# Supply-Chain Operations Reference-model

PLAN SOURCE MAKE DELIVER RETURN

SCOR Overview

Supply-Chain Council



Version 8.0

# Supply-Chain Operations Reference-model

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*The Supply Chain Operations Reference-model (SCOR®) has been developed and endorsed by the Supply-Chain Council (SCC), an independent not-for-profit corporation, as the cross-industry standard for supply-chain management. The SCC was organized in 1996 by Pittiglio Rabin Todd & McGrath (PRTM) and AMR Research, and initially included 69 voluntary member companies. Council membership is now open to all companies and organizations interested in applying and advancing state-of-the-art supply-chain management systems and practices.*

*Member companies pay a modest annual fee to support Council activities. All who use the SCOR-model are asked to acknowledge the SCC in all documents describing or depicting the SCOR-model and its use. The complete SCOR-model and other rleated models of the SCC are only accessable through the members' section of the www.supply-chain.org website. SCC members further model development by participating in project development teams- SCOR and other related SCC Models are collaborative ongoing projects that seek to represent current supply chain and related practice.*

*Further information regarding membership, the Council and SCOR can be found at the Council's web site: www.supply-chain.org.*



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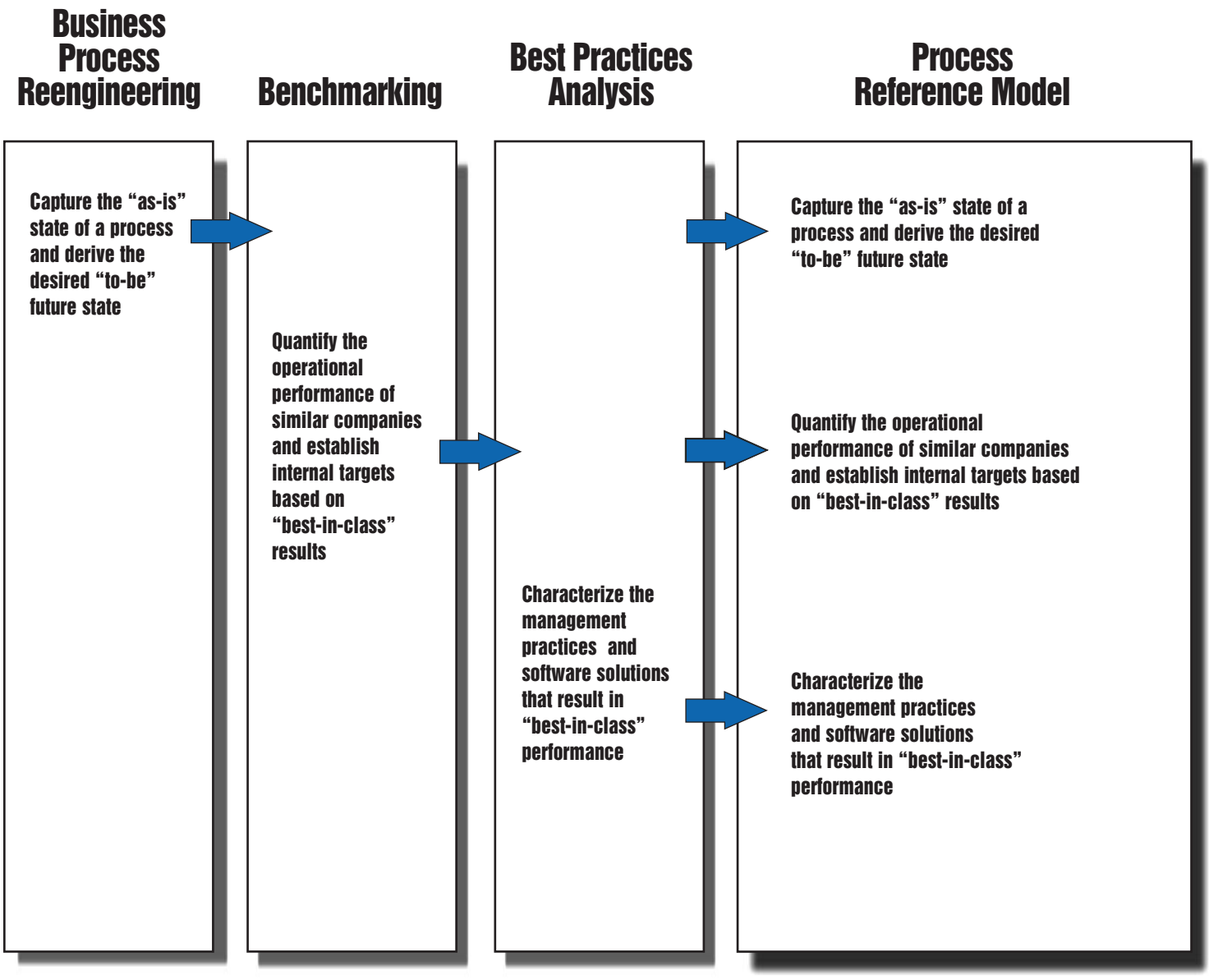
SCOR® Supply-Chain Council

# What Is a Process Reference Model?

Section ONE

Process reference models integrate the well-known concepts of business process reengineering, benchmarking, and process measurement into a cross-functional framework.



## A Process Reference Model Contains:

- Standard descriptions of management processes
- A framework of relationships among the standard processes
- Standard metrics to measure process performance
- Management practices that produce best-in-class performance
- Standard alignment to features and functionality

## Once a Complex Management Process is Captured in Standard Process Reference Model Form, It can Be:

- Implemented purposefully to achieve competitive advantage
- Described unambiguously and communicated
- Measured, managed, and controlled
- Tuned and re-tuned to a specific purpose

# A Process Reference Model Becomes a Powerful Tool in the Hands of Management

Section Two

# Model Scope and Structure

## The Boundaries of Any Model Must Be Carefully Defined

*"From your supplier's supplier to your customer's customer"*

### SCOR spans:

- All customer interactions, from order entry through paid invoice
- All product (physical material and service) transactions, from your supplier's supplier to your customer's customer, including equipment, supplies, spare parts, bulk product, software, etc.
- All market interactions, from the understanding of aggregate demand to the fulfillment of each order

### SCOR does not attempt to describe every business process or activity, including:

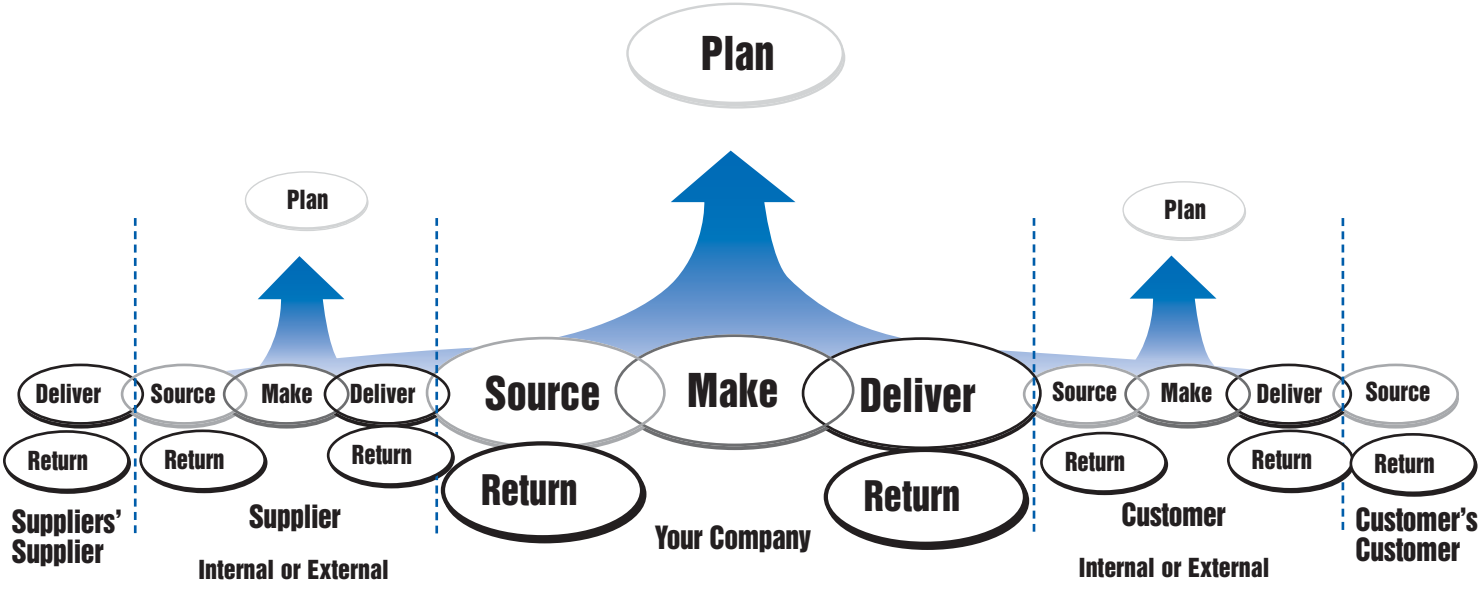
- Sales and marketing (demand generation)
- Research and technology development
- Product development
- Some elements of post-delivery customer support

Links can be made to processes not included within the model's scope, such as product development, and some are noted in SCOR.

