SCOR DIGITAL STANDARD

ASCM Supply Chain Operations Reference Model

SCOR Digital Standard

ASSOCIATION FOR SUPPLY CHAIN MANAGEMENT

Introduction

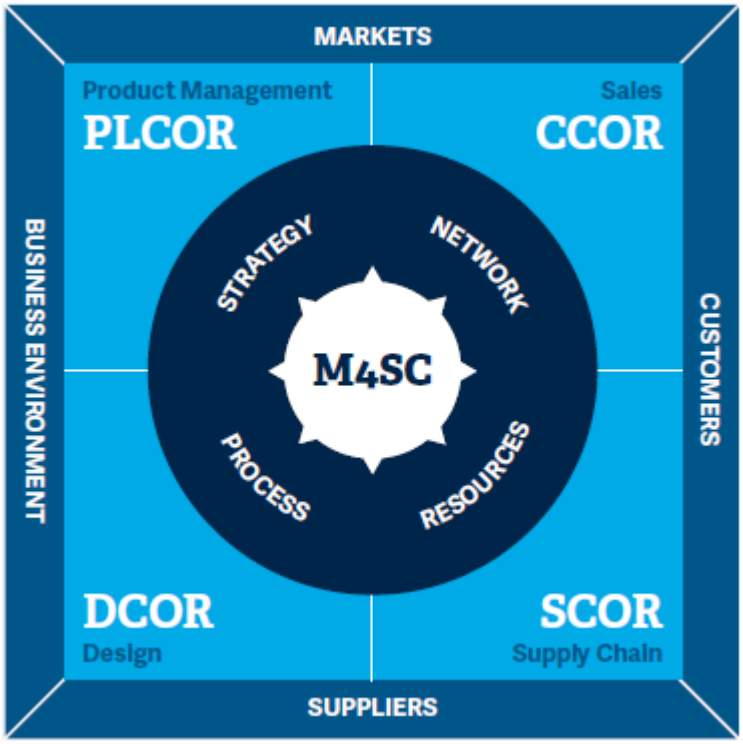
Introduction to SCOR

The Supply Chain Operations Reference Digital Standard (SCOR DS) is a model that provides methodology, diagnostic and benchmarking tools that help organizations make dramatic and rapid improvements in supply chain processes. The world of supply chain management never stops advancing, and neither do supply chain professionals and their organizations. Supply chains require savvy operators, supervisors and leaders with knowledge about the global standards and practices that move the needle on supply chain performance. ASCM is the global leader in supply chain organizational transformation, innovation and leadership that develops supply chain talent and elevates end-to-end supply chain performance. From education and certification, to benchmarking and best practices, ASCM sets the industry standard.

The SCOR Digital Standard is a part of the ASCM body of knowledge used to foster the advancement of end-to-end supply chain management.

ASCM frameworks

The SCOR Digital Standard is based off an archived enterprise portfolio describing the critical elements in a value chain. Including SCOR, the APICS (now ASCM) framework portfolio consisted of three archived frameworks: the Product Life Cycle Operations Reference mode (PLCOR), the Customer Chain Operations Reference model (CCOR), the Design Chain Operations Reference model (DCOR) and Managing for Supply Chain Performance (M4SC). These archived frameworks are available to members in the ASCM Digital Library. For more information, services and training related to these frameworks, please contact ASCM Corporate Development at corporatemembership@ascm.org.



Graphic 1: ASCM Frameworks and relationships
Credit: Ericsson, Lars Magnusson

The key focus of SCOR and the archived ASCM/APICS frameworks are as follows:

- PLCOR manages the activities for product innovation and product and portfolio management from idea to portfolio.
    - Key capabilities include Plan, Enable, Ideate, Develop, Launch and Revise.
- CCOR manages the customer interaction process from lead to contract.
    - Key capabilities include Plan, Relate, Sell, Contract and Assist.
- DCOR manages the product and service development process from portfolio to solution.
    - Key capabilities include Plan, Research, Design, Integrate and Amend.
- SCOR manages the business activities associated with all phases of satisfying a customer's demand from opportunity to payment.
    - Key capabilities include Plan, Source, Make, Deliver, Return and Enable.
- M4SC is the process that translates business strategies into supply chain execution plans and policies, moving strategies to plans and procedures.
    - Key capabilities include Align Strategy, Networks, Processes and Resources.

