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# Keeping SCOR on Your Supply Chain: Basic Operations Reference Model Updates with the Times

**George J. Schultz**

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*Today's manufacturers and service providers tend to be partners in one or more supply chains. Continued evolution of IT has enhanced discrete supply-chain activities. Yet in the blur of competitive business, managers need ongoing supply-chain assessment for potential performance improvement. Fortunately, the computerized Supply-Chain Operations Reference (SCOR) Model keeps current with industry's dynamic changes.*

**T**o IT and operations executives new to formalized supply-chain management, the term "SCOR Model" roughly means a tool to assess performance within their own company and with supplier and customer partners throughout the whole business of making and selling products or services. But equally for "old-timers" long familiar with SCOR — implying six years max — there is a good amount of new learning to do. The fact is, the officially immutable Supply-Chain Operations Reference (SCOR) Model continues to gain new interpretations and changed terminologies. But that is not a bad thing; it is part of the original concept to keep the basic "reference model" and its metrics always relevant to new conditions.

After all, how prevalent were E-businesses and the Web in 1996 when SCOR was adopted? Think also of tighter collaboration, product life-cycle contingencies, and

other popular strategies now helping corporations cope with their changed economics. Hence, a "fast-forward" on SCOR is in order for those already familiar with its practices, while affirming the model's basic components and procedures for newcomers.

The computerized SCOR Model is published by the independent nonprofit Supply-Chain Council (SCC), based in Pittsburgh, Pennsylvania. It is the most widely recognized and global data tool for viewing broad activities across a supply chain and assessing performance toward potential improvement. Moreover, the model supports cross-industry diagnostics, thanks to its standardized process definitions and metrics that fit all types of business operations and environments.

The model's predominant hallmarks are the 13 performance metrics at its top level, across five primary management processes: Plan, Source, Make, Deliver, and Return. Together, these processes capture all activities from order entry to final invoice payment, plus all steps of supply, manufacture, and delivery in between (see [Exhibit 1](#) and [Exhibit 2](#)).

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**Exhibit 1. SCOR's Five Core Management Processes**

<b>SCOR Process</b>	<b>Definitions</b>
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

**Exhibit 2. SCOR Model Level 1 Performance Metrics**

<b>Performance Attribute</b>	<b>Customer-Facing</b>			<b>Internal-Facing</b>	
	<b>Reliability</b>	<b>Responsiveness</b>	<b>Flexibility</b>	<b>Cost</b>	<b>Assets</b>
Delivery performance	✓				
Fill rate	✓				
Perfect order fulfillment	✓				
Order fulfillment lead time		✓			
Supply-chain response time			✓		
Production flexibility			✓		
Supply-chain management cost				✓	
Cost of goods sold				✓	
Value-added productivity				✓	
Warranty cost or returns processing cost				✓	
Cash-to-cash cycle time					✓
Inventory days of supply					✓
Asset turns					✓

Built top-down through three levels of increasingly detailed elements and process decomposition, the SCOR Model helps guide analysis of actual performance against established metrics. Such data supports benchmarking and performance comparison with competitors or cross-industry. Resulting assessment also suggests “best practices” to strengthen or improve essential activities in specific areas.

**Basics unchanged**

It is a dictum of the Supply-Chain Council and SCOR practitioners that the essential

model does not change. That is fundamental. Its interpretation and language surely have changed, however, to keep pace with a fast-evolving business and industrial world.

As a prime example, the “Return” element was not part of the originally recognized primary processes, but introduced in Version 4, then more fully implemented in 2001’s V.5. Still, its underlying activities were always there, under one or more of the other four primary elements. Now, from impetus by SCOR practitioner-users, these functions are regrouped here for clearer measurement of the support they have always provided within the other elements.

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The term “Return” literally denotes “returns,” whether of product and components or shipping materials; but realistically today, it also covers “recurring” processes in product life-cycle management, MRO

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(maintenance, repair, and overhaul), and other post-delivery or aftermarket support within a supply chain.

Today, also, most companies, both large and small, have at least some engagement with the Web and E-business — communications technologies barely aborning when SCOR was formalized and adopted by a loose inter-industry group of 69 companies in 1996. Sourcing, production, and logistics transacted via electronic commerce early on were, of course, reflected in SCOR’s general scope. Updated terminology in V.5.0 recognized electronic practices explicitly for better SCOR assessment, and this assimilation process continues.