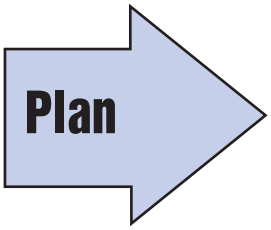
### SCOR assumes but does not explicitly address:

- Training
- Quality
- Information Technology (IT)
- Administration (non SCM)

### SCOR is Based on Five Distinct Management Processes

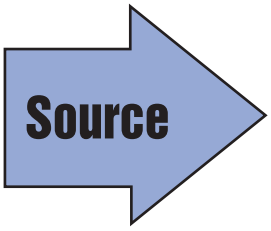


# Scope of SCOR Processes



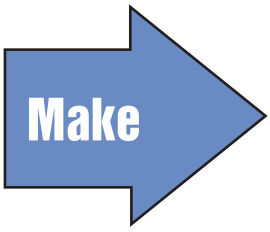

## Demand/Supply Planning and Management

- Balance resources with requirements and establish/communicate plans for the whole supply chain, including Return, and the execution processes of Source, Make, and Deliver.
- Management of business rules, supply chain performance, data collection, inventory, capital assets, transportation, planning configuration, and regulatory requirements and compliance.
- Align the supply chain unit plan with the financial plan.




## Sourcing Stocked, Make-to-Order, and Engineer-to-Order Product

- Schedule deliveries; receive, verify, and transfer product; and authorize supplier payments.
- Identify and select supply sources when not predetermined, as for engineer-to-order product.
- Manage business rules, assess supplier performance, and maintain data.
- Manage inventory, capital assets, incoming product, supplier network, import/export requirements, and supplier agreements.




## Make-to-Stock, Make-to-Order, and Engineer-to-Order Production Execution

- Schedule production activities, issue product, produce and test, package, stage product, and release product to deliver.
- Finalize engineering for engineer-to-order product.
- Manage rules, performance, data, in-process products (WIP), equipment and facilities, transportation, production network, and regulatory compliance for production.


## Order, Warehouse, Transportation, and Installation Management for Stocked, Make-to-Order, and Engineer-to-Order Product

- All order management steps from processing customer inquiries and quotes to routing shipments and selecting carriers.
- Warehouse management from receiving and picking product to load and ship product.
- Receive and verify product at customer site and install, if necessary.
- Invoicing customer.
- Manage Deliver business rules, performance, information, finished product inventories, capital assets, transportation, product life cycle, and import/export requirements.

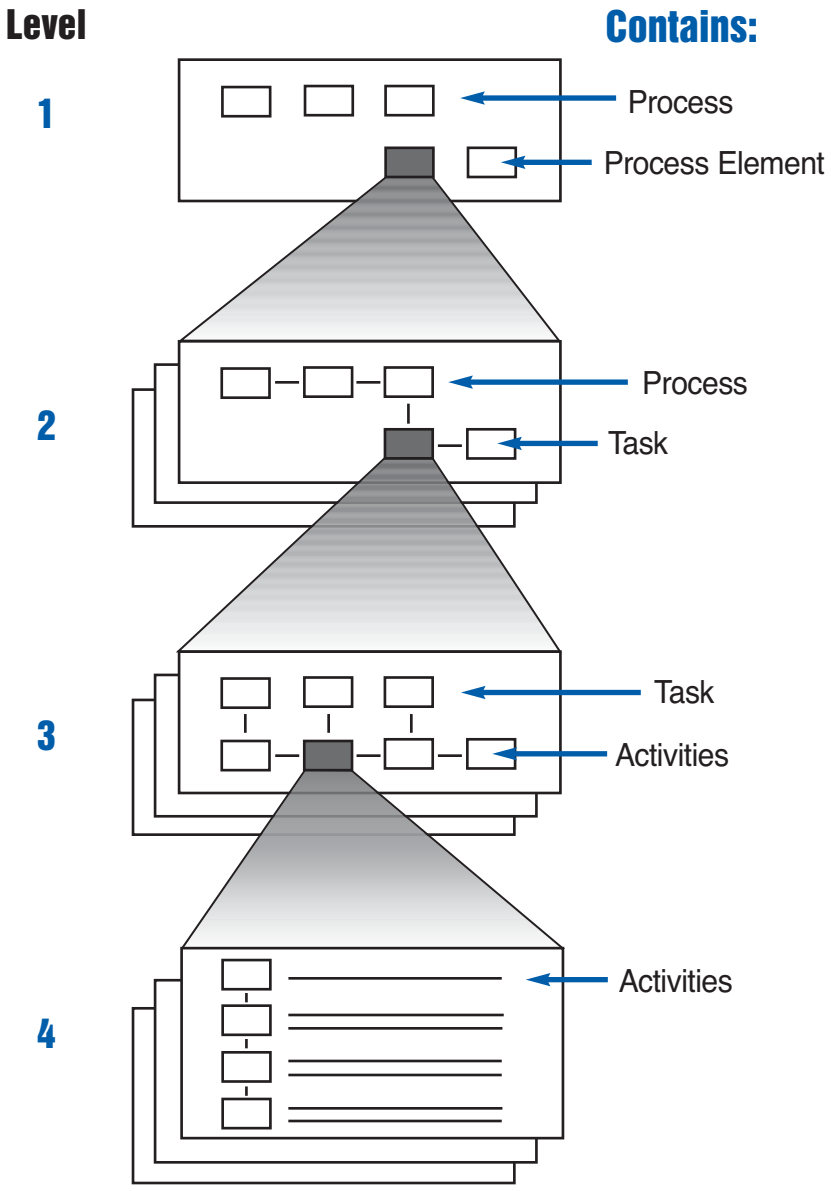

## Return of Raw Materials and Receipt of Returns of Finished Goods

- All Return Defective Product steps from source – identify product condition, disposition product, request product return authorization, schedule product shipment, and return defective product – and deliver – authorized product return, schedule return receipt, receive product, and transfer defective product.
- All Return Maintenance, Repair, and Overhaul product steps from source – identify product condition, disposition product, request product return authorization, schedule product shipment, and return MRO product – and deliver – authorize product return, schedule return receipt, receive product, and transfer MRO product.
- All Return Excess Product steps from source – identify product condition, disposition product, request product return authorization, schedule product shipment, and return excess product – and deliver – authorize product return, schedule return receipt, receive product, and transfer excess product.
- Manage Return business rules, performance, data collection, return inventory, capital assets, transportation, network configuration, and regulatory requirements and compliance.

# A Process Reference Model Differs from Classic Process Decomposition Models

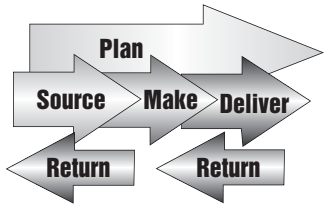
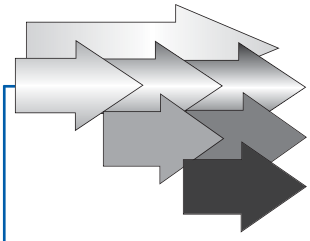
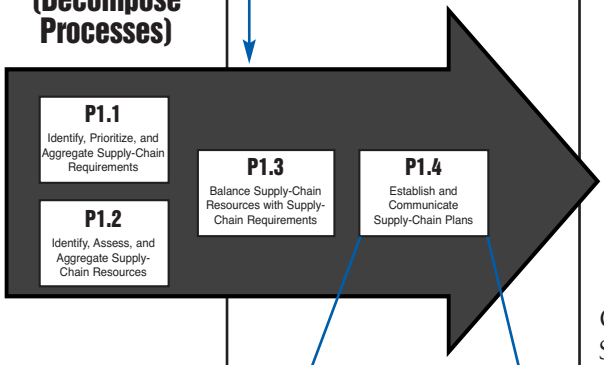
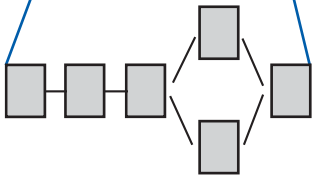
SCOR is a process reference model that provides a language for communicating among supply-chain partners

- **Process decomposition models are developed to address one specific configuration of process elements**




- **Provide a balanced horizontal (cross-process) and vertical (hierarchical) view**
- **Designed to be (re)configurable**
- **Used to represent many different configurations of a similar process**
- **Aggregate a series of hierarchical process models**

# SCOR Contains Three Levels of Process Detail

| | Level # | Description | Schematic | Comments |
|---|---|---|---|---|
| Supply-Chain Operations Reference-model | 1 | Top Level (Process Types) |   | Level 1 defines the scope and content for the Supply Chain Operations Reference-model. Here basis of competition performance targets are set. |
| | 2 | Configuration Level (Process Categories) |  | A company's supply chain can be "configured-to-order" at Level 2 from core "process categories." Companies implement their operations strategy through the configuration they choose for their supply chain. |
| | 3 | Process Element Level (Decompose Processes) |   | Level 3 defines a company's ability to compete successfully in its chosen markets, and consists of:<br>• Process element definitions<br>• Process element information inputs, and outputs<br>• Process performance metrics<br>• Best practices, where applicable<br>• System capabilities required to support best practices<br>• Systems/tools<br>Companies "fine tune" their Operations Strategy at Level 3. |
| Not in Scope | 4 | Implementation Level (Decompose Process Elements) |  | Companies implement specific supply-chain management practices at this level. Level 4 defines practices to achieve competitive advantage and to adapt to changing business conditions. |

# Process Categories

Defined by the Relationship Between a SCOR Process and a Process Type

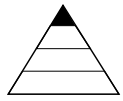
**"SCOR Configuration Toolkit"**

| | | SCOR Process | | | | | |
|---|---|---|---|---|---|---|---|
| | | Plan | Source | Make | Deliver | Return | |
| Process Type | Planning | P1 | P2 | P3 | P4 | P5 | Process Category |
| | Execution | | S1 - S3 | M1 - M3 | D1 - D4 | SR1 - SR3 | |
| | Enable | EP | ES | EM | ED | DR1 - DR3 | |

*Practitioners select appropriate process categories from the SCOR configuration toolkit to represent their supply-chain configuration(s).*

## Level 1 Process Definitions

SCOR Is Based on Five Core Management Processes



| SCOR Process | Definitions |
|---|---|
| Plan | Processes that balance aggregate demand and supply to develop a course of action which best meets sourcing, production and delivery requirements |
| Source | Processes that procure goods and services to meet planned or actual demand |
| Make | Processes that transform product to a finished state to meet planned or actual demand |
| Deliver | Processes that provide finished goods and services to meet planned or actual demand, typically including order management, transportation management, and distribution management |
| Return | Processes associated with returning or receiving returned products for any reason. These processes extend into post-delivery customer support |

