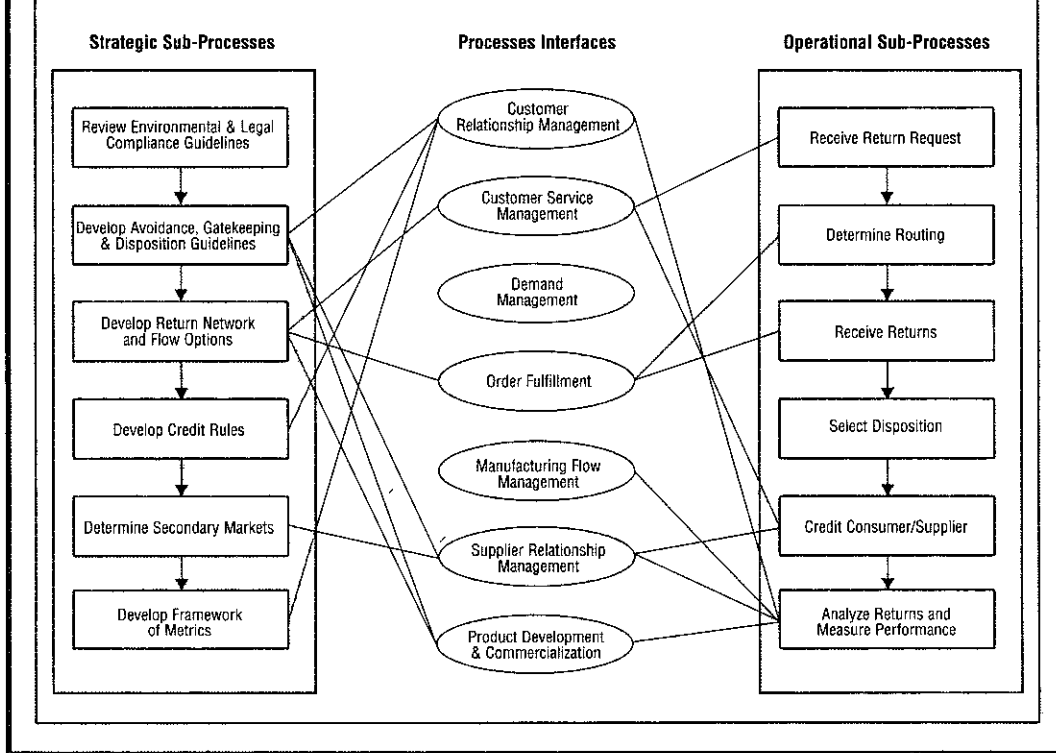
The Operational Process

At the operational level, the returns process is about managing the day-to-day returns activities. The process is initiated when a return request is received from a customer. This customer may be a consumer returning an item, or a retailer or distributor sending back items that did not sell. In some cases, these returns come through the customer service management process.

Once a return request is received, it is necessary to determine the routing for the returned product and generate the return material authorization (RMA) derived from the request. Advanced ship notices are sent, signaling to the receiving firm that the returns are on their way.

Once the item is returned, it is verified, inspected, and processed. This processing should be completed as quickly as possible so that product value does not decrease any

Figure 9
Returns Management



more than necessary. The order fulfillment team may become involved at this point to assist in managing the return flow back to the warehouse or central returns center.

Employees analyze the returns and select the appropriate dispositions using the rules developed in the strategic returns process. The disposition of the product can include return to the supplier, refurbishment, remanufacture, recycling, reselling as is, reselling through a secondary market, or sending the product to a landfill.

Once the returns are processed, credit is given to the appropriate customer, consumer or supplier. In some circumstances, a supplier might be crediting the firm for a return. This sub-process will use the credit authorization guidelines developed in the strategic returns process.

In the final step of the returns process, the team analyzes the causes of the returns and measures process performance. The data on returns are used to make improvements to the product and the processes. This analysis might result in feedback to the customer relationship management, manufacturing flow management, supplier relationship

management, or product development and commercialization processes. This analysis should be used in the ongoing strategic returns process to help develop avoidance guidelines.