Graphic 2: This graphic illustrates the level-1 processes for ASCM frameworks.

SCOR Digital Standard summary

The Supply Chain Operations Reference Digital Standard (SCOR DS) model is the product of ASCM (formerly APICS) following the merger of the Supply Chain Council and APICS in 2014. The SCOR model was established in 1996 and has been updated regularly to adapt to changes in supply chain business practices. SCOR remains a powerful tool for evaluating and comparing supply chain activities and performance. SCOR captures a consensus view of supply chain management. It provides a unique framework that links business processes, metrics, best practices and technology into a unified structure to support communication among supply chain partners and to improve the effectiveness of supply chain management and related supply chain improvement activities.

The ASCM member base represents a broad cross-section of industries, including manufacturers, distributors and retailers. The vast ASCM network also is composed of technology suppliers and implementers, academics and government organizations that participate in ASCM activities and the development and maintenance of the SCOR Digital Standard model.

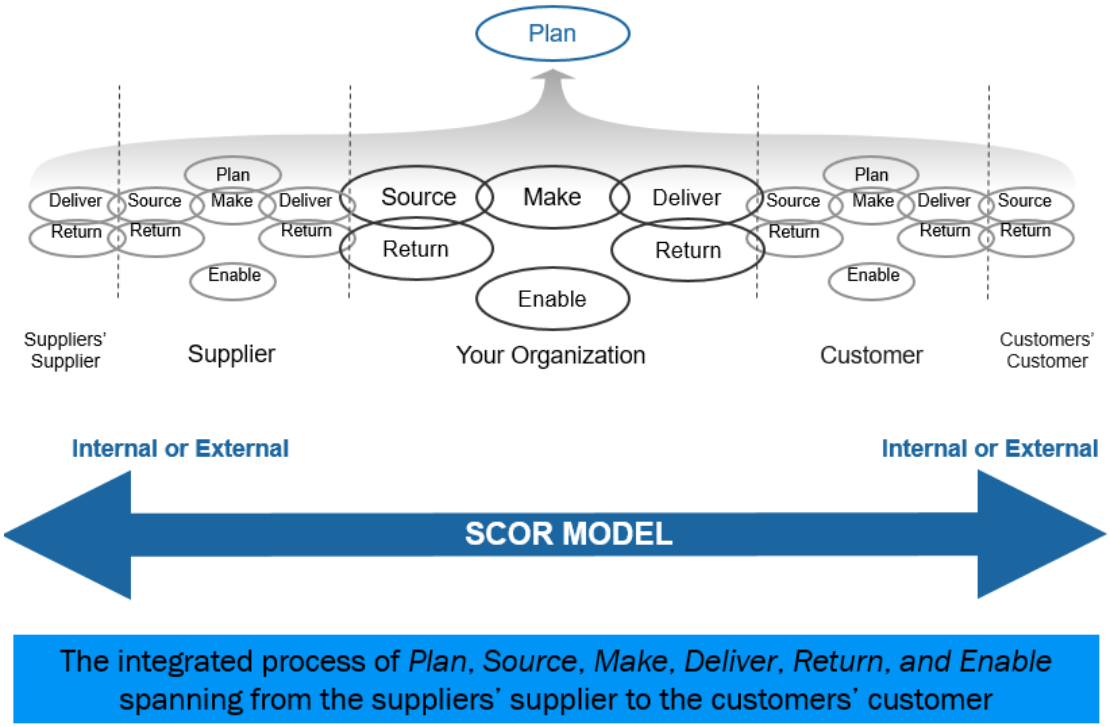
ASCM is interested in providing the widest possible dissemination of SCOR because the widespread use of the model enables communication using common definitions and measurements. It also results in better customer-supplier relationships, software systems that better support members through the use of common measurements and terms, and the ability to rapidly adopt common practices.