# Performance Attributes and Level 1 Metrics

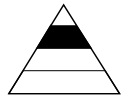
Level 1 Metrics are primary, high level measures that may cross multiple SCOR processes. Level 1 Metrics do not necessarily relate to a SCOR Level 1 process (PLAN, SOURCE, MAKE, DELIVER, RETURN).

| Level 1 Metrics | Performance Attributes | | | | |
|---|---|---|---|---|---|
| | Customer-Facing | | | Internal-Facing | |
| | Reliabilty | Responsiveness | Flexibility | Cost | Assets |
| Perfect Order Fulfillment | ✔ | | | | |
| Order Fulfillment Cycle Time | | ✔ | | | |
| Upside Supply Chain Flexibility | | | ✔ | | |
| Upside Supply Chain Adaptability | | | ✔ | | |
| Downside Supply Chain Adaptability | | | ✔ | | |
| Supply Chain Management Cost | | | | ✔ | |
| Cost of Goods Sold | | | | ✔ | |
| Cash-to-Cash Cycle Time | | | | | ✔ |
| Return on Supply Chain Fixed Assets | | | | | ✔ |
| Return on Working Capital | | | | | ✔ |

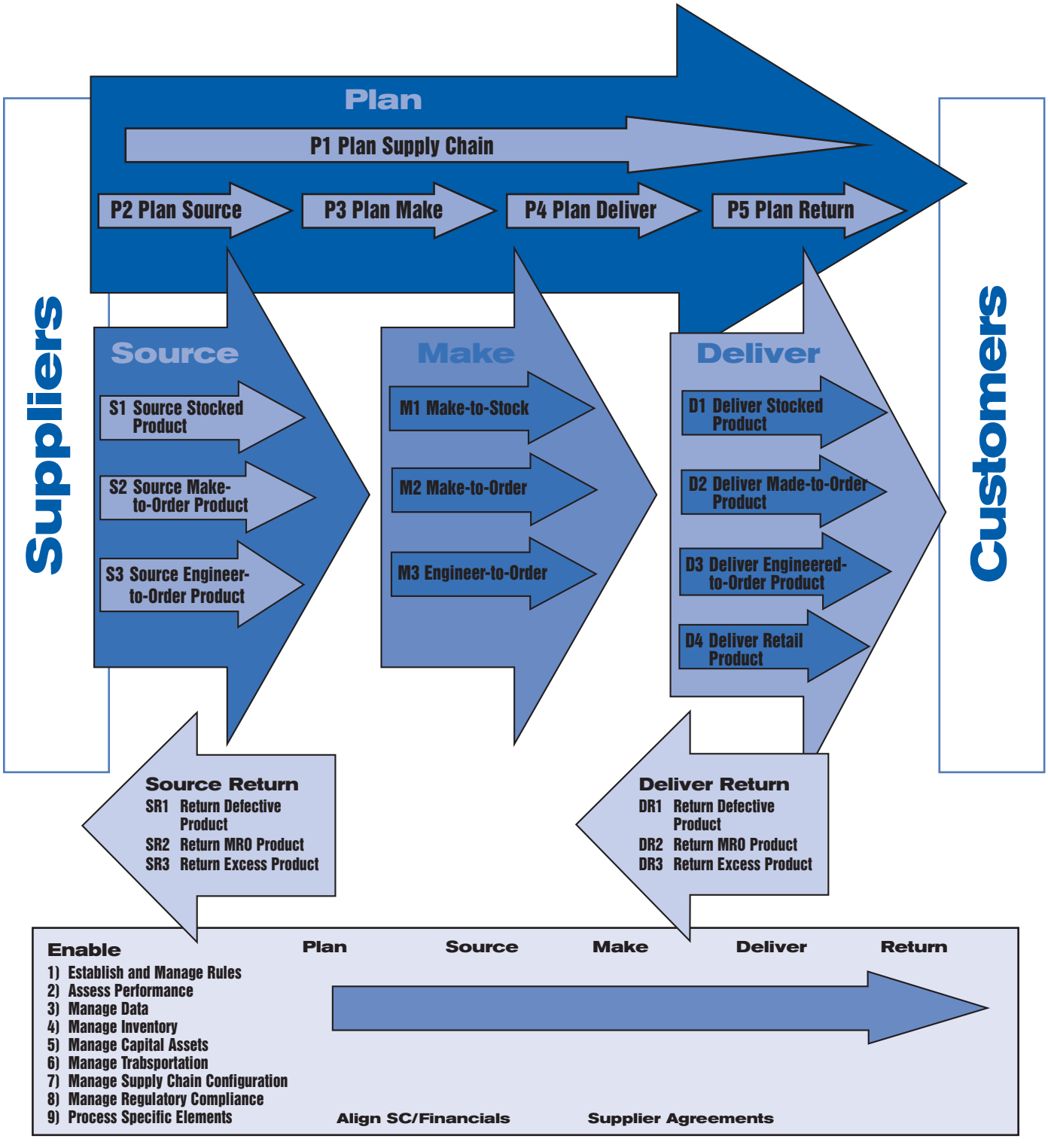
*The Level 1 Metrics are the calculations by which an implementing organization can measure how successful they are in achieving their desired positioning within the competitive market space. Most metrics in the Model are hierarchical – just as the process elements are hierarchical. Level 1 Metrics are created from lower level calculations and are primary, high level measures that may cross multiple SCOR processes.*

*Lower level calculations (Level 2 and 3 metrics) are generally associated with a narrower subset of processes. Level 2 and 3 metrics associated with Level 1 metrics are included in the SCOR 8.0 Appendix A. Additional metrics that do not "roll up" to Level 1 are needed as diagnostics (used to diagnose variations in performance against plan) and are included in the SCOR Process Tables and Glossary.*

# At Level 2, Each Process Can Be Further Described by Type



| SCOR Process Type | Characteristics |
|---|---|
| **Planning** | A process that aligns expected resources to meet expected demand requirements.<br>Planning processes:<br>• Balance aggregated demand and supply<br>• (Generally) occur at regular, periodic intervals<br>• Consider consistent planning horizon<br>• Can contribute to supply-chain response time |
| **Execution** | A process triggered by planned or actual demand that changes the state of material goods.<br>Execution processes:<br>• Generally involve -<br>1. Scheduling/sequencing<br>2. Transforming product, and/or<br>3. Moving product to the next process<br>• Can contribute to the order fulfillment cycle time |
| **Enable** | A process that prepares, maintains, or manages information orrelationships on which planning and execution processes rely |


Plan
P1 Plan Supply Chain
P2 Plan Source
P3 Plan Make
P4 Plan Deliver
P5 Plan Return
Suppliers
Customers
Source
S1 Source Stocked Product
S2 Source Make-to-Order Product
S3 Source Engineer-to-Order Product
Make
M1 Make-to-Stock
M2 Make-to-Order
M3 Engineer-to-Order
Deliver
D1 Deliver Stocked Product
D2 Deliver Made-to-Order Product
D3 Deliver Engineered-to-Order Product
D4 Deliver Retail Product
Source Return
SR1 Return Defective Product
SR2 Return MRO Product
SR3 Return Excess Product
Deliver Return
DR1 Return Defective Product
DR2 Return MRO Product
DR3 Return Excess Product
Enable
1) Establish and Manage Rules
2) Assess Performance
3) Manage Data
4) Manage Inventory
5) Manage Capital Assets
6) Manage Trabsportation
7) Manage Supply Chain Configuration
8) Manage Regulatory Compliance
9) Process Specific Elements
Plan
Source
Make
Deliver
Return
Align SC/Financials
Supplier Agreements