Consider also a SCOR updating when new technology was not the motivator. The term “supply chain” tends to connote manufacturing, but non-manufacturers as well had long since been using SCOR to advantage before Version 3.1 more directly recognized this *de facto* usage. Service industries and financial companies employed simple logic to apply SCOR Model terms to their types of supply-chain practices. Then, modified terminology within SCOR reflected — simply stated — that such industries also deal in “products” and product-based functions, not only manufacturers of physical goods.

Changes, yes, in SCOR’s common language, and broadening certain concepts; but the SCOR Model’s metrics structure remained constant.

### **Fundamental structure**

Fundamentally, SCOR is a guide, a structure to help companies manage their supply-chain processes. It does not promise solutions or outright recommendations. However, users find it a powerful aid in organizing their process data toward process improvement. Perhaps its key contribution here is the common language that enables effective communication between supply-chain partners. That, and SCOR’s linking process elements, metrics, best practices, and the features associated with execution of a supply chain.

The SCC differentiates between SCOR as a “process reference model” and “process decomposition” models, which it says are developed to address one specific configuration of process elements.

Some specialized consulting firms offer benchmarking services for performance analysis and comparison among supply chains, often using proprietary supply-chain models. When SCOR users consult additional outside expertise, the Council recommends that they determine whether other models used are aligned to SCOR for greatest potential benefit.

The SCOR Model is available only to official SCC members, who download it from the Council’s Web site (members section) for prospective implementations within their companies. (This Web access procedure, together with the voluntary nature of member participation, means that the Council is unable to know and report the number of SCOR models actually implemented and in active use by member companies.)

The SCOR model’s hierarchical levels with their respective metrics permit increasingly detailed performance assessments of all actions under the Plan/Source/Make/Deliver/Return five primary management processes. Assessment applies the model’s standard “performance attributes” to as-is activities, leading to modification or improvement decisions. These performance

**Exhibit 3. Performance Attributes and Associated Level 1 Metrics**

<b>Performance Attribute</b>	<b>Performance Attribute Definition</b>	<b>Level 1 Metric</b>
Supply-chain delivery reliability	The performance of the supply chain in delivering: the correct product, to the correct place, at the correct time, in the correct condition and packaging, in the correct quantity, with the correct documentation, to the correct customer	Delivery performance Fill rates Perfect order fulfillment
Supply-chain responsiveness	The velocity at which a supply chain provides products to the customer	Order fulfillment lead times
Supply chain-flexibility	The agility of a supply chain in responding to marketplace changes to gain or maintain competitive advantage	Supply-chain response time Production flexibility
Supply-chain costs	The costs associated with operating the supply chain	Cost of goods sold Total supply-chain management costs Value-added productivity Warranty/returns processing costs
Supply-chain asset management efficiency	The effectiveness of an organization in managing assets to support demand satisfaction; this includes the management of all assets: fixed and working capital	Cash-to-cash cycle time Inventory days of supply Asset turns

attributes, each matched with one to several Level 1 metrics, are: supply-chain *delivery reliability*, supply-chain *responsiveness*, supply-chain *flexibility*, supply-chain *costs*, and supply-chain *asset management* (see Exhibit 3).

The defined attributes cover specific characteristics of a particular supply chain. This permits it to be analyzed and evaluated against other supply chains with competing strategies, thereby underscoring the value of SCOR’s standardized definitions for comparative analysis. It is about comparing “like” things, not “apples and oranges.” Applied in a supply-chain competitive context, it means not comparing one company that chooses to be the “low-cost provider” in its market, for example, against another company that chooses to compete on “reliability and performance.”