Specific changes in the SCOR Digital Standard from SCOR version 12.0 are outlined later in this Introduction.

Scope of the SCOR Digital Standard

The SCOR model has been developed to describe the business activities associated with all phases of satisfying customer demand. The model itself contains multiple tabbed sections and is organized around the six primary management processes of Plan, Source, Make, Deliver, Return and Enable. (See Graphic 3.) By using these process building blocks, the model can describe supply chains that are very simple or very complex using a common set of definitions. As a result, disparate industries can be linked to describe the depth and breadth of nearly any supply chain. The model has been able to successfully describe and provide a basis for supply chain improvement for global projects as well as site-specific projects.

SCOR process

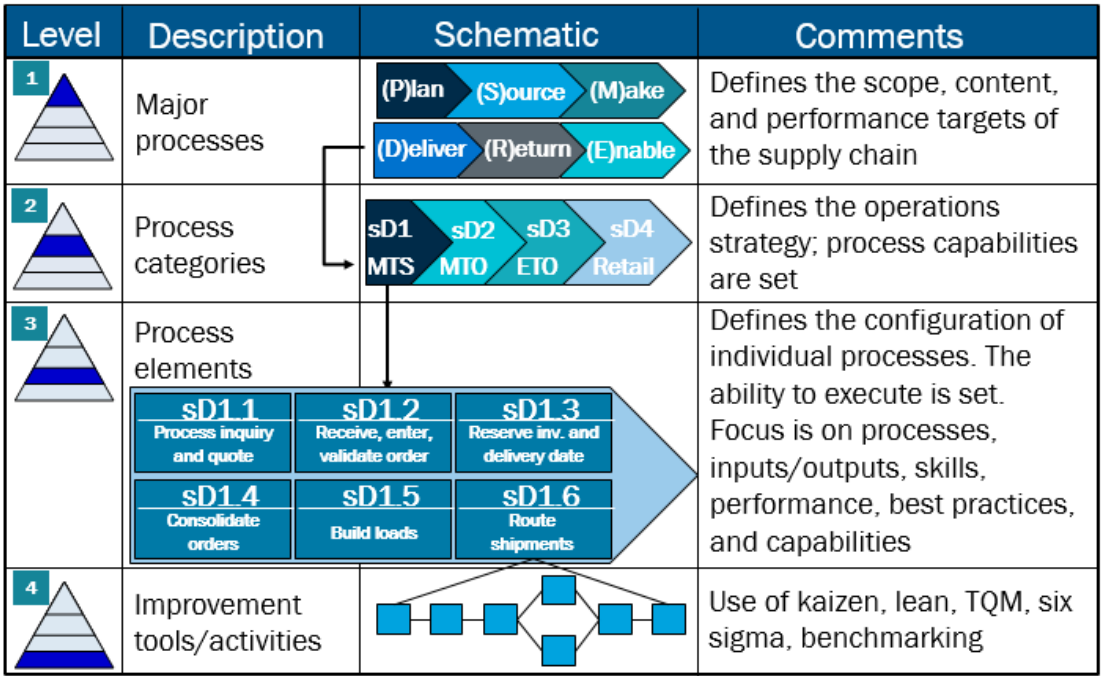


Graphic 3: SCOR is organized around six major management processes.

SCOR spans all customer interactions from order entry through paid invoice; all physical material transactions that occur from the supplier's supplier to the customer's customer, including transactions for equipment, supplies, spare parts, bulk products and software; and all market interactions from the understanding of aggregate demand to the fulfillment of each order. It does not attempt to describe every business process or activity. Specifically, SCOR does not address sales and marketing, including demand generation; product development; or research and development. However, these areas are covered in detail in the archived ASCM frameworks located in the ASCM Digital Library.