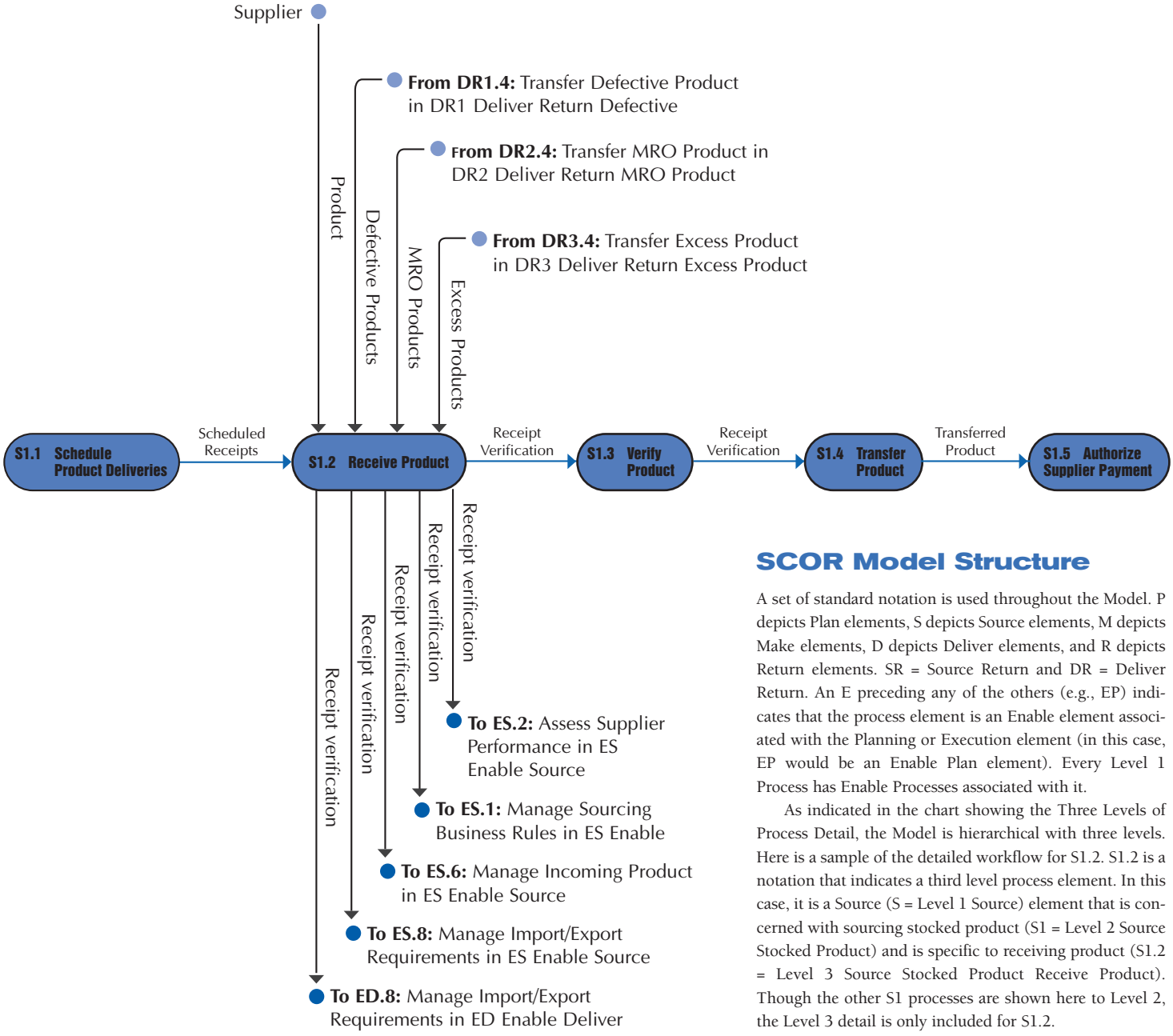
# SCOR Level 3

Presents Detailed Process Element Information for Each Level 2 Process Category

- Process flow
- Inputs and outputs
- Source of inputs
- Output destination

## S1 Source Stocked Product

*S1.2 Detail*




### SCOR Model Structure

A set of standard notation is used throughout the Model. P depicts Plan elements, S depicts Source elements, M depicts Make elements, D depicts Deliver elements, and R depicts Return elements. SR = Source Return and DR = Deliver Return. An E preceding any of the others (e.g., EP) indicates that the process element is an Enable element associated with the Planning or Execution element (in this case, EP would be an Enable Plan element). Every Level 1 Process has Enable Processes associated with it.

As indicated in the chart showing the Three Levels of Process Detail, the Model is hierarchical with three levels. Here is a sample of the detailed workflow for S1.2. S1.2 is a notation that indicates a third level process element. In this case, it is a Source (S = Level 1 Source) element that is concerned with sourcing stocked product (S1 = Level 2 Source Stocked Product) and is specific to receiving product (S1.2 = Level 3 Source Stocked Product Receive Product). Though the other S1 processes are shown here to Level 2, the Level 3 detail is only included for S1.2.

# Examples

SCOR Level 3 Standard Process Element Definition, Performance

## Process Element S1.1: Schedule Product Deliveries

### Process Element Definition

*Scheduling and managing the execution of the individual deliveries of product against an existing contract or purchase order. The requirements for product releases are determined based on the detailed sourcing plan or other types of product pull signals.*

| Metric | Definition |
|---|---|
| % Schedules Changed within Supplier's Lead Time | The number of schedules that are changed within the suppliers lead-time divided by the total number of schedules generated within the measurement period |
| Average Days per Engineering Change | # of days each engineering change impacts the delivery date divided by the total # of changes. |
| Average Days per Schedule Change | # of days each schedule change impacts the delivery date divided by the total # of changes. |
| Average Release Cycle of Changes | Cycle time for implementing change notices divided by total # of changes. |
| Cost to Schedule Product Deliveries | The sum of the costs associated with scheduling product deliveries. |
| Schedule Product Deliveries Cycle Time | The average time associated with scheduling the shipment of the return of MRO product |

| Best Practices | Definition |
|---|---|
| Advanced Ship Notices Allow for Tight Synchronization between Source and MakeProcesses | Blanket order support with scheduling interfaces to external supplier systems |
| Consignment Agreements Are Used to Reduce Assets and Cycle Time While Increasing the Availability of Critical Items | Consignment inventory management |
| Mechanical (Kanban) Pull Signals Are Used to Notify Suppliers of the Need to Deliver Product | Electronic Kanban support |
| Utilize EDI Transactions to Reduce Cycle Time and Costs | EDI interface for 830, 850, 856 & 862 transactions |

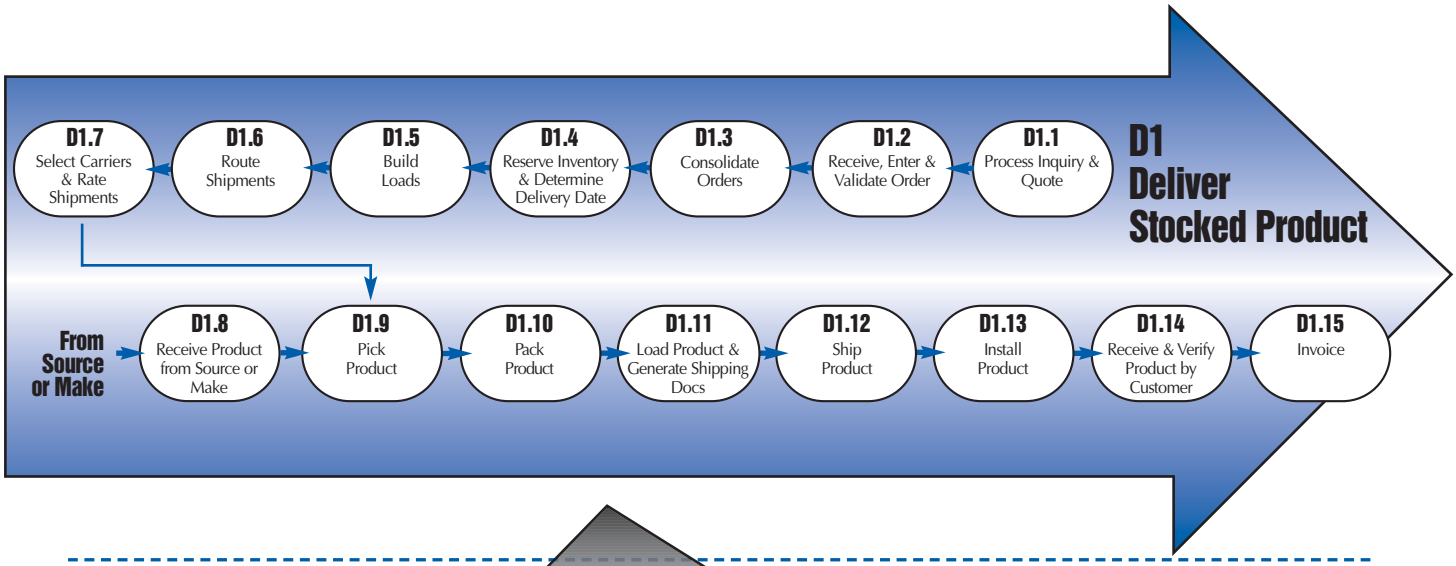
## Process Element S1.1: Schedule Product Deliveries

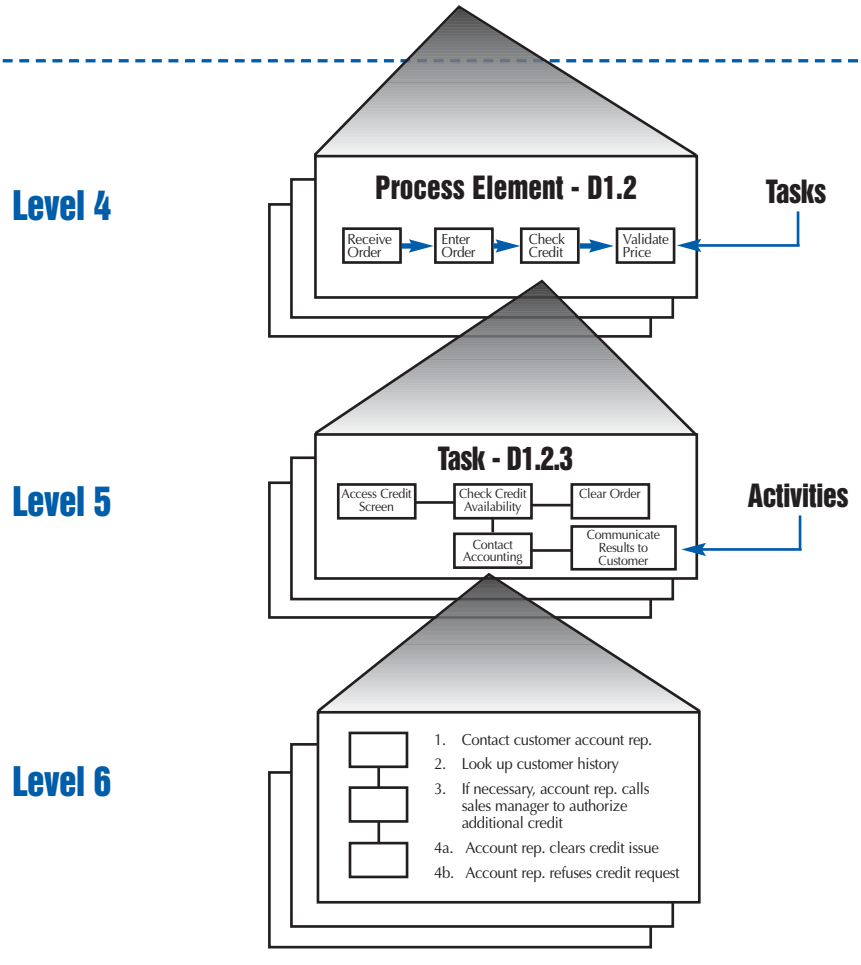
| Intputs | Definition |
|---|---|
| Logistics Selection from ES.6 Manage Incoming Product | Carrier selection and management for inbound or outbound shipments (linked to terms of delivery) |
| Production Schedule from M2.1 Schedule Production Activities<br>Production Schedule from M3.2 Schedule Production Activities<br>Production Schedule from M1.1 Schedule Production Activities | A plan that authorizes the factory to manufacture or repair a certain quantity of a specific item. |
| Replenishment Signal from M3.3 Issue Sourced/In-Process Product<br>Replenishment Signal from D1.3 Reserve Inventory & Determine Delivery Date<br>Replenishment Signal from M2.2 Issue Sourced/In-Process Product<br>Replenishment Signal from M1.2 Issue Material | Any signal that indicates when to produce or transport Items in a pull replenishment system. |
| Return Inventory Transfer Data from DR3.4 Transfer Excess Product<br>Return Inventory Transfer Data from DR2.4 Transfer MRO Product<br>Return Inventory Transfer Data from DR1.4 Transfer Defective Product | The process of receipt and verification of the returned item against the return authorization and other documentation and prepares the item for transfer. |
| Sourcing Plans from P2.4 Establish Sourcing Plans | An aggregate material requirements plan used to schedule material deliveries to meet production plan. |
| Supplier Performance from ES.2 Assess Supplier Performance | The results of measuring the actual supplier performance on cost, quality, engineering, purchasing, and so on, based on an agreed set of measurements. |