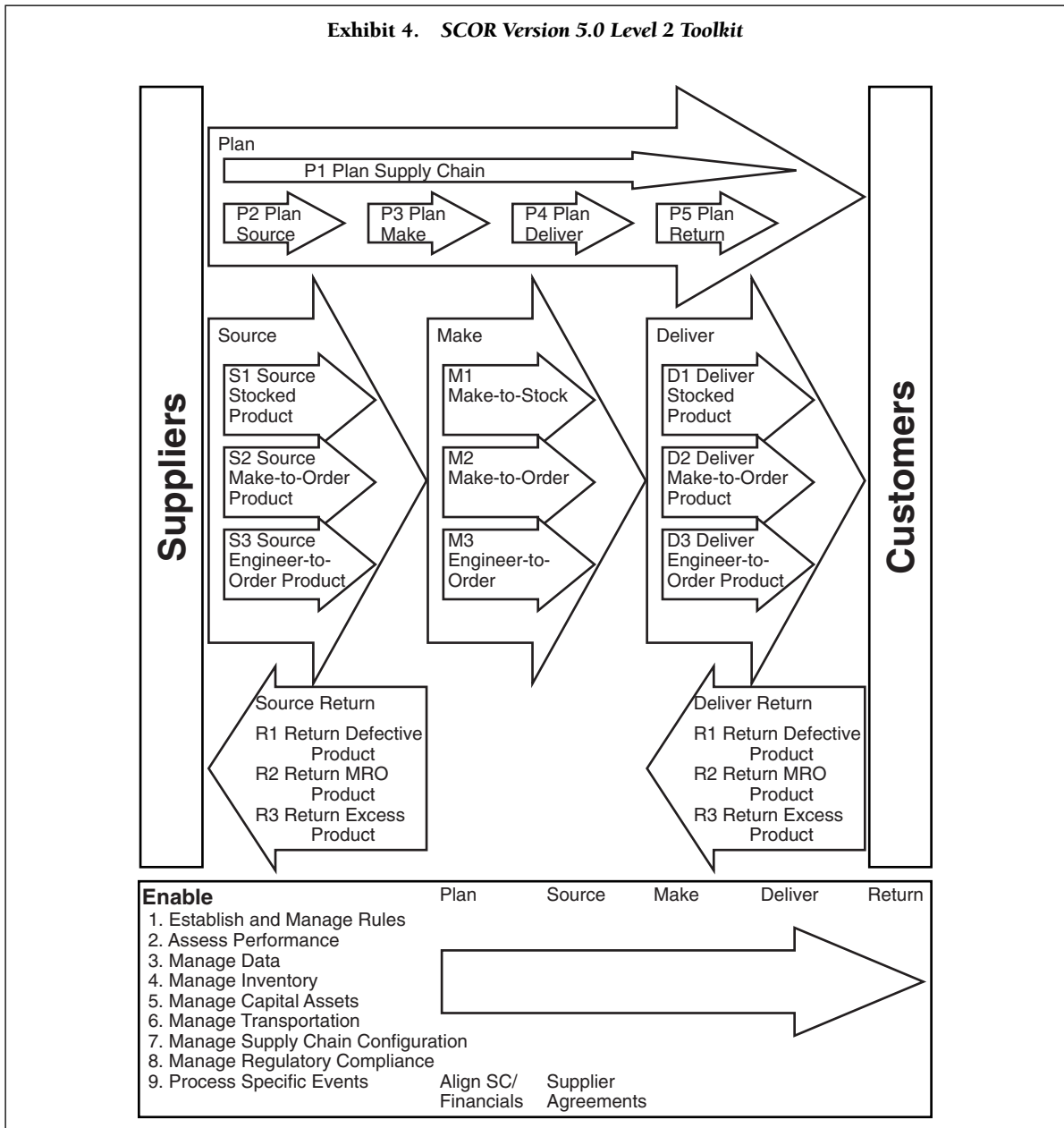
### Multi-level metrics

Regarding the hierarchical order of SCOR metrics and process elements, it should be understood that Level 1 metrics are created from lower-level calculations, those associated with a narrower subset of processes — very specific activities within the lower-end decompositions.

SCOR goes down through three levels. Outside the SCOR Model itself, a Level 4 (and beyond, as desired) developed and supported by user companies’ own IT solutions, allows further decomposing measurements to examine very specific elements of company performance.

- *Level 1* describes the five primary management processes and defines the 13 performance attributes applied. It delineates the scope and content of a SCOR-based model for setting performance targets.
- *Level 2*, the configuration level, is where companies can implement their operating strategies through the configuration they choose for their supply chain. Consider that the SCOR V.5 (current) “Level 2 Toolkit” contains 30 “core” process categories. En masse, they are a bit visually overwhelming. But not all 30, nor a number even close to that, would likely be applied to most supply-chain analyses. Yet the 30 named processes helpfully depict the activities range — both related or disparate — for potential supply-chain analysis at this level (see [Exhibit 4](#)).
- *Level 3*, the process element level, is instrumental in defining a company’s ability to compete successfully in its

**Exhibit 4. SCOR Version 5.0 Level 2 Toolkit**



markets. Here, managers can fine-tune an operation’s strategy through the defined process elements, information inputs/outputs, performance metrics, best practices where applicable, and system capabilities required to support best practices.

Take the example of a Level 3 process element underlying a company’s Level 2 process called “Source Stocked Product.” It

captures specific data on process flow, inputs (e.g., sourcing plan, replenishment signals) and outputs (e.g., procurement signal, product on order), and product delivery, receipt and verification, on through to product transfer and inventory availability.