As shown in Graphic 4, the model is designed to support supply chain analysis at multiple levels. ASCM has focused on the top three process levels, which are industry neutral. SCOR does not attempt to prescribe how an organization should conduct its business or tailor its systems and information flow. Every organization that implements supply chain improvements using SCOR will need to extend the model, at least to level 4, using industry, organization and location-specific processes, systems and practices.

SCOR process hierarchy



Graphic 4: SCOR is a hierarchical process model.

It is important to note that this model describes processes, not functions. In other words, the model focuses on the activity involved, not the person or organizational element that performs the activity.

SCOR structure

SCOR is a process reference model. The purpose of a process reference model, or business process framework, is to define process architecture in a way that aligns with key business functions and goals. Architecture here references how processes interact and perform, how these processes are configured, and the skills requirements for the staff operating the processes. The SCOR reference model consists of four major sections:

- Performance includes standard metrics to describe process performance and define strategic goals.
- Processes offers standard descriptions of management processes and process relationships.
- Practices explains management practices that produce significantly better process performance.
- People comprises standard definitions for skills required to perform supply chain processes.

The SCOR model also contains a section for special applications. Special Applications are used for suggested SCOR additions that have not yet been tested thoroughly for integration into the model but that ASCM believes would be beneficial for SCOR users.

Performance

The Performance section of SCOR focuses on the measurement and assessment of the outcomes of supply chain process execution. A comprehensive approach to understanding, evaluating and diagnosing supply chain performance consists of three elements: performance attributes, metrics, and process or practice maturity. These elements, as distinct from the levels in the Process and metrics hierarchies, describe different aspects or dimensions of performance:

- Performance attributes are strategic characteristics of supply chain performance used to prioritize and align the supply chain's performance with the business strategy.
- Metrics are discrete performance measures that are composed of levels of a connected hierarchy.
- Process or practice maturity is a reference tool based on objective, specific descriptions that can be used to evaluate how well supply chain processes and practices incorporate and execute accepted best-practice process models and leading practices.

Performance attribute	Definition
Reliability	The ability to perform tasks as expected. Reliability focuses on the predictability of the outcome of a process. Typical metrics for the Reliability attribute include delivering a product on time, in the right quantity and at the right quality level.
Responsiveness	The speed at which tasks are performed and the speed at which a supply chain provides products to the customer. Examples include cycle-time metrics.
Agility	The ability to respond to external influences and marketplace changes to gain or maintain a competitive advantage. SCOR Agility metrics include Adaptability (AG.1.1) and Overall Value at Risk (AG.1.3).
Costs	The cost of operating the supply chain processes. This includes labor costs, material costs, and management and transportation costs. A typical cost metric is Cost of Goods Sold (CO.1.2).
Asset Management	The ability to efficiently utilize assets. Asset management strategies in a supply chain include inventory reduction and insourcing rather than outsourcing. Metrics include Inventory Days of Supply (AM.2.2) and Capacity Utilization (AM.3.9).

Table 1: The SCOR performance attributes

Reliability, Responsiveness and Agility are considered customer-focused. Cost and Asset Management are considered internally focused. All SCOR metrics are grouped within one of the performance attributes.

Each Performance attribute has at least one level-1 or strategic metric. These level-1 metrics are the calculations by which an organization can measure how successful it is in achieving its desired positioning within the competitive market space.

Performance attribute	Level-1 strategic metric
Reliability	• Perfect Order Fulfillment (RL.1.1)
Responsiveness	• Order Fulfillment Cycle Time (RS.1.1)
Agility	• Upside Supply Chain Adaptability (AG.1.1) • Downside Supply Chain Adaptability (AG.1.2) • Overall Value at Risk (AG.1.3)
Cost	• Total Supply Chain Management Costs (CO.1.1) • Cost of Goods Sold (COGS) (CO.1.2)
Asset Management	• Cash-to-Cash Cycle Time (AM.1.1) • Return on Fixed Assets (AM.1.2) • Return on Working Capital (AM.1.3)

Table 2: The SCOR level-1 metrics

The SCOR metrics are organized in a hierarchical structure. SCOR describes level-1, level-2 and level-3 metrics. The relationships between these levels is diagnostic. Level-2 metrics serve as diagnostics for level-1 metrics. This means that by looking at the performances of the level-2 metrics, performance gaps or improvements for level-1 metrics can be explained. This type of analysis of the performance of a supply chain is referred to as metric decomposition or root-causing. Similarly, level-3 metrics serve as diagnostics for level-2 metrics. The level of a metric is included in the codification of the metric itself.