## Process Element S1.1: Schedule Product Deliveries

| Outputs | Definition |
|---|---|
| Procurement Signal (Supplier) to Supplier | Any signal that indicates when to produce or transport Items in a pull replenishment system, or the signal that sends the estimated need of parts or services to the supplier. |
| Product On Order to P2.2 Identify, Assess, And Aggregate Product Resources | Product on order with a selected source. |
| Product On Order to ES.9 Manage Supplier Agreements | |
| Scheduled Receipts to D1.8 Receive Product from Source or Make | Product due to arrive. |
| Scheduled Receipts to M1.1 Schedule Production Activities | |
| Scheduled Receipts to S1.2 Receive Product | |
| Scheduled Receipts to D4.2 Receive Product at Store | |
| Scheduled Receipts to M2.1 Schedule Production Activities | |
| Scheduled Receipts to M3.2 Schedule Production Activities | |

# Implementation of Supply-Chain Management Practices within the Company Occurs at Level 4 *(and below)*




▶ **Below Level 3, each process element is described by classic hierarchical process decomposition**

Section Three

# Applying the SCOR Model

## The Concept of "Configurability"

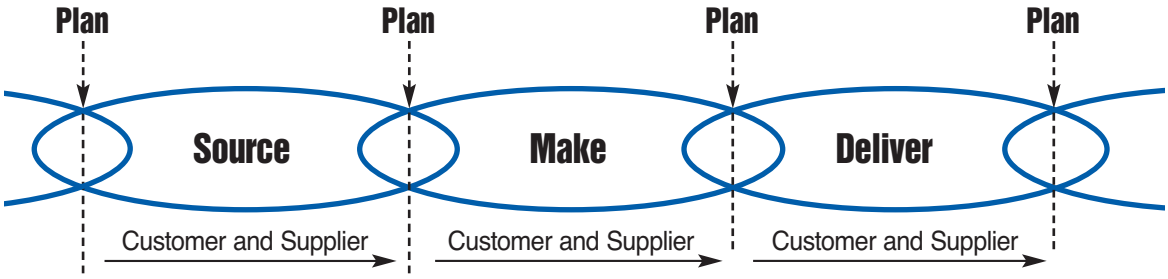
A supply-chain configuration is driven by:

- **Plan** levels of aggregation and information sources
- **Source** locations and products
- **Make** production sites and methods
- **Deliver** channels, inventory deployment and products
- **Return** locations and methods

SCOR must accurately reflect how a supply-chain's configuration impacts management processes and practices.

## Each Basic Supply-Chain is a "Chain" of Source, Make, and Deliver Execution Processes

### Configurability



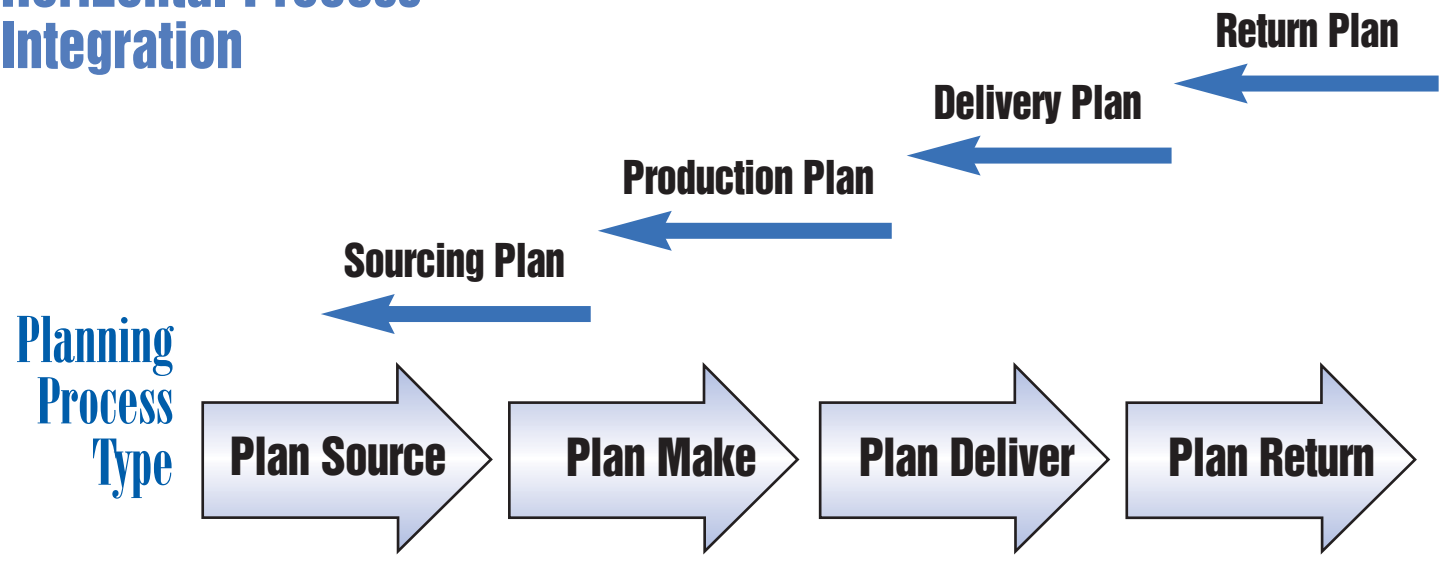

Each intersection of two execution processes (Source-Make-Deliver) is a "link" in the supply chain

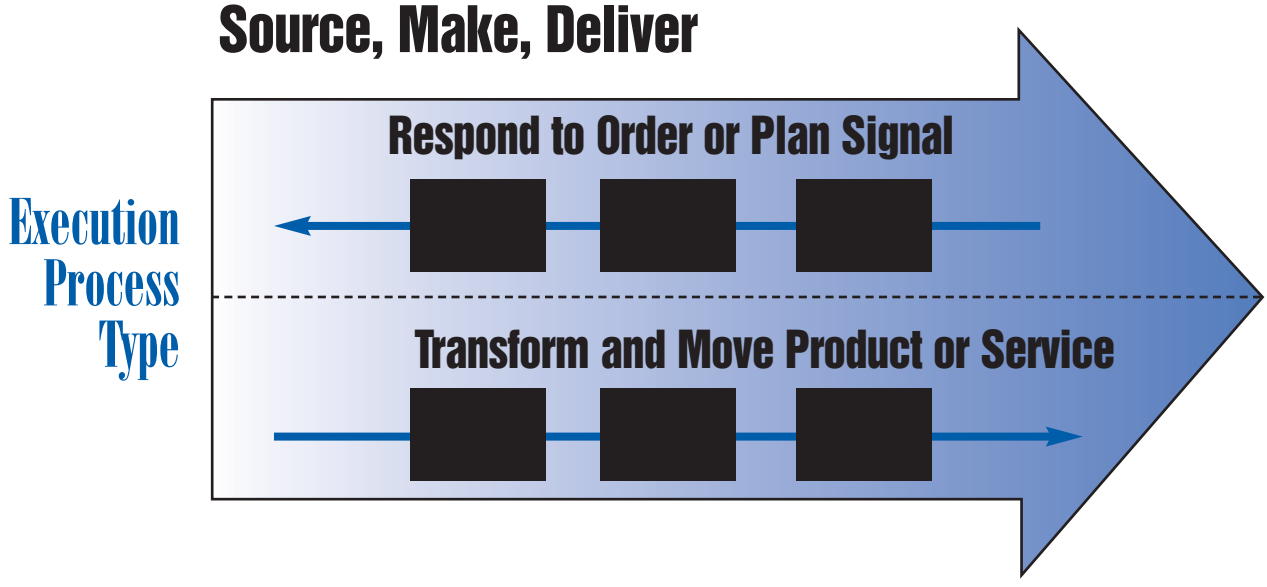
- Execution processes transform or transport materials and/or products
- Each process is a customer of the previous process and a supplier to the next

Planning processes manage these customer-supplier links

- Planning processes thus "balance" the supply chain
- Every link *requires* an occurrence of a plan process category