And then there is a different Level 3 example — a process element called “Schedule Product Deliveries” that

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specifically schedules and manages individual product deliveries against an existing contract or purchase order:

- It applies SCOR performance attributes against Level 3 metrics. For the Reliability attribute, the metrics are percent of schedules generated within supplier's lead time, or percent of schedules changed within lead time. For Flexibility, the metrics are average days per schedule change, or per engineering change.
- Examples of "best practices" here might be "Utilize EDI transactions to reduce cycle time and costs" and "Advance ship notices (ASN) allow for tight synchronization between SOURCE and MAKE processes."

A SCOR-based reference model at Level 4 and beyond, when utilized by the user company as described, constitutes the "implementation level." It addresses the company's specific supply-chain management practices — targeted to achieve competitive advantage, or adapting to changing business conditions.

Beyond this overview of SCOR and its basic procedures, the SCC offers full graphics-supported descriptions of the SCOR Model and all its components, plus execution features; see references at the end of this article.

### **Real-world view**

SCOR Version 5.0, with its host of significant updates within the basic model, remained at least into early 2003 as the current release for implementation and guidance. That is because "a funny thing happened to" an anticipated SCOR V.6 on the way to completion and promulgation in 2002. Some of the very issues it was addressing, it seems, matched the diligence of SCOR practitioners to ensure that SCOR's implementation remains totally practical and "real world."

Virtually all of the membership-driven Council's SCOR Model review, recommendation, approval, and implementation schema changed. The watershed changes

actually advanced some SCOR development strategies already underway, such as impetus from special industry groups (e.g., aerospace and defense, electronics) to address cross-company, vertical industry needs

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within SCOR, emphatically adding the discrete "Return" element derived from work of the aerospace/defense industry team, with wide endorsement from other industries' SCOR users with like needs.

A founding principle of the SCOR Model is that it remain under continuous development by its practitioners to stay viable among changeable industry practices and with new IT technology. And, because the model must be manageable for the people who own and operate supply chains, maintaining SCOR's usefulness "needs to be done with real supply chains in the field," emphasizes Scott Stephens, the Council's chief technology officer.

The SCOR revisions process has now moved fully from a standing-committee structure — each group previously focused on one of the Plan, Source, Make, Deliver, and Return primary elements — to a self-initiating project team approach. The project teams emerge from SCC members' improvement proposals, and are then authorized and supported by the new Technical Development Steering Committee.

From one viewpoint, continuance of the more narrowly focused technical committees structure risks excessively theoretical directions in SCOR revisions. Project teams

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bring a multiple-process, multiple-enterprise perspective to today's supply-chain issues that usually impacts more than a single process area.

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### ***Other revisions or extensions to SCOR are forthcoming.***

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#### **Model enhancement**

One of the first results of the new review practice will likely be the implementation of recommendations by a new retail industry project team, some of its members being Target Stores, Best Buy, and the Walt Disney Company. Its genesis was the realization by SCOR practitioners in retail operations that the model does not support the entire retail supply chain.

A key issue was lack of integration between retail stores' materials, work, and information flows with companies' selling and marketing environments. The group's corrective focus is specifically in Level 3 of the Deliver process.

The team's proposed fix is now in content and policy review by the Technical Development Steering Committee. It then is available, via the Web site, to the entire Council membership for review prior to acceptance by the Council's ultimate approval body, the interestingly named SCOR Board. However, observes the SCC's Stephens, "Most important is approval by the practitioners in actual supply-chain management, to prove the way it's working."

Other current project team initiatives address:

- *Supply-chain event-management and partner visibility*: assimilating standards for these technology-enabled operational practices among today's core capabilities in supply chain management. This project team is creating and defining process types, elements, tasks, activities, metrics, best practices, features, and functions that support existing processes

covered by SCOR, and relating them to the model's five performance attributes at Level 1 (see above).

- *Incorporating supply-chains partners' collaborative processes into SCOR model analysis*: encompassing both intracompany and intercompany collaboration practices, a project team (continuing work of a former Council committee) is defining basic forms and functions of collaboration, relating them to SCOR metrics, and identifying best-practice standards.
- *Revision of SCOR model metrics*: examining improvements to current metrics definitions and clarifying the relationship between SCOR Levels 1 and 2 metrics and related processes within the model. The project team (also succeeding a previous Council committee) looks toward accelerating SCOR implementation by making metrics deployment easier, and more intuitive through an explicit metric structure and clear linkage to the business. It also is reviewing benchmarking and performance comparison issues in the model.