Metrics codification starts with the performance attributes: Reliability is RL, Responsiveness is RS, Agility is AG, Cost is CO, and Asset Management is AM. Each metric starts with a two-letter code, followed by a number to indicate the level and then a unique numerical identifier. For example, Perfect Order Fulfillment (RL.1.1) is a level-1 metric within the Reliability attribute. Perfect Condition (RL.2.4) is a level-2 Reliability metric.

Process or practice maturity provides a qualitative comparison of supply chain processes and practices to descriptive representations of different levels of process and practice adoption and implementation. This evaluation measurement of supply chain process and practice effectiveness typically follows widely used models for practice maturity, which sometimes are referred to as capability maturity models. Numerous maturity models exist for supply chain management, and they typically follow a stages of maturity scale. On these types of scales, high-maturity processes employ, and often extend, best practices and are implemented with a high degree of discipline and compliance. By comparison, low-maturity processes are characterized by outdated practices or a lack of discipline and consistency. SCOR currently does not embed a prescribed maturity model framework and content directly into the SCOR model document. The Performance section provides an overview of this important element of supply chain performance, and SCOR users are encouraged to draw upon existing maturity models to develop and tailor the content to their industries and companies.

Processes

The Processes section of SCOR provides a set of predefined descriptions for activities most companies perform to effectively execute their supply chains. The six macro-level SCOR processes, Plan, Source, Make, Deliver, Return and Enable, are well-known and widely adopted. SCOR also identifies two more process levels. In this section, level indicates the span of the process. A level-3 process is focused on a more detailed activity. A level-1 process spans multiple level-3 processes. Graphic 4 shows the levels within the SCOR model processes.

Level-2 process categories determine the capabilities within the level-1 processes. The key level-2 processes are Make-to-Stock, Make-to-Order and Engineer-to-Order for Source, Make and Deliver processes and Defective; Maintenance, Repair and Overhaul; and Excess for Return processes. Level-3 processes are process steps that are performed in a certain sequence in order to plan supply chain activities, source materials, make products, deliver goods and services, and handle product returns.

Companies may develop standard process descriptions for activities within the level-3 processes, which would become level-4 processes. These processes generally are industry-, product-, location- or technology-specific. For example, most if not all companies need to perform a task known as receive, enter and validate a customer order. This is a level-3 process (sD1.2, for example). The level-4 processes would describe the steps to receive the order, such as whether the order was received electronically, over the phone or in person. Each of these scenarios may require a unique level-4 process description. Another step could be how the order is entered and processed. For example, electronic orders may be automatically processed by software, phone orders might be handled by the order desk, and in-person orders would be handled at the checkout counter.

The level at which processes need to be described depends on the project. For most projects, level-2 process diagrams help identify structural issues in the supply chain, such as why a company has a warehouse feeding a warehouse feeding a warehouse or why lead times for certain sources are longer.

Level-3 process diagrams help identify decision points, triggers and process disconnects. For example, consignment inventory is described at level 3. Another sourcing alternative, vendor-managed inventory, also is defined at level 3. Both need the standard level-3 processes, but the way these processes are sequenced and who performs them is the differentiator.

Process codification differs by level. Level-1 processes are represented by a capital letter preceded by a lowercased S, which stands for SCOR. sP represents Plan, sS identifies Source, sM labels Make, sD denotes Deliver, and sR marks Return. Most level-2 processes add a number, such as in sD1 for Deliver Stocked Product and sP3 for Plan Make. Level-3 processes add a period followed by a unique number, such as in sD1.1 for Process Inquiry and Quote and sD1.2 for Receive, Enter and Validate Order. Exceptions exist for Return processes. Level-2 Return processes are split into Source Return (sSR) and Deliver Return (sDR) processes to acknowledge the difference between returning something yourself or receiving a return from your customer. The level-3 processes are aligned with these codes; for example, sDR1.1 is Authorize Defective Product Return.