# How SCOR Logic Supports Horizontal Process Integration

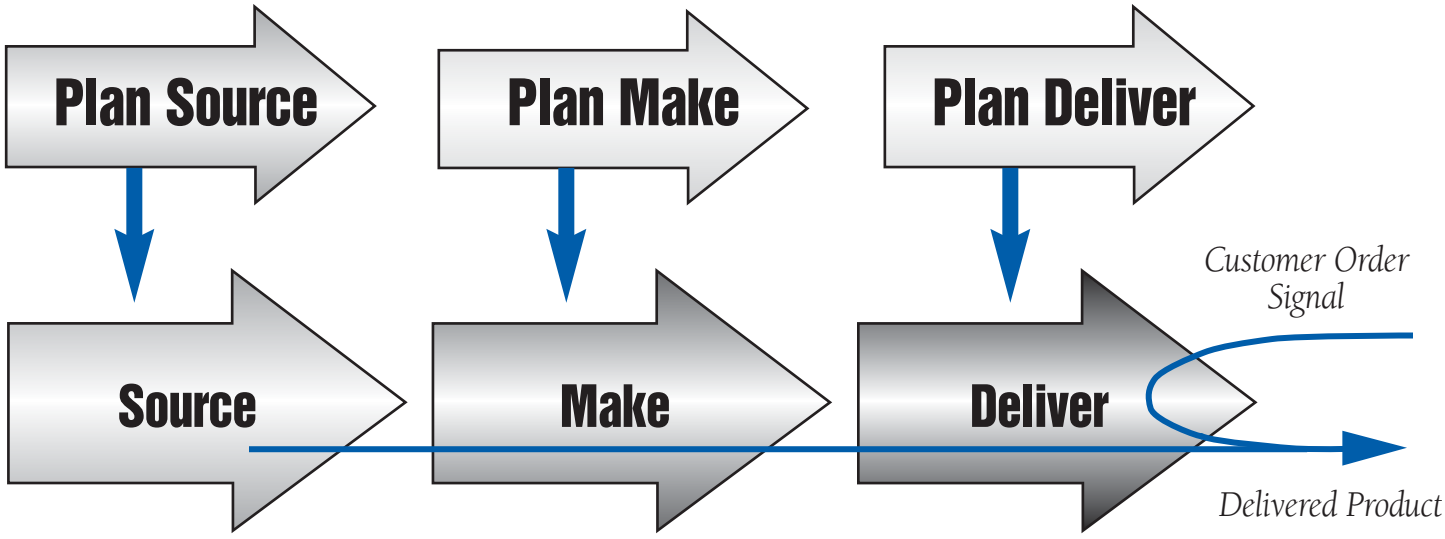


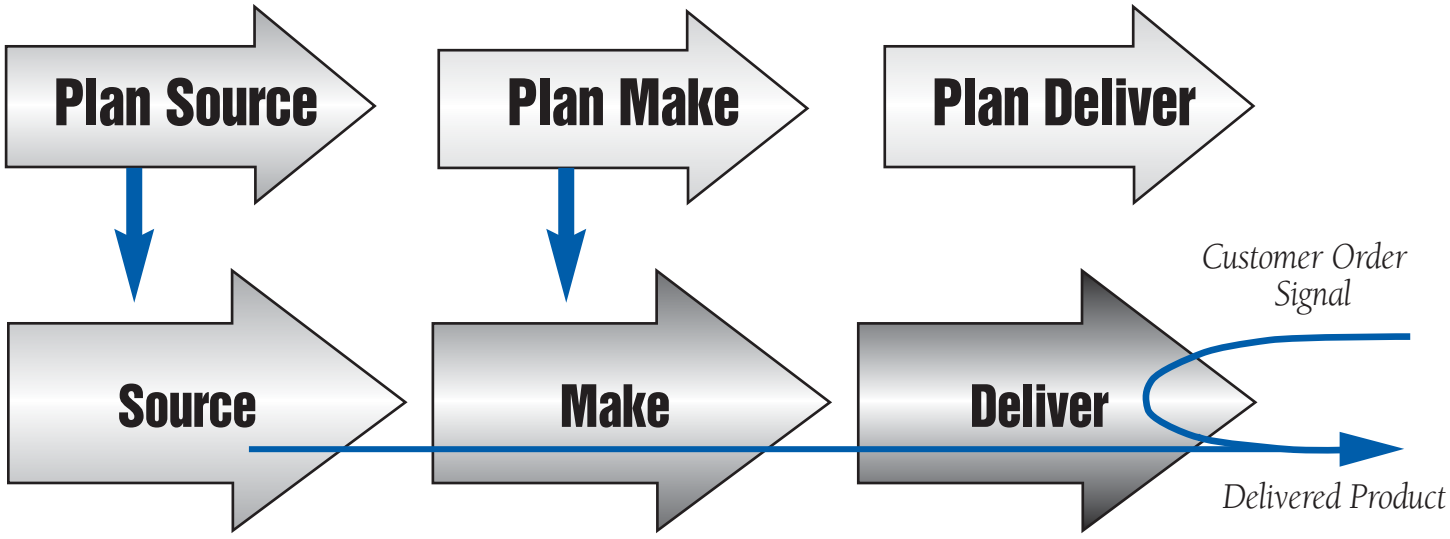
# How SCOR Describes One SCM Trade-off

## Make-to-Stock Configuration

**Common SCM objective** — achieve "market-winning" fulfillment time with the least inventory risk. *Example:* "pure" make-to-stock configuration. Plan Deliver and Deliver activities are taken upon receipt of Customer Order.



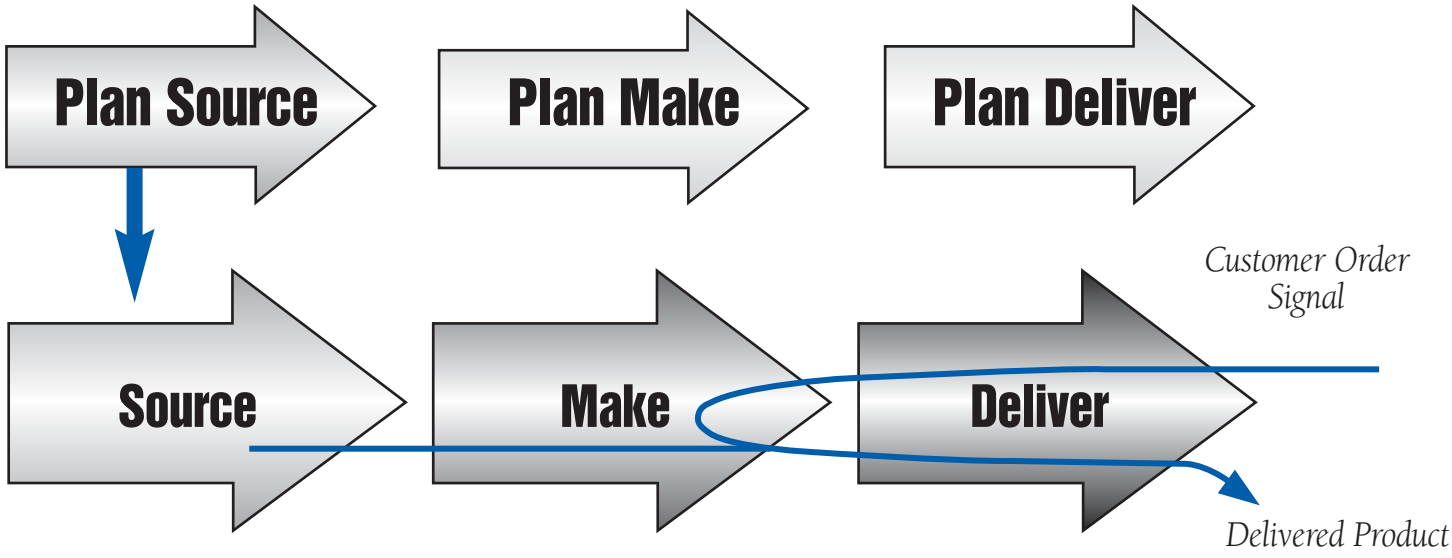

**Common SCM objective** — achieve "market-winning" fulfillment time with the least inventory risk. *Example:* replenish-to-order Deliver network. Plan Deliver activities are already in place and ready to be executed when Customer Order Signal is received.



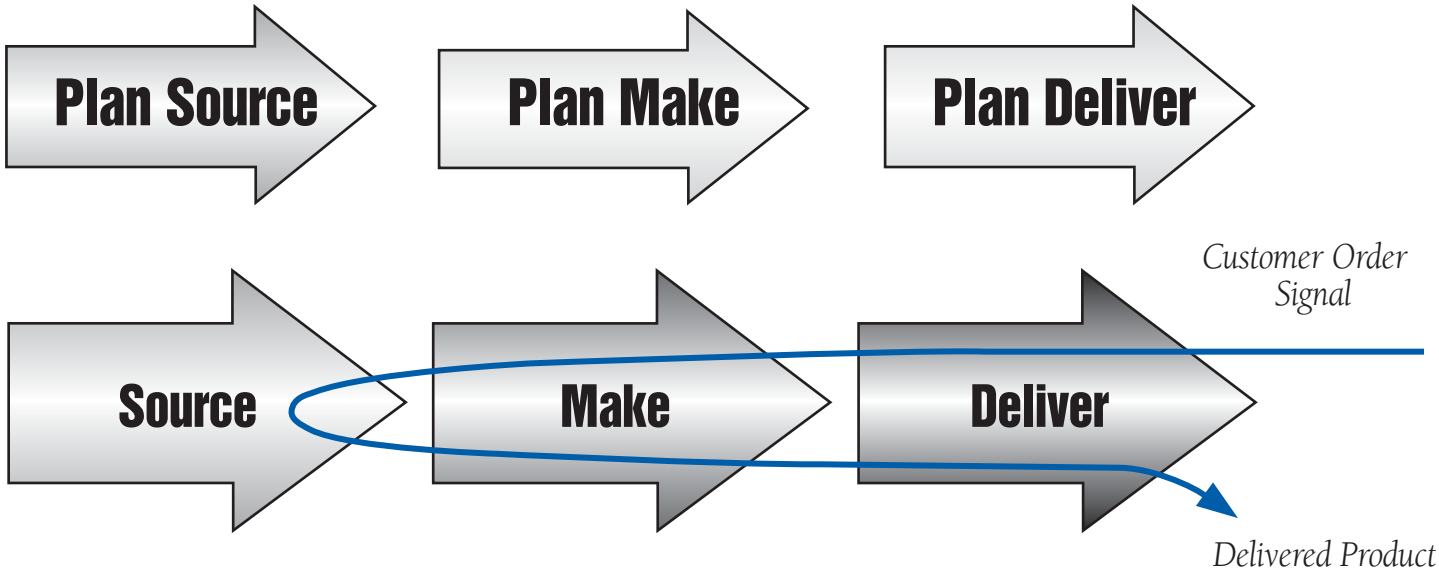
# How SCOR Describes One SCM Trade-off

## Make-to-Order Configuration

**Common SCM objective** — achieve "market-winning" fulfillment time with the least inventory risk. *Example:* make-to-order configuration. Plan Make and Plan Deliver activities are already in place and ready to be executed when Customer Order Signal is received.