Implementing Integrated Supply Chain Management

The implementation of supply chain management involves identifying the supply chain members with whom it is critical to link, the processes to be linked with each of these key members, and the type/level of integration that applies to each process link. The objective of supply chain management is to create the most value for the entire supply chain network, including the end-customer. Successful supply chain management involves the coordination of activities within the firm and between members of the supply chain. Consequently, supply chain process integration and reengineering initiatives should be aimed at boosting total process efficiency and effectiveness across the supply chain.

Although the functional expertise remains in place, implementing supply chain

The implementation of supply chain management involves identifying the supply chain members with whom it is critical to link, the processes to be linked with each of these key members, and the type/level of integration that applies to each process link.

If the proper coordination mechanisms are not in place across the various functions, the supply chain processes will be neither effective nor efficient.

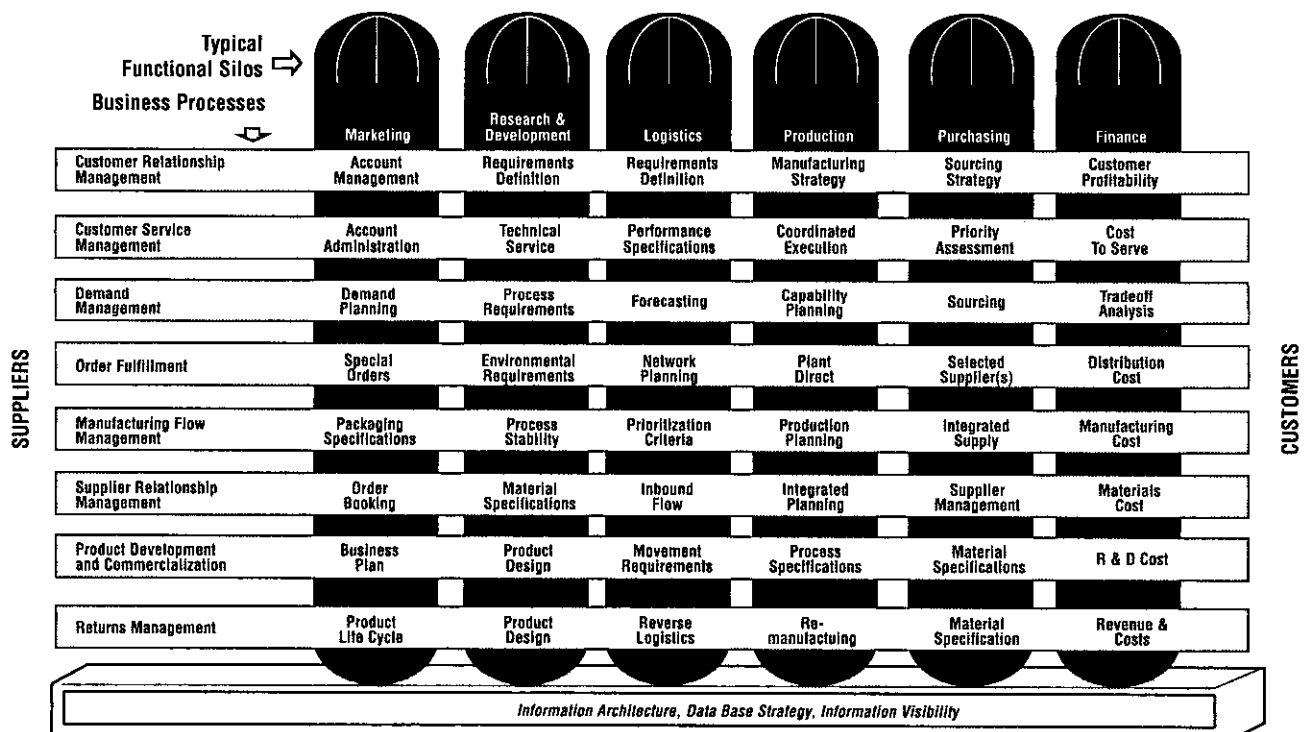
management requires making the transition from a functional organization to one focused on business processes first inside the firm and then across firms in the supply chain. Figure 10 illustrates how each function within the organization can be mapped with the eight supply chain processes. This figure provides examples of activities that might exist at each junction of a functional area and process. For example, in the customer relationship management process marketing provides the account management expertise, research and development provides the specifications which define the requirements, logistics provides knowledge of customer service requirements, production provides the manufacturing strategy, purchasing provides the sourcing strategy, and finance provides customer profitability reports. The customer service requirements are used as input to sourcing, manufacturing, and logistics strategies.