Practices

The practices section provides a collection of industry-neutral practices that companies have recognized for their value. A practice is a unique way to configure a process or a set of processes. The uniqueness can be related to the automation of the process, a technology applied in the process, special skills applied to the process, a unique sequence for performing the process, or a unique method for distributing and connecting processes between organizations.
SCOR recognizes that several different qualifications of practices exist within any organization and therefore includes emerging practices (EP), best practices (BP) and standard practices (SP). SCOR also recognizes the qualification of a practice may vary by industry or geography. For some industries, a practice may be standard, whereas the same practice may be considered an emerging or best practice in another industry. The SCOR classification of practices has been established based on input from practitioners and experts from a diverse range of industries.

All SCOR practices have been mapped to one or more classifications. SCOR recognizes 19 classifications, which help identify practices by focus area, such as inventory management or new product introduction.

Practices also are mapped to one or more practice pillars, namely Analytics and Technology, Process, and Organization. The pillars help identify where a given practice has the most impact and can provide maximum benefit.

People

The People section of SCOR was introduced in SCOR v10 and provides a standard for describing skills required to perform tasks and manage processes. Generally, these skills are specific to supply chain management, but some skills may be applicable outside the supply chain process domain as well.

Skills are described by a standard definition and association to other People aspects, namely experiences, training and competency levels. Competency levels are not included in the framework descriptions, but SCOR recognizes five commonly accepted competency levels:

- A novice is an untrained beginner with no experience who requires and follows detailed documentation.
- A beginner performs the work with limited situational perception.
- A competent employee understands the work and can determine priorities to reach goals.
- A proficient individual oversees all aspects of the work and can prioritize based on situational aspects.
- An expert has intuitive understanding and can apply experience patterns to new situations.

These competency levels are used similarly as process or practice maturity levels. The person or job specification is evaluated on the found, in the case of a person, or desired, in the case of a job specification, level of competency.

Codification within the People section represents skills, experiences and training. All People elements start with a capital H followed by a capital letter representing the element: S is for skills, E is for experiences, and T is for training. These are followed by a period and a four-digit number. For example, HS.0046 is the code for the skill Enterprise Resources Planning Systems, and HT.0007 is the code for APICS Certified Supply Chain Professional training.

Special Application: SustainableSCOR

SustainableSCOR offers a set of strategic environmental metrics to supplement the SCOR model to create a framework for environmental accounting. These metrics are closely aligned with the Global Reporting Initiative (GRI) Standards, which are the go-to standards for corporate sustainability reporting. The GRI Standards create a common language for organizations and stakeholders through which the economic, environmental and social impacts of organizations can be communicated and understood. The standards are designed to enhance the global comparability of and the quality of information about these impacts, thereby enabling greater transparency and accountability.

By adding SustainableSCOR metrics to the SCOR model, an organization can use the existing SCOR-based methods for defining supply chain scope and configuration. Once this process is complete, SustainableSCOR metrics allow for targeted, structured data collection and calculation of metrics, which ultimately provides a total view of supply chain environmental performance.

There are multiple other benefits to using the SCOR model as an environmental accounting framework:

- The framework clearly ties the various emissions to the originating processes, providing a structure not just for measuring performance but also for identifying where action can be taken to improve performance.
- The hierarchal nature of the SCOR model allows for strategic environmental footprint goals to be easily translated to targets in specific activities. Likewise, when strategic goals are not being met, the framework provides a structure for root cause analysis as well as end-to-end supply chain and value chain network optimization related to environmental performance.
- As with other SCOR model metrics, these metrics have clear definitions and a tie to process activities that provide a foundation for effective benchmarking. This capability allows companies to compare the environmental performance of their supply chains using the same methods currently used for comparing other types of business performance.