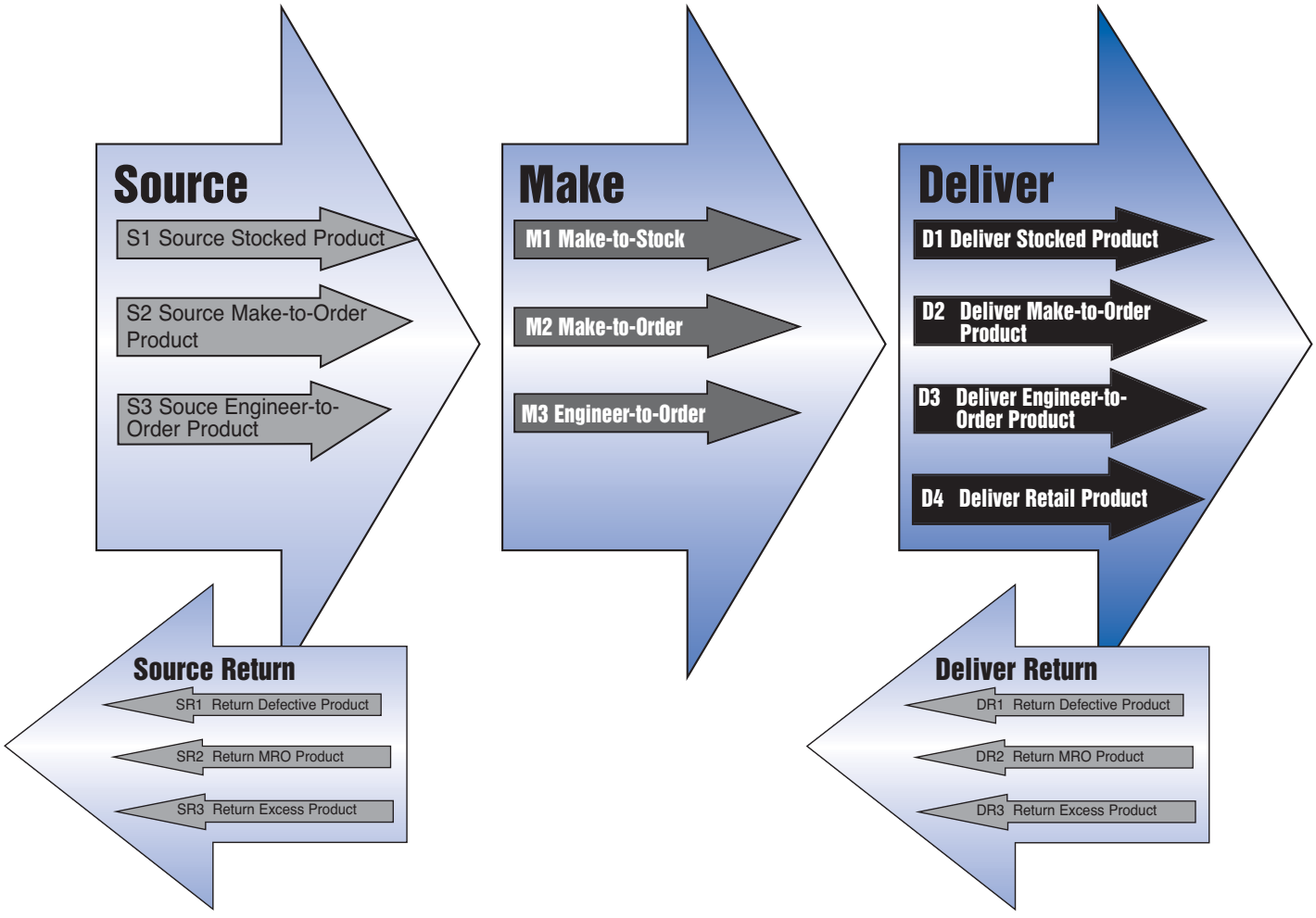

**Common SCM objective** — achieve "market-winning" fulfillment time with the least inventory risk. *Example:* make-to-order configuration that extends through the Source process. All inter-enterprise planning functions are already in place and ready to be executed when Customer Order Signal is received. This scheme requires some degree of intra-enterprise P1 Planning.



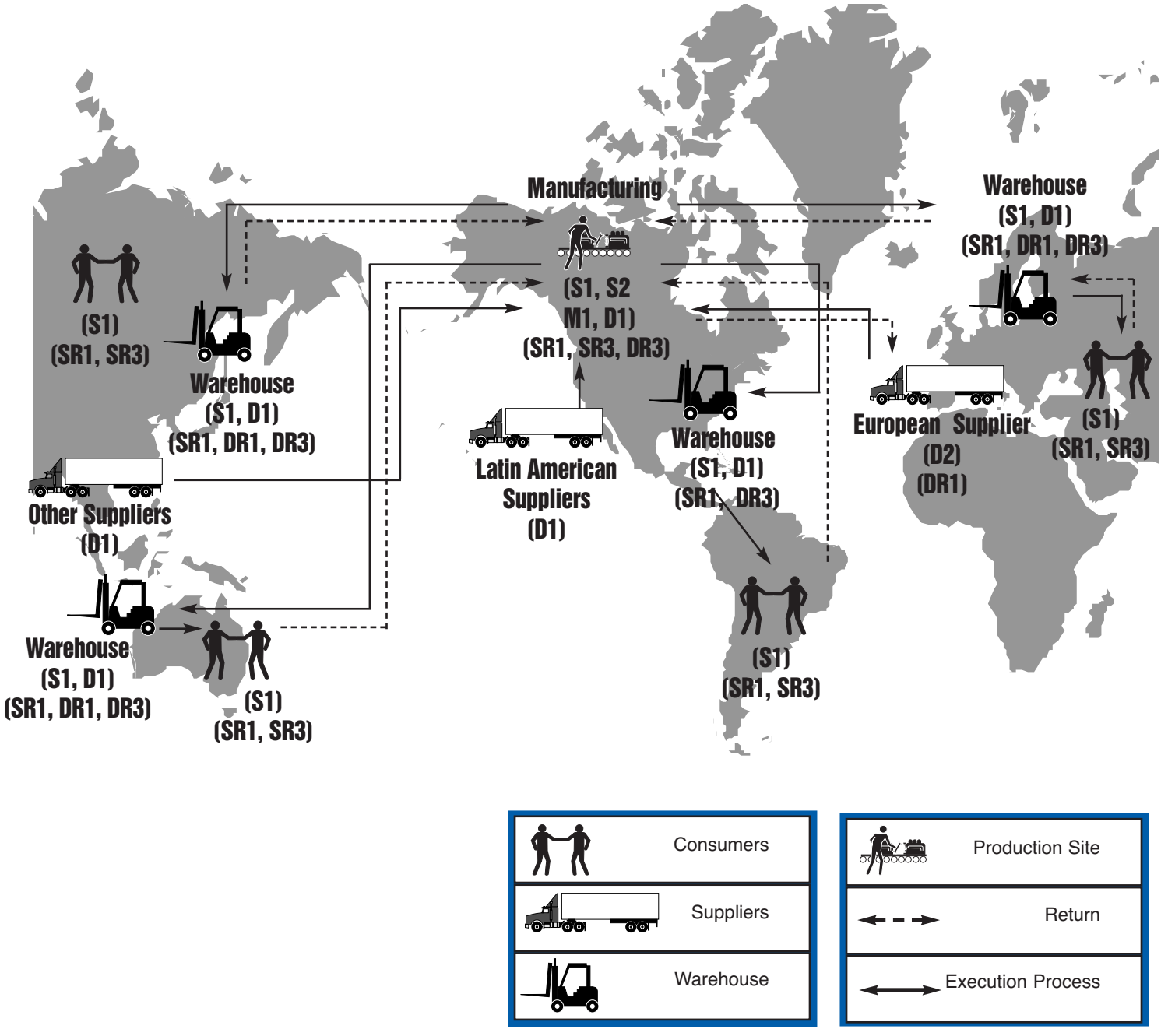
# Configuring Supply-Chain Threads

Configuring a supply-chain "thread" illustrates how SCOR configurations are done. Each thread can be used to describe, measure, and evaluate supply-chain configurations.