Any of these efforts could result in SCOR Model practice revisions. Other revisions or extensions are forthcoming as unfinished business from last year's delayed Version 6.0, the Council's continuing work toward fuller implementation of the Return process, and further assimilation of E-business practices and terms into the model's defined processes and metrics.

A pioneering tack within the new SCOR development framework is potential commissioning of outside research under a new Research Strategy Committee, actually a subcommittee of the Board. Research projects would not lead directly to changes in the model but, by augmenting presently all-volunteer technical efforts by SCOR users, help develop solutions to requirements identified by practitioners.

#### **Genesis of "Return"**

Something as significant as a new "primary process" — Return, joining the almost inviolable "fundamental four" atop the SCOR

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Model — warrants further attention, if only to confirm the principle that SCOR practitioners indeed shape the model. The fact that the impetus for it emanated from the SCC's aerospace and defense specialized industry group (A&D SIG) is hardly surprising. The manufacturers and their major customers, notably airlines and the U.S. Department of Defense (DoD), are long accustomed to maintaining and extending the critical life of equipment assets. The demands of such practices, however, identified incomplete support within the SCOR model, with particular focus on MRO processes.

The DoD itself, with its constituent service branches, comprises numerous supply chains by any definition. Their operations entail recurring materials and equipment functions in supply, maintenance and refurbishing to support equipment life cycles up to 20 and 40, or more. The DoD not only has multiple implementations of the SCOR Model but, as a SCOR practitioner, contributes unique operational expertise to the continued development of SCOR for all users. "For the military and for aviation, the easiest piece is producing the item initially. The hard piece is supporting it once it's out in the field, bringing things back, supplying new [components]," according to Louise Morgan, chairperson of the Council's A&D group and a logistics programs executive with United Defense, a systems manufacture based in Arlington, Virginia.

Strong concurrence in the need for this type of "recurring cycle" support within the SCOR Model came from such wide-ranging elements of the SCC as industrial equipment makers, electronics manufacturers, and the retail industry. The Return element was incorporated into SCOR V.4 and extended in V.5, with further development details under study. This scenario offers an example of attention to proving-out proposed revisions before being adopted into the model. Aerospace giant Boeing Co. has initiated a pilot implementation within a particular Return area, that of "reparables"

or practices keyed to the repair of equipment and systems.

### **The time was ripe**

Certainly there was a place for a comprehensive modeling tool by the mid-1990s,

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with industry on the crest of computerizing "everything," or the SCOR Model would not have gained so many adherents. From those first 69 companies that adopted the SCOR concept during 1996, and then formally incorporated the backbone Council the following year, membership has grown to more than 700 companies.

The Council's Fortune 500 brand of members, largely constituting supply chains within themselves, bring one perspective to fine-tuning supply-chain management. But so does involvement by its other members — the range of upper-midsize to small-small manufacturers, integrators and other service companies, or the admittedly complex model would not remain viable across all the avenues of commerce.

It is the cadre of enthusiastic supply-chain practitioners from diverse companies and diverse disciplines that keeps the SCOR Model current amid the waves of IT platform and application developments. They, along with their counterpart operations managers and corporate bosses, pressed to evaluate every popular new business process that comes along.

SCOR, along with the Supply-Chain Council, have long attained a global scope, too. The SCC now has seven foreign chapters, literally around the world. Their corporate members — again, perspective is the byword — equally contribute to the model's technical development, even as they extend its usage in the "small world" of interfacing

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commerce. And does not that mesh with the recognized supply-chain scope “from suppliers’ suppliers to customers’ customers”?

Perhaps also, one should credit outside forces in these early 2000s with sustaining interest in business practices assessment such as the SCOR modeling tool. Corporations everywhere are contending with a tight economy and are open to every possible methodology for cost-cutting, asset management, and better return on investment (ROI). Many are outsourcing more, or collaborating externally from product development to logistics in ways they never dreamed, and peering for advantage far down their products’ life cycles. They are operating in new territory.

It sounds as though SCOR’s type of proven process assessment will be around for awhile — as long as it stays new (at age 6, is a technology young or old?) and continually refreshed to fit the real world.

For further description of the SCOR Model and its application, see:

- [www.supplychain.org](http://www.supplychain.org) (non-member section)
- [www.supplychainworld.org](http://www.supplychainworld.org) (contains speaker and user presentations at Supply-Chain Council conferences)

For a SCOR-Model “Overview” booklet (current Version 5.0), or information about Council conferences/exhibitions and informational Webcasts open to non-members, contact the Supply-Chain Council at 412-781-4101. ▲