ASCM believes that this metrics structure provides an effective tool for environmental supply chain and value chain accounting. However, this approach is not currently in use; therefore, these metrics are not included as fully approved SCOR metrics and instead are included as a special application.

SCOR improvement program and SCOR Racetrack

The SCOR Racetrack model describes how to organize a SCOR improvement program using the SCOR process and supporting methodologies

The methodology is described in five distinct steps:

- Pre-SCOR program steps: Prepare the organization for the mission-critical SCOR improvement program.
- Set the scope: Understand the business environment and define the scope of the supply chain for a SCOR improvement program.
- Configure the supply chain: Determine the performance metrics and processes of the SCOR improvement program.
- Optimize projects: Establish the project portfolio including process scope, priority and anticipated benefits.
- Ready for implementation: Implement projects in the portfolio and commence benefits realization.

See Graphic 5 on the next page to view the SCOR Racetrack model in detail. The SCOR improvement methodology currently is described in full in the SCOR-Professional training material.

Graphic 5: SCOR Racetrack model

SCOR v13 Updates

The SCOR model is developed and maintained by the voluntary efforts of ASCM members and supply chain industry subject matter experts. ASCM depends on the contributions of its members to actively advance the state of knowledge in supply chain by identifying required model changes, researching and validating those changes, and developing the consensus regarding the proposed changes.

The following updates were included in this revision of the SCOR framework.

Performance

All metrics were reviewed and updated for accuracy and effectiveness.

A new metric was introduced in this edition: Risk Mitigation Costs (Enable) (CO.3.23).

Also, the names of two metrics were updated:

- Schedule Product Deliveries Cycle Time (RS.3.122) was changed to Schedule Deliver Return Products Cycle Time for clarity.
- Verify Product Cycle Time (RS.3.140) was updated to Verify Raw Material or Product Cycle Time for clarity.

Process

All processes were reviewed and updated for accuracy and effectiveness.

Practices

All practices listed in the SCOR Digital Standard were carefully reviewed and rearranged into the appropriate section: emerging, best or standard. All changes were validated by supply chain subject matter experts.

In addition, the codification of practices was updated to include special coding for each type of practice. Emerging practices now are labeled as EP, best practices now are labeled as BP, and standard practices now are labeled as SP. This is intended to help with the identification of practices.

The names of several practices were updated:

- Consignment Inventory with Key Suppliers (BP.036) was changed to Consignment Inventory with Suppliers to broaden the practice.
- Supplier Delivery Performance Analysis (SP.068) was updated to Supplier Performance Reporting to better align with evolving industry terminology.
- Alternative Supplier Benchmarking (BP.131) was changed to Request for Information to better align with the APICS Dictionary.
- Issue Invitation to Tender (Quote) (SP.132) was changed to Request for Quote to better align with the APICS Dictionary and evolving industry terminology.
- Vendor Collaboration (BP.145) was changed to Supplier Collaboration to better align with evolving industry terminology.
- Enterprise-Level Spend Analysis (BP.161) was changed to Spend Analysis to better align with the APICS Dictionary.

Nineteen new practices were introduced in this version update, namely

- EP.189 Augmented Reality
- EP.190 Robotic Process Automation

- EP.191 Artificial Intelligence
- EP.192 Big Data Analytics
- EP.193 Should Cost Modeling
- EP.194 Predictive Analytics
- EP.195 Digital Twin
- EP.196 Smart Contracts
- EP.197 Advanced Data Visualization and Visibility
- EP.198 Real-Time Location System
- EP.199 Autonomous Delivery
- EP.200 Stocktaking via Drones
- EP.201 Dynamic Inventory Management
- EP.202 Quick-Response Code
- EP.203 Mobile Distribution Center
- EP.204 Machine Learning
- EP.205 Dynamic Routing
- EP.206 Virtual Reality
- EP.207 Multi-Enterprise Business Networks.