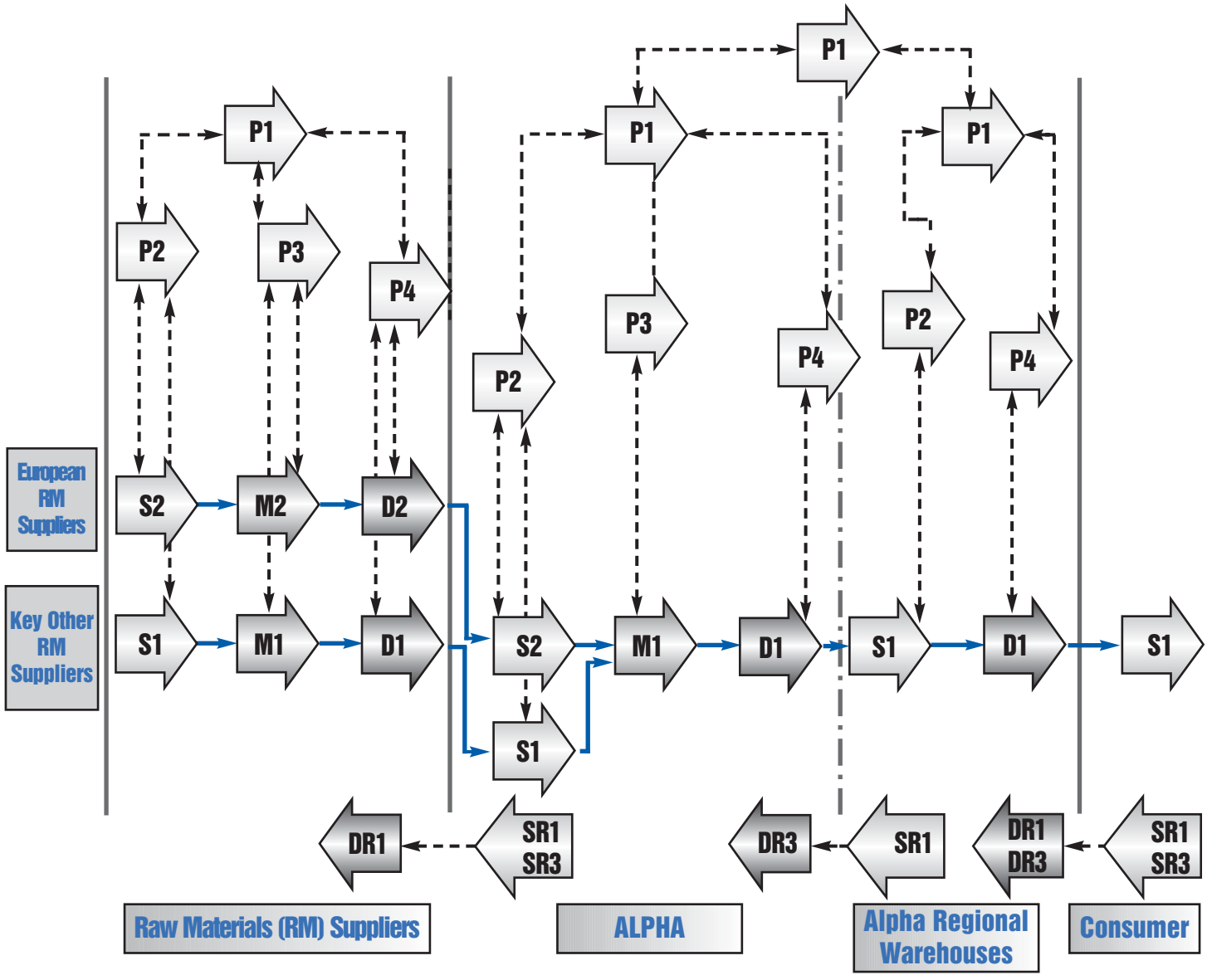
1. Select the business entity to be modeled (geography, product set, organization)
2. Illustrate the physical locations of:
   - Production facilities (Make)
   - Distribution activities (Deliver)
   - Sourcing activities (Source)
3. Illustrate primary point-to-point material flows using "solid line" arrows
4. Place the most appropriate Level 2 execution process categories to describe activities at each location



# Supply Chain Threads are Developed from the Geographic Product Flow



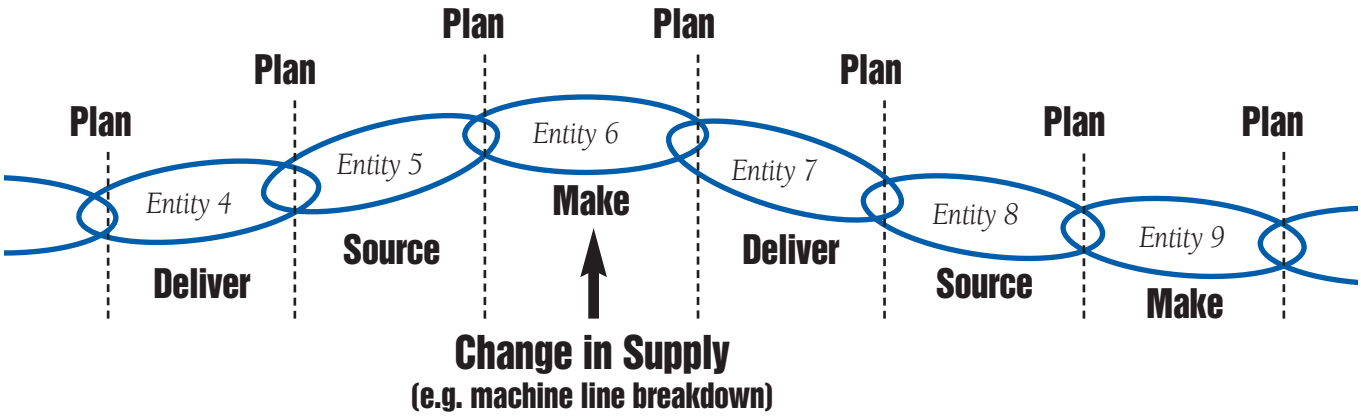
# SCOR Process Maps are Used as a Basis for Evaluating/Understanding the Supply Chain




5. Describe each distinct supply-chain "thread"
   - A supply-chain thread ties together the set of Source-Make-Deliver supply-chain processes that a given product family flows through
   - Develop each thread separately to understand common, and distinct, execution and return process categories
   - Consider end-to-end threads in the inter-company case
6. Place planning process categories, using dashed lines to show links with execution processes
7. Place P1, if appropriate
   - P1 - Plan Supply Chain aggregates outputs from P2, P3, and P4

# In a Classic Logistics World

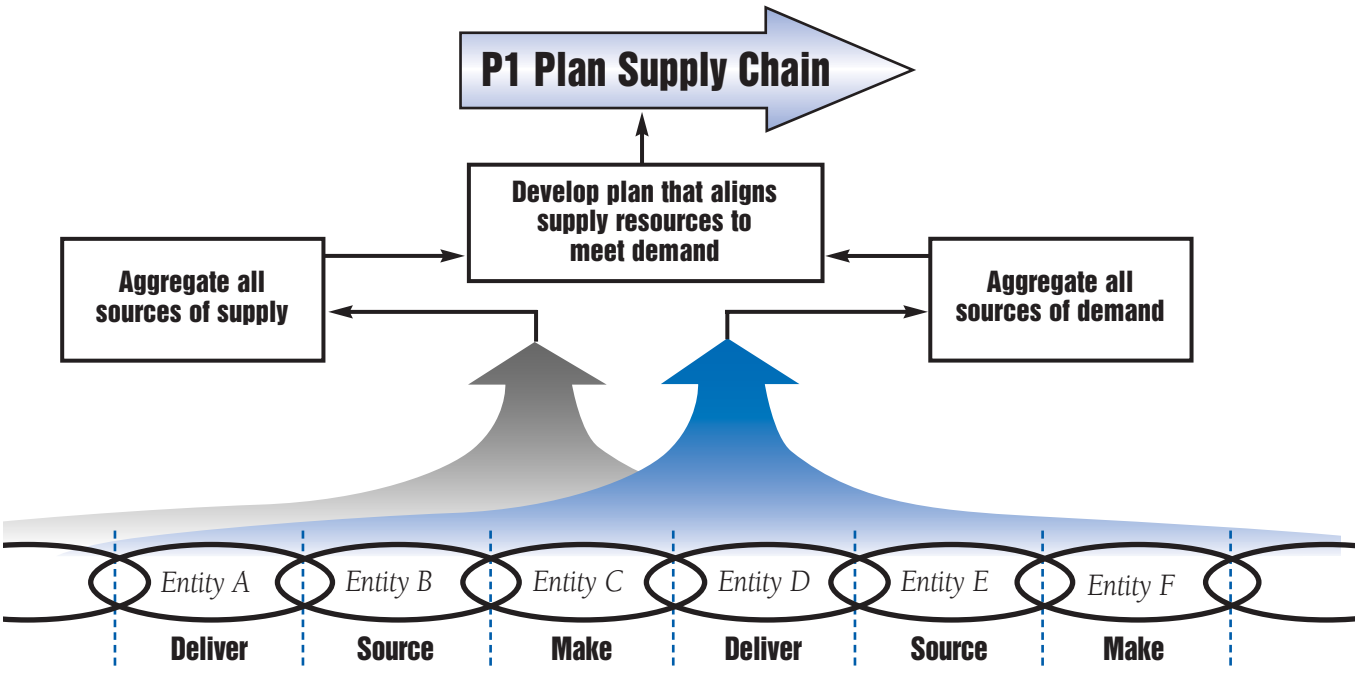
A change in a supply chain often "ripples" through each linkage, affecting other areas.




The impact of a change can be felt both up and down the supply chain

- A change in supply caused by a "production planner" may impact a "materials planner" and an "inventory planner"
- Further, such a change may impact both your customer's and supplier's supply-chain planning

# Effective Supply-Chain Management Requires Balancing Multiple Links Concurrently



Section Four

# SCOR Overview Summary

SCOR is a process reference model designed for effective communication among supply-chain partners.

- A standard *language* helps management to focus on management issues
- As an industry *standard*, SCOR helps management focus across inter-company supply chains

## SCOR is used to describe, measure and evaluate Supply-Chain configurations

- **Describe:** Standard SCOR process definitions allow virtually any supply-chain to be configured.
- **Measure:** Standard SCOR metrics enable measurement and benchmarking of supply-chain performance.
- **Evaluate:** Supply-chain configurations may be evaluated to support continuous improvement and strategic planning.

Notes

Notes

SCOR® Supply-Chain Council

## For more information: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