If the proper coordination mechanisms are not in place across the various functions, the supply chain processes will be neither effective nor efficient. By taking a process focus, all functions that touch the product or provide information must work together. For example, purchasing depends on sales and marketing data fed through a production schedule to assess specific order levels and timing of requirements. These orders drive production requirements that, in turn, are transmitted upstream to suppliers.

The increasing use of outsourcing has accelerated the need to coordinate supply chain processes since the organization becomes more dependent on suppliers [41]. Consequently, coordination mechanisms must be in place within the organization. Where to place these coordination mechanisms, and which teams and functions are responsible for managing them become critical decisions.

The requirements for successful

Figure 10
Implementation of Supply Chain Management



Note: Process sponsorship and ownership must be established to drive the attainment of the supply chain vision and eliminate the functional barriers that artificially separate the process flows.

Source: Adapted from Douglas M. Lambert, Larry C. Guinipero and Gary J. Ridenhower, "Supply Chain Management: A Key to Achieving Business Excellence in the 21st Century," unpublished manuscript.

implementation of supply chain management include:

- Executive support, leadership and commitment to change.
- An understanding of the degree of change that is necessary.
- Agreement on the supply chain management vision and the key processes.
- The necessary commitment of resources and empowerment to achieve the stated goals.

Implications and Research Opportunities

There are several implications for practitioners and researchers. While marketing strategy has always considered internal and external constraints, supply chain management makes the explicit evaluation of these factors even more critical. Additionally, traditional functional roles within the firm are changing. Team efforts are becoming more common for developing and marketing new products, as well as managing current ones. The role of the firm's sales force is becoming one of measuring and selling the value proposition for the customer.

This article builds on previous work supported by The Global Supply Chain Forum, in which the structure of supply chain management was described, by providing a more detailed description of the eight processes and their relationships to each other. However, there is much more work that needs to be completed. Research opportunities include:

- How can the relationships between sub-processes and the functional silos be operationalized within firms?
- How can cross-functional teams best work together to optimize supply chain management processes?
- How should the implementation effort across the multiple firms and functions be organized?
- What research is needed to further define each process?
- What are the implications for supply chain management given the shape and length of supply chains in which the firm is involved?
- How should firms in the supply share costs and benefits? What is the detailed interaction between the sub-processes and management components such as the risk

and reward structure or organizational structures?

- What specific metrics should be introduced to evaluate performance beyond the borders of the firm? How can firms within the supply chain optimize total supply chain performance while maximizing the measurement of their own operations [42]?

Conclusions

Since the concept of supply chain management was introduced, there has been a great deal of confusion about what it actually involves. While some managers and researchers continue to use supply chain management interchangeably with logistics, there is an increasing understanding that it is much more than logistics. In recent years, many authors have stressed the importance of implementing supply chain management as part of a process orientation to management. However, most of what is written about supply chain management advocates business process reengineering and integration without specifying the processes that are to be included in these efforts. It would be much easier for management to implement a process orientation within their firm if there were clear guidelines as to what the processes ought to be, what sub-processes and activities are included, and how the processes interact with each other and with the traditional functional silos. Further, how can the members of a supply chain practice process integration if there is not a common understanding of what the business processes are?

The members of The Global Supply Chain Forum identified eight business processes that must be implemented within a firm and then linked up, as appropriate, with key supply chain members [43]. In this paper, we provide strategic and operational descriptions of each of these processes. Our goal is to provide: 1) companies with a common structure for implementing supply chain management, 2) instructors with material that can be used in teaching supply chain management, and 3) researchers with fertile groundwork for delving more deeply into the issues within each process and with their integration between companies. We believe this article provides the framework

While some managers and researchers continue to use supply chain management interchangeably with logistics, there is an increasing understanding that it is much more than logistics.

necessary to develop the theory that will move supply chain management to its next evolutionary stage.

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