Lastly, all practices have been mapped to one or more practice pillars, namely Analytics and Technology, Process, and Organization. The pillars help identify where a given practice has the most impact and can provide maximum benefit. Adding this dimension to the SCOR model helps to recognize the impact that practices may have for company leaders leveraging the SCOR model to establish or redefine their supply chain practices.

People

All skills were reviewed and updated for accuracy and effectiveness.

Data Analysis (HS.0195) was added as a skill as a counterpart to Data Management (HS.0033).

In addition, the names of eight skills were updated:

- Change Notice Development (HS.0019) was updated to Change Order Development to better align with the APICS Dictionary.
- Cost/Price Analysis (HS.0024) was split into Cost Analysis (HS.0024) and Price Analysis (HS.0194) to add further details and specifications.
- ID & Damage Inspection (HS.0049) was changed to Receiving Inspection to better align with evolving industry terminology.
- Legislation and Standards (HS.0066) was changed to Regulations, Laws and Standards for clarity.
- Logistics and Freight (HS.0071) was shortened to Logistics to broaden the scope of the skill.
- Material Safety Data Sheet, Certificate of Compliance, Bill of Lading and Environmental Interpretation (HS.0080) was changed to Safety and Environmental Compliance to broaden the scope of the skill.
- Requirements Allocation (HS.0113) was changed to Requirements Identification to better align with evolving industry terminology.
- Risk Assessment (HS.0125) was changed to Risk Analysis to better align with the APICS Dictionary.
- Solicitation/Competitive Bidding Process (HS.0135) was shortened to Solicitation.

Special Application Update

Introducing the ASCM SCOR Digital Standard Information Model (SDSIM)

As organizations are reviewing and revising their supply chain processes and capabilities to support new digital business models, there is a recognized need to enrich the SCOR model with a formal, unified information model to support digital strategies. ASCM members and subject-matter experts have created just that for this edition of SCOR. The ASCM SCOR Digital Standard Information Model (SDSIM) captures all key elements of the supply and value chain domain in a formal, machine-readable format ideal for importing ASCM enterprise domain information into computer systems. Stating the combined domain knowledge in an unambiguous and digital manner assists with the domain's digital transition.

To gather, unify and communicate data from different sources, departments and organizations without loss of content, meaning or functionality requires a universal and flexible language that is understood by all participants, humans and machines alike. A well-defined information model can serve as such a language.

The ASCM Information Model is composed of two information models. The first is the SDS Information Model, which depicts an abstract view of SCOR and archived ASCM frameworks, CCOR, DCOR and PLCOR. All of this information is integrated into a single upper-level information model featuring all jointly used concepts within these value chain frameworks. The model incorporates practices, skills, processes, metrics, events and plans and maps them in relationship to each other. In most cases, elements from the Provenance Ontology, a widely adopted World Wide Web Consortium recommended standard, are used to describe the relationships. This section also uses examples from the SCOR model to demonstrate how SDSIM architecture is imported and implemented for the supply chain domain.

This edition of SCOR also features the initial conceptualization of the SCOR Information Model. All SCOR practices and skills as well as level-1 and level-2 metrics and processes are modeled. The first complete version of the SCOR Information Model, which will be released at a later date, will contain the complete SCOR model framework.

The detailed documentation for the information model is available at scor.ascm.org. The machine-readable versions in RDF will be available at a future date. This information is highly technical in nature and is intended for the use of supply chain managers in conjunction with their information technology teams.

As the SDSIM has not yet been fully developed or tested, the entire ASCM Information Model is being included in the Special Applications section of this version of SCOR. Both the SDSIM architecture and SCOR information models may shift over time as they are further developed and refined. The SCOR team welcomes your feedback.

Contributors to the SCOR Digital Standard

The development of SCOR depends on the support and input of SCOR practitioners, subject matter experts and ASCM members. The following individuals have devoted time and effort to the development of the SCOR Digital Standard. Thank you!

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Visit scor.ascm.org for more information regarding the SCOR framework. The SCOR Digital Standard is available to all ASCM members on the ASCM website at ascm.org.

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